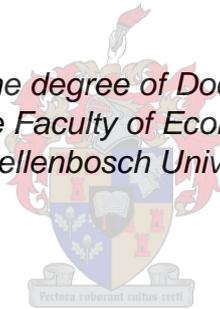


METHODOLOGICAL AGILITY IN THE ANTHROPOCENE
AN EMERGENT, TRANSFORMATIVE TRANSDISCIPLINARY RESEARCH APPROACH

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December 2019

DECLARATION

By submitting this dissertation electronically, I declare that the entirety of the work contained therein is my own, original work, that I am the sole author thereof (save to the extent explicitly otherwise stated), that reproduction and publication thereof by Stellenbosch University will not infringe any third party rights; and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

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ABSTRACT

The publication in 2002, by Nobel Laureate Paul Crutzen, of the ushering in of the Anthropocene, with the inception of the Industrial Revolution in Europe and North-America in the 18th – 19th centuries, has had some far-reaching ontological, epistemological, ethical and methodological implications for our intellectual/academic endeavours. This is the case, because never before in human history on earth were we required to face the global consequences of our own actions since the dawn of this new human-induced geological epoch.

Starting at the ontological level, today we are facing the planetary consequences of non-linear human-nature causal relations – i.e. witnessing the once literally unimaginable and universally accepted fact of the immutability of all natural laws and processes. In view of the overwhelming empirical evidence of the anthropogenic causes of climate change and global warming such strongly held views / theories of the ‘objectivity’ of nature is no longer necessarily valid. On the contrary, today it has become quite plausible to accept that *human actions* are responsible for interfering with and changing some of the earth’s four billion year old / evolved processes – such as, for example, the earth’s temperature self-regulating mechanisms. Very importantly, though, is that this interference and change of the latter has occurred to such an extent that we can no longer speak of the latter as purely ‘natural’ occurring processes.

At the epistemological level, this truly unprecedented change in causal human-nature relations, means that we are no longer challenged with the oft-repeated philosophical questions of *what* is knowledge and *how* it is produced *only*. Equally, if not more, important is the question *for what* are we producing knowledge? In the Anthropocene, it no longer suffices to produce knowledge that is concerned with the understanding (*Verstehen*) and explaining (*Erklärung*) of the anthropogenic causes of the Anthropocene *only*; we are also, at the same time, challenged to produce knowledge that can contribute to changing (*Verändern*) our thinking and actions responsible for (causing) the Anthropocene in the first place – i.e. producing practical knowledge capable of contributing to social change (*Verändern*) – in short, co-producing transformation knowledge.

However, co-producing transformation knowledge in the Anthropocene is not an end in itself. Transformation knowledge is inextricably linked to ethics / ethical questions with an explicit interest in figuring out how we should act *appropriately* and *fairly / justly* in the context of the Anthropocene today. This, in turn, means facing a triple-challenge of co-producing theoretical,

practical and normative knowledge which addresses the complex problem situations facing us in the Anthropocene today. *No action* is arguably the worst form of action to take in the Anthropocene, especially when considering that that the latter is the result of some deep-rooted structural socio-economic inequalities between the rich and the poor in the world. The quest for taking *appropriate* action is, therefore, fundamentally entangled with the question of figuring out how to act in a fair / just manner that can somehow contribute to *undoing* some of the historical injustices responsible for the Anthropocene – rather than *reproducing* the latter.

Dealing with these non-separable ontological-epistemological-ethical considerations and questions in the context of the Anthropocene have, indeed, far-reaching methodological implications – warranting some trans-disciplinary responses capable of doing science *with* society – rather than just *on, about* or *for* society – which are, normally, done from much more restricted perspective of *only* dealing with the study of certain (disciplinary) methods. On the contrary, in the context of the Anthropocene what is required today are trans-disciplinary approaches capable of going *beyond* (the ‘trans’ in trans-disciplinarity) such reductionist (methods-only) approaches, by engaging *with* complex societal challenges – which, in the process of doing so, are capable of venturing and crossing into the philosophical provinces of ontology, epistemology, logics, ethics etc. – *shaping* and *being shaped* by the latter.

However, there is an inherent risk in presenting such trans-disciplinary approaches as some or other methodological panacea – i.e. something which is relevant for ALL the different kinds of problem situations we are encountering in the Anthropocene today. Falling into this trap should be avoided at all costs, because not ALL problem situations faced in the Anthropocene today are necessarily complex problem situations. Indeed, some are straightforward / simple, others complicated and still others chaotic – for which there are certainly more appropriate methodological responses such as mono-, multi- and inter-disciplinarity, for example. In other words, it is much better to imagine trans-disciplinarity as one amongst a few context- or domain-relevant methodological responses; with the understanding that trans-disciplinarity is much more specifically focussed on and interested in tackling *complex* societal challenges that are considered *too complex* for tackling strictly from *within* single disciplinary boundaries *only*, but rather warrant methodological approaches capable of working both *across, between* and *beyond* disciplinary boundaries – including engaging with social actors’ non-academic knowledge systems.

The implications of working with such different domain-relevant methodologies, in turn, implies being or becoming methodologically *agile* – i.e. the ability to switch *between* and *within* the said different domain-relevant methodologies as and when required by any changes occurring

in the problem situations (contexts) at hand. This should not, however, be confused with the much more onerous Kuhnian notion of ‘paradigm switching’, which is simply too arduous an undertaking for the nimbleness required when facing ever-changing problem situations in the Anthropocene today.

In light of the above, the fundamental focus of this study is on developing such an agile transdisciplinary methodology – with an explicit interest in contributing to just and sustainable social change in/to the complex societal challenges facing us in the Anthropocene today in a manner that is mindful of not falling into the said trap of presenting itself as a panacea for ALL the different kinds of problems situations facing us in the Anthropocene today. In short, such an agile transdisciplinary methodology will be referred to throughout this study as an emergent, transformative transdisciplinary research (ETTDR) approach.

OPSOMMING

Die publikasie in 2002, deur die Nobel Laureaat Paul Crutzen, van die aanvang van die Antroposeen, sedert die Industriële Revolusie in Europa en Noord-Amerika in die 18de – 19de eeu, het verreikende ontologiese, epistemologiese, etiese en metodologiese implikasies vir ons intellektuele/akademiese strewes meegebring. Dit is die geval, omdat nog nooit voorheen in die geskiedenis van die mens op die aarde is van ons verwag om sedert die aanbreek van hierdie nuwe mensgeïnduseerde geologiese tydperk, die globale gevolge van ons eie optrede/aksies die hoof te bied nie.

Beginnende by die ontologiese vlak, wat ons vandag in die gesig staar is die planetêre gevolge van nie-lineêre mens en natuur oorsaaklike verhoudings – dit is die waarneming van 'n fundamentele klem verskuiwing in die eens letterlik ondenkbare en universeel-aanvaarde feit van die onveranderlikheid van alle natuurwette en –prosesse. In die lig van die oorweldigende empiriese bewyse en antropogeniese oorsake van klimaatsverandering en aardverwarming is hierdie sterk opvattinge en teorieë nie meer noodwendig geldig nie. Intendeel, vandag is dit heel wetenskaplik aanvaarbaar om te erken dat *menslike optrede* verantwoordelik is vir die inmenging met en verandering van die aarde se vier biljoen jaar oue geleidelik ontstaande en selfregulerende temperatuurmeganismes, in so 'n mate dat ons nie meer na laasvermelde kan verwys as 'n suiwer 'natuurlike' proses nie.

Op die epistemologiese vlak, beteken hierdie ongekende verandering in die mens en natuur kausale verhoudings dat ons nie meer alleenlik te staan kom voor die tradisionele filosofiese vrae oor *wat* kennis is en *hoe* dit voortgebring word nie. Ewe, indien nie meer, belangrik is die vraag: *waarvoor* bring ons kennis voort? Dit is nie langer voldoende om *slegs* kennis voort te bring wat alleenlik bydra tot ons verstaan (*Verstehen*) en verduideliking (*Erklärung*) van die antropogeniese (mensgeïnduseerde) oorsake van die Antroposeen. In die konteks van laasvermelde word daar ook, terselfdertyd, verwag dat ons kennis voortbring wat kan bydra tot die verandering (*Verändern*) van ons denkwyses en optredes wat in die eerste plek verantwoordelik is vir die oorsake van die Antroposeen – m.a.w die produksie van praktiese kennis wat tot sosiale verandering kan bydra. – kortliks: die mede-produksie van transformasie-kennis.

In die Antroposeen is die mede-produksie van transformasie-kennis egter nie 'n doel opsigself nie, aangesien dit onlosmaaklik met etiek / etiese vrae verbind is met 'n eksplisiete interesse in die vraag oor *hoe* ons toepaslik en regverdig / billik vandag in die konteks van die

Antroposeen moet optree? Dit, op sy beurt, beteken dat ons voor 'n drieledige uitdaging vandag te staan kom oor *hoe* om teoretiese, praktiese en normatiewe kennis voort te bring wat komplekse probleemsituasies in die Antroposeen aanspreek. *Geen optrede* is waarskynlik die ergste vorm van aksie om in die Antroposeen te neem, veral met dié wete voor oë dat laasvermelde die gevolg is van sommige diepgewortelde strukturele sosio-ekonomiese ongelykhede tussen die wêreld se rykes en armes. Die soeke na die neem van gepaste aksie is daarom onlosmaaklik verstrengel met die vraag oor *hoe* om op 'n regverdige/billike wyse op te tree op só 'n wyse dat dit kan bydra tot die *ontknoping* van sommige van die historiese onregverdighede wat tot die ontstaan van die Antroposeen gelei het – eerder as om laasvermelde te *reproduseer*.

Die hantering van sulke onlosmaaklike ontologies-epistemologies-etiese oorweginge en vrae het verreikende metodologiese implikasies vir die manier waarop ons navorsing doen in die Antroposeen. Hiervoor is daar sekere trans-dissiplinêre benaderings benodig word, wat daartoe instaat is om wetenskap doelgerig *saam met* die gemeenskap te bedryf – eerder as om net kennis *oor* of *vir* die gemeenskap te lewer. Sulke pogings gaan gewoonlik gepaard met baie beperkte benaderings wat die konsep van metodologie gewoon wil reduceer tot die studie van sekere dissiplinêre metodes. Wat vandag, in die konteks van Antroposeen, benodig word is trans-dissiplinêre benaderings wat verder kan gaan (i.e. 'trans' in trans-dissiplinêr) as sulke reduktionistiese, instrumentele benaderings. M.a.w. navorsingsmetodologieë wat daartoe instaat is om op so 'n wyse met *komplekse* samelewingsprobleme om te gaan dat dit die intense wisselwerking tussen metodologie en die filosofiese sferes van ontologie, epistemologie, etiek etc. aanspreek.

Daar is egter 'n inherente risiko daaraan verbonde om sodanige trans-dissiplinêre benaderings aan te bied as een of ander tipe metodologiese wondermiddel wat relevant en bevoeg is om letterlik AL die verskillende probleemsituasies wat ons vandag in die Antroposeen in die gesig staar, aan te spreek. Hierdie lokval moet ten alle koste vermy word, aangesien ALLE probleemsituasies wat ons vandag in die Antroposeen ervaar nie noodwendig *komplekse* probleemsituasies is nie. Sommige is voorwaar heel duidelik/eenvoudig, ander is ingewikkeld en nog ander is chaoties van aard – waarvoor daar duidelik meer gepaste metodologiese benaderings is, soos byvoorbeeld: mono-, multi- en inter-dissiplinêre benaderings. Met ander woorde, dit is baie beter om die trans-dissiplinêre benadering te sien as een van enkele konteks- of domein-relevante metodologiese benaderings. Met dit in gedagte, is die fokus van transdissiplinêre navorsing baie meer spesifiek gerig op die hantering van *komplekse* samelewingsuitdagings – i.e. probleemsituasies wat as *te ingewikkeld* beskou word om streng net vanuit enkel-dissiplinêre

grense aan te pak, eerder benader moet word deur *oor*, *tussen* en *buite* dissiplinêre grense heen te beweeg – insluitende die betrokkenheid van nie-akademiese kennisstesels.

Die implikasies om met sodanige verskillende domein-relevante metodologieë om te gaan, impliseer weer op sy beurt 'n breë ingestelheid van *metodologiese behendigheid* – i.e. die vermoë om oor te skakel *tussen* die vermeldde domein-relevante metodologieë – waar en wanneer sulke skuiwe nodig geag word in die lig van enige veranderinge wat in die probleemsituasies na vore kom. Sodanige oorskakeling tussen verskillende domein-relevante metodologieë moet egter nie verwar word met die Kuhnian-begrip van 'paradigma skakeling' nie, omdat laasvermelde eenvoudig te gewigtig is vir die beweeglikheid wat vereis word deur die gedurig-veranderende probleemsituasies (kontekste) in die Antroposeen.

In die lig hiervan is die basiese fokus van hierdie studie gerig op die ontwikkeling van so 'n beweeglike transdissiplinêre metodologie – 'n benadering met 'n eksplisiete interesse om regverdige en volhoubare maatskaplike verandering aan te bring in genoemde komplekse probleemsituasies wat ons vandag in die konteks van die Antroposeen in die gesig staar. In kort, daar sal regdeur hierdie studie na so 'n behendige transdissiplinêre metodologie as 'n ontluikende, transformatiewe transdissiplinêre navorsingsbenadering (ETTDR) verwys word.

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ACRONYMS

CST	Centre for Complex Systems in Transitions
ETTDR	Emergent Transformative Transdisciplinary Research
ERC	Ekanini Research Centre
ID	Interdisciplinarity / Interdisciplinary
MOD	Monodisciplinarity / Monodisciplinary
MD	Multidisciplinarity / Multidisciplinary
SPL	School of Public Leadership
SES	Social Ecological Systems
SU	Stellenbosch University
SI	Sustainability Institute
SD	Sustainable Development
ToC	Theory of Change
TD	Transdisciplinarity / Transdisciplinary
TDCS	Transdisciplinary Case Study
TDCSR	Transdisciplinary Case Study Research
TTDR	Transformative Transdisciplinary Research

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† Russel Botman passed away in 2014

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*“The road is
made by
walking”*



Antonio Machado

CHAPTER 1: OBJECTIVES AND MODUS OPERANDI OF THE STUDY

The main focus of this study is methodological with the view of contributing to developing transdisciplinarity (TD) as a research methodology that is fundamentally and simultaneously collaborative, transformative and agile. In other words, a systematic attempt will be made in this study to integrate these three aspects into an emergent, transformative transdisciplinary research (ETTDR) that approach that is capable of working in and on complex problem situations in fluid social environments by not only focusing on the *understanding* and *explaining* (*Verstehen / Erklärung*) of the complexity of the contextual problem situations at hand, but also figuring out how to *changing* it (*Verändern*).

Before proceeding with an explanation of the modus operandi of how this will be tackled, the following graphic / visualisation depicts the essence of this integration challenge at hand:

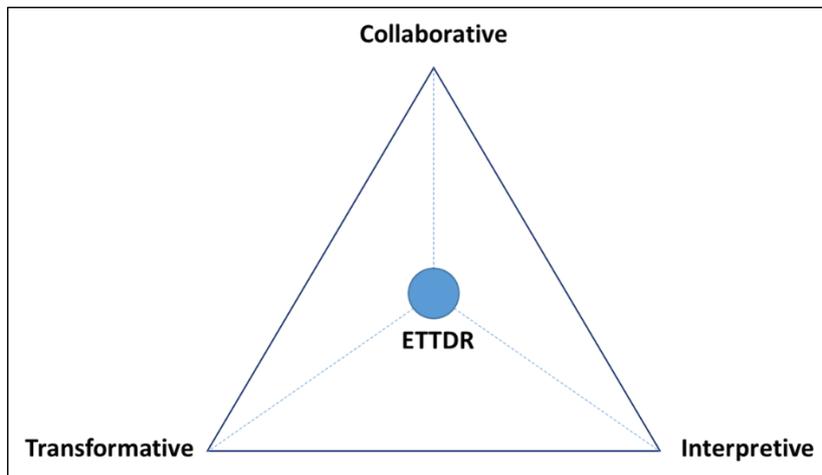


Figure 1: Triadic Relativity of ETTDR

Source: By Author 2019

Figure 1 denotes the methodological agility of ETTDR in terms of a three-way set of inextricably interconnected relationships – in short, the triadic relativity of ETTDR. By this is simply meant a dynamic methodological approach allowing for emergence in a manner that is both collaborative (working *between* and *across* disciplinary and non-disciplinary boundaries), interpretive (making sense in / of the emergent situation / context – meaningmaking), and transformative (contributing to social change in / to the emergent problem situation at hand).

In Figure 1 the ETTDR approach has been located in an ideal-typical position – signified by the blue ball – conferring a completely equal value / weighting (e.g. 33,3%) on all three fundamental aspects making up the ETTDR approach. However, in practice this will very seldom, if ever, be case. On the contrary, in emerging real-world situations, on-going change

in circumstances and focus of what is needed is what should be expected, rather than some or other fixed / static centre position with all three – the collaborative, transformative and interpretive aspects – remaining fully intact in terms of their equal (33,3%) importance / weighting in relation to each other.

What is required is a more dynamic way of imagining the internal dynamics of the ETTDR approach. This is indeed the purpose of the above dynamic triadic structure – suggesting that a change in the direction of any one of the three fundamental aspects can certainly be imagined, without necessarily severing any of the crucial three-way connections linking all three aspects in a mutually constitutive way with each other. In other words, a shift in the need and emphasis towards one of the three aspects still means remaining connected to the other two aspects. For example, a move more in the direction of the interpretive aspect (e.g. 60%) could mean less of a focus on the transformative and collaborative aspects (e.g. 20% each) – but not necessarily at the cost of completely obliterating either of the latter two aspects equally responsible to constituting the ETTDR approach.

The blue ball in Figure 1 therefore does not symbolise some or other perfectly integrated end-goal to be achieved in / under (even irrespective of) all real-life changes in the context and issues at hand. Instead, the purpose of Figure 1 is to enable a dynamic understanding of how certain shifts in emphasis / priorities can and do occur in different directions, whilst, at the same time, retaining some measure of all the fundamental aspects of the matter(s) of concern under discussion. In other words, a triadic integrative logic suggests that it is more a matter of degree than kind, namely of acknowledging changes in the center of gravity (main focus), symbolised by the blue ball, and working with any uneven weight distributions that might emerge from this – rather than being forced into a position of having to make strong binary choices between seemingly mutually exclusive situations. This is particularly important when dealing with the consequences of real-world emergence – i.e. when facing ever-changing and evolving new (even unexpected) real-life situations and having to respond to the latter in a methodologically agile manner.

This is indeed the logic and approach that will be followed throughout this study¹ in pursuit of developing, as systematically as possible, the notion of methodological agility consisting of the continuous interacting (mutually constituting) of the said – collaborative, transformative and interpretive – aspects of the ETTDR methodology. The latter is particularly attuned to the

¹ See [Section 7.2](#) below for an even more detailed explanation of how to go about working integratively with the internal dynamics between ontology, epistemology and ethics, using this same triadic mode of reasoning.

fact that context matters and for this reason that the Anthropocene² is brought into the discussion on methodology right from the onset as a concrete example of the importance of context at all levels.

In this regard, it matters hugely, methodologically speaking, how something like the Anthropocene has been imagined and framed. Although the anthropogenic nature of the Anthropocene has been acknowledged as the most important aspect of the latter in the literature, the general trend (especially amongst earth scientists) has been to frame the Anthropocene as something akin to a 'polycrisis' (Morin and Kern, 1999). By this is simply meant focusing almost exclusively on the 'exteriority' of the Anthropocene – i.e. conceiving of the latter as a new human-induced geological epoch comprising of multiple, irreducible, interconnected problems existing independently from our 'interior' phenomenological world of (human) experiences, perceptions and observations.

What is missing from this perspective of the polycrisis becomes abundantly clear when the Anthropocene is viewed through another lens, i.e. the lens of a 'meta-crisis' (Bhaskar et al., 2015). Bhaskar and his colleagues have come up with this concept certainly not to deny the 'objective' nature of the Anthropocene, but rather, and very importantly, to stress the social character of the latter in the sense that said interconnected crises are also *situated within an inter-subjective context of 'interior' meaning-making* (Bhaskar et al., 2015). In other words, the Anthropocene is not just a so-called earth-systems problem *only* of interest to natural or earth scientists, but also comprises philosophical, existential, religious, worldview, psycho-spiritual dimensions that are essential to include in an adequate understanding of the complex dynamics in play in order to facilitate more effective responses.

As mentioned, the methodological implications of approaching the Anthropocene not only as a so-called polycrisis, but *also* as a meta-crisis are indeed far-reaching. By bringing the interior world of human sense-making into the discussion, indeed matters hugely for the way in which we respond to the Anthropocene methodologically. Although the latter has already been written about in the TDR literature ([Seidl et al., 2013](#)), to my knowledge, no successful attempts have as yet been made to systematically integrate the above mentioned three fundamental aspects into a coherent ETTDR methodology capable of tackling the Anthropocene as *both* a poly- and meta-crisis. To be sure, in the literature on TDR, a lot of emphasis has been placed on the collaborative, and even transformative, aspects. However, in so doing, not sufficient attention has been given to the challenge of figuring out how deal

² See [Annexure A](#) (included in this document) for a selection of some key definitions and understandings of the Anthropocene.

more systematically with the interior world of human meaning-making in the context of the Anthropocene, and bringing this into TDR approaches and processes.

A fundamental question in this study is therefore how we respond to Anthropocene as both a poly- and meta-crisis in a *methodologically agile* manner if by methodology we mean, in broad terms, not *only* the study of methods, but *also* the logics and principles underlying and guiding our scientific inquiry – in a manner which allows for our methodological reflections and decision-making to cross into *the philosophical provinces of logic, epistemology, and ontology* (Baugh Jr and Baugh, 1990; Blumer, 1986).

It must be said from the outset that the intention with developing the ETTDR approach is not to establish a so-called new general ‘Science’ per se which can be pursued as some sort of a panacea for ALL problem situations encountered in the Anthropocene. On the contrary, as mentioned, the intention is to develop ETTDR as an agile, new methodology for *doing science with society* in a context-relevant manner. This will be explained in more detail in [Chapter 4](#) below, but suffice it to mention here that it is critically important not to approach the Anthropocene as some or other homogeneous reality producing and presenting us *only* with *complex* problem situations. On the contrary, we may also encounter other and very different kinds of problem situations that are *not* necessarily complex, but rather straightforward, complicated or chaotic – which indeed may not require transdisciplinary responses, but rather any one, or combination of, mono-, multi- and inter-disciplinary methodological approaches

This is in essence what is meant by *methodological agility*, namely making sense of the contexts within which different kinds of problem situations are embedded and encountered and, then, in the light this sensemaking, understanding *when* to switch between the different methodologies and, then, more specifically in light of this, understanding *how* to pursue an ETTDR approach when facing *complex* problem situations – and in so doing, avoiding the risk of using the proverbial sledgehammer to crack a nut. In other words, in the interest of being / becoming methodologically agile, we need to be careful of not falling into the trap of using the internal logics, principles and methods of the different methodologies interchangeably. The latter are not just part of some or other methodological toolbox that can merely be accessed and utilized at will – irrespective of the differences in the design, purposes and functions etc. of the methodologies

To this end, in developing ETTDR as an appropriate research approach for dealing with complex problem situations in a methodologically agile manner, the following modus operandi will be followed in this study:

- [Chapter 2](#) will discuss the rationale of the study by asking three separate, but linked questions: What is ETTDR? Why ETTDR? And, ETTDR *for* what? This discussion will connect the notion of doing transformative research with society with the notion of methodological agility – in so doing, laying the groundwork for developing these ideas further and deeper in the ensuing chapters of this study.
- [Chapter 3](#) will focus on the challenges of initiating an intentional Transdisciplinary Case Study (TDCS) – known as the Enkanini case study – having to deal with real-world contexts of emergence / complexity and concomitantly high levels of uncertainty and unpredictability. From this invaluable experience has emerged an approach that will be referred to as ETTDR design and strategy-making – which basically means that the research process can be co-designed and co-constructed as the research process *unfolds* together with the social actors participating in the process. This will lay the groundwork for what is to follow in the ensuing two chapters on multi-track ETTDR processes and the guiding logics, principles and senses necessary for steering the research process in a transformative direction.
- [Chapter 4](#) will introduce the first of two or three heuristics in the form of an adapted version of the Cynefin multi-ontology decision-making framework – positing four different kinds of contexts: also known as the obvious / simple, complicated, complex and chaotic domains. The differences between these four domains are fundamental ontological differences in terms of their internal causal dynamics: events in the obvious / simple domain are caused by single linear cause–effect relationships, in the complicated domain by multiple linear cause–effect relationships, by non-linear cause–effect relationships in the complex domain and in the chaotic domain there are no cause–effect relationships, meaning that things just happen randomly and with no detectable patterns at all. The main purpose of introducing this multi-ontological decision-making framework is threefold: (a) to ensure that we do not approach the Anthropocene as some or other monolithic reality with complex problem situations only, (b) to situate mono-, multi-, inter- and trans-disciplinarity as four equally valid research methodologies in each of the four domains – with the ETTDR approach placed specifically in the complex domain, and (c) to enable methodological agility – i.e. to facilitate our decision-making when having to decide on when to switch methodologies *between* and *within* the four fundamental domains – without turning this into paradigm switching exercises in the Kuhnian sense of the word (Kuhn, 2012) – which is simply too onerous for participating in collaborative *science-with-society* processes.

- [Chapter 5](#) posits the notion of multi-track ETTDR processes in response to the dominant view expressed in the TD literature of the global North, namely that ETTDR processes are normally conducted with so-called formal 'legitimized' stakeholders – in other words, with people who have been mandated to speak for and make decisions on behalf of other people. Although this has become an accepted practice in highly developed and democratically organised / structured countries, such as Switzerland, Germany and the Netherlands, this is certainly not a practice which can be uncritically adopted and applied to developing world countries. Here the challenge is to deal with *informality*, i.e. engaging with individual people in their *informal* social networks and institutions with no mandate to speak or make decisions on behalf of other people, but only for themselves. This was indeed the challenge the research team faced from the very onset of initiating the TDCS in the informal settlement of Enkanini in 2011 (described in more detail in [Chapter 3](#)). Drawing on the literature on second / multi-track diplomacy in conflict resolution and peace-building (Davies and Kaufman, 2003; Diamond and McDonald, 1996) was indeed very helpful, at both the theoretical and practical levels, to conduct the Enkanini case as a Track-2 type process working directly with the individual shack-dwellers in the absence of any leadership figures claiming to speak on behalf of the Enkanini residents. Therefore, since it cannot be assumed that all or most countries are as highly organised and structured as the democratic countries in the Global North today, this idea and the practice of following multi-track ETTDR processes, rather than just one type of process across ALL different contexts / situations, are indeed a very important for how to go about conducting collaborative *science-with-society* processes in different parts of the world today.
- [Chapter 6](#) demonstrates that the methodological implications of working in complex, emergent social environments and adopting an emergent research design may very well result in an 'anything goes' approach in the sense that there are no guiding logics, principles and methods for such emergent research processes (Feyerabend, 1993). In [Chapter 5](#) any such assumptions or suggestions will be dispelled with by demonstrating that a key output of the ETTDR design & strategy-making approach, pursued and discussed in [Chapter 3](#), was the developing / formulating of some logics and principles, necessary for guiding / nudging our decision-making in the Enkanini case. This was, very importantly, done in an organic, bottom-up way, which means that, on the one hand, it is not a fundamental prerequisite to have a clear set of guiding logics and principles at hand when initiating ETTDR processes and, on the other hand, that the specific guiding logic and principles that are produced by an ETTDR approach do not necessarily have to make any claims to be universally applicable and transferrable in

order to demonstrate their usefulness in terms of guiding decision-making in ETTDR processes. On the contrary, it will be argued in this chapter, that the challenge is for different ETTDR approaches to come up with their own context-relevant guiding logics and principles, which can then form the basis for developing a more generally applicable set of guiding logics and principles.

More importantly, though, is to understand the phenomenological origins of any guiding set of logics and principles. In this regard, it will be pointed out that human experiences, perceptions, observations – in short, our senses – have a key role to play in the developing of any guiding logics and principles. In other words, contrary to the research strategies developed by the positivist, empiricist and rationalist trends in the history and philosophy of science to exclude our embodied experiences and senses from the research process, the goal in ETTDR processes is rather to accept and work with these as part and parcel of what constitutes the complexity of problem situations in the complex domain. To this end, a heuristic will be introduced in [Section 6.5](#) of this chapter to facilitate the process of bringing together some of our research senses and logics and principles.

- [Chapter 7](#) focuses on the important aspects of ETTDR that have not been covered systematically in this study, but which will form the research agenda of future research. In other words, given the specific methodological focus of this study of contributing to the developing of ETTDR methodology, there are certainly some areas that fall outside the scope of this study, but which are certainly considered critically important, both in terms of affecting and being affected by matters methodological. In this penultimate chapter of the study the focus will fall specifically on the following areas that have only been referred to broadly, in passing, throughout the study, but which are nevertheless considered important enough to be pursued further for undertaking ETTDR in future:
 - *Meta-theoretical* – i.e. investigating the implications of adopting an ‘anticipatory ethics’ approach with the aim to integrate ontological, epistemological and ethical considerations vs. treating them as three so-called separate domains of inquiry. onto-ethico-epistemology position (already developed at the quantum level (Barad, 2012, 2010, 2007)) for tackling complex societal problem situations in the Anthropocene, which no longer treats ontological, epistemological and ethical questions as belonging to three fundamentally separate bodies of knowledge;
 - *Theory of change* (ToC) – i.e. investigating the pros and cons of developing and adopting ‘radical incrementalism’ as a possible theory and praxis of change for guiding ETTDR processes in a transformative direction, without facing the near

- impossible challenge of having to bring about some deep structural change in research processes in general and ETTDR processes in particular;
- *Narrative-based methods* – i.e. proceeding with and further developing the work that has already commenced with regard to using narrative-based research methods not only for providing better and deeper understanding (*Verstehen*) of the role of human experiences, perceptions and observations at the phenomenological level of complex problem situations at hand, but also for indicating how to use these experiences, perceptions and observations the latter strategically in order to contribute some about small-scale / incremental social change (*Verändern*) to these situations (in terms of a radical incrementalism theory of change).
 - [Chapter 8](#) will conclude this study by reaffirming the importance of avoiding the pitfalls of un/intentionally initiating collaborative *science-with-society* processes on the assumption that ETTDR is a panacea for ALL different kinds of problem situations facing us in the Anthropocene today. Instead, it is much better to adopt an approach of methodological agility, namely switching between the equally valid domain-relevant methodologies of mono-, multi- and inter-disciplinary and trans-disciplinarity – depending on the specific context of the specific problem situations encountered in the obvious / simple, complicated and complex domains respectively.

CHAPTER 2: RATIONALE FOR ETTDR – WHY, WHAT AND FOR WHAT?

2.1 Introduction

As mentioned in [Chapter 1](#) above, the overall objective of the study is to contribute to developing the ETTDR approach for using in a methodologically agile manner – i.e., in short, a research methodology that is capable not only of providing an understanding / explanation (*Verstehen / Erklärung*) of the complex challenges being faced in the Anthropocene today, but also of venturing into finding ways and means of changing (*Verändern*) these complex challenges. A good starting point for launching this investigation is to start with the three basic questions of: *What* is ETTDR? *Why* is it necessary? And, more precisely, *for what* is it considered an appropriate approach? The main focus of Chapter 2 is to start with these questions as providing some pointers or perspectives which can be further developed in the study, rather than trying to come up with some or other definitive responses to them. In this regard, although the three questions will be addressed sequentially – why, for what, what is ETTDR? – it is important not see them as three completely separate and unrelated questions, but rather as intricately interconnected questions intended to throw some more light on the central focus of this study, namely the developing of the ETTDR methodology capable of tackling complex problem situations in the context of the Anthropocene today.

For Blumer, the methodology of science, in its most general expression, is the self-reflection of the scientific enterprise, that is, the study of the principles which underlie scientific inquiry (1969b: 24). This definition implies that, as with every self-reflective endeavor, methodology has an indefinite boundary. Its further reaches pass into the philosophical provinces of logic, epistemology, and ontology, blending fully into the array of their discourses. For this reason, Blumer's statement defining methodology begins with a discussion of idealism and realism (Blumer, 1969b: 21-2; Baugh Jr and Baugh, 1990). However, it will be argued below that, when facing the (ethics) question of *how to act* in the context of the Anthropocene today, discussions on methodology go beyond these mere philosophical domains of logic, epistemology and ontology.

2.2 What is ETTDR?

As already mentioned: TD, in general, is not purporting to be a 'new' science per se, but rather is a new approach for *doing transformative research with society in a methodologically agile manner*. However, this assertion begs the question: what do we mean by 'methodology'? What does it mean that TD is a 'methodology' for *doing science with society*? In short, the answer is that the notion of methodology should not be reduced to the study of methods *only*. On

contrary, methodology means much more than working with certain methods only, since it also, very importantly consists of the guiding logics and principles necessary for steering our decision-making and actions when designing and conducting research. Reducing methodology to the study of methods *only* falls into the trap of an instrumentalist understanding of methodology – resulting in the proverbial ‘tool box’ approach. One way of avoiding this trap is to go back to the original etymological meaning of methodology, originating from and comprised of the three Greek words: ‘meta’ (μετά) signifying what is ‘beyond’ or ‘above’, ‘hodos’ (ὁδός) denoting a journey from point A to point B, and ‘logos’ (λόγος) referring to the logic or reasoning employed for figuring out how to get from point A to point B. When putting these different aspects and meanings of the word methodology together for undertaking research, it means that methodology, broadly speaking, refers to the reasoning, logic or principles for guiding our decision-making during the research process.

The word method, on the other hand, shares the same Greek etymology, but consists of only two components: ‘meta’ and ‘hodos’ – thereby omitting the important notion of ‘logos’.³ This means that ‘method’ has a more restrictive performative meaning, because it is about the activities or actions of *doing* or *performing* certain techniques, steps or procedures when *using* certain tools and instruments for *navigating* the research process (the journey). However, methods on their own cannot tell us *how* and *for what* they are or should be used – especially when facing the challenge many different and differing pathways of changing (*Erklärung*) complex problem situations. The methodological requirements in this regard for conducting ETTDR processes are some context-relevant guiding logics and principles, capable of guiding our decision-making and actions during the research process. What these guiding logics and principles might be for ETTDR processes will be discussed in more detail in [Chapter 6](#) , but it is sufficient for our purposes here to reaffirm the importance of not conflating methodology and methods, for falling into this trap will close all opportunities for dealing with and developing a more in-depth understanding of the guiding role and function of ETTDR processes in social change processes, and the need for some guiding logics and principles in this regard. This does not mean, however, that methods are unimportant and therefore not part of the discussion on methodology; on the contrary, methods are part and parcel of the methodology, but they become operative only once we have developed a better understanding of the guiding logics and principles, responsible for the overall steering / nudging of ETTDR processes, including the question of what methods are appropriate and how they should be used.

However, taking this route of explaining ETTDR in terms of a more general meaning and definition of the notion of methodology should not be seen as an attempt to develop ETTDR

³ See Van Breda, J et al., 2016; Van Breda and Swilling, 2018.

as some sort of a **panacea**: i.e. a universal methodology applicable to ALL problem situations in the world today, and one that can merely be applied and transferred in an instrumentalist ‘cut-and-paste’ manner from one context to another as if the differences between them do not matter at all. On the contrary, context matters hugely in this regard, simply because the differences in context are *differences in kind, not in degree*.⁴ So, for example, the differences between *complex*, *complicated* and *chaotic* contexts are qualitatively different from each other and not just different types of the same phenomenon, as it were. It must be said that, even at the time of the Anthropocene, not all situations / contexts encountered are equally complex – some are certainly more complicated or chaotic than others. The fundamental differences between the different kinds of context will be discussed in more detail in [Sections 2.5.2 – 2.5.5](#). However, before doing so, it is important to mention here that acknowledging this reality of facing fundamentally different kinds of contexts certainly has some major methodological implications at both the strategic and operational levels for the way in which the science–society relationship is being conducted in the Anthropocene.

The ETTDR approach needs to be developed here in a manner that satisfies the principle of **methodological agility**: i.e. ability to switch *between* the four different kinds of methodologies – of mono-, multi-, inter- and trans-disciplinarity – when facing different kinds of contextual challenges – without falling into the trap of committing some category errors (Ryle, 2015) along the way by ensuring that the different kinds of contexts are approached in terms of context-relevant methodological concepts, logics, principles, practices and methods, and not in terms of the concepts, logics, principles, practices, methods etc. that are relevant in / for another context. This concept of being methodologically agile⁵ will be further developed in [Chapter 4](#) below – however, suffice to mention here is the fact that this should not be confused with the much stronger Kuhnian notion of ‘paradigm switching’ (Kuhn, 2012) – a much more onerous, if not impossible, methodological challenge to fulfil, since a paradigm switch is akin to a so-called ‘Gestalt’ switch⁶ – i.e. a radical change between different modes of science during which the ‘new’ scientific paradigm discards with the old / outdated paradigms to the extent that the latter become completely defunct and relegated to the proverbial dust heap.

⁴ In other words, in evolutionary biological terms one would say that differences in kind are akin to different species, while differences in degree are like different variations or mutations of the same species.

⁵ In Chapter 4, a distinction will be made between two types of methodological agility and discussed: (a) **inter-methodological agility** referring to the need for inter-changing methodologies **between** four ontologically different domains or contexts and (b) **intra-methodological agility** referring to the need for adopting / using different research strategies, processes, practices, methods etc. **within** a particular domain – with specific reference to the complex domain. The challenge of the transferability of knowledge will also be discussed in more detail in terms of this distinction between inter- and intra-methodological agility in [section 4.6](#) below.

⁶ At least, this was the view of the early Kuhn (in the first edition of *Structure of Scientific Revolutions*) when he associated paradigm switches with the notion of a ‘Gestalt switch’.

By way of example, though, a fundamental paradigm switch may be required if the central arguments developed by Funtowicz and Ravetz on *post-normal science* were to be accepted (Funtowicz, 1993; Funtowicz, 1994; Funtowicz and Ravetz, 1995; Funtowicz and Ravetz, 2012). Acknowledging the fact that we are living in a complex world with complex problems, these two authors suggest that ‘post-normal’ science is not only the fundamentally ‘new way’ of doing science today, but also that ‘the old’ – or ‘normal’ – way of doing science has in fact become outdated and should therefore be replaced by post-normal science – along the lines of performing a radical Kuhnian-like paradigm switch.⁷ However, for our purposes, there is no need to go along with this kind of approach, simply because, as stated, not ALL problem situations in the Anthropocene are equally complex as the two authors make it out to be.

On the contrary, the need for developing the ETTDR approach in a context-relevant way is aimed at contextualizing / situating this approach vis-à-vis the other equally valid context-relevant approaches in a dynamic manner – with the express view of allowing for flexible interchanging between them, whilst at the same time being mindful of the methodological differences in the concepts, logics, principles, practices, methods etc. being used when dealing with the different contextual challenges. It is therefore important not to explain these methodological differences between the mono-, multi-, inter-, and trans-disciplinary approaches merely in the abstract, but rather in terms their situatedness in the different kinds of contexts each of these different methodological approaches addresses – which will now be discussed in more detail below.

2.3 Why ETTDR?

ETTDR is needed when dealing with complex societal challenges, characterised by their non-linear cause–effect relationships. This will be discussed in more detail in [Section 4.4](#) below, but suffice it to mention here that what distinguishes linear from non-linear causality is that in linear causality A always causes B and C causes D in uni-directional way, rendering it impossible for B to loop back onto A, thereby producing a return or two-way causal effects, as it were. In non-linear causality, on the other hand, feedback loops between A and B and C and

⁷ Although, it must be said that they have not explicitly adopted these Kuhnian concepts and language to develop their ideas on post-normal science. This is an inference drawn, on my side, in order to highlight the implications of going along with and adopting the notion of a post-normal science as proposed by Funtowicz and Ravetz. However, many of their ideas on complexity and post-normal science are applicable in / for the Complex Domain, but not beyond. Hence, presenting post-normal science as some or other panacea is simply too restrictive for conducting the broader science-*with*-society relationship – particularly when confronting non-complex (especially simple and complicated) problems in the Anthropocene today – still warranting normal science approaches (i.e. different variations / permutations of mono- and multi- and interdisciplinarity).

D are a fundamental feature of these two-way causal relationships, making it possible for A to cause B and B to cause A at the same time (Jackson, 1991).

However, what this non-linearity means for the purposes of understanding and approaching the anthropogenic challenges in the Anthropocene today is that the latter are not just as a ‘polycrisis’ (Morin and Kern, 1999), consisting of multiple interconnected ‘objective’ crises, existing independently from us, as it were. On the contrary, when these challenges are imagined as a ‘meta-crisis’ (Bhaskar et al., 2015), situated *within* an inter-subjective or social context of meaning-making. Making this move allows us to better understand the complex dynamics involved in the Anthropocene; this is because the process of meaning- or sense-making of our *different* and *differing* experiences and perceptions are part and parcel of the feedback loops between the anthropogenic causes and effects of the Anthropocene, starting at the phenomenological level and then iteratively recurring at the ontological, epistemological and social (change) levels. Since the non-linearity in all of this involves the *disproportionality* between the causes and effects experienced and observed in the Anthropocene, we need to assume that this will manifest itself not only in terms of many different ways of framing the Anthropocene⁸ – not only in disciplinary terms, but also in terms of the many different perspectives involved in the real-life experiences of ordinary people. To be sure, there are no short-cuts in dealing with this challenge of bringing together and making sense of the multiple disciplinary and non-disciplinary perspectives. This is simply a challenge which cannot be dealt with in terms of the singular / reductionist disciplinary approaches in an attempt to avoid the potential threat of relativism⁹ in all of this. However, to be sure, these multiple perspectives add to the complexity of the problem situations facing us in the Anthropocene, thereby warranting TD approaches that can *work within the Anthropocene* in an integrative way. This will be discussed in more detail in [Section 4.4](#) below; suffice it to mention here that this (integrative way) does not imply trying to dissolve or discard differences, but rather using differences creatively to come up with new / innovative ways of understanding the complex problems situations facing us in the Anthropocene today.

2.4 ETTDR FOR WHAT?

However, this challenge of dealing with the complexity of problem situations in the Anthropocene does not only refer to the understanding and explaining (*Verstehen / Erklärung*) of the latter, but also for exploring and figuring out different ways and means of changing

⁸ As we have already seen and commented on in the introduction to the thesis.

⁹ This potential threat of relativism stems from the position known as ‘perspectivism’, which implies that each individual perspective is completely unique, with no possibility of any inter-connections and overlapping between them, capable of producing emerging patterns from all the singular perspectives.

(*Verändern*) these complex problem situations. To be sure, this need for social change in the Anthropocene increases the complexity of what we are being confronted with today, since the challenge is no longer restricted to merely understanding and explaining complex problem situations. In other words, the complexity of the challenges facing us in the Anthropocene today provide, simultaneously, two angles for the rationale of ETTDR: *why* and *for what* is it needed? Not only are things too complex for the single disciplines to understand and explain the complexity of the challenges we are facing in the Anthropocene today, but also figuring out different ways and means of how to bring about some social change in the Anthropocene today cannot be undertaken in isolation from society – i.e. without including the relevant societal stakeholders / social actors who are actually involved in bringing about the required social change.

However, when positing the need for social change as an explicit and fundamental goal of ETTDR, it is quite easy to fall into the trap of conflating social change processes with ETTDR processes and, consequently, treating them as one and the same thing. It is therefore important, from the outset, to distinguish¹⁰ between social change and transdisciplinary research processes (Scholz et al., 2006a; Scholz, 2011). This will be discussed in more detail in [Chapter 5](#) below, but suffice it to mention here that this distinction is made at both the conceptual / theoretical and practical levels in order to better understand and manage / guide / nudge / steer collaborative ETTDR processes in a transformative direction. Such ETTDR processes may or may not necessarily intersect with any existing and/or future real-world societal change processes and where such intersections do happen, ETTDR processes refer to transdisciplinary research processes initiated and conducted with an explicit interest in contributing to the social change processes through knowledge co-production processes. This will be the topic of more in-depth discussion in [Chapter 5](#) below, but suffice it to mention here that in practice such intersections between societal social change processes and ETTDR processes can and do happen in many different ways, always bringing the perspectives of multiple social actors into the research process and thereby adding more layers of complexity to the challenge of bringing together and integrating different and differing experiences and perceptions of a particular situation at hand.

Therefore, in the interests of better understanding the role of academia *in doing transformative research with society in a methodologically agile manner* in the Anthropocene today, it remains important not to conflate ETTDR and social change processes, and it is with this in mind that the focus of in this study will shift more explicitly in [Chapter 6](#) to the task of developing some

¹⁰ This conceptual distinction is made here whilst acknowledging, at the same time, that in practice (e.g. in real-life TDCSR projects) these two processes – i.e. social change and ETTDR processes – will always intersect and overlap in many different ways and tend to blur such conceptual distinctions.

guiding logics and principles necessary for steering / nudging (Snowden, 2015a; Sunstein and Thaler, 2012) our decision-making practices in ETTDR processes in the direction of bringing about some social change. In this, we cannot merely assume that interacting with societal stakeholders or social actors in collaborative ETTDR processes will, in and of itself, guarantee that the research process will move in a transformative direction. For this to happen, it remains crucial that a coherent and enabling set of logics, principles, practices and methods are explicitly developed for steering / nudging our recurrent (Knorr Cetina, 2001) decision-making practices as processes in our various ETTDR endeavours. In the absence of this, TDR processes may very well veer off in different directions – guided by some well-established positivist and interpretivist ideas and practices – ending up in a position of *merely* being satisfied with *understanding* and *explaining* (*Verstehen / Erklärung*) the complex problem situations we are facing in the Anthropocene today, and not changing them.

CHAPTER 3: ENKANINI – A CASE STUDY IN ETTDR¹¹

3.1 Introduction

The notion of methodological agility was introduced in [Chapter 2](#) as part of a broad ETTDR strategy is that it is aimed at participating in dynamic science-*with*-society research processes in the context of the Anthropocene. However, for our purposes of further developing the ETTDR approach, it is important to make the following conceptual distinction between two different types of methodological agility: (a) **inter-methodological agility** for switching *between* the different domain-relevant methodologies of mono-, multi-, inter- and transdisciplinarity (for more on this, see [Chapter 4](#)), and (b) **intra-methodological agility** for making methodological changes *within* any one of these particular domains.

In this chapter the focus will fall more specifically on introducing the notion of emergent research design as an example of **intra-methodological agility**. In practice, this meant adopting a context-relevant approach of research design and strategy-making during real-life, unfolding ETTDR processes embedded in fluid informal social contextual settings of an informal settlement – known as “Enkanini” in the town of Stellenbosch, South Africa. A key feature of initiating this intentional transdisciplinary case study (TDCS) was the absence of any formal ‘legitimated’ leaders or decision-makers. This meant that the only realistic option for starting this TDCS was to engage with individual social actors in their informal social networks and relationships. In such a context of social fluidity, even using the word ‘the community’ is problematic, not only because there are no formal leadership figures mandated to speak on behalf of others, but also because there is no history or shared experiences, rituals, practices etc. of *working together* (Sennett, 2012) on any matters of mutual concern.

Therefore, starting, or trying to start, ETTDR processes in such fluid social contexts with some or other pre-planned research design in place is certainly not a sensible approach. The latter normally requires some clear-cut (measurable) end-goals, objectives, epistemic objects, research methods etc. – indeed a fundamental pre-requisite in mono-, multi-, and inter-disciplinary research approaches. However, when confronted with the kind of social volatility, as experienced from the onset in the Enkanini informal settlement, a much more methodologically agile approach is required – in short, an emergent research design and strategy-making approach capable of *allowing for and working with emergence*, – or in the poetic words of Antonio Machado: “*making the road by walking*”.

¹¹ This chapter is based on a published paper [Van Breda and Swilling, 2018](#).

Allowing for emergence will be discussed in more detail in [Section 6.2.3](#) below as one of five key design principles of the emergent research design approach – however, suffice it to mention here that these design principles were not a clear-cut, well-formulated set of principles, readily available in the TDR literature, for example. On the contrary, these principles *both* emerged from *and* guided the Enkanini TDCS (discussed in more detail in [Section 6.2](#) below). This approach and practice of allowing for and working with emerging guiding principles is truly part and parcel of implementing the broader research strategy with intra-domain methodological agility – i.e. when required to make some domain-relevant methodological changes, when confronted with the non-linear causal dynamics in complex problem situations within the complex domain (described in more detail in [Section 4.4](#) below).

In order to illustrate how much context matters in all of this, the focus in this chapter will therefore be explicitly on describing some of the salient aspects of the real-life context of the “Enkanini” informal settlement *within* which this TDCS was embedded, and which, at the same time, gave rise to developing the emergent design approach. To this end, the *single case study* or *idiographic* approach (Gerring, 2006; Krohn, 2010, 2008; Yin, 2009) introduced and discussed in this chapter is considered particularly appropriate approach for our purposes here as it allows for *deeper immersion* into a particular context – in so doing, enabling the elicitation of in-depth insights and understandings not only of the complexity of the social context itself, but also of the emergence of the methodological logic and principles that both emerged and guided the *unfolding* research process in the Enkanini TDCS.

And, to reaffirm: although high levels of uncertainty or unpredictability are to be expected when working with non-linearity, this is by no means an insurmountable obstacle for gaining some deeper insights into and understandings of the patterning¹² caused by the non-linear causal dynamics in real-life situations in the complex domain. To be sure, making sense of the patterning (Bollier and Helfrich, 2015) caused by non-linear causality is part and parcel of engaging with the complexities of problem situations – which, as mentioned, is what makes knowledge co-generation possible *within* the enabling boundaries of *unknown unknowns* in the complex domain (to be discussed in more detail in [Section 4.4](#) below). However, this is not the kind of knowledge that can be developed from first principles, or by scanning the literature *only*; it certainly warrants, in the words of William James, some form of ‘radical empiricism’ (James, 2013) – which, in this case, has meant, as mentioned, setting up and embedding a particular transdisciplinary case study *within* the context of an emerging informal urban settlement in the town of Stellenbosch (South Africa) – which, in effect, became the

¹² Making sense of the patterning of complex situations is NOT the same as postulating / hypothesising law-like causal forces.

social laboratory or generator of much of critical reflection and theory-building presented in this study.

The entire project described in this chapter took place during 2011 – 2016¹³. Throughout this period the Enkanini TDR team had to learn how *to allow for* and *deal with* the emergence of unforeseen stakeholder alliances, both *outside* and *within* the Enkanini informal settlement. As the project was an unfolding one, decisions were taken reflexively based on the contextual events in Enkanini. As a result it was not possible to know upfront how and what would need to be funded. The challenge of this type of research is therefore not restricted to matters of theory or navigating said complex social and environmental contexts, but to a large degree depends on being able to fund interventions, change tasks quickly, and scale up or suppress the small-scale experiments as the need arose. It thus became increasingly necessary to develop a practical and strategic *intuition* as to when to apply for funding and who to apply to. Sensing when to act upon converging moments, and how to turn these into opportunities to attract funders, has been fruitful to date. That said, most of the researchers involved in this ETTDR process have become invested in the project and its unfolding process in ways that go beyond purely financial matters.

3.2 Overview.1: “Enkanini” Means “Taken By Force”

In 2006, 47 families who had been renting shacks in the backyards of permanent dwellings in the settlement of Kayamandi, Stellenbosch, in South Africa’s Western Cape Province, broke through the border fence surrounding the settlement to invade the adjacent municipal-owned land. Motivated by their inability or unwillingness to pay rent in the Kayamandi settlement, the families erected 12 shacks on the recently cleared area. Stellenbosch Municipality (SM) served an eviction notice on the families for their illegal occupation of the land and instructed them to move to Klappmuts, a settlement located about 15 km north of the town of Stellenbosch (Wessels, 2015).

“Then, during the night, especially over weekends, people broke through the fence from Kayamandi’s side to build their houses outside of the marked area. This is when people started to call this place Enkanini, which means “taken by force” [in isiXhosa], because the people build their houses outside of the demarcated area” (Nobuhle Ntsokoto, an original resident of Enkanini)

¹³ This does not mean that the project no longer exists. On the contrary, it still exists, but it has during this time period morphed into an entrepreneurial business opportunity, managed by individual members of the Enkanini community, and is, therefore, no longer purely or predominantly a research project.

Within three months the number of families living in this illegal and informal settlement had increased to about 500 and the number of shacks to about 125, making it impossible for municipal officials to implement the eviction order (Wessels, 2015). The settlement quickly spread up the side of the Papegaaiberg Mountain, a steep slope, and by 2011 (5 years later) about 1 500 people occupied the settlement in about 400 shacks (Wessels, 2015). In efforts to contain the settlement, the municipality placed armed guards in towers on the periphery. New shacks would then be demolished. Nonetheless, people continued to build their shacks, mostly at night and very quietly. Once the shack is built, the occupant is protected by her/his constitutional right to a fair trial prior to eviction (Wessels, 2015).

In 2012 the municipality was forced to install eight ablution blocks with toilets and taps for potable water and concrete waste skips, but the ratio of 1 toilet to 54 residents, and 1 tap for every 140 people, was barely adequate (von der Heyde, 2014). Waste was collected on an intermittent basis. By 2015 about 8 000 people, moving from both the rural areas and other urban settlements were living in Enkanini in about 2 000 shacks. Today, Enkanini is Stellenbosch's largest informal settlement, the average age of residents is between 25 and 29 years of age, and nearly half of them are women (Wessels, 2015).

The problems that have arisen as a result of the lack of services include high levels of theft and assault, indoor air pollution because of paraffin and candle use, frequent fires (111 fires), flash floods (840 since inception), and increased health risks (Wessels, 2015).

3.3 Overview.2: A Fragmented Community

As the settlement became increasingly crowded, people organised themselves into informal structures to deal with the challenges of living in an informal and radically underserved settlement. These structures included street committees, churches, saving groups ('stokvels'), gyms, gardening groups, crèches and animist groups (Wessels, 2015). Each structure served a particular set of interests reflecting the fragmented nature of the settlement. Residents had in a sense also started tackling micro-level governance issues, such as demarcating space for new arrivals and approving new business enterprises (such as the Somalian-owned spaza shops) (Wessels, 2015). Further examples of micro-level self-governance include solving street-level problems (sometimes through vigilante action), and using communal savings to invest in infrastructural services and improvements (such as water pipes and illegal electricity connections) (Wessels, 2015).

Enkanini, however, cannot be defined as an organised or mobilised community with a history of working together, shared practices, rituals, actions and institutional co-operative arrangements. It is better understood as a spatial or administrative unit with key stakeholders

being the residents (although not a unified group), Stellenbosch Municipality and, once the research project had begun, the University. Stellenbosch Municipality warned the research group not to engage with the politically volatile community as the project could become politicised and it could not guarantee the safety of the researchers (Keller, 2012).

Given the fragmented nature of Enkanini's representative structures, the transdisciplinary research team could not conduct the conventional and exemplary engagement process with legitimated stakeholders because there weren't any. No one group had a mandate to speak for all residents of Enkanini. To overcome this hurdle, the team had to connect directly with individuals and families in the informal settlement and they had to do this in an appropriate way that aligned with the principles of TDR (Brent and Swilling, 2013). For the first half of 2011 the TD research group walked the small streets and alleyways of Enkanini familiarising themselves with the social dynamics and the issues that mattered to the individuals they met. They helped some families paint their shacks and helped tidy up some areas of the settlement. As time passed and the team became a familiar sight in the settlement, members were invited into residents' shacks for tea or coffee, and later, as relationships deepened and trust was built, to stay over for weekends (Wessels, 2015).

This deviation from the exemplary first step of engaging legitimated stakeholders also shaped the remainder of the research process. It became clear to the TD researchers that the community (its identity, power dynamics and structures, and vision) was an emerging one, meaning any research process undertaken within this context would therefore of necessity also need to be emergent.

3.4 Getting Started with Dynamic Epistemic Objects – Developing Guiding Problem Statements and Research Questions

The TD research group had been tasked with establishing a research process that would generate co-produced innovative socio-technical knowledge. The initial research question was: "What does *in situ* upgrading [as specified by the relevant government programme] mean in practice from the perspective of the average shack dweller living in Enkanini?" (Allen et al., 2015; Swilling, 2016a, 2016b). Given the fragmented nature of the Enkanini 'community', the research team could not, however, conduct a legitimated stakeholder engagement process to arrive at a co-generated problem statement and research questions. They had to use the information gathered from their interactions with residents to frame a guiding or provisional problem statement and associated research questions (Allen et al., 2015; Swilling, 2016a, 2016b).

The research team also had to acknowledge that as the research process unfolded, the problem statement and questions *could* be adapted in line with a changing understanding of the context. The initial research aimed to answer the question of what the government's new policy of *in situ* upgrading of informal settlements would mean in practice for the average resident of Enkanini. After many interviews with government officials and consultants, it became clear that the answer to this question was 'Wait!' for the service delivery grids to arrive. This generated what eventually became the primary research question, namely: What can be done while people *wait* for this service to arrive? To address this question, a wider range of issues surfaced through this immersive process than originally anticipated, including the unsafe living conditions that put personal health and safety at risk, and a lack of waste disposal infrastructure (e.g. sanitation, solid waste management).

The research team was operating in an informal context in which the settlement had no certainty about the future because of the eviction order. It could take up to eight years for the municipality to rezone the land and formalise the settlement (Allen et al., 2015; Swilling, 2016a, 2016b). Only once this process was complete would the municipality begin to consider installing formal services for all residents – that is if it had the financial and human capital to do so, as the topography is steep, making it difficult and expensive to build service-delivery infrastructure (Keller, 2012). The provisional problem statement thus became: What could be done between *now* and the arrival of the [electricity] grids to improve quality of life? In other words, what can be done while we wait? (Allen et al., 2015; Swilling, 2016a, 2016b).

Researchers continued to deepen their relationships with the residents that had welcomed them in. Through continuous discussion, the central issues affecting quality of life began to emerge, the most primary of which was the lack of energy provision. While some on the upper slopes were accessing electricity illegally from electricity 'barons' living in the adjacent serviced settlement of Kayamandi, most resorted to using paraffin lamps and candles, with the consequent implications for indoor air pollution and fire (Wessels, 2015). Additional issues that surfaced through this immersive process included the unsafe living conditions that put personal health and safety at risk, and a lack of waste disposal infrastructure (sanitation and garbage).

One member of the TD research team describes this unfolding process as a journey, because it "included exploration, navigation through the often messy tensions and lived realities of the research context, and it was non-linear in nature" (Wessels, 2015). Essentially, the process was designed as it unfolded, that is, making the road by walking it (Machado, 2003; Machado and Trueblood, 1982). Each intervention made by the TD research team (these are described below) shifted the social landscape, generating new and sometimes unexpected problems.

These turning points or bifurcations – described below as small-scale social experiments – marked the “beginning of a new translation that changes the meaning and outcome of a narrative” (Wessels, 2015). These points led to a shift or reorganisation of existing systems, which in itself generated new tensions or challenges. These new challenges in turn generated new research questions, which would need to be researched in an adaptive, fluid and contextual manner.

3.5 Experimentation with Safe-To-Fail Social Change Experiments¹⁴

This section of the case reports on three small-scale social experiments¹⁵ in alternative service delivery that were undertaken during the TDCSR project in Enkanini, namely:

- *Electricity – the iShack project;*
- *Solid waste treatment – the Bokashi project;*
- *Sanitation – the gravity-fed sanitation toilet project; and*
- *Learning and research – the Enkanini Research Centre project.*

3.5.1 The iShack Energy Project

The lack of basic service infrastructure compounded the reality of living in badly constructed shacks. The resultant negative quality of life was apparent to the TD researchers when visiting Enkanini residents in their homes. Laurens Maritz, who later enrolled at the Sustainability Institute, had engaged with Enkanini residents through *Rights to the City*, a NGO focused on inclusion of the urban poor in 2010. He and his wife lived in a shack in Enkanini on the grounds of Mama Matshaya’s soup kitchen. This experience shaped his ideas and determination to create an improved shack – the iShack as it is now known – based on ecological building principles and the provision of energy through solar panels (Keller, 2012). He gathered a team together, drawn from engineering, architecture, anthropology, economics, marketing and accounting students, to work with one resident – Nosango Plaatjie – to co-design, test and implement the radically new shack (Keller, 2012). This was the original Enkanini Research Group. The success of the first iShack rested on both (a) the relationship between the TD research team and Nosango Plaatjie, the first recipient in 2011, and (b) the interdisciplinary nature of Maritz’s research team.

The use of solar energy panels to provide for three lights, an outside motion sensor and a cell-phone charger attracted particular attention (Keller, 2012). This was subsequently structured as a stand-alone system comprising a distribution box connected to two indoor lights, a cell-phone

¹⁴ This section will deal more explicitly with the notion of (research strategy) radical experimentation with small-scale safe-to-fail social experiments that was mentioned briefly [section 2.5.4](#) above.

¹⁵ These four small-scale projects were the outcomes of having following a multi-track ETTDR process, and more specifically within this an informal social-actor – also referred to as Track 2 approach below – which will be discussed in more detail in [Section 4.3](#) of [Chapter 4](#).

charger, an outside security light, and a television set (Wessels, 2015). Electricity provision was an ongoing source of tension in the settlement, with some demanding that the municipality provide it, while others, having already given up on the municipality, noted that “the only thing that we can say we want help with is for them to bring us cables, poles and electricity boxes. We can dig holes for electricity poles, and install electricity” (Swilling, Buthelezi & Kenya unpublished).

In 2011 the Gates Foundation provided funding to roll the system out to 100 households, and the South African government subsequently granted R17 million from the Green Fund to bring the project to scale and install another 1 500 systems (Wessels, 2015). What started as a practical exploration of a hypothetical solution to the poor living conditions and lack of energy provision began to morph into an entity of its own. The core group of Enkanini volunteers – Madiba Galada, Yondela Tyawa, Sylvia Sileji, Victor Mthelo and Sizimpiwe Mgopho – began along with TD researchers to interact with other informal settlements and private businesses and organisations, thus broadening the stakeholder network from the local to the regional – stretching beyond the boundaries of the initial project (Wessels, 2015). The Enkanini Research Group transformed into what is now known as the Transitions Collective.

Having deep relationships with this core group of Enkanini volunteers allowed the TD research team to navigate their way through the political and social dynamics of the community and to constantly test and retest the research problems and questions. It would not have been possible to reach this level of collaboration in a community that already had access to basic services provided by local government.

Of particular importance was the practical knowledge that the Enkanini co-researchers provided, Madiba Galada in particular, on what Enkanini residents would be able and willing to pay for such a service. The insider practical knowledge of the employment and remuneration landscape, as well as the prioritisation given to spending, combined with the data gathered through an enumeration report, enabled the TDR team to begin to work on the institutional design of a financial payment and maintenance system. This was essential as it would ensure the longevity of the intervention beyond the research stage. Shack dwellers currently rent the system for R150 a month (Wessels, 2015); it is controlled remotely and can be switched off if payment is not made (Wessels, 2015).

Those with the iShack system note that their children “talk about things now; they learn about different countries and how those people live” from watching television; that the television had shifted the nexus of entertainment from the informal taverns (“shebeens”) to the home; that they were spending less money as they did not have to buy paraffin or candles for lighting; and that it is safer now as “when there is a knock on the door, we can switch on the lights” (Swilling, Buthelezi & Kenya unpublished). Perhaps most importantly, residents who had felt like “outsiders to Stellenbosch” and “not welcomed as people”, now commented that “we are now the same as the people who live in the area where there is electricity” (Swilling, Buthelezi & Kenya unpublished).

Effectively, this small-scale social experiment has jump-started a process of social mobilisation in the settlement regarding demands for incremental upgrading (Swilling et al., 2013). It has also generated dissension and become politicised in that some residents mobilised around demanding energy provision from the municipality in fear that the existence and continued uptake of the iShack system will delay the arrival of the grid.

The success of the iShack project, which has about 870 subscribers to date, has also had wider implications. In May 2013 Stellenbosch Municipality made South African history by being the first to amend its indigent policy to include payment of the free basic electricity subsidy to those living in non-grid-connected informal households (such as Enkanini) (Wessels, 2015). This transformative precedent could have national policy implications for the future if the other 226 local municipalities follow suit. In addition, the small-scale project has reached sufficient scale to be presented as a workable model for government to implement and upscale (Allen et al., 2015; Swilling, 2016a).

If government did commit the necessary resources, the TD research and implementation process itself would need to be stepped up to a more formal engagement with relevant stakeholders, including all three tiers of government. The cost for each solar system is about R7 000 and so requires subsidisation; to enable the state to fulfil its responsibility towards providing subsidised energy, the system has been purposely positioned as part of the settlement's infrastructure, as opposed to private ownership (Wessels, 2015).

The project has also acted as a funding bridge attracting funding from both government and from NGOs, such as the Gates Foundation. The community volunteers who helped researchers set up and administer the project were co-producers of the knowledge and the system and they took part – some still take part – in a “learning process encompassing facilitated dialogue, conceptual thinking and government development processes” (Wessels, 2015).

A further by-product of this small-scale social experiment has been the training of local residents as technicians to install and manage the iShack system, as well as provide maintenance; in other words, this socio-technical intervention has created livelihood opportunities around an essential and forward-looking technology without requiring formal training and certification (Wessels, 2015).

The success of the iShack project inspired the initiation of other small-scale socio-technological experiments, which were guided by the same principles. One of those was the 'Bokashi' waste-treatment system project.



Figure 2: *The iShack Project*

Source: Wessels, 2015

3.5.2 The Bokashi Solid-Waste Project

There are seven concrete waste bays in Enkanini placed at locations convenient for pick-up by municipal vehicles; however, they are not necessarily placed where waste is generated or disposed of (von der Heyde 2014). Waste is irregularly collected, and the bays are open to the rain and wind, which hastens any decomposition or putrefaction process, generates contaminated runoff, and allows waste to be blown across the surrounds (von der Heyde 2014). The bays attract rats and other pests, which then pose a health hazard to residents, and are a breeding ground for mosquitoes (von der Heyde, 2014). Most waste does not reach the bays because of their inconvenient location and waste is thrown into easy dumping spots, where it accumulates for months on end or is flushed down the toilet, which leads to further complications in the form of clogged drains and unserviceable toilets (von der Heyde, 2014).

As waste is not differentiated in the bays, it is not possible to reclaim materials that could be re-used or to reclaim the monetary value from materials that could be recycled, which have often been contaminated by human waste or putrid animal carcasses (von der Heyde, 2014). A waste characterisation study indicated that a high percentage of the waste generated in the settlement was organic (von der Heyde 2014). To address this problem, Master's student, Vanessa von der Heyde,¹⁶ implemented a Bokashi waste-treatment system.¹⁷ She made contact with a wide range of disciplinary experts from the growing field of organic waste

¹⁶ Vanessa von der Heyde's Master's research thesis can be downloaded from this website:

<http://scholar.sun.ac.za/handle/10019.1/86274>

¹⁷ The following website provides more information on the Bokashi organic waste treatment system:

<http://www.earthprobiotic.co.za/>.

treatment, who in turn co-designed a context-relevant organic waste treatment system for small groups of Enkanini residents (up to 20 participating households).

Households collected their organic household waste in buckets to which effective microorganisms were added and the buckets were then dropped off at the local church. From there, the decomposed waste was used in local food gardens or sold to the Agriprotein project to produce animal and soil feed (von der Heyde 2014). Researchers noted that it was easier to implement this project as the residents of Enkanini had, by this time, become accustomed to TD researchers being in the settlement and had a better understanding of what they were trying to achieve, i.e. that the research team was not there to provide municipal services, but rather to find off-grid sustainable solutions to problems (von der Heyde, 2014).

This small-scale social socio-technological pilot project provided both direct and indirect benefits to the Enkanini community. Besides the obvious contribution of decreasing the amount of household waste accumulating in rubbish skips that were not cleared on a regular basis, an unintended consequence was a reduction in the rat population. A third of residents surveyed in 2013 noted that there were fewer rats in and around their shacks, another 29% said that the smell was less offensive, and 20% said that they liked having a designated space for their food waste and knowing where to put it (von der Heyde, 2014).

The Bokashi pilot study also contributed to ameliorating Stellenbosch Municipality's larger waste problem in that the landfill site is above the legal minimum and the new site will have a very short life span. If a project such as this were to be implemented across the Enkanini settlement, it would divert about 12 000 kilograms of food waste a week from the landfill (von der Heyde, 2014).

Perhaps biggest contribution of the pilot study is the sense of collaboration built among participating households, 60% of whom continued the system under their own steam once the pilot study had been completed (von der Heyde, 2014). Co-researchers continue to help coordinate this self-organised waste-management service, indicating their increased capacity to engage in project implementation around basic service delivery issues (von der Heyde, 2014).

This project further extended the stakeholder network into the wider community, particularly through *Probio*, the manufacturer of Bokashi effective microorganisms. *Probio* provided not only technical expertise, but also donated the Bokashi product for accelerating decomposition of organic waste to the project. Stellenbosch Municipality was also closely involved with this project, and it is the first time that the municipality has not met with political resistance from residents ((Swilling et al., 2013); von der Heyde 2014). Saliem Haider, head of the Waste

Treatment Department at Stellenbosch Municipality, was keenly interested in this project and contributed by funding the waste characterisation study.



Figure 3: *The Bokahshi Solid-Waste Treatment Project*
Source: *von der Heyde, 2014*

3.5.3 The Gravity-Fed Sanitation Project

The third small-scale social experiment focused on sanitation. The \pm 8 000 Enkanini residents have to share 80 communal toilets between them. Besides the obvious implications, such as blocked sewage lines, long walks to and from the blocks for some residents, and long queues to use the facilities, the lack of adequate facilities contribute to incidences of rape and assault. Many women are scared to go to the toilet blocks at night for this reason. So they make use of plastic bags to dispose of their waste, which is either thrown into the bush or into overfilled rubbish skips, which, as mentioned above, are not cleared on a regular basis. This immediate situation provoked the initiation of a third small-scale socio-technological experiment – a sustainable toilet system to manage solid waste.

PhD students Lauren Tavener-Smith (Tavener-Smith forthcoming) and Lorraine Ambole (Ambole, 2016; Ambole et al., 2016) investigated a few options for dealing with this dilemma, including dry compost toilets and non-flush gravity-fed toilets, ultimately deciding on a gravity-fed flush toilet, because it was the most appropriate for the context and, importantly, it was perceived as a dignified system. This small-scale sanitation project involved 20 households, which were divided into groups of five; each group was connected to an anaerobic biogas digester that produced gas for cooking purposes. Each household paid a small fee to cover the maintenance, repair and operating costs of the biogas digester. This was an important step in the research process seeking to find what could be done now while residents waited,

because it indicated that users were willing to pay for sanitation services (Tavener-Smith forthcoming).

Besides the obvious advantages of proving that there are more sustainable sanitation systems that are less costly to implement than conventional ones (Ambole et al., 2016), this project also expanded the net of relationships between the researchers, residents and wider society. Tavener-Smith worked with Maluti Water, an engineering firm specialising in sanitation and drainage systems. A visible example of the sanitation system was installed at the Enkanini Research Centre, where the gas was used for cooking in the kitchen that served a small restaurant and supported a catering business.

The gravity-fed project has also attracted outside funding – from the William Frank Trust Fund, among others – illustrating the potential for this type of TD research process not only to create income-generating opportunities for system operators, but also to attract funding in order to scale up the ‘experiment’.



Figure 4: *The Gravity-fed Sanitation Project*

Source: [Wessels, 2015](#)

3.5.4 The Enkanini Research Centre (ERC)

As time went by, the need to build a dedicated TD research space in the Enkanini community emerged and was constructed when Madiba Galada, who had been hosting church meetings, moved out of the community (Wessels, 2015). Before his departure, he arranged an alternative meeting space in a shack often used as a church. This new geographic space hosted workshops with residents who were willing to test the first steps of co-produced strategies and became an innovation hub in the community, thereby increasing the tempo at which new ideas were shared and constituted into co-produced new knowledge sets (Wessels, 2015).

The church was demolished and a new centre built in 2013. It is a visitor's centre for academics and media, but mainly a meeting space for various networks within the community and also a

cool, protected space for kids to do their homework after school. The Enkanini Research Centre also provides a living display of sustainable building techniques and material (recycled from the surrounds) and serves as a test ground for the new technologies, such as biogas generation through an interconnected toilet system and solar technologies (Wessels, 2015).

In effect, the experimental TD research site has been grounded in physical reality at the Enkanini Research Centre, which is run by co-researcher Yondela Tyawa, who also has a restaurant and catering business on site. The building comprises a meeting area, living area for the caretaker, and a kitchen. The meeting area is also an office and demonstration space. Yondela offered himself as caretaker and caterer. A code of conduct solidifies the “mission to improve the livelihoods of informal dwellers by establishing the Enkanini Research Centre, which aims to make a substantial contribution to theoretical, practical and applied research on informal settlement upgrading” (Enkanini Research Centre Association 2013). Stellenbosch University donated R70 000 to cover construction costs and the legal fees for drafting the Centre's constitution (Wessels, 2015).



Figure 5: The Enkanini Research Centre (ERC)

Source: Wessels, 2015

3.6 Dealing with Emerging Stakeholder Formations

The start to the second year of the TD research project (2012) marked the beginning of some unforeseen stakeholder formations, posing some real challenges to the continued existence and/or relocation of the project, thereby forcing us to find differing ways of navigating our way, both in theory and practice, through these unexpected turn of events. As a direct result of our

small-scale experiments and on-going presence in Enkanini, stakeholder formations emerged both *inside* and *outside* of the settlement with varying, but equally significant, consequences.

3.6.1 Stakeholder Formations outside Enkanini

In January 2012 Stellenbosch Municipality initiated the Kayamandi Development Forum (KDF) as a multi-stakeholder platform for discussing the developmental issues facing the formal Kayamandi settlement and the new informal Enkanini settlement (Wessels, 2015). It engaged with legitimated stakeholders from different jurisdictions representing Ward 12 in the broader Stellenbosch Municipal District. This engagement was problematic from the start as Enkanini did not have legitimated representatives. To address this drawback, the Stellenbosch Municipality signed a memorandum of understanding with Shack Dwellers International (SDI). This is an NGO with international experience in working with and mobilising the urban poor in informal settlements, and its local federations – the South African Informal Settlement Network and the Community Organisation Resource Centre (Wessels, 2015).

Stellenbosch Municipality is the first in South Africa to sign such an agreement (Wessels, 2015). The aim was to engage Enkanini residents in an enumeration exercise (list and count) that would simultaneously identify urgent issues as well as potential leaders and decision-makers. The latter could then be approached to enter into a more formal negotiation process with the state. This stakeholder alliance convened its first general meeting in February 2012 and invited the TD research group and spokespersons from the emerging Enkanini informal settlement network. This network was driven primarily by a group of disgruntled shack-dwellers living in the upper parts of the settlement.

3.6.2 Stakeholder Formations inside Enkanini

The formation of these two opposing stakeholder formations – initiated in part due to the presence of the TD research project – had two important implications for the Enkanini project. The first was that the KDF attempted to bring the iShack project under its control with a vision of rolling out the project following the enumeration process. This strategy would effectively (a) reduce the role of the TD research group (including co-researchers) to that of technical advisors (given the knowledge and skills gained in the design, testing and installation of the system so far); and, (b) reduce the scope and direction of the TD research project as a whole. If the project was co-opted into a larger design structure that envisioned a division of labour, it would alter the course of what was intended.

The second implication was that the opposition and on-going agitation from the Enkanini informal settlements network to stop the roll-out of the iShack project could possibly force the

project to close down or relocate to a different settlement. This network of disgruntled shack-dwellers viewed the iShack project as a diversion from their long-term goal of gaining access to the state-provided electricity grid and hence as one that did not serve the long-term interests of the Enkanini settlement residents.

In effect, the Enkanini Research Group became a third stakeholder formation – with both inside and outside connections. The individual relationships built between TD researchers and Enkanini residents, as well as the strengthened relationships between the Enkanini Research Group and the Working Group, led to the formation of the *Transitions Collective*. This was the coming of age of a true transdisciplinary working group comprised of researchers from different disciplines and community co-researchers, some of whom held other jobs.

The role of the Transitions Collective was to drive, guide and develop the emergent transdisciplinary research process, particularly through the co-designing, testing and piloting of three small-scale social experiments: the iShack project, the Bokashi solid waste-treatment system, and the gravity-fed flush sanitation system. In addition, it would act as an intermediary between the disparate Enkanini community and the emergent stakeholder formations. The latter include the municipality, the University, the Sustainability Institute (which houses the Transitions Collective), and private businesses, in particular Specialised Solar Systems, Maluti Water and Probio. These businesses were introduced to the transdisciplinary research process and to the notion of co-producing solution-orientated knowledge. The Transitions Collective took on an identity of its own within the Sustainability Institute, a partner of Stellenbosch University – see www.transitionscollective.co.za

The TD research team was forced to deal with a process challenge relating to how and on what basis they should proceed with the project, including their role and further participation in the KDF, which had now become highly politicised. The team also had to quickly engage with the rising tensions in the community and ensure that residents understood that the research problem was based on what could be done now, while people waited, and was not designed to close off the option of them gaining state-supplied electricity from the grid. Specialised Solar Systems, the company responsible for the technical design of the DC-electricity solar units, were able to modify the design to enable the switch over in the future, if necessary or desired, to AC-electricity systems. The responsiveness of the TD research team to the situation, to prove that they were working on interim solutions, as opposed to imposing their own agenda on the settlement, gave further legitimation to the TD research process in the eyes of the community and, in turn, enabled the further roll-out of the TD research project.

3.7 Securing Multiple Financial Flows

One final note on this case is a comment on the need for emergent finances. As the project was an unfolding one, with decisions taken in the moment, based on the contextual happenings in the settlement, it was not possible to know upfront what would need to be funded and how this was to be done. The challenge of this type of research is therefore not restricted to matters of theory or navigating complex social and environmental contexts, but to a large degree is dependent on being able to fund interventions, change tack quickly, and scale up or damp down the small-scale experiments.

Funders therefore also need to understand the nature of the TD research project and its adaptive approach and transformative purpose. An important learning point for the research team has been to learn to determine which funding calls to apply for and how to frame the funding proposals to allow the space required for this type of emergent, shifting and contextual work. In effect, this knowledge about the nature of TD funding is also an emergent outcome of the research process as it became increasingly necessary to develop a practical and strategic *intuition* as to when to apply for funding and who to apply to. This sensing of when to act upon converging moments and turn these into opportunities to attract funders has been fruitful to date and most of them have become invested in the project and its unfolding process in more than financial terms.

To illustrate, the TDR project was initiated in 2011 with a R1.2 million grant from the National Research Foundation. In particular, the Gates Foundation formally requested us to submit a funding application for the first pilot study that would connect 20 individual shack households to a local micro-DC energy grid (the iShack project). It granted R1.7 million to the research project for this purpose. In 2012 a successful application to the South African Green Fund was made for R17 million to install the iShack system in 1 500 shacks. Further funding was given by the William Frank Trust Fund. Stellenbosch University and Stellenbosch Municipality have both given either small grants for specific purposes or donated expertise or material, as have the three businesses involved in each of the small-scale experiments (Specialised Solar Systems, Maluti Water and Probio). This level of funding provided an opportunity to upscale the iShack project significantly and to take on a project-management team of six agents who could install about five new connections a day. In essence, having the necessary funding has shaped the decision to structure the individual small-scale experiments as sustainable business opportunities that create jobs. An example is that of trained agents who took it upon themselves to start a franchise business, which takes responsibility for maintaining the installed systems.

What began as an informal process of building relationships with individual residents, undertaking myriad discussions with social actors from both within and without Enkanini, drawing upon a range of disciplines, as well as the practical lived knowledge of the co-researchers, and instituting small-scale social experiments with limited participants, has led to an outcome that could not have been predicted at the onset of the TDR project. The emergent, and in some cases, unintentional outcomes (reduced rat populations, decreased health risks, increased prospects for livelihood, income-generating activities, etc.) were all incrementally co-designed and co-produced informally with Enkanini residents, specifically with those residents wanting to improve their situation in the present as opposed to waiting or turning to violence.

Today, as load-shedding increases in South Africa, caused by the inefficiencies of the national electricity supplier ESKOM¹⁸ and its inability to supply South Africa with adequate electricity, the shacks with iShack systems burn bright in the informal settlement of Enkanini. Despite the opposition to extending this system, because of fears that it will delay the arrival of grid-provided electricity, this system is proof that an incremental approach brings about much more than just an electricity supply. In this case, it has generated linkages both *within* the community and *between* the community and broader stakeholder groups. It has generated job opportunities and new knowledge, and it has created a sustainable system that has the potential to be rolled out on a national level and transform the lives of millions of South Africans.

3.8 Enkanini ETTDR approach: outcomes and outputs

The abovementioned Enkanini informal urban settlement in the town of Stellenbosch provided a very rich / dense social context *for* and *within* which the ETTDR approach was developed and pursued as a concrete exercise in doing science *with* society in and under fluid societal conditions. As said, the emergent nature of this informal settlement clearly warranted an (equivalent) emergent research design approach capable not only of being co-designed during the unfolding research process, but also, at the same time, contributing to some form of social change. In short, this is basically what the ETTDR approach is all about; in order to present the achievements and impacts of this approach as systematically as possible, it will now be discussed in terms of the two oft-used concepts of research *outcomes* and *outputs*:

3.8.1 Social change outcomes

3.8.1.1 Safe-to-fail social change experiments / probes

¹⁸ For more information on ESKOM and 'load shedding', see: www.eskom.co.za.

In the complex domain there is also a two-way kind of (causal) relationship between outputs and outcomes – they are never completely separate, without any mutual influencing / affecting of each other. However, in the case of the Enkanini experience, the specific dynamics of this two-way relationship, and the way it played itself out in practice, produced very different results than those, for example, presented in the transdisciplinary literature (Scholz, 2011; Scholz et al., 2009; Stauffacher et al., 2006; Wiek et al., 2006) – espousing the already mentioned rational-teleological approach for dealing with formal ‘legitimated’ stakeholders. As mentioned, a core aspect and purpose of the latter approach is always to get the participant stakeholders to decide and agree on some shared ends or goals, *before* (as a pre-condition) setting out on a process of rational discourse and decision-making with a view to identifying and implementing the most efficient and effective *means* with which to achieve the shared goals or ends. And in order to persuade and secure the stakeholders to participate in such rational-teleologically constructed processes, it is felt necessary to have some protected ‘communicative spaces’ (Habermas and McCarthy, 1985) or ‘conflict-free zones’ (Scholz, 2011; Scholz et al., 2009, 2006b) – purposefully constructed in order to somehow protect these formal stakeholder engagement processes from any ‘outside’ influences – normally in the form of power and knowledge inequalities / asymmetries. In short, this means trying to keep the (rational) ends-means discussions between the proverbial four walls, thereby not allowing any ‘externalities’ to affect what happens between the four walls.

Forced to adopt an emergent research design approach, because of the emergent nature of the informal settlement context in which the Enkanini TDCS was embedded, the research team was enabled, right from the onset, to imagine the research process as part and parcel of a broader *discovery of the evolutionary potential of the present* (Snowden, D., 2015b) vs. trying to approach the present from some or other idealised and normatively constructed view / vision of the future. As mentioned, this fundamental difference in orientation also resulted in very different outcomes. Rather than purposefully trying to establish ‘conflict-free zones’ for conducting rational-like discourses *about* what could and/or should be done to bring about social change in the present, the research team proceeded with the co-designing and implementation of the three small-scale safe-to-fail social change experiments, in the *in-between* (Vilsmair and Lang, 2015), *third spaces* (Soja, 1996) or, alternatively, in the words of Snowden and Unger *adjacent possibles* (Snowden, 2016b; Unger, 2007b; West, 1986). Not only was this an attempt to discover what was indeed plausible, but the actual co-creation and assemblage of the physical objects in the form of the iShack project, the gravity-fed toilets and the Bokhasi waste treatment system became important ‘boundary objects’ (Bowker et al., 2016; Star, 2010; Star and Griesemer, 1989; Sveta, 2013) or dynamic attractors (Snowden, 2006a) for imagining what is indeed plausible under the current social and material conditions

of the Enkanini informal settlement – rather than just talking *about* some abstract non-existing possibilities and with no exposure to the complexities of the current situation. On the other hand, as these three small-scale experiments were diametrically different from and opposed to abstract non-existing entities, they never purported to be permanent solutions – from the start they were conceived and assembled as interim experimentations with what is / was plausible in the current situation and could very easily have been dis-assembled and re-configured into something different and new, should this have been necessitated by a change in circumstances at any point during the research process.

Therefore, as the emergent research design approach started to gain traction, and was practically translated into many different side-casting (Snowden, 2012) techniques and activities of co-designing and experimenting with some small-scale safe-to-fail experiments (i.e. adjacent possibles), it became abundantly clear that the Enkanini TDCSR process was on a very different research trajectory than the textbook examples coming from the global North. In short, it became quite clear that the shared logic of the different versions of the rational-teleological approach – developed in and for stable democratic countries such as Switzerland, the Netherlands and Germany – was incommensurate with the demands and multiple unknown unknowns in such a volatile social context, and would therefore simply not work. The research team, therefore, felt challenged from the onset to come up with a very different approach that could help them navigate their way during the unfolding research process.

To be sure, this emergent research design approach, in turn, did not mean falling around in the dark, completely without any knowledge of the different possible options. On the contrary, a range of known options came up during the discussions, ranging from state-driven upgrading of services to permanent neglect, with a bottom-up, informal incremental approach lying somewhere between these extremes. Therefore, not knowing what exactly could be achieved *in the present* (given the social, material and geographical conditions and limitations of the Enkanini informal settlement), the TDR team could only start the research process with a very open-minded transformative orientation, as something which could only be explored incrementally as the research process unfolded on a daily basis.

Still, this approach of side-casting and experimenting with some small-scale safe-to-fail social change experiments resulted in some interim solutions in the form of the iShack, Bokhasi and gravity-fed sanitation projects – discussed in Sections [3.2.5.1 - 3.2.5.3](#) above. Of these three, the iShack project has developed the furthest with more than 1 200 individual shack households belonging and contributing to payment and maintenance of this self-organised

mini-electricity grid system – unsupported by the local government and completely driven as an entrepreneurial business enterprise at the moment. In other words, it has gone way beyond what started out as a research project. However, it is too early to say what the longer-term policy implications of this project and business model will be in terms of its uptake either by the local Stellenbosch Municipality or any other municipalities in South Africa. Only time will tell.

3.8.1.2 Multi-track ETTDR processes vs. multi-stakeholder forums

It has already been noted that the notion of ‘outcomes’ seems to suggest the production / creation of something(s) tangible and measurable. However, the opposite might also be true in view of the strategic decision taken at the start of the Enkanini case study NOT to join the Stellenbosch Municipality-initiated multi-stakeholder forum with the SDI. A logical consequence of this decision could easily have resulted in trying to set up an alternative multi-stakeholder forum with some of the service providers with whom the research team came into contact during the research process (as mentioned in [Section 3.6](#) above). However, this did not happen on the basis of pursuing the emergent / explorative logic of the ETTDR approach – namely to engage more directly with individual shack-dwellers and building relationships of trust with them rather than trying to work *through* some or other elected or appointed representatives speaking on their behalf.

The many, small and positive experiences generated and fed back by the individual shack-dwellers to the research team contributed significantly to creating real-time feedback loops, which, in turn, generated (re)new(ed) human energy and motivation within the research team to keep on with the process of figuring out the next steps in the direction of the adjacent possibles. What this meant, very importantly, is that the relationship between the ETTDR approach and the bottom-up incremental social change strategy steadily became clearer, slowly but surely. The slow picture that started to emerge for the research team was that their various experimental side-casting research activities were in fact contributing to something more than the sum total of the individual activities added together – which, as mentioned already, was an emerging mini-power electricity grid – co-designed, implemented, maintained and paid for by the participating individual households *without* any support from the government (at any level – national, provincial and local).

However, it was during this unfolding ETTDR process that it became apparent to the research team that it would not necessarily be an appropriate strategy to follow to try and set up an alternative multi-stakeholder forum and/or participating in the Municipality / SDI one. It was felt that not only would this take too much time, energy and resources to make happen, but it was

also felt that it was too risky, because it was not uncommon for powerful, well-organised stakeholders to impose their own interests *onto* collaborative research processes – even to the point of ‘hi-jacking’ such processes for furthering their own agendas. In short, it became clear that the challenge of nudging the research process – as an experiment in various socio-technical innovations¹⁹ (Geels, 2005, 2010, 2018) – in a transformative direction was demanding enough in the fluid Enkanini environment – and that by adding any more layers of complexity to the research process could only become counter-productive by diverting the emerging focus and attention away from the ETTDR approach.

3.8.1.3 Nudging decision-making style

Decision-making and strategy-making are two sides of the ETTDR methodology, and the style or the manner in which this is being performed is also crucial for participating in science-*with*-society processes in the complex domain. When dealing with unknown unknowns and the high levels of uncertainty and unpredictability that come with this, it is not advisable *to direct* the research process too strongly in a transformative direction – as per the role of an authoritarian director of a play, for example. This ‘direction’ may very well be experienced and perceived as ‘yanking’ the process in certain direction, driven by too strong (linear) intentions and expectations – which in turn may produce yet another, and unnecessary, layer of complexity to an already complex problem situation at hand. Therefore, a more appropriate style or way in which to conduct decision-making in ETTDR processes would be that of ‘nudging’ (Abdukadirov, 2016; Snowden, D., 2015a; Sunstein and Thaler, 2012). What this means, in the words of Snowden, is doing two things at the same time: (a) “you start with where people *are*, rather than where you would like them to be” and (b) doing lots of small things to influence the direction of behaviour (rather than ideas) within a complex system” (Snowden, D., 2015a). This is indeed consistent with the already mentioned theory and praxis of social change of probing and experimenting with multiple safe-to-fail experiments (Snowden, 2013) and figuring out the next steps in the direction of the adjacent possibles (Unger, 2007a, 2014; West, 1986) – clearly a very different style and approach than trying to push or yank people in the direction of some or other idealized and normative vision of the future (e.g. preferred scenarios), which, as mentioned, fails to give serious consideration to the complexities in the current situation.

In the experience of the Enkanini case study, although the research team may not have used the terminology of ‘nudging’ explicitly to describe their decision-making style, it is in hindsight clearly something which developed in an organic, bottom-up way as the research process unfolded. And the main reason for making this point lies in the fact that at no point in the research process did the research team try to engage with the individual social actors with a

¹⁹ In other words, as mentioned, not just purely technical innovations.

view of co-designing some or other preferred future scenarios for them. On the contrary, the three mentioned safe-to-fail socio-technical experiments were nothing more than radical experimentation with what was plausible in and under the current conditions and could, therefore, only be undertaken incrementally, one step at a time. In other words, decision-making and strategy-making in the process of figuring out the plausible in the present remained tightly interwoven for the entire duration of the research process. To be sure, ‘nudging’ goes against the grain of rational-teleological planning and decision-making, but is certainly something that needs some serious consideration in the interests of methodological agility – especially when working in the kind of emerging, developing world contexts such as Enkanini.

3.8.2 Methodological outputs

3.8.2.1 Multi-track research processes

ETTDR processes cannot be reduced to just one kind, structured in a manner to, for example, deal with formal, ‘legitimated’ stakeholders only. The above Enkanini TDCS experience has shown that this is not always possible, and that it is therefore crucial to imagine ETTDR processes as being profoundly *flexible* and *dynamic* – i.e. capable of both *shaping* and *being shaped* by the non-linear causal dynamics (social context) of the complex domain in which they are embedded. A major advantage of the ETTDR approach has been the co-designing of the research process in such a manner that it is not fundamentally dependent on the presence of formal, legitimated stakeholders – but instead that it can be initiated and conducted with individual social actors in their informal social networks and institutions. This praxis of engaging with informality in ETTDR processes has given rise, at the theoretical level, to the concept of multiple or “multi-track” TTDR processes and, given the importance of this notion for further developing the ETTDR methodology, it will be discussed in more detail in [Chapter 5](#) below; however, suffice it to mention here the importance of this for sustaining methodological agility in the sense that switching over the ETTDR methodology is not just something that happens at the conceptual level – becoming familiar with a different set of concepts and ideas – but rather it may very well mean / demand conducting ETTDR processes in ways that are counter-intuitive in a democratic society – i.e. *without* having access to and dealing with representatives who have been mandated to speak and make decisions on behalf of other people – in other words, dealing informally with individuals who can only speak on behalf of themselves.

3.8.2.2 Guiding logics and principles

As mentioned, dealing with non-linearity in informal social situations / contexts in ETTDR processes does not mean that anything goes (Feyerabend, 1993). On the contrary, there is still a need for some guiding logics and principles that enable navigation of the research process in a transformative direction. Without some guiding logics and principles, the research process may very well become scattered to the proverbial four winds, without ever contributing to some form of social change. However, what does not make sense in this context, is an approach of merely drawing the guiding logics and principles from the literature and merely applying them *as is* to different contexts. Instead, when working in emergent social contexts any guiding logics and principles may also have to be developed *during* the unfolding research process. This was indeed the case in the experience of the Enkanini TDCS, by following the ETTDR approach and developing some context-relevant guiding logics and principles in an organically bottom-up way during the unfolding research process. Given the importance of this process and for understanding how such guiding principles can both emerge from and guide the research process, which will be discussed in more detail in [Chapter 6](#) below. However, suffice it to say that by positing these guiding logics and principles, no claims are made about their real or potential universality – i.e. that they can be applied as is to ALL emerging social contexts in different parts of the world. On the contrary, following the ETTDR approach means that different research experiences and processes under different material and social conditions may very well have to come up with their own context-relevant guiding logics and principles.

3.8.2.3 Dynamic epistemic objects – guiding research questions & problem statements

Working in the complex domain, such as the emerging informal settlement context in Enkanini, also does not mean going into the research process without any problem statements and research questions to focus the investigation. On the contrary, problem statements and research questions are indeed needed, but with the clear understanding that they are flexible / dynamic epistemic objects (Knorr Cetina, 2001; Knorr-Cetina, 2009) that will undergo many iterations of change during the unfolding research process – i.e. not only as researchers critically reflect on their research experiences and come into contact with many different bodies of literature, but also, very importantly, as and when the social actors' practical / experiential / tacit understandings and insights of the complex problem situations at hand are being engaged with and made part and parcel of the research process. Contrary to the positivist trend in the history and philosophy of science, the challenge is, therefore, not to figure out how *to exclude* our experiences and perceptions at the phenomenological level, but rather figuring out how *to include* these in a meaningful way in the research process by making

sense of at times many different and differing experiences and perceptions in such a way that it can influence and even change our initial guiding epistemic objects.

As mentioned, formulating sufficiently flexible problem statements and research questions was crucial at the start of the Enkanini research process. The question of what can be practically done *in the interim whilst waiting* for the Government to arrive with its grid-like infrastructure solutions was indeed an important starting point in this regard, in the sense that it was both broad and dynamic enough to initiate the research process with the clear understanding that this can and should be further pursued and developed *during* the unfolding research process by the individual researchers.

One of the major learning points from the ETTDR experience in the Enkanini TDCS is that in order to do science *with* society in the complex domain, it is not a fundamental prerequisite to have some initial clear-cut hypotheses, problem statements and research questions (epistemic objects). On the contrary, these can be designed and developed along the way, facilitated by some context-relevant guiding logics and principles, which will be different from the inductive and deductive modes of reasoning used for guiding truth-seeking and hypostudy-testing types of research in the mono-, multi- and inter-disciplinary methodologies approaches. Examples of the kind of guiding logics and principles that both emerged and guided the ETTDR approach in the Enkanini case study will be discussed in more detail in [Chapter 6](#) below.

3.8.2.4 Research methods

The same response goes for working with certain research methods when initiating and conducting ETTDR processes in the context of complex, emerging problem situations in the complex domain: it is not a fundamental prerequisite to have clear-cut methods and knowing exactly in advance how they will be used – at the start, even *before* the research process has actually commenced (Gellner, 2005). The reason for advising *against* such an instrumentalist approach is quite simple: when working with *unknown unknowns* it is far from clear exactly what it is that we do *not understand*, and it will, therefore, be highly premature to decide *in advance* exactly what research methods will and should be used *prior to* venturing into any complex real-life problem situations in the complex domain. This is not an argument *against methods per se* (Feyerabend, 1993), but rather, as in the case with epistemic objects mentioned above, deciding on existing methods or developing new ones as the research process unfolds.

This was indeed the case in the Enkanini experience. By following the ETTDR approach it was indeed possible to start intuitively with a particular method, which is known in the literature as ‘deep ethnographic interviewing’ (Pelto, 2017), used by some of the researchers (Wessels,

2015) during the research process, especially during their invited stay-overs with the individual shack-dwellers, in order to listen carefully to their lived experiences prior to moving into the informal settlement of Enkanini. However, upon critical reflection, it was found that the strong point of this method of working in a very detailed and in-depth manner with individual lived experiences was also a limitation of the method, which inspired a search for some other narrative-based methods capable of dealing with multiple narratives. This, in turn, led to the discovery of the SenseMaker® approach, which will be briefly referred to again in [Chapter 7](#) below. However, suffice it to mention here that this will only be a very cursory overview of this approach, only for illustrative purposes to basically demonstrate how starting intuitively with a particular context-sensitive method can in fact lead to discovering more relevant methods during the research process. However, as mentioned, going into a methods discussion in any detailed manner falls outside the scope of this study and will therefore only be explored in very broad terms in [Section 7.5](#) below.

3.8.2.5 Dynamic research roles

As far as the assuming and performing of certain roles in ETTDR processes are concerned, it is clear that there are some already well-described roles in the TD literature – such as, for examples, the three roles of: (a) the reflexive scientist, (b) the change agent, and (c) the intermediary / facilitator (Pohl et al., 2010). What is important to note about these roles, as with the epistemic objects, is that they need to be seen as very dynamic and flexible – certainly not static, but capable of changing and being changed as circumstances change during the emerging research process. What this meant in the case of the Enkanini experience is that, although the researchers felt they could identify with most of these roles, they also felt that it was important to change the labelling to some extent, especially the role of ‘change agent’. In view of the particular history of apartheid in South Africa, and the fact that informal settlements are in many ways still remnants of the old Group Areas Act(s), which prohibited black people from moving into the city in search of a better life and economic prospects for themselves, the researchers felt quite strongly that their role of change agents could be better described as ‘activists’, since change agents just did not sound appropriately forceful enough. In this kind of volatile context, words certainly matter and with the name change also came some unexpected consequences, though. Resonating and expressing more strongly and accurately their multiple identities as researchers and activists, performing the latter role in practice translated into a conflict of roles from time to time – meaning that they felt it more and more difficult to distinguish between the roles and needed some strong reminding from supervisors that whilst they were activists, they were also at the same time reflexive scientists. However,

this was certainly not an insurmountable problem, but just something which needed to be carefully managed during the research process.

The flip-side of the role and function of roles in ETTDR processes is that they may very well become too static in their function and performance. When this happens, they become the embodiment of some already-scripted roles (Hajer, 2005)²⁰ which cannot be changed, but only acted out as per a pre-produced research script – complete with pre-defined problem statements, research questions, methods, outputs and outcomes etc. – merely requiring both researchers and social actors (co-researchers) to act out their pre-defined roles. And when this happens, when the so-called role-players start getting the feeling of merely acting in some sort of an already-scripted play, the result may very well be people just going through the motions in some sort of a mechanical way, just to please the director in charge and, thereby, failing to pay attention to changing issues and the context at hand. Therefore, needless to say, the roles and the function of roles are another key aspect of methodological agility: not only are there more and different roles literally coming into play when switching *between* the different methodologies, but of equally critical importance is also the way they are being enacted and played out *within* a particular methodology. More specifically, in terms of adopting and pursuing the ETTDR methodology, this means carefully treading a very fine line in the way the roles are managed and acted out – somewhere between the two extremes of too much flexibility, on the one hand, and being too static, on the other hand.

3.8.2.6 Methodological agility in practice

Introducing the Cynefin heuristic has certainly been very helpful, at the conceptual level, not only for understanding the emergent nature of the Enkanini situation from different perspectives, but also for responding to this in a dynamic way by switching between different methodological orientations – thereby starting a practice of what was referred to earlier (in [Section 3.1](#)) as **methodologically agility** – i.e. both inter- and intra-methodological agility. In this regard, the suggestion of four ontologically distinct domains posited in the Cynefin framework can also be imagined as providing us with four different lenses, as it were, through

²⁰ The problem here is not so much with the imagery of the stage / dramaturgy per se, since the metaphorical nature of the imagery certainly helps to explain some of the abstract ideas and concepts associated with the research process in which both researchers and social actors are required to play different roles from time to time (Pohl et al., 2010). The problem, however, is more with conception of dramaturgy, of the stage, the actors etc. as static elements. For example, in physics time and space for Newton formed an inert, universal cosmic stage on which the events of the universe played themselves out, as it were, whereas for Einstein the situation was the complete opposite: time and space played an integral part in how the universe actually evolved. In other words, the proverbial stage is something dynamic, interacting with the actors and the actors interacting with the (changing) stage (Greene, 2005) – and it is this precisely this *dynamic conception* of the stage that is key for our purposes of understanding the vibrant interaction between context and human agency in the Complex Domain.

which particular problem situations can be interpreted, not only for the purposes of sensemaking and acting at the phenomenological and practical levels respectively, but also, and very importantly for our purposes, deciding on and switching between appropriate research approaches at the methodological level. Therefore, the trap of reductionism, of looking at problem situations from only one, narrowly defined perspective, can certainly be avoided when using the Cynefin framework as a hermeneutic heuristic for both practical and methodological decision-making.

Therefore, for example, different aspects of the dynamics of the different domains become 'visible' when looking at the Enkanini informal settlement through the four lenses of the Cynefin framework – this, in turn, demands different methodological responses, which in practice may very well overlap from time to time, depending on which aspects of the problem situation one is working on. Starting with the obvious or complicated domains perspectives, it is abundantly clear from the daily protest actions of people living in informal settlements in South Africa that what is fundamentally at stake are peoples' basic unmet needs for proper housing with basic infrastructure services such as electricity, water, sanitation etc. – and that the challenges facing Enkanini are very similar, if not identical, to this. This was indeed the singular line of reasoning adopted by all the political parties contesting the local government elections in 2011, namely promising the people of Enkanini *immediate* electricity if they would vote for them.

However, it is also possible to look at Enkanini through the complexity lens, in which case the situation appears to be a lot messier than what was put forward by the political parties and their respective ward councillors seeking to be (re)elected into office. Given the legal (eviction order), social (un-mobilised community), financial (budgetary constraints) and geographical (steep incline) conditions and limitations of the Enkanini informal settlement, it was certainly not clear at all how the politicians' promises, based on their linear thinking of the relationship between cause (voting) and effect (electricity delivery), would be realized in such a short space of time.

Therefore, had the research team decided to follow this linear cause and effect reasoning, relevant to the obvious domain, it would almost certainly have resulted in approaching the complex situation of this emerging informal settlement with a very specific mono-disciplinary approach. In all likelihood, this would have meant going into the research process with a pre-defined problem framing and definition of the Enkanini situation as predominantly an 'energy problem'. This, in turn, would have steered the research process very quickly, from the onset, into a single disciplinary – i.e. engineering – direction, namely one of finding the most cost-effective and energy-efficient technical solution for the people living in this informal settlement

– weighing up the merits and demerits of energy sources such as biomass, gas, paraffin, solar, diesel etc.

Importantly, though, in the light of all these unknowns and uncertainties, it certainly was not clear at all *where* and *how* to start the research process in 2011 as well as exactly what the research team could hope to achieve from a small research project with a very limited budget in the current situation. This was true not only in terms of coming up with some innovative ideas and solutions, but also in terms of the research process itself, of where and how to start it in a truly emergent context of an un-mobilised community with no legitimated leaders or decision-makers with whom to initiate some form of engagement.

However, on critical reflection, figuring out in practice how to engage with this emerging, informal community without access to any formal ‘legitimated’ stake-holders (explained in more detail in [Sections 3.1](#) above), in fact represented the beginnings of a *praxis of methodological agility*. As said, this practice is considered to be an essential aspect of a dynamic ETTDR approach, which, in turn, is integral to the broader ETTDR approach. In fact, without this ability to view and make sense of problem situations from radically different perspectives and, accordingly, making the necessary methodological changes as the context of the problem situation changes or our understanding of the context changes, the inducement would be to enter and participate in ALL science-with-society processes with just ONE methodological approach – in a crudely reductionist manner, as if context does not matter.

As mentioned from the start of this study (in [Chapter 2](#)), the rationale for developing ETTDR, through the ETTDR approach in this chapter, is mindful of the potential danger of presenting the ETTDR approach as some or other panacea for ALL kinds of problem situations. However, what the research team’s experiences and observations in Enkanini have demonstrated is that this kind of methodological reductionism, the proverbial one-size-fits-all approach, can indeed be avoided by becoming methodologically agile. This means, both in theory and practice, that it is necessary at certain times to work in a mono- and inter-disciplinary way, and other times in a more trans-disciplinary way – depending on the changes in the social context and/or changes in our understanding of the context. And building on these valuable experiences and insights gained by the Enkanini research team – i.e. learning how to be/come methodologically agile both in theory and praxis – is indeed key for the way in which we initiate and participate in broader science-*with*-society processes in different parts of the world, facing different kinds of challenges and problem situations.

3.9 Enkanini: An ETTDR case study: summary

As mentioned, the agile ETTDR approach developed and pursued in and during the abovementioned Enkanini TDCS is part and parcel of the broader ETTDR methodology for conducting science-*with*-society processes in highly fluid / emergent societal contexts. In other words, the TTDR approach is not necessarily relevant when societies are more established / stable / structured / organised democratic institutions – as can, for example, be found in Northern European countries such as Switzerland, Germany and the Netherlands etc. Therefore, the types of research outputs produced by the ETTDR approach that are of interest for our purposes of developing the ETTDR methodology, all relate to a number of fundamental aspects as outlined below.

Therefore, paradoxical as it may sound, it is worth mentioning that intentionally deciding not to try and set up an alternative multi-stakeholder forum produced a different process type of 'outcome' than would have been the case had the research team decided to participate in the Municipality-initiated multi-stakeholder forum in 2011. However, this is not contradictory at all if we remove any linear assumptions / expectations between intentional research actions in ETTDR processes and specific kinds of outcomes – such as the (replication) of multi-stakeholder forums, and instead allowing replacing the latter with completely different and unexpected kinds of outcomes. In this regard, as mentioned, this meant traversing a very different research trajectory in the Enkanini case study – which has subsequently been called a multi-track approach for transdisciplinary research processes (Van Breda and Swilling, 2018). Given the importance of this particular and unexpected outcome for our purposes of further developing the ETTDR methodology in a methodologically agile manner, it will be discussed in more detail in [Chapter 5](#) below.

CHAPTER 4: MULTI-ONTOLOGY METHODOLOGICAL DECISION-MAKING FRAMEWORK

4.1 Introduction

A very useful way of achieving the objective of distinguishing between the different kinds of contexts, alluded to above, for situating the different context-relevant methodologies is by introducing the “Cynefin” multi-ontology decision-making framework developed by David Snowden (Snowden and Boone, 2007) of [Cognitive Edge](#) (see Figure 6 below for a graphic representation of this). “Cynefin” (pronounced phonetically kunev-in) is a Welsh word denoting a place of multiple belongings in the sense of a cultural holding space where people continuously negotiate their different identities. This is also close in meaning in the way Bourdieu used the term ‘habitus’ (Bourdieu, 2008; Costa and Murphy, 2015) as a dynamic formative context (Bateson, 1972; Ciborra and Lanzara, 1994; Garfinkel, 1991; Heritage, 2013; Mills, 2017, 2014; Schutz, 2012, 1973; Unger, 1997) or the social place and space where people continuously make and re-make their social habitats whilst, in the process of doing so, adopting different identities and roles. However, and very importantly for our purposes, the Cynefin framework goes *beyond* the phenomenological level of merely describing our lived experiences of meaning-making of our social habitats / worlds, by suggesting that underlying our lived experiences are some fundamentally different kinds of causal or cause–effect relationships – which means that the contextual differences are in fact ontological and not just phenomenological.²¹

The four distinct contexts – also referred to as domains – are the as follows: the obvious / simple domain, the complicated domain, the complex domain and the chaotic domain (described in more detail Sections [4.2](#), [4.3](#), [4.4](#) and [4.5](#) below). There is also a fifth domain – disorder – but this is strictly speaking not a separate ontological domain with its own discernible cause–effect relationship and therefore denotes more of an in-between epistemological space, as it were, from where figuring out and the sense-making of the abovementioned domains takes place.

²¹ Acknowledging that the fundamental differences between the four domains are in fact *ontological* due to the differences in their (underlying) causal dynamics is to agree with Aristotle’s fundamental point about the link between knowledge and *understanding the causality* of things: “we do not have knowledge of a thing until we have grasped its *why*, that is to say, its *cause*” (Aristotle, 1961). In other words, understanding and explaining some of the salient features of the fundamentally different kinds causality between the four domains is critical for our purposes here in the sense that we will be dealing with these ontological differences first, before proceeding with a discussion of their epistemological and methodological implications and strategies (ontological differences).

Given the fundamental methodological interest of this study, the Cynefin framework alluded to above will be adopted and adapted (see Figure 7 below) here for our purposes to mean a holding-space of multiple research methodologies. In other words, it is treated as a meta-theoretical space, where *methodology* as such becomes the subject of our critical reflections and discussions. However, making this move does not imply opening up a back-door, as it were, for developing the ETTDR methodology in a purely abstract way decoupled from context. On the contrary, the Cynefin framework opens up the opportunity for discussing all four of the said methodologies – including the ETTDR methodology – in terms of one of the four contexts / domains – each warranting its own context-relevant methodological approach.

However, before proceeding with a more detailed discussion on the **domain-relevancy** of the four research methodologies, it is important to comment on the actual status of the Cynefin framework. Although it posits that the differences between the four domains are fundamentally ontological – given the different kinds of causality underpinning the domains – it does not follow that this framework should be treated in a literal or realist sense of the word – as some kind of a mirror-image of the actual structure of reality (independently of our minds, as it were). This will definitely be reading too much into the Cynefin framework and would tend to result in using the Cynefin framework essentially as a classification tool – i.e. using it in an instrumentalist way for merely categorising things.

Instead, a better approach for our methodological purposes is to treat the Cynefin framework more as an abstract or ideal-typical²² representation of the different kinds of real-life situations we can expect to encounter in the Anthropocene, and then using it as a heuristic tool for decision-making purposes – i.e. figuring out when and how to pursue the ETTDR methodology, and when not. As already mentioned, the purpose of this is to enable **inter- and intra-methodological agility**, which, in turn, is considered critical for the way in which the broader *science-with-society* relationship is to be conducted. The ETTDR methodology of doing *science with society* is, therefore, by no means purporting to be a cure-all approach which can or should be followed for tackling every problem situation under the sun, as it were. The more detailed discussion below of the domain-relevancy of the mono-, multi-, inter- and transdisciplinary methodologies will make a case for why the ETTDR approach is considered to be particularly appropriate for tackling complex problem situations with non-linear cause–

²² It should be noted that there is some resemblance with the way Max Weber (Finch, 2011) coined and used this notion of ideal types – as abstractions rather than replicas of reality. However, there are also some important differences here, since for Weber ideal types were primarily to be used for analytical / comparative purposes and not so much for decision-making purposes, as proposed above. The problem with this purely analytical approach advocated by Weber is that it does not necessarily lead to decision-making by asking the crucial question: *what are the next steps?* (Unger, 2007b). In other words, once problem situations have been analysed and categorised, they tend to be left alone – job done – failing to figure out what needs to be done next.

effect relationships in the complex domain – and, conversely, why the other research methodologies are considered to be more appropriate for tackling problem situations with linear cause–effect relationships.

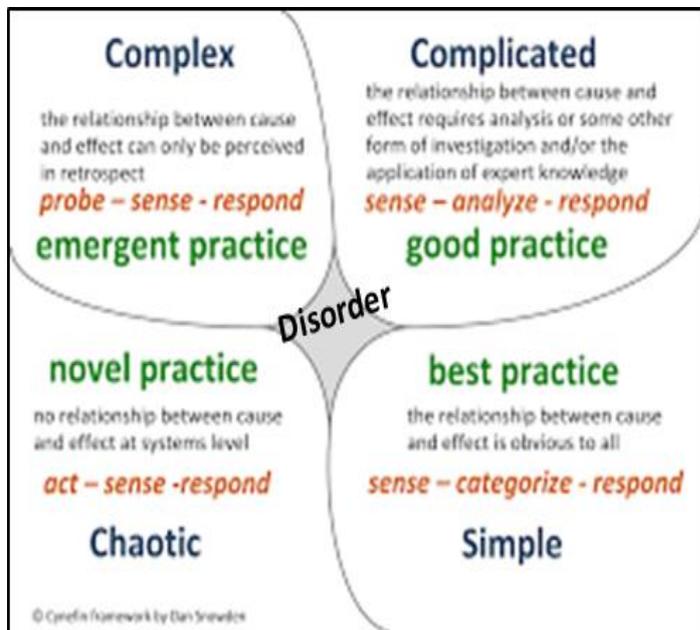


Figure 6: The Cynefin multi-ontology decision-making framework
Source: Snowden and Boone, 2007

The Cynefin decision-making framework as depicted in Figure 6 with its four different ideal-typical domains or contexts – developed by [Cognitive Edge](#) for the purposes of considering taking appropriate action when confronted with radically different causal dynamics in four different kinds of contexts / domains, namely: the simple / obvious, the complicated, the complex and the chaotic domains.

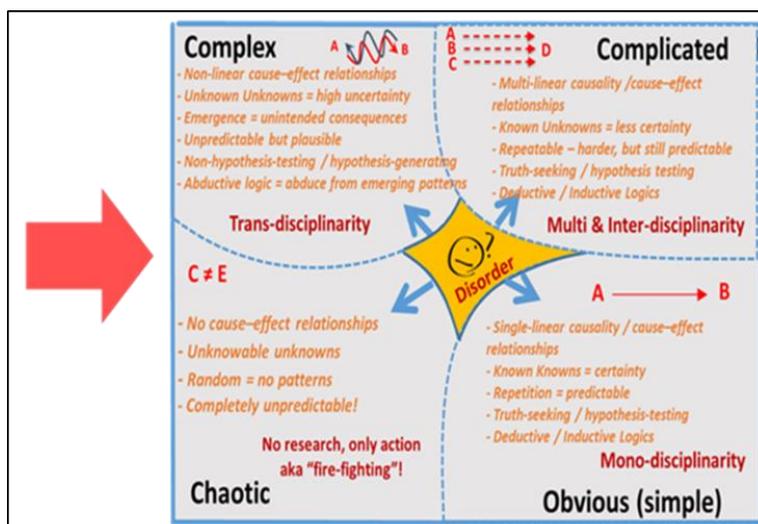


Figure 7: Domain-Relevant Methodologies²³

²³ This is an adapted version of the Cynefin framework

Source: By Author 2019

The red arrow in Figure 7 signifies the process of adopting and adapting the Cynefin framework for the purposes of developing the ETTDR approach – i.e. as a particular domain / contextual-relevant research methodology *in relation to* the other research methodologies situated in the different kinds of domains / contexts. The red arrow signifies the process of adopting and adapting the Cynefin framework for the purposes of developing ETTDR as a particular domain / contextual-relevant research methodology *in relation to* the other research methodologies situated in the different kinds of domains / contexts.

4.2 Mono-Disciplinarity in / for the Obvious / Simple²⁴ Domain

The obvious / simple domain (see Figure 8 below) is fundamentally characterised by linear causality, or linearity for short: i.e. events / occurrences that are caused by single, clear-cut and repeatable cause–effect relationships, in which A causes B, C causes D, E causes F etc. – with no evidence of any feedback loops occurring between B and A, D and C, F and E etc. Underpinning these notions of linear causality / linearity is the Cartesian two-world theory of the ‘natural’ vs. the ‘social’ as two fundamentally different worlds or realities – in which things seemingly work in a mechanical / machine-like fashion according to some immutable universal natural and social laws in Nature and Society respectively. These ontological ideas of the world and how it works have some profound epistemological and methodological implications. At the epistemological level, they give rise to the conception that the function and purpose of our knowledge is merely to be able to *understand* and *explain* the true nature of reality and how it works according the immutable universal laws with a view to somehow bringing the latter (universal natural laws) under control for the benefit of society. It is perfectly possible to produce certain knowledge of linearity in this domain, since the one-to-one cause–effect relationships are repeating and manifesting themselves very much in similar or same identical ways as in the past, irrespective the different contexts in which this happen.

Linear causality, especially single linear causality, normally produces clear-cut epistemic objects that can be described as ‘known knowns’ (Snowden and Boone, 2007), which means that they assemble and present high levels of certainty and predictability about them. In other words, there is very little doubt that an effect (the manifest problem) has a very particular or singular cause – i.e. things can only be explained in this particular way and in no other way(s). In such cases an appropriate epistemological strategy is through **categorisation** of the

²⁴ The obvious domain can also be referred to as the simple domain, provided that the notion of ‘simple’ is not mistaken for being ‘simplistic’ in the sense – an overly reductionist rendition of what is being described as ‘simple’ (Snowden, n.d.).

different types of knowledge(s) produced by the individual disciplines, by classifying them according to some well-established disciplinary concepts and theories as well as using tried and tested practices and methods, such as hypostudy testing, for empirical verification of the taxonomic knowledge system. In this regard, what seems to work particularly effectively is consistently applying the principle of parsimony, also known as Occam's Razor (LLC and LLC, 2010; Sober, 2015), namely that 'entities should not be multiplied unnecessarily', or put differently: 'when there are two competing theories that make exactly the same predictions, the simpler one²⁵ (with the least assumptions) is the better one.' In other words, in this domain reductionism works extremely well as the dominant logic for how knowledge *is* and *should be* produced – the ultimate goal of which is always to establish the Truth about a particular problem situation, which can be fully understood and explained in terms of single linear causal relationships.

In this domain, **mono-disciplinarity** (see Figure 8 below) is considered to be a domain-relevant methodological approach – especially if there is strong consensus amongst the individual disciplines that it is quite possible for them to work *separately* on the obviously straightforward / simple issues / challenges at hand.²⁶ It also helps if the latter challenges are seen as *unconnected* problems and it is, therefore, completely up to the individual disciplines to theorize the true nature of the cause–effect relationships in this domain. In this mono-disciplinary mode of doing research, the individual disciplines therefore do not see any need for knowledge *co-production* – by crossing disciplinary boundaries in order to come up with some integrated perspectives for understanding / explaining the obvious / simple issues at hand.

Therefore, when facing problem situations caused by straightforward single cause–effect relationships, there is certainly no need for collaboration across and between disciplinary boundaries. To be sure, in the obvious / simple domain, the single disciplines are up to the task of developing their own epistemic objects – i.e. problem statements and research questions – and with no inputs whatsoever from other disciplines on the methods to be used for data collection and answering the research questions. However, when it comes to finding some solutions for societal problems, the individual disciplines normally hand over their

²⁵ For example: facing a situation where one finds a hole in a window the width of one bullet and a bullet lodged in the wall, in line with the hole. One explanation is that a single bullet was fired through the window. A second explanation is that two bullets were fired through the same hole and that the second bullet has been removed by someone. A third explanation is that ten bullets were fired through the same hole, all of which have been removed except the one in the wall. According to the Occam Razor principle, the single bullet explanation is the favoured explanation, because there is overwhelming evidence for it and demands the least amount of assumptions to make (as would be the case in both the second and, even more, in the third explanations).

²⁶ Here the phrase 'at hand' denotes issues / challenges that are clear-cut with very little, if any, uncertainty with regards to their single linearity / cause–effect relationships.

'scientific' findings to the relevant decision- or policy-makers with the clear understanding that the responsibility for implementing the suggested solutions are those of the decision- / policy-makers – and not those of the researchers / scientists. This division of labour, with its clearly differentiated roles and responsibilities, is made possible on the assumption that implementation is also, in and of itself, a straightforward matter of linear causality between well-intended actions (cause) and desirable outcomes (effects). In other words, decision- and policy-makers must always ensure that the actions to remedy the problem situation at hand are implemented exactly as intended by the researchers / scientists. Should something go wrong during the process of implementation, it can only be a case of failing to implement according to the plan – normally because the decision- / policy-makers misunderstood or failed to understand the intended actions in the recommended solutions. This approach normally translates into doing research *on, about* or *for* society which quite often results in an approach of 'speaking truth to power' (Flyvbjerg, 2004).

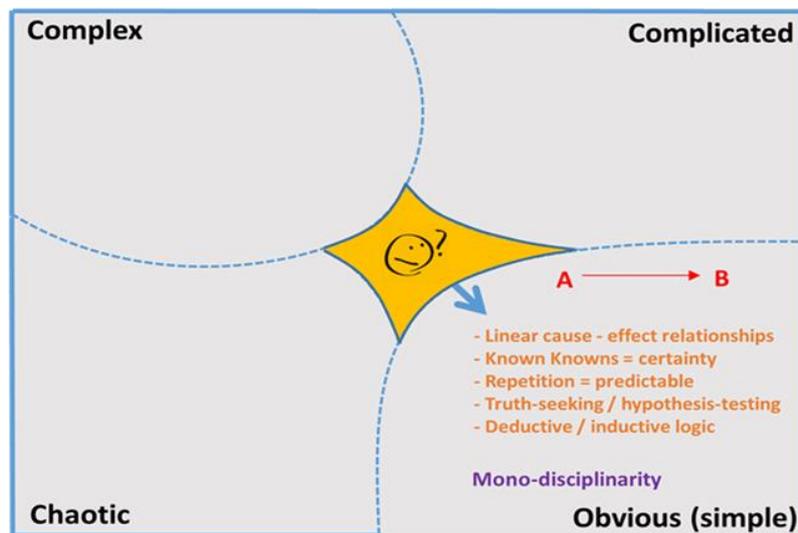


Figure 8: Mono-Disciplinarity in/for the Obvious/Simple Domain
Source: By Author 2019

Figure 8 focuses only on the dynamics of the obvious / simple domain, characterized in the main by single, repeatable linear cause–effect relationships (A causes B) which can be successfully theorized by the individual disciplines concerned by using the well-established deductive / inductive logics and principles for developing discipline-specific problem statements, research questions, hypotheses etc. – without any interaction and collaboration between the individual disciplines or any relevant social actors.

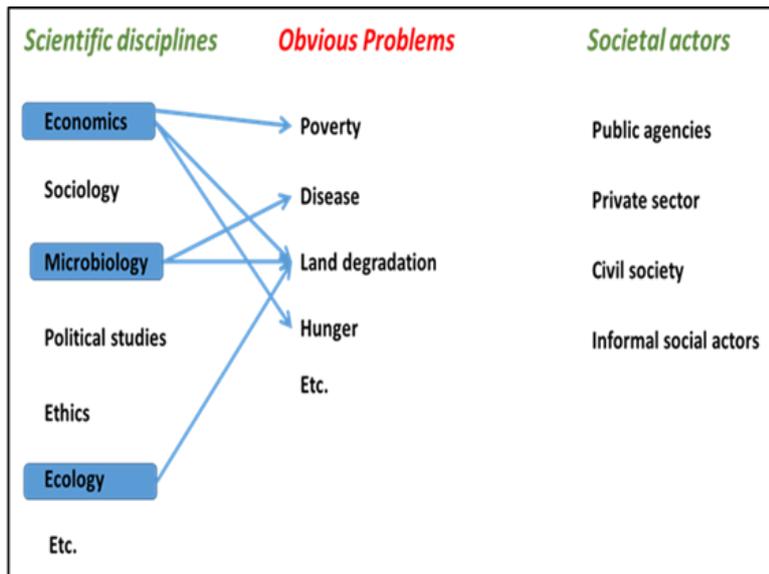


Figure 9: Mono-Disciplinarity²⁷

Source: By Author 2019 – adaptation from: Hadorn and Pohl, 2008

The blue arrows in Figure 9 linking the three disciplines concerned (highlighted in blue boxes) with the different problems / issues here, signify the gist of the mono-disciplinary approach in the obvious domain, where the individual disciplines are not only working on *separate issues*, but also working *separately from each other* – without any form of interaction and collaboration between them and/or with any of the relevant societal actors / stakeholders showed in Figure 9.

In short, the obvious / simple domain is the field where, methodologically speaking, the single-discipline experts tend to reign supreme with the sole responsibility of producing Truth-full knowledge of the straightforward, linear problem situations at hand – clearly with no need for interacting with other disciplines and/or any societal stakeholders outside of academia. Bringing the perspectives of these latter stakeholders into the research process is widely considered as redundant or counter-productive for doing so can only lead to ‘contaminating’ the ‘objectivity’ of the knowledge produced in the research process – thereby making the problem situations at hand unnecessarily ‘complicated’ or ‘complex’.

4.3 Multi- And Inter-Disciplinarity in / for the Complicated Domain

If the obvious / simple domain is characterized by the active presence of single-discipline experts, then the complicated domain is characterized by multiple-discipline experts. The reason for this is that the difference between the two domains is one of degree and not of kind in the sense that linear causality is still at the heart of the complicated domain. To be clear

²⁷ Single disciplines focusing on separate problems without any interactions / exchanges between them.

about this, the obvious / simple domain is characterized by singular linear cause–effect relationships whereas the complicated domain is characterized by multiple linear cause–effect relations. This is illustrated in Figure 10 below, indicating that any one cause or combination of A, B or C can be the cause of effect D. In other words, there is a shift from one-to-one causal relationships in the obvious / simple domain, to many-to-one or even many-to-many linear causal relationships in the complicated domain – but clearly with no fundamental change in the uni-directionality and repeatability in these linear causal relations.

However, given this multivariate nature (Bai et al., 2010) of this, it is not always immediately clear which of the many different causal relationships are actually the predominant ones in any given situation. This gives rise to epistemic objects which can be described as ‘known unknowns’ (Snowden and Boone, 2007) – with less certainty and predictability than in the case of ‘known knowns’ in the obvious / simple domain, but not completely uncertain / unpredictable as in the case of the complex and chaotic domains respectively (discussed in more detail in [Sections 4.4](#) and [4.5](#) below). Figuring out which of the multiple linear causal relationships are the predominant ones is certainly something which can be achieved amongst the individual disciplines. For this it is necessary to follow an appropriate epistemological strategy of analysis – i.e. through sufficient, in-depth analysing of the complicated problem situation at hand through exchanging disciplinary ideas, concepts, insights and understandings, practices, methods etc. In other words, it is the complicated nature of the problem situation at hand which motivates the relevant disciplines to come together with the view to achieving sufficient clarity through some form of disciplinary exchange and interaction.

In fact, to be more precise, in the complicated domain there are two domain-relevant methodological approaches possible with varying degrees of collaboration and interactions between the relevant individual disciplines. The first mode is known as multi-disciplinarity (see Figure 11 below) in which the different individual disciplines are now working on the same problems – no longer on separate ones as in the obvious / simple domain – in an attempt to figure out which of the multiple causal relations are the predominant ones. However, in the multi-disciplinary mode, this work is still undertaken by the individual disciplines but working independently from each other – with each discipline still using its own well-established ideas, concepts, reasoning etc. to develop certain hypotheses for unravelling the complicated situation of facing multiple linear causal relationships. In other words, this mode of working independently on the same issues, without the need for collaboration, is made possible by the linearity of the causal relationships – enabling the individual disciplines to theorize and hypothesize on the predominance of the multiple causal relations in this domain – but always as determined by the disciplinary perspectives of the relevant individual disciplines. In this

mode, the expert analysis of the complicated problem situation at hand will be provided by the project leader of the research project, charged with the responsibility of coming up with some or other integrated perspective and explanation of the multiple causal dynamics at work – normally at the end of the research project, when all the participating disciplines have had the chance to complete and submit their own discrete research findings.

In the case of the inter-disciplinary approach (see Figure 12 below), the individual disciplines start to realise that working strictly *within* their own disciplinary boundaries presents some serious limitations for dealing with the multivariate dynamics at play in complicated problem situations and that it would, therefore, be better to start collaborating with each other in order to come up with the best possible integrated hypotheses in this regard. This collaboration can take many different forms, but normally entails some form of exchange of information and methods amongst the relevant disciplines – i.e. borrowing concepts, perspectives and practices etc. from another discipline in order to come up with a more enriched / multifaceted / integrated inter-disciplinary understanding (*Verstehen*) and explanation (*Erklärung*) of the complicated causal dynamics of the problem situation at hand – something which cannot be achieved by the individual disciplines working in isolation from each other and without any interaction amongst them.

Inter-disciplinary research approaches are therefore also similar to the mono- and multi-disciplinary approaches, driven by linear inductive / deductive reasoning – where all the key research activities, such as problem framing, research design, selection of methods, data collection, analysis and interpretation, solutions and recommendations etc., are all still independently performed by inter-disciplinary experts – clearly warranting some extraordinary inter-disciplinary expertise for working both *across* and *between* disciplinary boundaries. This is clearly more than what is required in mono- and multi-disciplinary approaches – but still does not warrant any contributions and interactions with any social actors in all of this. And the reasoning for not bringing social actors' practical / experiential / embodied understanding and knowledge of the complicated problem situation(s) at hand *into* the research process is that it is seen as superfluous and may only serve the purpose of unnecessarily 'complicating' or 'contaminating' the research process. Practical / experiential / embodied understanding and knowledge is, therefore, explicitly excluded from multi- and inter-disciplinary research processes – from the onset, as part of the research design and strategy-development of the latter. In other words, the individual disciplines, in both the multi- and inter-disciplinary methodologies, still do not see a need for any form of *knowledge co-production* – especially the need for engaging with the practical / experiential / embodied understanding and knowledge of social actors. The need for *knowledge co-production* is something which

manifests itself most strongly only in the complex domain, when facing complex, non-linear problem situations, and to which the ETTDR methodology wishes to respond purposely by way of explicating as clearly as possible the different sets of guiding logics, principles, practices, methods etc., necessary for driving and steering ETTDR processes – which will be discussed in more detail in [Section 6.2](#) below.

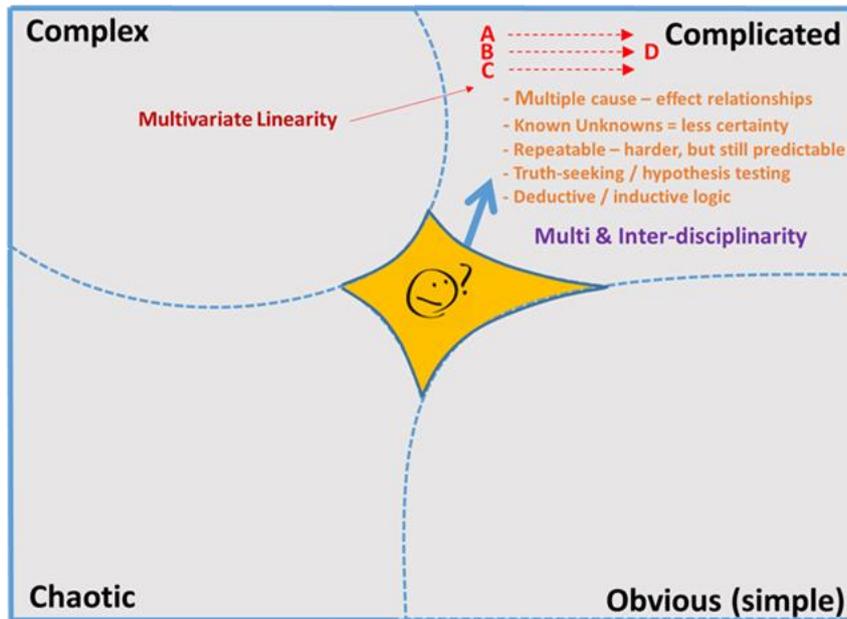


Figure 10: Multi- & Inter-disciplinarity in/for the Complicated Domain
Source: By Author 2019 – adaptation from: [Snowden and Boone, 2007](#).

Figure 10 focuses only on the salient dynamics of the complicated domain, characterized mainly by the multi-variate nature of multiple, repeatable linear cause–effect relationships (A, B, C causes D). Although it is not immediately clear which of these are the predominant causal relations, it is something which can be successfully theorised in two different ways / modes: (a) **multi-disciplinarity** (see Figure 11 below) – i.e. by allowing individual disciplinary experts to work separately – without necessarily any interaction and collaboration between them and/or any relevant social actors – using well-established disciplinary logics (e.g. deductive / inductive reasoning), principles and methods for developing and researching discipline-specific problem statements, hypotheses and research questions, and (b) **inter-disciplinarity** (see Figure 12 below) – i.e. when disciplinary experts are becoming aware of the limitations of their individual disciplinary approaches and starting to collaborate with each other by, for example, exchanging ideas, concepts, insights etc. for a better / more integrated understanding of the complicated problem situation(s) at hand.

In other words, whether using the same and/or different approaches in these two different research modes, it produces the same convergent effects / outputs: arriving at the same and/or similar conclusions – in this case some or other integrated theories on the predominant

(actual or potential) cause–effect relations at work in the complicated problems). This phenomenon of convergence in scientific inquiry has been referred to in the literature as *consilience* (Wilson, 1999). In this context of multi- and inter-disciplinary modes of scientific inquiry / research it means that, irrespective of their different points of departure, merging into something holistic somehow seems to be a guaranteed point of arrival.

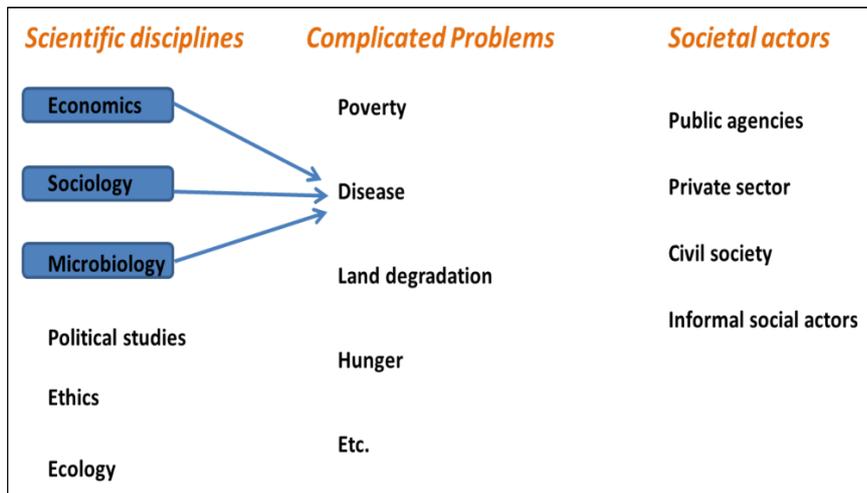


Figure 11: Multi-Disciplinarity²⁸

Source: By Author 2019

The blue arrows in Figure 11 above denote two important aspects of **multi-disciplinarity**: (a) the different disciplines are now focusing their efforts on the same issues in complicated problem situations, and (b) no need for any interactions / collaborations with non-academic societal stakeholders / actors. In fact, multi-disciplinary practices have evolved over time based on the premise that by working *within* well-established disciplinary boundaries and by excluding any societal stakeholders / actors from the research process will certainly produce sufficient understanding / insight into which are the actual and predominant causal relations amongst the many possible / potential ones.

²⁸ Single disciplines focusing on the same problems, but still working separately without any interactions / exchanges between them and/or societal stakeholders.

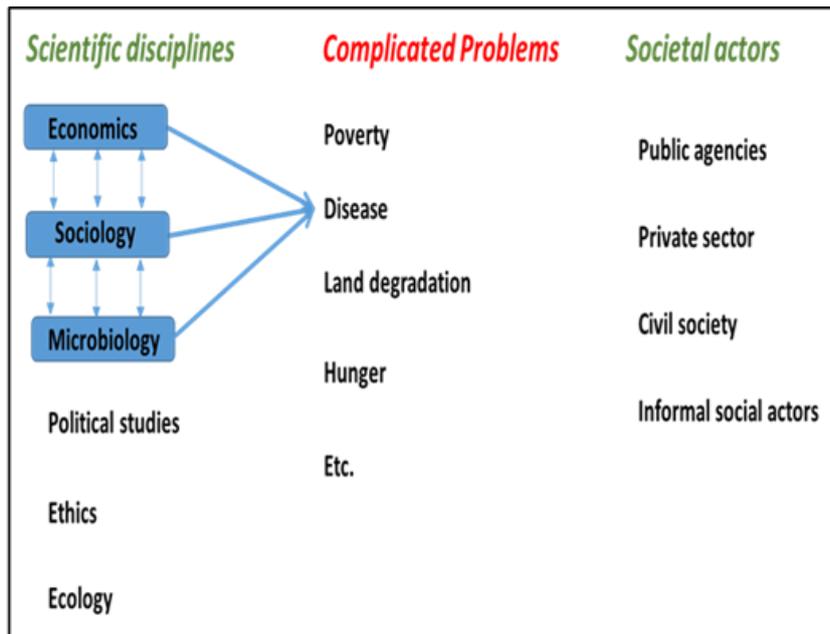


Figure 12: Inter-Disciplinarity²⁹

Source: By Author 2019 – adaptation from: Hadorn and Pohl, 2008

The solid blue arrows in Figure 12 denote a shift taking place in the **inter-disciplinary** methodology in which the different disciplines are now focusing their efforts on the same problems / issues at hand. The smaller blue arrows (between the highlighted disciplines) signify the second important feature of this approach, i.e. the fact there is now some form of interaction / collaboration between the different disciplines mentioned – exchanging some information, insights, practices and methods. However, the absence of any lines or arrows to and from the listed societal stakeholders / actors signifies the fact there is still no engagement with them in an attempt to bring *their* embodied understanding of the complicated issues at hand *into* the research process.

Very importantly though, with the strong emphasis on convergence / integration in both the multi- and inter-disciplinary approaches, the prevailing attitude of doing science *for* society (similarly as in the case of mono-disciplinarity in the obvious / simple domain mentioned above) is still the predominant approach when it comes to the question of bringing about social change. In practice, this means bringing about social change in the complicated domain is still seen as a straightforward undertaking of merely *applying* and *implementing* the intentional actions recommended *by* the disciplinary experts *to* the relevant societal actors – provided, though, that the latter strictly follow the clear-cut methodical steps and procedures set out in the plans and recommendations of the science experts. Misunderstanding, lack of

²⁹ Single disciplines focusing on same problems and starting to collaborate with each other, but still no contact with any non-academic societal stakeholders.

understanding or lack of (political) will etc. are all reasons that can bedevil the well-intended and reasoned implementation plans and recommendations of the experts, whose responsibilities clearly stop as soon as they have done their job of producing the required knowledge and explanation(s) of the multiple causal dynamics prevalent in the complicated domain.

In other words, multi- and inter-disciplinary approaches are not expected to go beyond merely providing policy recommendations to relevant societal decision-makers – with the responsibility for the actual implementation and of any social change recommendations always remaining squarely in the court of the relevant decision- and policy-makers. Although it is trickier facing any un/intended consequences (produced by multiple linear causal relationships), these can also ultimately be sorted out through even more **analysis** and **integration** work by the multi-disciplinary experts – and, in so doing, providing the certainty and predictability needed by said decision-makers in their planning of the way forward. Still, researchers involved in multi-and inter-disciplinary research work will not get their proverbial hands dirty with facing the actual consequences of their implementation recommendations – in these two modes, providing analysis and integration are considered as sufficient.

To be sure, it is only in the complex domain (discussed in more detail in [Section 4.4](#) below) with its messy non-linear causal relationships that a significant shift takes place when researchers are having to face unforeseen consequences of their own intentional actions – especially their intentional knowledge co-production efforts.

4.4 ETTDR in / for the Complex Domain

In the complex domain we observe and encounter a radical shift from linear to non-linear causality. In short, this means that events / occurrences in this domain no longer occur, because of (i.e. caused by) some direct, uni-directional cause–effect relationships between A (cause) and B (effect), but rather by bi-directional or circular feedback loops occurring between $A \rightarrow B$ and back from $B \rightarrow A$ again (Colchester, 2016a) (see Figures 9, 10 and 11 below for some simple graphic depictions of this). In philosophical language this means that the differences between the complex and the obvious / simple and complicated domains are ontological – or to put in differently: they are fundamental differences in kind and not just in degree (i.e. merely different types of the same thing / phenomenon).

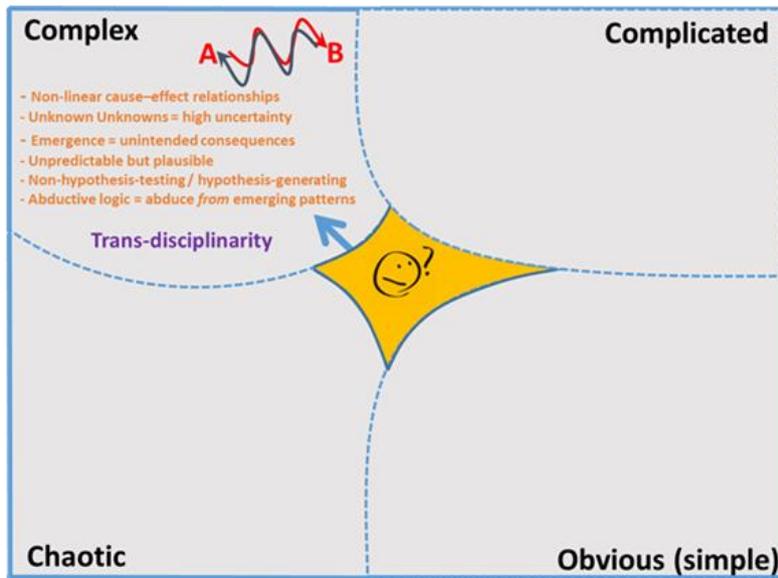


Figure 13: Trans-Disciplinarity in / for the Complex Domain
 Source: By Author 2019

The wave-like red and blue arrows between A and B in Figure 13 signify bi-directional, non-linear cause-effect relationships producing emergent events in the complex domain, which are non-repeatable and unpredictable, the limitations of which (enabling boundaries) are both driving and guiding our epistemological endeavours in this domain (for more on this, see epistemological strategies in [Section 4.4](#) below).

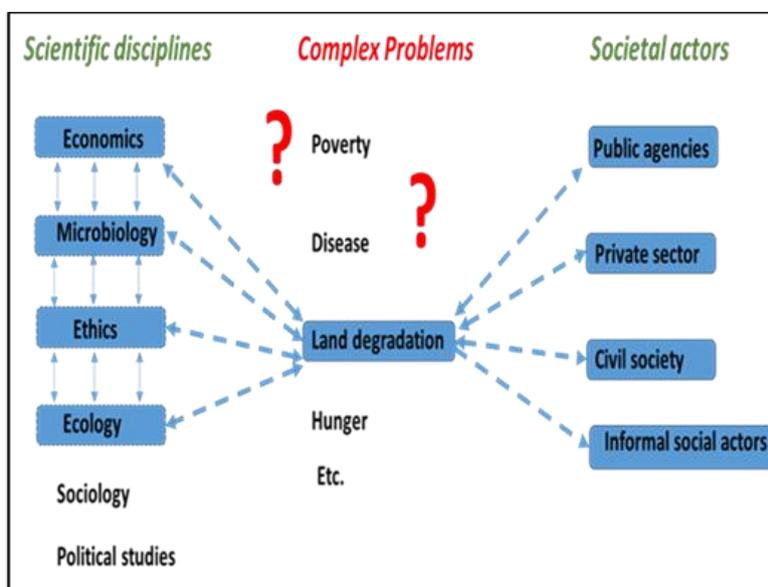


Figure 14: Trans-Disciplinarity³⁰
 Source: By Author 2019 – adaptation from: Hadorn and Pohl, 2008

³⁰ Different disciplines interacting and focusing on the same complex problem situations as well as engaging with non-academic societal stakeholders.

The two red question marks in Figure 14 here signify the uncertainty / complexity of complex problem situations (referred to as *unknown unknowns* in Figure 13 above) in the complex domain. As a result, the blue dotted lines to the left and right of the complex problems also denote some uncertainty in that it is not immediately clear which disciplines and social actors should be brought *into* the research process. This may only become clearer *during* the unfolding research process, which, in turn, means that the participants will enter and exit at various stages of the dynamic research process.

For our purposes of developing the ETDR approach as a domain-relevant methodology in / for the complex domain, it is important to better understand the complex nature of non-linear causality in this domain, and to this end a number of salient features of complex systems will be explained in some more detail below, which will also help to explain the some of the major ontological differences with the other domains.

- **Circular causality** – the main difference between the complex and the other (previous two) domains lies in the non-linear causality of events in the complex domain. This implies the possibility of circular causal relationships between A and B and, very importantly, between B and A, in turn. In other words, it is possible to speak of bi-directional or two-way or causal relationship between A and B. This is truly unimaginable in terms of linear causality, because of the perceived effect of the arrow of time which, arguably, cannot be turned backwards, as it were, in order to cause reverse causation: i.e. all possibilities have been exhausted as soon as A has caused B; nothing more can happen between A and B in time (although other linear causal relationships, e.g. between C and D, are still possible in the case of multiple linearity). Not so, though, in circular causality: the two-way causation between A and B and B and A can happen in real-time, meaning at the same time or within very small time delays between them – which are, for all practical purposes, still experienced and perceived as real-time events.
- **Dynamic / non-repetitive recursivity** – circular causality is always a dynamic process, consisting of multiple iterative cycles of causation during which A and B are continuously morphing – i.e. *transforming* and *being transformed* by their two-way causal interactions with each other. This means that A and B are no longer exactly the same original causes and effects, but they change with each reverse cycle that takes place. See Figure 15 below for a simple graphic illustration of this dynamic process of at least three iterative cycles, during which A and B are depicted as undergoing significant changes *during* or *within* each loop (e.g. from A_0 to A_3 and from B_0 to B_3). The net or overall effect of this is also important: for example, there are significant differences between A_3 and A_{11} and B_3 and B_{11} as causes and effects respectively –

given the changes they have undergone during the different iterative causal loops / cycles.

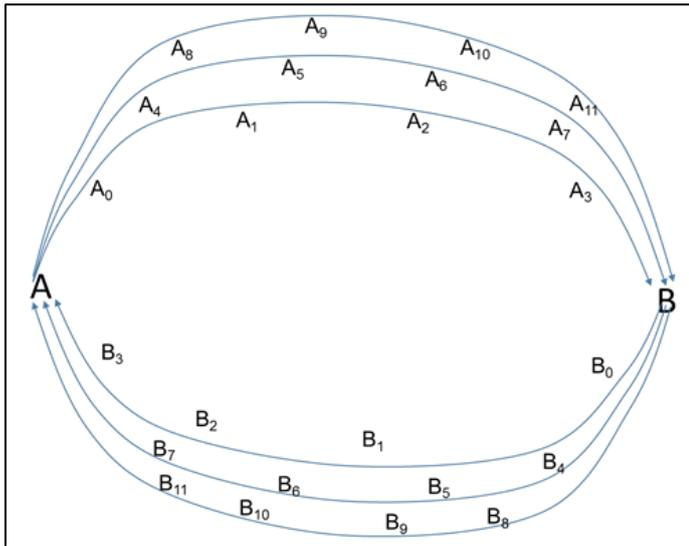


Figure 15: Non-linear / circular causality
Source: By Author 2019

- **Circular causality** – Figure 15 signifies a dynamic process of three iterative causal cycles / loops, during which both cause (A) and effect (B) are changing and being changed by each other – undergoing some significant transformations as they work upon and interact with each other.
- **Distributed causality** – in emergent complex systems causality can never be reduced to some or other ultimate cause or centralised power nodes (Funtowicz, 1994). This is the case, because in emergent complex systems things are inextricably connected to each other in a network-like manner, and in which causes and effects are continuously changing and being changed by each other (circular causality). The overall effect of this means that there is no over-determination (*Überdeterminierung*) responsible for the final causality of things in complex systems. In emergent complex systems things happen because of their interconnectivity – i.e. through a multiplicity of intense local interactions. The very notion of causality – of *what* causes *what* in space and time³¹ – can be seen as a dynamic, emergent property of complex adaptive systems themselves (Juarrero, 1988, 2010, 2002) – which, in turn, suggests that it makes more sense to talk of distributed non-linear / circular causality or the *causal impact of the system as a whole* (Rosen, 2005).

³¹ If the notion of causality is replaced by gravity, then the differences between Newton's and Einstein's theories of gravity. Gravity for Newton was some or other unexplained force, somehow situated within objects (e.g. the sun, planets and moons in our solar system), whereas for Einstein gravity was more of relational concept – i.e. not 'inherent' in things / objects, but rather between things (what he referred to in his general theory of relativity as curved spacetime).

- **Disproportionality** – said distributed causality does not *ipso facto* imply that causality is distributed across emergent complex systems in a completely even or symmetrical manner. On the contrary, *asymmetrical* distribution is more than often the norm because of the unevenness in the intensity or causal relations between inputs (causes) and outputs (effects). This, in turn, means that relatively small inputs (causes) can produce (disproportionally) large outputs (effects) *across* the system – which should not be confused with the notion of uber-causes. This is also known as ‘power-law’ distribution or the 80/20 Pareto principle (Boisot, 2013, 2011). These are all different concepts used to express the *asymmetries* in the number (percentage), size and strength between inputs (causes) and outputs (effects) in complex systems. A case in point here are the relatively small amounts of anthropogenic CO₂³² and CH₄ molecules added to and changing the chemistry of the Earth’s atmosphere – thereby producing / causing climate change and global warming at the planetary scale.
- **Variation / varied effects** – this means that the asymmetrical intensities and causal powers in non-linear / circular causality can be both virtuous and vicious cycles – thereby, producing both positive and negative effects. In other words, the mere fact that things are fundamentally interconnected in the complex domain does not automatically imply some or other normative or inherently ‘good’ / ‘desirable’ social order³³ that somehow needs to be preserved in perpetuity. On the contrary, asymmetrical power-law distributions across complex systems can produce both disastrous and beneficial outcomes for human and non-human life on Earth. A case in point here is once again global warming / climate change – simultaneously producing droughts and floods across the planet with different degrees of strength / intensity.
- **Real-time changes** – as mentioned, for all practical purposes, the changes in two-way causal relationships are always or mostly experienced as real-time changes – meaning that there are no significant observable time delays (latency) between causes and effects: A causes B and B causes A (virtually) simultaneously. This has indeed very important practical and methodological implications for decision-making aimed at taking transformative action(s) in the complex domain, as will be discussed in more

³² According to the [IPCC](#) (International Panel on Climate Change) CO₂ levels are currently (April 2018) sitting at around 410 ppm – up from pre-industrial levels of ± 260 – 280 ppm. However, this is still, by volume, relatively small percentage (> 1%) of the Earth’s atmosphere when compared to nitrogen (78.09%) and oxygen (20.95%), for example.

³³ Much of the literature on systems thinking (Wright and Meadows, 2012a) seems to be premised on the assumption that interconnectedness is significant in and of itself, and therefore merely *understanding* and *explaining* (*Verstehen / Erklärung*) how this works is the primary goal of science – thereby, resulting in a conservative-conservationist approach of preserving the (interconnected) status quo.

detail in different parts of the study, in particular the need for real-time monitoring and evaluation in [Section 7.6](#) below.

- **Contextuality / radical openness** – emergent complex systems are always radically open (Chu et al., 2003) to the environment / context in which they are embedded (see Figure 16 below). In other words, there are never completely fixed boundaries separating complex systems from their embedded environment / context, and this, in turn, introduces almost an infinite number of active variables continuously interacting and changing each other, producing even higher levels of complexity and unpredictability. This is particularly important, as will be demonstrated throughout the study, when dealing with the challenge of bringing many different and differing human experiences, perceptions and observations (at the phenomenological level) into ETTDR processes – which is another way of saying that the research process is always radically open to the environment / context in which it is embedded and the challenge is how to deal with this complexity, rather than trying to reduce or exclude the latter from the research process. A useful way of making sense of this, at the conceptual level, is through the modelling relationship – especially if such modelling is done mindful of the fact that this is never an exercise in reductionism, since emergent complex systems can never be fully understood by reducing it to its parts (Rosen, 2005). Even the most complex (mathematical) models are never replicas or mirror-images of reality itself, but always abstract approximations of the latter (Rosen, 1987; Rosen et al., 2012).

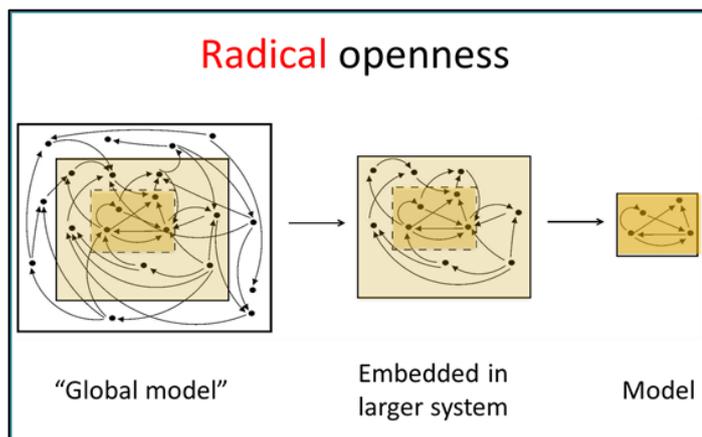


Figure 16: Radical Openness

Source: [Chu et al., 2003](#)

Figure 16 signifies the notion of ‘radical openness’ of emergent complex systems, starting with a model of just a few circular causal relationships, which are embedded in at least two larger systems with many more circular causal relationships – both effecting and being effected by the circular causal dynamics in the modelled system.

As mentioned, all of the abovementioned features / aspects describe, in one way or another, the fundamental ontological differences between the complex and other domains, centring in the main on the notion of non-linear / circular causation. However, it is only when all of these ontological features / aspects are taken together that it becomes possible to fully appreciate the high levels of uncertainty and unpredictability encountered in the complex domain: i.e. dealing with what can be described, epistemologically speaking, as *unknown unknowns* (Snowden, 2005; Snowden and Boone, 2007), which are qualitatively different from the *known knowns* and *unknown knowns* encountered in the obvious / simple and complicated domains respectively.

Therefore, when approaching the complex domain, on the basis that there are things that we don't know that we don't know, it certainly introduces from the onset a very different *probing logic / approach* for ETTDR processes – at both the practical and theoretical levels. At the practical level, this means that when we do not know what the unintended consequences of our intended transformative actions might be, a plausible way of figuring this out is simply to accept that we need take a stab at things (this will be discussed in more detail throughout the study, and more specifically in [Section 7.3](#) below as part of a suggested theory of change that will be referred to as 'radical incrementalism'). At the more theoretical level, though, the challenge is how to co-generate dynamic epistemic objects (Cetina, 2009; Knorr Cetina, 2001) from unknown unknowns.³⁴ It is certainly much easier to do this when dealing with known knowns and unknown knowns, but with unknown unknowns it certainly get a lot trickier. In this regard, it may be quite helpful to think of developing some epistemological strategies, specifically aimed at dealing with unknown unknowns when, for example, setting out to intentionally co-produce system, target and transformation knowledge (Hadorn and Pohl, 2008a; Pohl and Hadorn, 2007a). At least four such epistemological strategies will now be discussed in some more detail below³⁵, before tackling the methodological implications of this in [Chapter 6](#) below.

4.4.1 Epistemological strategy #1: Embracing unknown unknowns as enabling knowledge-producing boundaries

³⁴ In other words, dealing with fundamental uncertainty is not just something that is applicable at the micro-physical or quantum level of reality – as per, for example, Heisenberg's uncertainty principle (Heisenberg, 2013, 2007; Lindley, 2008; Stephens, 2017) – but is certainly something we should expect to encounter at the more macro level when dealing with non-linearity in the complex domain.

³⁵ The four epistemological strategies discussed here are by no means intended to signify an exhaustive list of all possible epistemological strategies in the complex domain. Instead, they merely serve as some examples of the kind of epistemologies strategies that can be pursued when working within the enabling boundaries of the unknown unknowns in the Complex Domain. Therefore, this should be seen as an invitation / challenge to add to these epistemological strategies in order to both expand and deepen our understanding of knowledge generation in the Complex Domain – both *how* and *what* type of knowledge generation is possible / desirable in this domain.

It was mentioned above that what differentiates, ontologically speaking, the complex domain from the other domains is its non-linear causal dynamics, which are also what is responsible for producing the epistemic objects of the unknown unknowns and adjacent possibles in this domain – both of which are closely associated with high levels of uncertainty and unpredictability. However, this does not mean having to accept the conclusion (à la post-modernity) of epistemological relativism – where ‘anything goes’ (Feyerabend, 1993) as the only legitimate counter-position to the claims / promises of certainty and predictability put forward by positivism in the history and philosophy of science. However, this binary dilemma of enforcing a choice between one of the two extreme positions of *certainty vs. relativism* can in fact be averted if we approach unknown unknowns in the complex domain as **enabling boundary conditions** – in other words, as something that is epistemologically generative³⁶ in the sense that they make knowledge production and sharing possible (Boisot, 2002, 2004; Juarrero, 2002; Snowden, 2016a; Takaki, 2013a, 2013b) – rather than the opposite as something which is *only* restrictive impeding knowledge production. To be sure, though, although it may not be possible to produce certainty and predictability in the context of unknown unknowns in the complex domain, when imagined as **enabling boundaries** they do indeed allow for knowledge generation of a different kind to take place in this domain – i.e. when knowledge is directed towards **plausibility**, rather than trying to produce the **Truth**.

The importance of plausibility will be discussed as a separate epistemological strategy #2 below, but suffice it to stress here, very importantly, that pursuing this affirmative epistemological strategy of acknowledging and working with/in the enabling (epistemological) boundaries of the complex domain gives rise to producing a different kind of knowledge – in other words: not just different in degree or more of the same kind of truth-seeking knowledge. By accepting and working within the enabling boundaries of the unknown unknowns it certainly opens things up for further exploring the in-between / third space(s) – situated somewhere between the two extreme positions of certainty vs. relativism – along the lines of the Aristotelian ‘golden mid-way’,³⁷ not as a fixed position though, but rather as a dynamic position capable of moving (sliding) between these extremes. In other words, if imagined as being produced by the non-linear causal dynamics (ontology) of the complex domain, the enabling boundaries can then be acknowledged as the epistemologically generative boundary conditions that permit collaborative knowledge co-

³⁶ This notion of epistemological generativity was first used by Jean Piaget (Piaget, 1998) in the field of cognitive development. However, the adoption of this notion here for our purposes is done in a more general sense to describe what happens at the epistemological level in the complex domain and is, therefore, not restricted to this very specific (sub)disciplinary field of cognitive development. Neither is this related to Noam Chomsky’s (structuralist) ideas on universal generative grammatical rules (Chomsky, 2002; Chomsky and Chomsky, 2006) responsible for generating language necessary for *describing* and *knowing* the world. Instead, the notion of *epistemological strategies* (used together with the guiding methodological logics and principles described in [Chapter 6](#)) is more focused on dynamic, context-sensitive knowledge generation processes, during which our knowledge is continuously *shaping* and *being shaped* by the non-linear causal dynamics of the complex domain.

³⁷ Referring broadly here to Aristotle’s notions of the *golden mean* or *golden middle way* as the *desirable middle* between two extremes (Aristotle, 2013).

production and sharing to happen within the complex domain – indeed a fundamentally important point for incorporating into our task ahead of further developing the ETTDR methodology.

4.4.2 Epistemological strategy #2: Acknowledging plausibility as the objective of co-producing transformative knowledge in the complex domain

As mentioned, working with fundamental uncertainty and unpredictability in this domain does not necessarily mean that anything goes and, therefore, dispensing with epistemological goals / objectives per se. However, it does suggest replacing and pursuing very different goals / objectives though and what this translates into in practice is a process of **probing** for **plausible vectors of social change** (Boisot and McKelvey, 2010; Snowden, 2016a) under the prevailing material and social conditions of any given problem situation in the Complex Domain. As already alluded to, in this regard there can be no fixed end-states or set of conditions that can be actually be reached / achieved. However, the uncertainty and unpredictability in all of this is only a problem from the perspective of linear causality, but not necessarily from a non-linear perspective in which the new challenge of **exploring for plausibility** becomes one of co-designing and creating the social and institutional spaces for the **adjacent possibles** (Snowden, 2016b; Unger, 2007a) to emerge in many surprising / unexpected ways and places *within* the context of the problem situations at hand in the complex domain. In other words, if certainty and predictability are no longer deemed appropriate epistemological goals / objectives to be pursued in this domain, then they can indeed be *replaced* with the more appropriate goals / objectives, such as figuring out the plausibility of adjacent possibles – or, to put it differently: figuring out the next possible steps *in the direction of* adjacent possibles.

To be sure, though, doing exactly this is by no means a straightforward exercise in reductionism, because, in the context of non-linear causality in the complex domain, even the seemingly simple task of figuring out the next steps *towards* the adjacent possibles cannot be predicted with any certainty – since it is impossible to know in advance what the intended and, very importantly, unintended consequences of seemingly 'small' social perturbations / interventions might be. As already mentioned above, two of the fundamental aspects of dealing with emerging complex systems, in the context of the complex domain, are that: (a) causal power is distributed *across* the system which, in turn, means that (b) small changes can have big effects / outcomes. Although this inherent uncertainty / unpredictability in complex systems is quite well understood at the theoretical level, it becomes even more prominent at the practical level when assembling the different disciplines and social actors in order to figure out what the possible next steps towards the adjacent possibles mean *for them*, in the contexts of the real-life complex problem situations *facing them*. What might be plausible adjacent possibles for one group of people may very well be interpreted and imagined as the complete opposite by another group – given the real and/or potential differences in the needs, interests, values and expectations between individuals and groups of people.

The challenge of how to deal with such different and differing (conflicting) issues in ETTDR processes will be discussed in more detail in Sections [6.2.3](#) and [6.2.4](#) – in terms of the two guiding principles of *allowing for emergence* and *absorbing complexity*. However, suffice it to mention here that, when taken together, these two guiding principles suggest that it is critically important not only to acknowledge differences, but also to allow them to actually surface and work *with* them as providing some (human) energy for driving the research process – rather than trying to somehow banish differences from the research process, or by trying to reach premature convergence. In such collaborative efforts it is indeed key to keep the focus on looking for the *evolutionary potential of the present* (Snowden, 2015b) – rather than opting for some or other teleological³⁸ approach in which having some end-goal(s), in the form of a shared vision(s) of, or preferred scenario(s) for, the future, becomes a fundamental prerequisite for co-producing transformative knowledge.

What is more important for our purposes here is to accept that adopting plausibility rather than striving for complete certainty and predictability, as a more appropriate epistemological goal / objective for co-producing transformative knowledge, does not mean contributing to such end-goal(s) free of any real and/or potential differences. On the contrary, both in theory and in practice there are always multiple adjacent possibles (hence the plural) and by accepting plausibility as an epistemic goal / objective, it is better to **anticipate**³⁹ that this will generate differences that will surface and, therefore, to be prepared for working *with* differences as and when they emerge in the way that allows them to energise ETTDR processes in messy real-life complex situations in the complex domain. As mentioned, the challenge of *how to* navigate the complex domain, by way of some context-relevant guiding logics and principles, will be the main focus of our discussion in [Chapter 6](#) below.

4.4.3 Epistemological strategy #3: Accepting non-linear intentionality – expecting the unexpected⁴⁰

In both psychology and philosophy (Sulis and Trofimova, 2001) the notion of **intentionality** has been strongly associated with being *deliberate* or *purposive* in our interactions with others (humans and non-humans) in the world, in the strong sense of the word of not only being directed *towards* something (human or non-human), but actually bringing about change in *what* (human or non-human) it is *directed at*. Intentionality is, therefore, premised on the fundamental assumption that there must be some or other direct causal link / relationship between our intentions / intended actions (driven by our hopes, desires, needs, aspirations, expectations, perceptions etc.) and *that*

³⁸ Teleological in the Aristotelian sense of the word (Aristotle, 2013, 1961; Aristotle and Sachs, 1999), where always having a clear purpose or end-goal(s) is fundamental for the way in which we engage with the world.

³⁹ The importance of anticipation / anticipatory awareness will be discussed in more detail in [Section 6.3](#) below.

⁴⁰ This notion of *expecting the unexpected* is taken over from Oscar Wilde's saying *that to expect the unexpected shows a thoroughly modern intellect* (Wilde, 2008), and adopted more specifically for epistemological purposes – i.e. turning it into an enabling epistemological strategy, capable of contributing to co-producing transformative knowledge in the context of non-linear causal dynamics in the complex domain.

towards which they are directed (real or imagined). As mentioned, making this assumption of direct causality makes sense when working in the Obvious / Simple and Complicated domains, but not necessarily in the context of non-linear causality in the Complex Domain. In this latter domain the epistemological challenge is two-fold, namely to retain the notion of intentionality whilst, at the same time, not allowing it to be imbued with linear reasoning. In short, we need a new kind of non-linear intentionality that can help us to make sense of, and come to terms with, the fact that our intended actions in co-producing transformative knowledge may not produce the kind of social change that was envisioned in the first place, and may very well result in / produce very different kinds of social change.

To be sure though, it is simply not possible nor desirable to completely dispense with intentionality when setting out to co-produce transformative knowledge. As already mentioned, if we are no longer interested in the Aristotelian goal of merely understanding and explaining (*Verstehen / Erklärung*) the world around us, but also changing it (*Verändern*), then there will always be the intention, tacit or explicit, to produce knowledge with a certain goal and intention in mind. In other words, even in the Complex Domain, the challenge is not to try and get rid of intentionality per se (Juarrero, 1988, 2010, 2002) in our epistemological efforts, but rather to *reimagine* and *replace* it with different ideas and expectations of directionality and causality involved in this – and, in so doing, avoiding the danger of falling into the trap of linear reasoning.

In this regard, a start was already made with replacing certainty / predictability with the notion of plausibility as the goal of transformative knowledge co-production in the Complex Domain. As mentioned above, in developing epistemological strategy #2, in the context of the Complex Domain, the adjacent possibles (plural) are never clear-cut / fixed states, but are always dynamic, subject to change and taking on many different forms in the present.⁴¹ And building on this, we can now posit the notion of embracing non-linear intentionality of *expecting the unexpected*, or the unintended consequences of our collaborative knowledge co-production actions.

In the literature this notion of *expecting the unexpected* has become known as **anticipatory awareness** (Poli, 2009, 2010a, 2010b) as a different research approach to, for example, that of **predictive anticipation** typically used in Futures Research / Studies – still in an effort to come up with different ways of forecasting / predicting the future (normally in terms of a limited number of scenarios of the future). As mentioned, the latter approach may be more appropriate to follow when working with linearity in the obvious / simple and complicated domains, but not for facing non-linearity in the complex domain. Therefore, the suggestion to adopt an **anticipatory approach** in our collaborative knowledge co-generation activities is two-fold, namely: (a) to consciously embrace a different kind of *non-linear intentionality* aimed at enabling researchers to be prepared

⁴¹ Understanding this important point of experimenting with *interim* vs. permanent solutions in the Enkanini TDCS was crucial at both the theoretical and practical levels – something that was discussed in more detail in [Chapter 3](#) above.

for *working with* uncertainty, unpredictability and unforeseen consequences of their our own (transformative) actions as and when these emerge *during* ETTDR processes (Nadin, 2012, 2010; Rosen et al., 2012)⁴², and, in so doing, (b) to *replace*⁴³ linear intentionality and assumptions of *direct causality* between our co-produced knowledge (cause) and social change outcomes (effects) – which, as said, can be more appropriately used in the obvious / simple and complicated domains.

To ensure that these two critical aspects – anticipation and plausibility – of this epistemological strategy #3 are aligned and keep on reinforcing each other, it is important that the approach of anticipatory awareness is consistently exercised *during* the process of figuring out the next possible steps in the direction of adjacent possibles. In other words, to *assume* the unexpected when co-designing and co-producing the knowledge necessary in figuring out the possible next steps. How this challenge of *exercising* this counter-intuitive⁴⁴ logic of non-linear intentionality is actually performed throughout the research process is indeed critical for developing the ETTDR methodology, since it takes us *beyond* mere critical reflection (at the theoretical level) to actually *doing* things (at the practical level) – in other words, where theory and practice meet and interact to create a virtuous learning process of *learning by doing* and *doing by learning*.⁴⁵ This, in fact, takes us directly to the next important epistemological strategy #4 of **side-casting** or experimenting with multiple small-scale social change experiments as an on-going practical exercise in co-producing transformative knowledge in a way that avoids falling into the trap of linear reasoning and assumption-making.

4.4.4 Epistemological strategy #4: Experimentation with multiple safe-to-fail social change experiments through side-casting (adjacent possibles)

As already alluded to above, it is critical in ETTDR processes to create opportunities for experimenting with real-life experiments that can practically demonstrate the principle of plausibility – in other words, what is practically possible and in the context of the prevailing social and material conditions of the complex problem situation at hand. The aim of pursuing this epistemological strategy of side-casting is to create such opportunities *in the present* – rather than at some deferred point in the future; warranting a two-way teleological process of fore-casting and back-casting (Scholz, 2011; Scholz et al., 2009, 2006a; Wiek et al., 2006). As already mentioned, a fundamental problem with this approach is the prerequisite that participants in the process commit to some or other highly idealized and normative visions or scenarios of the future. For this rather complicated forwards and backwards teleological process to work, though, the latter (visions and future

⁴² Both Nadin and Rosen stress the importance of *anticipation as process* and not just as a once-off event (e.g. at the start of the research process).

⁴³ As mentioned, this epistemological strategy of *replacing* is very different from those trying to either suppress or, even worse, completely delete [erase? eliminate?] any form of intentionality.

⁴⁴ Counter-intuitive in the sense of being contrary to linear thinking and reasoning.

⁴⁵ This important point of creating and following such a virtuous learning process in ETTDR processes will be discussed in more detail in [Section 6.2. 5](#) below under the heading of Transformative Triple-Loop Learning.

scenarios) are normally disconnected from the complexities in / of the present situation which, in turn, makes such visions and future scenarios very difficult, if not impossible to realize in practice – and certainly not something which can merely be overcome by more or better linear thinking and planning.

By not focusing on some deferred and idealised future state, the strategy of side-casting seeks to open up **real-time opportunities** for imagining and discovering new / different adjacent possibles under the prevailing conditions of the current situation. In so doing, by experimenting with multiple different adjacent possibles **in the present**, it is simply no longer appropriate to merely rely on linear thinking / reasoning epitomised by assuming direct causal links between our knowledge co-production activities (causes) and social change outcomes (effects). This is the case because in the complex domain adjacent possibles are always emergent and, for this to occur, a different approach of anticipatory awareness or expecting the unexpected (i.e. adjacent possibles) is needed.

To be sure, pursuing this epistemological strategy of **side-casting** is very much geared towards working *within* the enabling boundaries of unknown unknowns in the complex domain. As said, the latter are indeed *enabling* boundaries that make knowledge production possible – albeit that this may not be knowledge aiming or claiming to be certain and predictable. The strategy of side-casting is therefore put forward as a way of co-generating knowledge – through **real-time** discovery and experimentation – in the complex domain that may contribute to emergent adjacent possibles – without the burden of having to postulate certainty and predictability in all of this. Therefore, by embracing and working with emergence through this strategy of side-casting, our understanding of the dynamic / flexible / mutable nature of **epistemic objects** in the complex domain is deepened / advanced in the sense that there is movement / change in the latter from

epistemic *objects* (Cetina, 2009; Knorr Cetina, 2001) to epistemic *things* (Rheinberger, 1997) to *matters of concern* (Latour, 2007, 2014a; Latour and Weibel, 2005) *for us*.^{46 47}

In other words, in the context of non-linear causal dynamics of the complex domain it is quite possible that our intentionality (desires, needs, interests, expectations etc.) in complex problem situations at hand will not remain static, but also undergo some change. What may have started out as some abstract problem statements and research questions may very well undergo many iterations of change to the point that they become real practical matters of concern for us. Or, alternatively, what may start out as some or other specific practical issue may equally undergo many iterations of change to become the subject of deep theorising. However, key in this is that our intentionality be seen as being part and parcel of this two-way process / movement between theory and practice, and whichever way this unfolds, that our intentionality in and of itself will undergo change – as our understandings (theory) and actions (praxis) are both shaping and being shaped by the non-linear causal dynamics in this domain. Furthermore, not only are the complex problems at hand being worked on by participants involved in ETTDR processes, but equally are

⁴⁶ Merely acknowledging the ontological status of the linear vs. non-linear cause–effect relationships here will also help us not to get embroiled in the philosophical debate on realism vs. constructivism here – in other words, trying to answer the question whether causality (both linear and non-linear causality) actually exists independently from our knowledge constructions of it, or whether it is merely a product of our knowledge constructions, and nothing more. Without trying to settle some old philosophical scores here, what will do for our purposes at this point is to say that the different kinds of causality can be accommodated in the so-called constructivist-realist position – i.e. acknowledging both, at the same time, namely the independent existence of things as well as, at the same time, our knowledge construction of them. Another important perspective on this position comes from Bruno Latour, arguing that merely acknowledging the *social construction* of things does not permit us to explain away their independent existence – i.e. erroneously concluding that (the socially constructed) things do not actually exist (Latour, 2007). Doing so, however, would be tantamount to committing a category error of serious proportions by allowing ourselves to fall into the trap of confusing our (socially constructed) explanations (*explanans*) with the actual existence of things in the world (*explanandum*). However, and very importantly, by avoiding this trap we can go one step further by agreeing with Latour's assertion that there is a direct (positive) proportional relationship between our social constructions and the ontological status of things, namely that well-constructed issues are more 'real' for us than badly constructed ones – meaning that the better we go about the social process of assembling / constructing issues, the more or stronger effects they have or produce on us to act on the issues at hand, by, for example, changing them or the conditions that produced them.

⁴⁷ It is proposed that the notion of 'matters of concern' be used together with that of 'epistemic objects' in order to provide as rich as possible a description of what is implied here when shifting from merely theoretical knowledge objects to more practical issues. To be clear, our interest in understanding the ontological effects produced by non-linear causality is no longer purely for the purposes of theoretical inquiry *only*, but also for practical *enactment* – especially in view of the serious societal challenges these effects pose *for us* when non-linearity / circular causality keeps on producing persistent problems / challenges. In other words, by introducing this notion of 'matters of concern' here, we come closer to the Lukácsian notion of things-for-us (Lukács et al., 2002; Lukács and Lukács, 1971). What this means for our purposes is that there are no short-cuts for establishing the ontological status of the said non-linear / circular causal dynamics in the complex domain by merely deducing them from some universal / first principles. To be sure, figuring out this kind of ontology (things-for-us) comes at a high price, epistemologically speaking, since establishing the 'realness' of non-linear / circular causal relations in the complex domain can only be achieved through some laborious efforts of consensus-building between, across and beyond disciplinary boundaries in collaborative knowledge co-production processes, in the context of the specific problem situations we encounter in the complex domain.

they being worked on by many other social actors outside ETTDR processes – continuously *affecting* and *being affected by* these external social actors.⁴⁸

As paradoxical as it may sound, dealing with non-linear / circular causality in the complex domain means that when we don't know what we don't know, we need to take a stab at things. In other words, if want to develop better insights and understandings of the complex problems situations encountered in the complex domain, and at the same time accept the impossibility of producing certain and predictable knowledge in this domain, then it follows that we need to experiment with different practical interventions / actions. However, the purpose of doing so is most certainly not *only* to solve practical problems, but also to contribute to developing some new theoretical insights and understandings into the complex problem situations at hand. In this way, theory and praxis⁴⁹ are effectively just two sides of the same (epistemological) coin, as it were – inextricably linked together and mutually *shaping* and *being shaped* by each other by way of providing the experience and concepts necessary for producing new knowledge. Such a dynamic two-way knowledge production process can, metaphorically speaking, be imagined as the knitting or weaving⁵⁰ together of the experience and concepts into producing new insights and understandings – not only for the sake of explaining and understanding (*Erklärung / Verstehen*) the complex nature of the problem situations in the complex domain, but also, at the same time, for figuring out different possibilities of changing (*Verändern*) the latter.

It is exactly *in* this challenge of having to figure out the different directions / routes / vectors of social change in the complex domain that the importance of imagining and working with the adjacent possibles comes to the fore. As mentioned, together with unknown unknowns, the adjacent possibles are the epistemic objects produced by the non-linear causal dynamics in the complex domain. This presents yet another important epistemological challenge in ETTDR

⁴⁸ This may be the response to the ideas developed by Niels Bohr on the observer effect in quantum physics (McEvoy, 2001), namely that the observer (subject) can affect the observed (object) in the sense that the mere act of observation can interfere with and change the probability of the position of the object (e.g. electron) when observed, by 'fixing' it in a particular location. However, at the macro level of real-world events, particularly in the context of non-linear causal dynamics in the complex domain, this dynamic two-way process between the subject and object is not as strange as it may sound at the quantum level – it certainly happens all the time, but then through human actions *acting on* the issues at hand, rather than through observations *only*.

⁴⁹ In order to make the importance of this two-way relationship between theory and praxis even more explicit, it can be said that in going *beyond* (the 'trans' in trans-disciplinarity) knowledge does not have necessarily mean having to revert back to some old metaphysics or inventing some new kind of metaphysics, but can be achieved *through praxis* in the sense that engaging in changing how we are doing things (transformative actions) can generate some new insights and understandings that purely theoretical reflection simply cannot achieve.

⁵⁰ This metaphor of the knowledge production process as weaving or knitting something together should not be mistaken for a straightforward teleological process (in the Aristotelian sense) where the end-goal of e.g. a carpet or quilt is clearly and intentionally shared by the knowledge producers. On the contrary, although the end-product may turn out as some or other coherent and aesthetically pleasing object (whatever form or shape this may take), there is no necessity in this (that it *had* to be what it became or turned out to be and, furthermore, there are always many pieces of the cotton or wool (materials) that have been discarded during the process of producing the end-product.

processes – namely to shift our knowledge interests / focus on what is plausible (Boisot and McKelvey, 2010; Snowden, 2016a), rather than only trying to produce predictable and certain knowledge about some or other future state / reality. In practice, what this focus on plausibility means is having to figure out what are the next possible steps for co-creating adjacent possibles – i.e. social and institutional arrangements needed for creating real-life places / spaces / settings / situations that are both embedded in and different from (e.g. more desirable) the contexts of the current situations in which they are embedded – rather than trying to push / pull the current situation towards a particular (pre-defined) outcome. Some concrete examples of this was already discussed in more detail in [Section 3.5](#) above as part of the “Enkanini” TDCS, but suffice it to mention here that the adjacent possibles are allowed to initiate and introduce social and institutional arrangements that are significantly different to what is already existing in the current situation, but not too differently so that it can still be recognised for its potentiality – of what is plausible / possible in bringing about wider⁵¹ social change in the context of the current situation.

Another critically important feature of the adjacent possibles is their mutability. They certainly need not be imagined as fixed or permanent solutions to the current situation, because in the complex domain all things are subject to the same non-linear causal dynamics, including the adjacent possibles. As epistemic objects, the adjacent possibles, therefore, need to be seen as collaborative experiences in ‘radical experimentation’ (Unger, 2007b; West, 1986) with multiple small-scale safe-to-fail probes (Juarrero, 1991, 2002; Snowden, 2013). In other words, in co-producing the knowledge needed for establishing (i.e. co-designing) adjacent possibles, there is no intention to establish fool-proof / sure-fire / fail-safe social entities that are somehow shielded from the non-linear causal dynamics of the contexts in which they are embedded. On the contrary, rather than falling into the trap of teleological thinking and planning – focused on some or other highly idealised and normative deferred / future state towards which the current situation should be pulled / pushed – the focus is and should remain on making sense of the current situation in order to figure out the next possible steps in the direction of the adjacent possibles. In fact, what is more important in this regard is the real-time social learning that occurs and enables participants in ETTDR processes to figure out the next possible steps and change direction if needed. This has indeed been adopted as one of the key guiding principles of the ETTDR methodology as Triple-loop Transformative Learning, which will be discussed in more detail in [Section 6.2.5](#).

⁵¹ This simply means ‘wider’ or ‘broader’ than the actual safe-to-fail experimentation with the adjacent possibles themselves. However, there is no single answer to the question: Exactly how wide or broad can this go in order to become ‘social change’? The short answer is that it depends on the context and can only be figured out in each situation in which ETTDR processes are embedded.

One way that this can be done in a practical sense, including some appropriate methods that can be used for co-producing the kind of real-time transformative knowledge needed for this, will be discussed briefly in [Chapter 7](#) below. However, here it will suffice merely to give a graphic depiction of this (see Figure 17 below), when, for example, using a narrative-based approach in this regard.

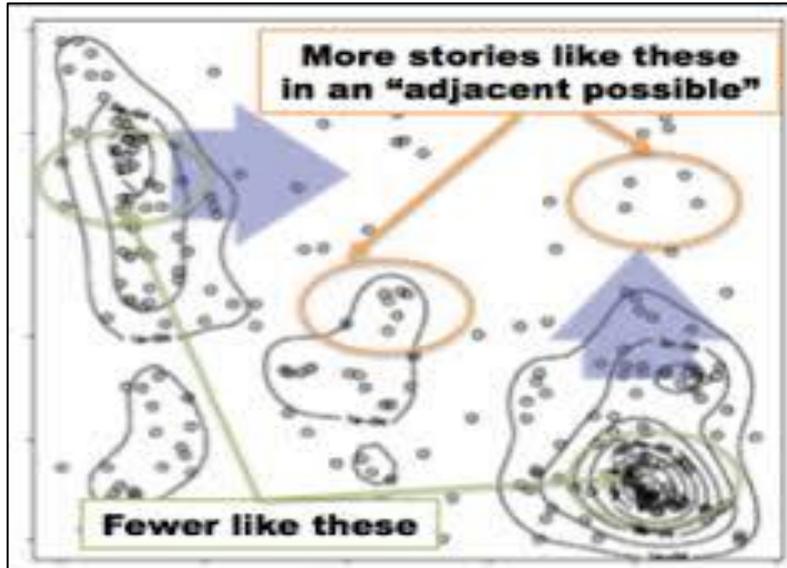


Figure 17: *Adjacent Possibles*
Source: Snowden, 2012

Figure 17 represents the quantitative results of a (qualitative) narrative research process. The black dots and contours denote the patterns of real responses (how the system is currently disposed). The light grey dots represent the desired direction. From the results, it is clear that there are two distinct groupings / peaks in the top left and bottom right of the landscape. The grey arrows indicate the direction towards 'adjacent possibles' – small groupings of stories or observations that are already present in the system and therefore can be amplified in order to evolve the system in the desired direction, much like 'crossing a river with stepping stones', rather than trying to cross in one big jump. This approach allows for the users (both researchers and story-tellers) to access the stories that form these adjacent possibles and thereby enable the deployment of small contextual nudges to initiate the required shifts.

Therefore, in summary, the above epistemological strategies have been put forward in order to demonstrate that being epistemologically active and generative is indeed possible *within* the enabling boundaries of unknown unknowns in the complex domain. As mentioned, the latter domain does not imply the end or impossibility of knowledge production – nor does it mean, as said before, that *anything goes* (Feyerabend, 1993). On the contrary, knowledge production is possible in the complex domain, provided that this is approached with a sense of epistemological humility (Cilliers, 2008) by expecting the unexpected, rather than predicting or promising certainty – and, very importantly, where and when the unexpected adjacent

possibles do emerge, do not to stop and regard this as some or other fixed state or point of arrival, but rather keep on imagining other adjacent possibles and exploring the next steps from here in the direction of the adjacent possibles (Unger, 1998a, 2007a, 2014). And what drives our quest for knowledge production in this on-going process of exploring and experimenting with plausible outcomes – rather than certain / predictable ones – is simply the challenge of acknowledging and working with emergence – i.e. the challenge of making sense of complexity in order to act, which means figuring out the next possible actions in the direction of the adjacent possibles. In other words, if the challenge to produce certainty and predictability is what is driving our epistemological efforts in the obvious / simple and complicated domains, then it is may very well be the opposite in the complex domain: our quest for knowledge production is driven precisely *because of* (and *not in spite of*) the uncertainty and unpredictability facing us in the complex domain – i.e. we are motivated by the very fact that things are *unclear* and *uncertain* to start with and they have to be painstakingly figured out in a bottom-up way by looking and searching for some **plausible patterns** that may give us some insights into and understandings of the non-linear causal dynamics at work in the particular problem situation(s) we are encountering. Be that as it may, it is only in the chaotic domain that we are possibly facing a radically new situation where research and knowledge generation may no longer be possible / desirable – this will now be discussed briefly in [Section 4.5](#) below.

4.5 Chaotic Domain: No Research – Only Action

The chaotic domain is radically different, ontologically speaking, from any of the other three domains in the sense that events / occurrences happen purely chaotically or randomly – i.e. there seems to be no repetition or repeatability in the way that things happen in this domain – without any detectable pattern-like connections between / amongst all these haphazard events (see Figure 18 below for a graphic depiction). In other words, what is fundamentally lacking in the chaotic domain, when compared to the other three domains, is that there are no discernible causal relationships at work – producing events that are completely uncertain or unpredictable, both in foresight and hindsight.

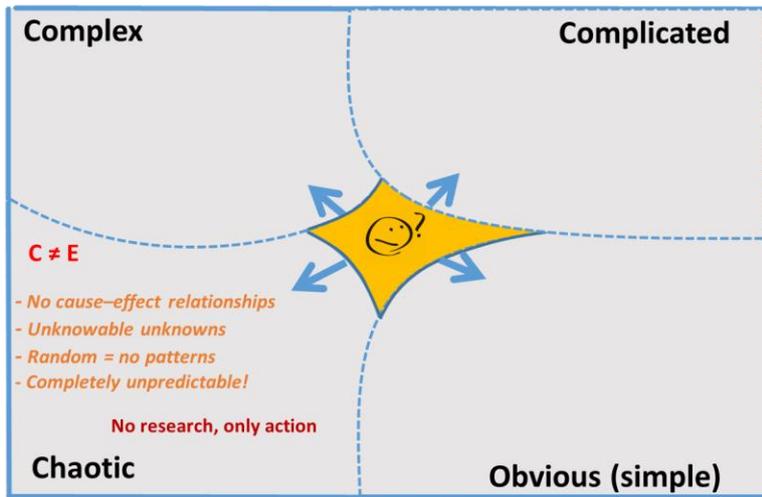


Figure 18: The Chaotic Domain

Source: By Author 2019 – adaptation from: Snowden and Boone, 2007

The “C ≠ E” inscription (in red) in Figure 18 indicates the absence of any cause–effect relationships in this domain where events occur in a purely random fashion – with seemingly no repeatable patterns or connections between these haphazard occurrences. In practice, these events normally manifest themselves as completely unforeseen crises that warrant urgent crisis-management actions to bring the crisis situation under control in order to prevent any further crises from developing. Under these circumstances there is normally no time or resources available for doing any substantive research. However, the effect of bringing things under control might very well imply a shift towards / into the complex domain, where they may then come into the scope of the ETTDR approach.

In real-life situations these random events are normally manifested as completely unforeseen crisis situations – such as the sudden outbreak of a fire in a theatre building full of people. In such case the best possible response is urgent **crisis management** – i.e. bringing things under control as quickly as possible in order to prevent any escalation of the current crisis or even starting new / different ones from breaking out somewhere else. In this domain there is no time to search or look for any underlying ‘causes’ in an attempt to find durable solutions. However, the purpose of this crisis management strategy is two-fold: first, to exercise sufficient control over the symptoms of the random occurrences in order to, secondly, try and shift them to the adjacent complex and complicated domains – from where (especially the complicated domain) they can then be more systematically / efficiently tackled in terms of linear cause–effect solutions. In other words, what this strategy implies at the ontological level is bringing about social change in two fundamental ways: firstly, from random non-causality to non-linear causality and then, secondly, from non-linearity to (multiple) linear causality. Needless to say, this is indeed a tall order and warrants further in-depth discussion that goes beyond the scope of this study.

However, what is important for our purposes is understanding the implications of dealing with purely random events in this domain, at both the epistemological and methodological levels. At the epistemological level this means dealing with '*unknowable unknowns*' (Snowden and Boone, 2007) – which, in turn, basically implies that we may *never* come to understand why things happen the way they do in this domain. Therefore, to the extent that this is indeed the case, it will be a fruitless exercise to try and develop some epistemological strategies for venturing into the chaotic domain with its unknowable unknowns. The methodological implications of this are indeed far-reaching, since it implies random events in this domain are in principle un-researchable. Therefore, for all practical (and theoretical) purposes, no further attempts will be made to explore this domain any further from a transdisciplinary perspective (or, for that matter, any other possible domain-relevant research methodology for this domain).

However, suffice it to say that the value of acknowledging random-like events in the chaotic domain lies in the fact that it helps to accept that there are certain kinds of problem situations that are indeed completely *beyond* our epistemological and methodological reach and abilities, and they should rather be dealt with on a more practical (crisis-management) level, as mentioned briefly above. This, in turn, is very helpful for our efforts to develop the need for inter-methodological agility in the sense that this can assist us in agreeing that there certainly some chaotic issues that are simply not researchable and that we should rather turn our focus to what is researchable. However, things do change and what might have appeared or manifested itself as chaotic at first may very well, in a different context, be perceived and understood as complex – or, vice versa, what appears and manifests itself as complex at first may very well become perceived and understood as chaotic, in a different context and under a different set of circumstances. In other words, the need for methodological agility – i.e. to switch between said domain-relevant methodologies – comes to the fore where and when we become aware of changes in our context or our understanding of the context.

4.6 Knowledge Transfer

It was already mentioned briefly in [section 2.2](#) above (p.11) that knowledge transfer should not be conducted in a mere 'cut-and-paste' manner, because such an instrumentalist approach assumes the possibility of de-contextualisation. The transferring of research methods between different contexts is particularly prone to this kind of instrumentalist approaches, and this objection against the latter is, therefore, equally important when considering the impossibility and undesirability of any research strategies aiming to perform

said de-contextualisation simultaneously on two levels – i.e. both *between* and *within* the above mentioned four contextual domains.

To be clear, any considerations of knowledge transfer within the complex domain would always face the challenge of overcoming the reality of *singularity*. This concept of singularity has been used in many ways in literary and philosophical discussions, but the following salient aspects of this concept as systematically developed by Attridge ([Attridge, 2004](#)) of particular importance for our purposes of developing an approach of methodological agility:

- Singularity is generated not by a core of irreducible materiality or vein of sheer contingency to which the cultural frameworks we use cannot penetrate but by a configuration of general properties that, in constituting the entity (as it exists in a particular time and place), go beyond the possibilities pre-programmed by a research paradigm's rules and practices;
- Singularity is not *pure*: it is constitutively impure, always open to contamination, grafting, accidents, *re*interpretation, and *re*contextualization. Nor is it inimitable: on the contrary, it is eminently imitable, and may give rise to a host of imitations;
- Strictly speaking, therefore, singularity, like alterity and inventiveness, is *not a property* but an *event, the event of singularizing which takes place in reception: it does not occur outside* the responses of those who encounter and thereby constitute it. It is *produced, not given in advance*; and its *emergence* is also the *beginning of its erosion*, as it brings about the changes necessary to accommodate it. Singularity is not the same as autonomy, particularity, identity, contingency, or specificity; nor is it to be equated with “uniqueness,” a word which I shall employ to refer to an entity which is unlike all other entities *without* being inventive in its difference—which is to say, without introducing *otherness* into the sphere of the same. A work that is unique but not singular is one that may be wholly comprehended *within* the norms of the culture: indeed, it is the process of comprehension—the registering of its particular configuration of familiar laws—that discloses its uniqueness.

In summary, therefore, when knowledge transfer – especially *within* the complex domain – is understood from this perspective of innovative / inventive ‘uniqueness’ is particularly helpful since it guards against falling into the trap of *replication* – i.e. trying to reproduce the exact same ideas, concepts, principles etc. produced under radically different contextual conditions. On the contrary, the notion of singularity suggests that knowledge transference goes hand in hand with the principle of **innovation** (discussed in more detail below in [Section 6.2.6](#)) – i.e. the need for establishing something new and different during the process of transferring knowledge *between* different problem situations in the complex domain. In other words,

transferring the guiding logic and principles – developed *during* the ETTDR approach *in* and *for* the fluid informal settlement of Enkanini – to other similar / different fluid situations is certainly not an impossibility. However, as long as this undertaken on the basis of **re**interpretation and **re**contextualisation the said guiding logic and principles in a manner that what is being transferred is both innovative and context-relevant for the new context.

Bringing the notion of singularity into our understanding of knowledge transfer *within* the complex domain makes sense, because it is in *this* domain that we are facing non-repeatable events which force us, first and foremost, to **re**contextualize and **re**interpret the actual, emerging contexts *within* the complex domain. This certainly opens the possibilities of innovation = coming up with ‘new’ ideas / knowledge or methods with which to generate new knowledge. This is a very different strategy from the one of **de**- contextualization explicitly followed by Bergmann et.al, for example, when explaining the transferability of different methods between different contexts (Bergmann et al., 2013). To be sure, this strategy may be applicable when dealing with repetition / repeatable events in the obvious / simple domain, but not necessarily, as said, when facing non-repeatable events in the complex domain. Here the strategy of **re**contextualising and **re**interpreting – i.e. making sense of emerging contexts *as if for the first time* (Latour: Reassembling the Social). This is a more appropriate context-relevant approach to follow, which does not exclude *per se* the possibility of transferring knowledge generated in / under completely different contextual conditions, but can only do so as *a last resort*, as it were, and not the other way around, namely of adopting an “*attitude that we must understand our tools before we use them...*” (Gellner, 2005, p. 17). This in effect means falling into the trap of adopting an abstract *a priori* approach to knowledge transfer, namely of deciding both on the *what* and the *how* of knowledge transfer *prior to* any attempts at **re**contextualising / **re**interpreting said new, emerging contexts – in other words, not only is the *kind of knowledge* that should be transferred decided upon in advance, but also the *rules* and *techniques* involved in *how to* perform the actual knowledge transference.

This, however, is not the case when dealing with repeatable events in, for example, the obvious / simple domain. Here it is indeed possible to undertake knowledge transfer as an exercise in replication – copying and pasting the exact same principles.

4.7 Multi-Ontology Decision-Making Framework: Summary

The main objective for introducing the multi-ontology Cynefin decision-making framework has been two-fold: (a) contributing to a broad research strategy for participating in collaborative science-*with*-society processes in an methodologically agile manner, and, within this strategy, (b) situating TTDR as a specific domain-relevant methodology in / for the complex domain –

alongside the other equally domain-relevant methodologies of mono-, multi- and inter-disciplinarity in / for the obvious / simple and complicated domains (see Figure 15 below for a complete graphic representation of this). This, as mentioned, is of particular significance when confronted with fundamentally different kinds of problems situations in the context of the Anthropocene today.

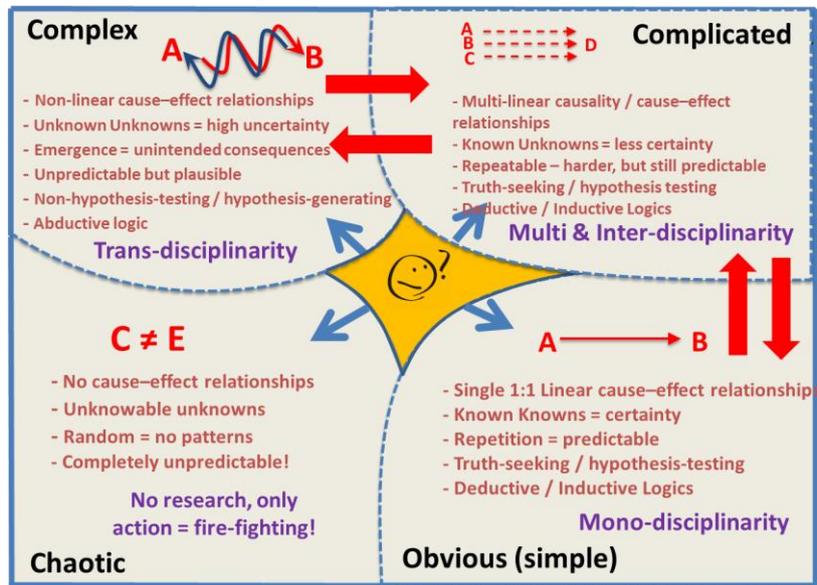


Figure 19: Methodological Agility⁵²

Source: By Author 2019 – adaptation from: Snowden and Boone, 2007

The blue dotted lines in Figure 19 signify **enabling boundaries** for distinguishing the four domains from each other as well as allowing for contextual changes to occur both *within* and *between* the different domains. The red arrows, in turn, signify the dynamic methodological changes and flexibility required for following / tracking any such changes – more specifically, signifying the methodological **ability** and **agility** needed for switching between and adapting to the domain-relevant research methodologies – each with their own set of concepts, logics, principles, practices, methods etc. as per the logic of the bounded applicability principle.

Adopting methodological agility (both intra- and inter-methodological agility) has the distinct advantage of keeping our focus on the simple, complicated, complex or chaotic nature of the problem situations facing us, without, very importantly, falling into the trap of engaging in any of the fiercely contested ‘methods disputes’ or ‘paradigm switching’ debates – which may be interesting from a theoretical perspective, but with very little, or no, practical value, especially when engaging with non-academic social actors in the collaborative science-*with*-society processes. In other words, there are no reasons whatsoever to try and develop and present TTDR methodology as a panacea for ALL problem situations in the Anthropocene today –

⁵² Switching between domain-relevant methodologies.

simply because not ALL problem situations in the Anthropocene manifest themselves as equally complex problems.

And, from this exercise of contextualizing / situating the ETTDR methodology *in* and *for* the complex domain, it became possible to formulate some appropriate epistemological strategies (in [Section 4.4](#) above) for working with non-linear causal dynamics in the complex domain and for furthering our methodological considerations in the remainder of this study, in particular [Chapter 5](#) below. However, before setting out to do so, it is worth noting (without going into too much depth here) that accepting that the ontology of circular / non-linear causal dynamics allows for bringing the notions of **intentionality** and **human agency** into our thinking and theorizing – in particular, their causative role and power in bi-directional causal relations (Brøgger, 2018; Mingers, 2014a; Varela, 1999).

This, in short, means accommodating and working with different forms of human subjectivity in ETTDR processes – rather than following the different strategies developed by rationalism, empiricism, and positivism etc. to explicitly remove all forms of human subjectivity from the research process. The net effect of doing so is reductionism – i.e. reducing, rather than adding, layers of complexity that are part and parcel of the unknown unknowns in the complex domain. This may indeed be necessary for working in the obvious / simple and complicated domains, but it is certainly a fatal epistemological mistake to make in the complex domain, since different forms of human intentionality / subjectivity (different and differing phenomenological experiences, perceptions, observations etc.) are integral to the understanding and changing of non-linear causal relationships, including human–natural or human–environmental relationships, in the complex domain. However, when dealing with the notion of human intentionality in non-linear causal relations, for example, it may very well become necessary to come up with a different understanding and definition of something along the lines of non-linear intentionality and anticipatory awareness of the unexpected – which is no longer based / premised on strictly linear assumptions and reasoning.

However, coming up with such different ways of understanding intentionality falls outside the methodological scope of this study; suffice it to say here that the causative role and power of human agency in non-linear causality is certainly not restricted to the notion of intentionality *only*. For our purposes it is therefore worth merely noting that working with different forms human agency / subjectivity in ETTDR processes also means including the important area of ethics in the broad double sense of the word of figuring out *how we should act* in our complex

world and, more specifically, *facing (or taking responsibility) for the consequences of our actions*,⁵³ or not, i.e. *failing to take action*.⁵⁴

Dealing with different aspects of human subjectivity certainly cannot be avoided in ETTDR processes – especially not by trying to appeal to the so-called Humean is–ought conundrum⁵⁵ (Hume, 2018) as a justification for banishing ALL normative statements from the research process⁵⁶. Any attempts to do so run the risk of completely *misunderstanding* non-linear causal dynamics in the complex domain – including the causative role and power of human agency in non-linear cause–effect relationships – and hence posing a threat of adversely affecting participation in collaborative ETTDR processes with non-academic social actors.

In short, without an ethical dimension, transformative approaches to complex problem situations in the complex domain become very difficult, if not impossible to sustain. What is needed, therefore, at the theoretical and even meta-theoretical levels (Bhaskar et al., 2015) for participating meaningfully in ETTDR processes is an approach which accepts the non-separability of ethics, epistemology and ontology. Such an approach has already been postulated in the form of an **ethico-onto-epistemology**⁵⁷ (Barad, 2012, 2007). However, this work has been done in the context of quantum physics, and delving any deeper into this issue here falls outside the more narrow methodological scope of this study; suffice it to say that up-scaling, as it were, what Barad has achieved at the quantum level to the more macro level of facing planetary challenges in the context of the Anthropocene today, is of the utmost importance for using the ETTDR approach in future – since it has a direct bearing on the way we approach intentional knowledge co-production of systems, targets and especially

⁵³ This notion of ethics will be returned to briefly in [Section 7.2](#) below to highlight some of the ‘ethical moments’ that present themselves in narrative-based ETTDR processes and how to possibly respond to these so as to not try and side-step these important ethical moments ([Derrida, 2016, 1997, 1978](#)).

⁵⁴ In non-linear causality the negative is as important here as the positive, simply because facing the un/intended consequences of failure to act is as unavoidable as in the case of actually taking certain actions. Either way, altered / changed situations will be faced, which in all probability would be significantly different to what existed *before* any actions were taken or *not* taken.

⁵⁵ This is also known as the ‘Humean guillotine’ or the ‘fact vs. value’ gap.

⁵⁶ In other words, this is-ought problem is perfectly understandable from a linear causality perspective: the unidirectionality of A causing B in time and space is basically final, in the sense that the arrow of time rules out any possibility of reverse feedback and causation. However, the situation changes radically when reverse causation (bi-directionality) happens between B and A, especially when the causal feedback loops consist of both material and non-material flows, including informational and intentional flows such as human emotions, values, needs, desires etc. – all matters of human agency / subjectivity. It surely impossible for Hume to imagine the human subjectivity coming into contact with and interacting with the former (matter / material flows) strictly from the perspective of linear causality. However, this is indeed possible to imagine from a non-linear causal perspective.

⁵⁷ Also known as ‘agential-realism’ in the literature (Barad, 2012, 2010; Gisbourne et al., 2015).

transformation (Hadorn and Pohl, 2008b; Pohl and Hadorn, 2007a) in the complex domain (something that will be very briefly taken up again in [Section 7.2](#) below).

CHAPTER 5: MULTI-TRACK ETTDR PROCESSES

5.1. Introduction

One of the important lessons learnt early on in the Enkanini TDCS was, as mentioned, that formal 'legitimated' stake-holder engagement is not a fundamental prerequisite for initiating and conducting ETTDR processes when dealing with a socially fluid social context such as the Enkanini informal settlement. On the contrary, it became increasingly clear that, in terms of the prevailing circumstances in this informal settlement, it would not be an appropriate strategy to follow, but rather to pursue a different strategy of, as said, interacting with individual shack-dwellers in their informal networks and relationships – exploring with them incrementally what was plausible in / under their current circumstances without having a clear-cut idea(s) of exactly in which direction this may evolve.

What was needed, and positively responded to without necessarily naming it as such at the time, was to be methodologically agile in this dynamic / fluid social context, in both senses of the word inter- and intra-methodological agility. Of particular importance here is intra-methodological agility. It was already alluded to (in [Chapters 2](#) and [3](#) above) that this meant working from time to time with both mono-, inter- and transdisciplinary approaches – depending on the changing issues in the context of the Enkanini informal settlement during the unfolding research process. However, when facing the reality of the absence of any formal 'legitimated' leaders / decision-makers within this situation, the research team also demonstrated their intra-methodological dexterity by exploring a different and uncharted research trajectory and process, without access to community leaders / decision-makers with whom to engage in a facilitated rational-teleological planning type of process, starting from some or other shared vision or preferred scenario(s) of the future. In other words, the research process itself, and any contributions it could make to some form of social change, was unknown and could only be explored incrementally, and driven by the co-designing and experimenting some side-casting activities in the form of the three small-scale safe-to-fail experiments.

Since this was completely uncharted territory for the research team, and because the TDR literature does not provide guidance for those embarking on such an emergent type of process with informal, unlegitimated stakeholders, the research team had to find theoretical guidance from a different body of literature focused on bottom-up and parallel / adjacent approaches. To that end, useful concepts to work with were found in the literature focused on peace-building and conflict resolution, in particular Track 1 and Track 2 negotiation processes

(Diamond and McDonald, 1996).⁵⁸ Track 1 approaches normally involve high-level government officials and leaders whose intent is to influence power structures and improve power relations so that negotiations and discourses can move forward. The downside of Track 1 is that if power structures suppress underlying issues, the sustainability of any agreements can be compromised (Mapendere, 2005).

Track 2 approaches are not a replacement for Track 1, but rather a supplement to them. Their intent is to build relationships and encourage new thinking that can inform Track 1 negotiations. Often Track 2 approaches (conducted via unofficial channels) can precede official negotiations, laying the groundwork and establishing a certain level of trust between people, thereby de-escalating the situation. Track 2 initiatives build bridges, increase trust, correct misperceptions and unfounded fears, and mitigate dehumanization and entrenchment (Burgess & Burgess, 1997). A downside to Track 2 is that participants rarely have the resources to implement any agreements. Sometimes, the two tracks occur simultaneously, which is called multi-track diplomacy (Burgess & Burgess, 1997; Mapendere, 2005; Snodderly, 2011).

The notion of Track 2 peace-building or conflict-resolution efforts is recognised for its affirmation that informal trust- and relationship-building initiatives contribute to finding and implementing durable solutions in the more formal Track 1 negotiation processes. These are normally conducted between legitimated decision-makers representing the interests of their constituencies / stakeholders (Davies and Kaufman, 2003; Diamond and McDonald, 1996; Esterhuysen, 2012). In this body of literature it is accepted that the connection and interaction between Track 1 and Track 2 is fundamental, because without the building of trust and relationships that happens in informal Track 2 processes, it becomes very difficult, even impossible, to imagine reaching and implementing formal Track 1 negotiated agreements.

Looking at things from a Track 2 perspective made it possible to see a connection between initiating the Enkanini TDR process and contributing to a process of incremental social change. It became apparent that taking this informal route of building individual relationships of trust around the co-design and implementation of small-scale social experiments could potentially contribute to building a wider community culture of working together (Sennett 2012) and hence negotiating a better future for themselves with government.

⁵⁸ Although not directly relevant, it is still interesting to take note of George Soros's call on the EU to allow member states to pursue "multi-track" relations with the bloc rather than "ever closer union", i.e. in response to the Brexit vote in the UK to leave the EU – see: <https://www.theguardian.com/business/2018/may/29/george-soros-drastic-action-needed-for-eurozone-to-survive>

However, it is worth repeating here again the notion of methodological agility (referred to in [Chapters 2](#) and [3](#) above) as something which is necessary not only for inter-changing *between* different domain-relevant methodologies – mono-, multi-, inter- and trans-disciplinarity – but also *within* a particular domain. So, for example, the complexity encountered in the complex domain also refers to ability to engage with different kinds of social actors *during* the emergent research process. In practice, social actors are almost certainly a heterogeneous in nature, with different values, needs, interests etc., and can, therefore, be expected to vary significantly – depending on the actual issues in context being faced. In other words, in certain contexts one may have to engage with highly formalized, well-resourced and well-educated ‘legitimated’ stake-holders, mandated to speak for or make decisions on behalf of the people they ‘represent’ – whilst, in other situations, social actors may only be individuals active in their informal social networks, relationships and institutions – with no mandate to speak on behalf of others, but only for themselves.

Therefore, in order to be methodologically agile, what is needed is a multi-track research process approach that would make it possible to conduct ETTDR processes in each of them. In this chapter, within the context of the Enkanini case study the focus will be on developing this notion of a multi-track approach as a concrete example of an emergent situation where initiating and conducting a ETTDR process in the context of informality was the main challenge from the onset – in other words, in the absence of ‘legitimated’ stakeholders. In other words, the multi-track approach pursued in the Enkanini case can be seen as a direct response to the challenge / need for being methodologically agile *within* the complex domain with its multiple complexities / non-linearities.

5.2 Formal, Informal and Intermediary Multi-Track Processes

As already alluded to, ETTDR processes in the complex domain do not consist of just one kind / type of process, but of at least three distinct types of processes, namely: (a) formal stakeholder processes – also referred to briefly at Track 1 processes, (b) informal or individual social actor processes – Track 2 processes, and (c) intermediary processes – known as Track 3 processes. Part and parcel of intra-methodological agility within the complex domain is figuring out which of these processes to follow. This decision is completely context dependent, which means that it hinges entirely on the actual real-life circumstances of the complex problem situation at hand, including the question of whether there are formal ‘legitimated’ stakeholders present and accessible, or not. The differences between these three different processes are important for further developing the ETTDR methodology – in particular the guiding logics and principles (which will be discussed in more detail in [Chapter 6](#)). The multi-

track idea will also serve the purpose of better understanding what it means to be methodologically agile *within* the complex domain.

5.2.1 Track 1: Formal Legitimized Stakeholder Processes

Track 1 processes – already referred to above as those formal and institutionalized processes that are normally conducted by leaders or decision-makers mandated to represent and negotiate on behalf of the vested interests of certain well-organised and resourced stakeholders – are well recorded in the TDR literature from the developed Global North (Bergmann et al., 2013; Foley et al., 2017; Jahn, 2008; Jahn et al., 2012; Lang et al., 2012; Regeer and Bunders, 2009; Scholz, 2011; Scholz et al., 2006b; Scholz and Tietje, 2002; Seidl et al., 2013; Wiek et al., 2006). What this body of literature has in common is that science *with* society in general and transdisciplinary knowledge co-production in particular happens between scientific experts and legitimated stakeholders, present and ready to engage with each other *as equals* in rational-teleological thinking and planning-type processes, in which the force of the better argument is guaranteed to prevail if the parties involved have managed to establish some *prior* consensus or common ground on the *ends* to be achieved *before* entering into a rational discussion with each other on the most effective and efficient *means* with which to achieve the *ends*.

A good text-book example of this type of rational-teleological approach is the forward operating and backward thinking and planning process developed by [USYS TdLab](#) (ETH Zurich), graphically depicted in the six steps in Figure 20 below, namely: (1) starting with the case, (2) faceting the case, (3) scenario building, (4) eliciting stakeholder preferences, (5) developing common assessment criteria and (6) future action.

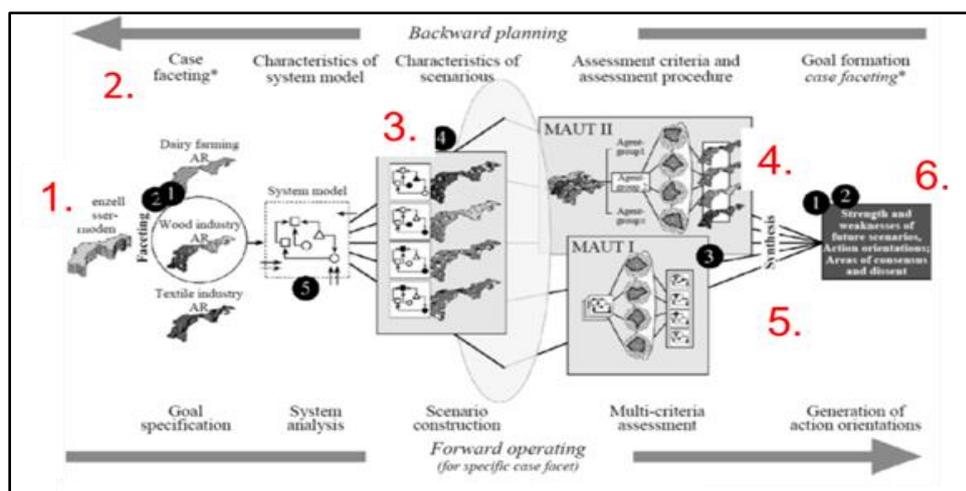


Figure 20: Rational-teleological backward planning & forward operating

Source(s): Scholz, 2011; Stauffacher et. al., 2006

The key point about this approach is its very strong and purposive goal orientation by focusing the attention of the stakeholders involved on the present *via* the future – normally a highly normative and idealized representation of the future in the form of some or other ‘most preferred or desirable scenario’, always the outcome of a rational discussion (based on so-called ‘objective’ / measurable criteria) of many possible scenarios. The strategy here is to attempt to first build consensus around certain normative *ends* – what ‘should be’ achieved – *before* turning the focus on discussing and finding the most effective and efficient *means* with which to achieve the mutually agreed upon *ends*. However, there are two major challenges with this rational-teleological thinking and planning approach. The first is what happens if the participants fail to reach agreement on *how* this idealized depiction of the future is being developed and presented, because of unequal knowledge/power relations amongst them, and favour the needs and interests of the more powerful over those of the less powerful. In practice, this may result in this goal-seeking process finding it very difficult, if not impossible, to get off the ground as it were. However, addressing this challenge of unequal knowledge / power relations has been the strategy of deliberately constructing some ‘conflict-free zones’ (Scholz, 2011; Scholz et al., 2006b) in an attempt to provide the participants with some ‘safe spaces’ to engage with each other *as equals* in rational discourse.

The second challenge assumes that the force of the better argument has prevailed in these purposely constructed conflict-free zones, resulting in the parties indeed finding common ground on some or other most desirable future state. However, in practice they may find it too difficult or even impossible to actually translate the idealized future state *into* reality, because the rationally agreed upon *means* with which to achieve this are found to be incapable of dealing with the complexities of bringing about the necessary social change under the current conditions in the present situation. In this case, this approach will find it equally very challenging going forward, but is certainly something which can be addressed by the participants; this is provided that they do not adopt an instrumentalist attitude and approach by trying to shape and mould reality *into* the idealized picture of the future, but rather, during the second or third iterations of these iterative processes, try to change and adapt both the mutually agreed upon *ends* and *means* in order to cater *for* the prevailing circumstances of the situation at hand.

5.2.2 Track 2: Informal Social Actor Processes

In Track 2 processes the fundamental assumption is that doing *science-with-society* in general and ETTDR processes in particular can take place between individual social actors in their informal networks in their actual community settings. The starting point in Track 2 processes is, therefore, not some or other idealized and deferred state in the future, but rather to *discover*

the evolutionary potential of the present (Snowden, 2015b) through (radical) experimentation (Unger, 2014, 2007b, 1998b) with some small safe-to-fail social experiments (Snowden, 2013) – situated as boundary objects (Akkerman and Bakker, 2011; Bowker et al., 2016; Star, 2010; Star and Griesemer, 1989; Wall and Mollinga, 2008) – and then in a bottom-up way sharing the learning experiences in this of what works and what does not work, as an incremental strategy for plotting the next steps for going forward (Unger, 2014, 2007a; West, 1986). The imagery and practices here are more those of side-casting (Snowden, D., 2012) rather than using the forward or backward casting techniques explained in the TD literature (Scholz, 2011; Scholz et al., 2006b; Scholz and Tietje, 2002; Wiek et al., 2006) – and, consequently that of a bottom-up and *outward spiralling or vortex-like process* (see Figure 22 below).⁵⁹ The latter process always produces and unleashes some human energy generated by what can be *imagined in the small* and then using this energy to bring into the social ‘event horizon’ or ‘sphere of influence’ of such bottom-up processes what can immediately be attracted and included.



Figure 21: Vortex-like process

Source: [Wessels, 2015](#)

In practice, this outward spiralling effect of this vortex-like process means using the *boundary objects as attractors* (Colchester, 2016b; Snowden, 2006a; Young, 2011) by continuously looking for opportunities to assemble more people with the new innovative ideas, to either expand the current small-scale experiment or coming up with different boundary objects and connecting them strategically through a new set of social and institutional arrangements – not yet in existence – but incrementally creating the conditions for the emergence of an ‘adjacent

⁵⁹ This symbolism of a bottom-up, spiralling / vortex-like process played a particularly important role in the imaginations and reflexive thinking of the TDR team in the Enkanini case study and is a very powerful way of visualising the outward and upward dynamics of Track 2 ETTDR processes – in particular because this allows for the notion of non-linear feedback loops or reverse causation.

possible' (Snowden, 2016b; Unger, 1998b, 2007a, 2014); that is a different social reality emerging from new sets of social and institutional connections and relations, existing in between, alongside and entangled with the prevailing societal structures – without (at least in its emerging stages) purporting to replace them.

Key in these Track 2 processes is the formation of transdisciplinary or socio-epistemic communities (Van Breda, J et al., 2016) emerging from the human energy circulating in these outward spiralling social change processes. By working at the micro level, and by building individual epistemic relationships with individual social actors in their informal social settings and networks, from this bottom-up process of connectivity small, collaborative networks or epistemic communities emerge. The individuals in these emerging epistemic communities are, through the transdisciplinary process of knowledge co-production, empowered with practical knowledge that they can use to negotiate a better future for themselves, particularly when having to face policy- and decision-makers who may very well be participating in the more formal Track 1 processes on the future of the very challenges confronting their communities. In a social context where there is no history of shared rituals and experience of working together (Sennett, 2012), these emerging individual epistemic relationships and their transformation into socio-epistemic communities is indeed a very fragile process and many things can go wrong to undo these newly formed social connections. These connections, particularly in the beginning, have to be made and re-made, constructed and re-constructed, *as if it is the first time every time this happens* (Latour, 2007) and it is only through this painstaking assemblage and re-assemblage of these epistemic relationships that, slowly but surely, the patterns of the formation of these new socio-epistemic communities can be seen to emerge.

The notion of 'epistemic communities' has been widely published in a range of social science studies, including the literature on inter- and transdisciplinarity. However, in these bodies of literature, the notion of an 'epistemic community' has been portrayed as something which has its origins, existence and functions primarily in the academic environment, essentially *across* and *between* the social sciences and humanities (Klein, 2008). Meanwhile, in the literature on cities in a developing world context, for example, 'epistemic communities' have been thought of as having their genealogy, existence and functioning in civil society, essentially in the social spaces existing *between* the state and the private sector (Pieterse, 2006). What is fundamentally missing from these perspectives is the joint presence of science *with* society in their formation and functioning. In the case of an interdisciplinary concept of 'epistemic communities', society is simply absent from how they are being constructed and what they produce; similarly, academia or science does not feature in the way civil society's 'epistemic

communities' are understood. This is very different from the experiences and observations of the research team's work in the Enkanini TDCS (2011 – 2017). Even in its current rudimentary form, their research is pointing to a much more 'hybrid' phenomenon in which '[transdisciplinary epistemic communities](#)' (Brenner and Elden, 2009) can be seen to be constructed *from* the careful building and developing of informal socio-epistemic relationships between individual researchers and social actors.

The main challenge and critique facing these incremental bottom-up Track 2 type processes is that they cannot bring about structural change in society since they are confined to, at most, establishing different sets of socio-epistemic connections existing and functioning as 'adjacent possibilities' in 'in-between' / 'third' spaces *only*, without ever perturbing or changing any of the existing and dominant unequal, unjust and unsustainable societal structures at large. The response to this challenge and critique is two-fold: firstly, that the notion of deep-structure societal change is a highly problematic theory of social change that suffers from what has been called 'structure fetishism' (Unger, 1997),⁶⁰ a mistaken study that 'structure' is absolute – an end-in-itself – which denies *any* possibility that we can change the quality of our 'formative contexts'⁶¹ (Bateson, 1972; Ciborra and Lanzara, 1994; Garfinkel, 1991; Heritage, 2013; Mills, 2017, 2014; Schutz, 2012, 1973; Unger, 1997) within a particular institutional / structural order – without necessarily surrendering to what already exists in a particular formative context .

In other words, it is always possible to figure out how to construct better institutional and discursive formative contexts that are 'structure-challenging' rather than 'structure-reproducing' (Unger, 1997). Therefore, deep-structure societal change does not necessarily have to be the strategic object or focal point of TTDR programmes or projects, which, in any event, would simply fall outside the scope and sphere of influence of what research can hope

⁶⁰ "By the structure of society, I mean the institutional and ideological presuppositions that shape the routine practices, conflicts, and transactions in that society, and that are largely taken for granted, even to the point of being invisible, as if they were part of the nature of things. In a free society, this institutional and ideological framework does not present itself as an alien fate beyond the reach of the transformative will and imagination" (Unger, 2014b, p. 295).

⁶¹ Formative context is a dynamic understanding of context, which might be likened to Einstein's dynamic understanding of spacetime that no longer subscribes to the Newtonian view which imagines space and time not only as two separate realities, but also seeing space, in particular is seen as something static, universal and unchanging – something like a static stage or place-holder where things merely happen (move) by virtue of the application of some or other external force. *Spacetime*, on the other hand, is seen as something fundamentally integrated (two sides of the same reality) and dynamic which means it can *affect* and *be affected* by the actions / movement of bodies. The fundamental difference of course between spacetime and context is that the former is natural reality created during the early origins of the Universe and context refers to human-made social and institutional connections, relations, arrangements etc. – which makes it even more important to imagine it in these dynamic terms as something which is mutable, rather than as some or other static 'background' merely there for better *understanding* and *explaining* (*Verstehen / Erklärung /*) things.

to achieve in this regard. There is indeed an alternative possibility, both in theory and praxis, that Type 2 transdisciplinary research processes can contribute to, namely to incrementally bring about new types of social connections and institutional arrangements – within the formative contexts – that are not only qualitatively different to those of the existing structural order, but which are also continuously critical of and challenging the existing structural order.

Secondly, this contextual focus on what can be achieved at the micro level does not mean that there should not be any attempt at influencing things at the policy level, looking at the longer-term implications of what comes out of the more informal and local-level achievements. On the contrary, contributing to policy-level changes remains a top priority of TTDR approaches and if this is not what can best be achieved in Track 2 transdisciplinary processes, then it means that these contributions fall more in the ambit of Track 1 processes. This, in turn, means that these two different tracks should be seen as complementary processes, with deliberate attempts made to provide continuous information and communication feedback loops to flow to and from them so as to ensure dynamic, two-way interactions between Track 2 into Track 1. This is indeed the focus of Track 3 or the intermediary processes, which will be discussed in more detail below.

5.2.3 Track 3: Intermediary Processes

When compared to the role, function and dynamics of Tracks 1 and 2 in shaping ETTDR processes, as described above, it is indeed debatable whether Track 3 constitutes a separate process altogether, because it does not necessarily have as its focus a separate societal domain of its own, but is something more like liminal as *in-between* (Vilsmäier and Lang, 2015) or *third spaces* (Soja, 1996), as it were. Therefore, the *raison d'être* of Track 3 processes is linked more to creating some on-going feedback loops – of information and communication flows – between Tracks 1 and 2 with the express purpose of enabling the two processes to shape and influence each other. In practice, this may also mean from time to time facilitating joint meetings between representatives from both Track 1 and Track 2 processes to discuss matters of mutual concern that may have emerged during the course of conducting these two parallel processes.

From a Track 2 perspective such meetings could be of high strategic significance, affording the opportunity to negotiate a better deal for those affected by policy-level decision-making. In other words, using this opportunity to increase the quality of the participants' 'formative context' in their current situation, rather than at some unknown point in the future. From a Track 1 perspective such joint meetings are of equal strategic value, because they afford the opportunity to formulate evidence-based policy-level decision-making informed by actual real-

life experiences and experimentation, with many different small social change experiments to see what works and what does not work in practice. Therefore, although the nature of intermediary work undertaken in Track 3 processes is very different to *what* happens in Tracks 1 and 2, it is critical for *how* the latter are performed as well as the outcomes produced by these two parallel processes.

In the case of the Enkanini experience, the opportunity for setting up some joint meetings between representatives of the more formal – Track 1-type – multi-stakeholder process initiated between the Municipality, Shack Dwellers International ([SDI](#)) and other stakeholders and representatives from the more informal – Track 2-type – processes has not as yet taken place. In our view, this may happen in the not too distant future when the number of shacks connected to the iShack system is closer to 2 000, i.e. when this would present at scale a workable model for implementing the government's [Breaking New Ground Informal Settlement Upgrading Programme](#) at municipal level. However, from our experiences and observations, we are convinced that the leadership figures who have emerged during the informal processes in Enkanini over the last couple of years have indeed been sufficiently empowered by the knowledge co-production that has taken place in order to represent the needs and interests of the community in any negotiations with the Municipality on what is practically possible whilst waiting for the government to arrive with its more permanent and longer-term grid solutions for this informal settlement.

However, the presence and effects of Track 3 intermediary-type action have also been felt on at least two strategically important issues concerning the future of the Enkanini informal settlement. Firstly, Stellenbosch Municipality (SM) was the first municipality in 2014 in South Africa to change its indigent free electricity policy – of R55.00 per household per month – to shack dwellers not connected to the national electricity grid, but connected to their own self-initiated and maintained mini-grid in the form of the iShack system. The significance of this policy shift was not only of immediate benefit for the shack dwellers connected to the iShack system – contributing to their monthly payments of ±R150.00 – but also for the community at large, since this move also signalled an acceptance of their permanency in this particular location where they have decided to settle. Secondly, this happened two years later when the Municipality rescinded their legal eviction order served on the community in 2010. This means that the community of ±2 000 shacks is no longer seen by the authorities to be occupying this piece of land illegally, although this still does not mean that the shack dwellers can get freehold / tenure of the individual pieces of land on which they have built their shacks. This is certainly an important issue that would make another significant contribution to improving the immediate quality of the 'formative context' of the residents in Enkanini whilst they are still awaiting the larger infra-structural changes from the side of the government. However, we believe that the

painstaking work that has gone into engaging with individual shack dwellers in their informal settings and networks and incrementally connecting them to their own self-initiated, paid-for and maintained mini-power grid has contributed immensely, firstly, to changing and extending the Municipality's indigent free electricity policy to include those connected to the iShack system, and secondly, to finally rescinding the eviction order hanging over the residents' heads for almost ten years and the uncertainty that this created for them.

Another concrete example of the role of intermediaries in Track 3-type processes, during the Enkanini case study was an opportunity which presented itself during a two-day workshop (in September 2015) between a group of SU academics and researchers and some senior officials of SM (see Figure 22 below). This group of people met fortnightly on Friday afternoons in a typical Track 1 formal stakeholder forum process to discuss the future development plans for the town of Stellenbosch. The intermediaries in this were some of the academics and researchers who were also intimately involved in the Enkanini TDCS – either as supervisors (academics) or on a more day-to-day operational basis (researchers).



Figure 22: Track 3-type process⁶²

Source: By Author 2019

The challenge of this particular two-day workshop was to explore the implications of a transport-oriented development plan (TOD) vs. the current developer-driven development process resulting in undesirable urban sprawling eating its way into both agricultural and very eco-sensitive land around the town. However, on the second day of this workshop, during a brainstorming session on some of the possible transport nodes, the opportunity emerged to discuss the possibility for one of the two existing train stations to be moved to the area just

⁶² A two-day strategic workshop between municipal officials and university academics held at the Sustainability Institute in September 2015.

below Kayamandi and Enkanini as a high-dense and mixed-use work and living area. Including Enkanini in this type of discussion was due to the presence of the intermediaries, who, had they not been present in this two-day workshop, would clearly have meant a golden strategic opportunity was missed.

5.3 Multi-Track ETTDR Processes: Summary

As mentioned above, the multi-track approach for conducting ETTDR processes in different kinds of real-life contexts in the complex domain has been one of the key emergent outcomes of the ETTDR approach – in the sense that it was not intentionally planned for, or even anticipated, but rather that it was a response *in the moment* to the situation on the ground in 2011 that there were no formal legitimized stakeholders in the emerging Enkanini informal settlement with whom to start the TDCS. In this regard, the discovery of the literature on multi-track diplomacy and peace-building was very useful, since it enabled the research team to figure out the next possible steps of the research process in the fluid social context of the Enkanini informal settlement. This happened at two levels simultaneously: (a) at the conceptual / theoretical level, imagining and situating the ensuing ETTDR process as a second track type of a process – not in opposition to formal stake-holder driven processes, but rather as parallel – yet very different – to the latter, and (b) at the strategic level, learning from the onset to becoming methodologically agile in the sense of learning to use different aspects of mono-, inter- and trans-disciplinary approaches, whilst keeping the focus on the next possible steps in terms of co-designing and constructing the three small-scale safe-to-fail social change probes, and only then, when facing the consequences (peoples' responses and reactions) to the latter projects, figuring out the next steps forward.

The purpose of being methodologically agile *within* each of the three multi-track ETTDR processes is to figure out how to contribute to social change in the actual real-life contexts in which such research processes are embedded. In practice this remains a real challenge – given the predisposition of explicitly transformative research processes to become very much *entangled with* the actual social change processes they set out to initiate. However, when this happens, the research process runs the risk of losing its research focus and to avert this danger it is important not to treat them as *identical* processes.

Key in this regard, of not treating them as one and the same, is the strategic understanding of knowing *when*, *where* and *how* to manage the so-called entry and exit points for transformative research processes – both in terms of starting and stepping aside (but not away) from the social change process. Yet in initiating the informal Track 2-type process in the Enkanini informal settlement, it was for all practical purposes impossible to separate the two processes. The main reason for this was that the day-to-day activities of the people involved (researchers

and co-researchers) became inseparably intertwined. And when this happens it may very well lead to some role confusion in terms of when and how to perform the three mentioned roles of reflexive scientist / researcher, change agent / activist, and intermediary / facilitator (Pohl et al., 2010). Interestingly though, allowing the conflating of the different roles may very well produce the direct opposite position of over-structuring the research process – to the extent that both researchers and social actors are merely required to passively go through the motions of *acting out* some pre-determined roles – conducted, controlled and performed very much according to the rules and lines of a pre-scripted play performed on stage, as it were, for some attentive audiences (Hajer, 2005).

Either way, allowing the roles to become *too entangled*, on the one hand, or *too impassive*, on the other hand, it is bound to produce some negative effects not only on the way (process) transformative knowledge is being co-produced, but also the transformative knowledge per se (outputs / outcomes). It therefore remains critically important to treat – in both theory and practice – the research and social change processes as two distinct processes – but always in ways that would *acknowledge* and *work with* dynamic non-linear feedback loops and the two-way / mutual impacting on and transforming of each other. However, in the Enkanini case, the time for actually stepping *aside from* (but not completely *away from*) the social change process arrived when it became increasingly clear to the research team that this process had gained sufficient traction and momentum of its own in order to be transformed into an operationally and financially self-sufficient entrepreneurial business opportunity – and to be managed henceforth by some of the co-researchers who have become empowered to do so during the research process.

In concluding this section, it is important to acknowledge that there are multiple ways (processes) in which to navigate science-with-society relationships in the context of the complex domain. In this chapter at least three possible processes have been discussed, with specific reference to Track 2 types of processes dealing with informal processes. The key lesson that has been learnt from the practical research experiences in the Enkanini TDCS (since 2011) is that when faced with a particular set of circumstances, it is critically important to be methodologically agile, in the sense of being able to co-design the research process as it unfolds – including iteratively and dynamically (re)working the epistemic objects and (transformative) social outcomes produced by the emerging research process – rather than approaching the latter with too many fixed, pre-determined ideas, practices, methods etc.

The particular set of circumstances faced by the research team in the Enkanini case was the absence of formal 'legitimated' stakeholders with whom to engage in setting up and conducting the research process, and hence the research team was compelled to adopt an emergent

research design approach from the onset. Still, in other situations with different sets of circumstances there will be very different challenges to face, but the need for methodological agility – especially real-time learning and figuring out different ways of co-designing the emerging research process – will remain. Needless to say that *how* all of this happens in practice may differ from context to context, but what is crucial in this is *sharing the learning*⁶³ and feeding it (the learning) back into initiating and conducting collaborative *science-with-society* processes in the context of the Anthropocene today.

5.4 ETTDR Processes for Faculty

The multi-track approach presented above consists of at least three different – yet related – kinds of collaborative ETTDR processes which are all in one way or another embedded in – shaping and being shaped by – some real-world, social change processes. As mentioned, when such multi-track processes are conducted in and exposed to the non-linear causal dynamics in the complex domain, they would be dynamic, non-linear processes with no direct, linear causal connections between their intentional knowledge co-production inputs and any transformative social outcomes. However, this does not mean that such non-linear ETTDR processes cannot produce some transformative social outcomes per se. On the contrary, as demonstrated from the experiences and observations in the concrete Enkanini case, transformative social outcomes are indeed possible if approached and constructed as small-scale social change interventions, which may or may not succeed, depending on the context in which they are embedded – this, in turn, makes it fundamentally uncertain and unpredictable whether such small-scale safe-to-fail interventions will, or may, contribute to larger structural change in society – as some or other over-arching purpose or end-goal (telos). Be that as it may, managing ETTDR processes in such dynamic, non-linear contextual circumstances is not only in and of itself a complex undertaking, but it is also a real challenge presenting them back to the academy / faculty, with its clear institutionalized practices and expectations around linearity, certainty, predictability etc. – the fundamental goal / purpose is always to seek and produce the Truth in / of the particular problem situation being confronted and studied.

The challenge we therefore face is how to present the inherent non-linearity of the ETTDR processes embedded in the complex domain to faculty in a way which makes sense in terms of the more linear reasoning and expectations governing academia. One way to respond to this challenge is to openly admit that it is an impossibility and simply refrain from trying to

⁶³ This important issue will be discussed in more detail in [Section 6.2.5](#) below as the *learning of learning* under the heading of “Multi-Loop Transformative Learning”. It is exactly this reflexive, transformative learning that happens *within* contextually embedded ETTDR processes that needs to be shared for initiating and conducting dynamic *science-with-society* processes in different parts in the world.

present something. Another response, however, is to acknowledge the fundamental differences between real-world non-linearity and academic linearity, and try our best to present something that would be understandable to faculty – on the clear understanding that this is a *linear representation* (or abstraction) of the fundamental non-linearity in complex real-life situations in which ETTDR processes are embedded and exposed to – and, very importantly, that such linear abstractions (or models) cannot in any way purport to express the full complexity of what happens in real-life ETTDR processes.

Therefore, in line with this approach and way of reasoning, an attempt will be made in this study at presenting such an ideal-typical⁶⁴ ETTDR process – on the clear understanding that this is still work in progress and by no means purporting to make any claims to universality, namely that it can be applied uncritically ‘as is’ to real-world situations and/or academic institutions of higher learning across the world. Given the provisionality of this endeavour, it will therefore be presented in [Section 7.6](#) below together with some other aspects of the ETTDR methodology that fall outside the scope of this study and that would need to be further elaborated on in future.

⁶⁴ As already mentioned, the notion of ideal-typical is used here in the Weberian sense of the word (Bruun and Whimster, 2012; Finch, 2011; Weber, 2009), namely that the purpose of the abstract linear, step-by-step version research process presented here is not to try and replicate or transfer ‘as is’, but that it is at least hoped that some of the fundamental aspects of it will be found useful in / for some other real-world and institutional contexts and settings across the world.

CHAPTER 6: GUIDING LOGICS, PRINCIPLES AND SENSES / SENSIBILITIES⁶⁵

6.1 Introduction

These guiding logics and principles presented and discussed below should be seen as cognitive facilitators of imaginative and iterative decision-making processes. These processes are, by definition, incremental in that they tend to get driven forward by those who are best placed to ask ‘What is the next step?’ (Unger, 2007b, 1998a) during the unfolding of the applied research processes. Rather than having to predict or know too far in advance exactly what the consequences of embarking on a particular vector or direction of change may be, it is strategically and practically more important to figure out the next step, and then to see where that may lead within a rapidly changing context. In other words, the guiding logics and principles of the ETTDR approach presented below are not pre-determined or fixed principles, but rather are a more formal articulation of what emerged during the course of the Enkanini case study. Nevertheless, they may be useful for guiding the way ETTDR case studies are conducted in future.

Although the primary focus of this chapter is establishing the guiding logics and principles necessary for guiding our decision-making in ETTDR processes, it should be said that the actual Enkanini TDCS (introduced and discussed in [Chapter 3](#) above) can serve to demonstrate the context *from* and *within* which the ETTDR approach actually emerged. In this regard, the context is critically important to show that the guiding logics and principles were not derived solely from the literature, but emerged *from* the constant and critical two-way exchange between theoretical reflection and on-the-ground experiences in the Enkanini context. Therefore, the single case study or idiographic approach (Gerring, 2006; Krohn, 2010, 2008; Yin, 2009) adopted in [Chapter 3](#) is considered an appropriate approach for eliciting in-depth insights and understandings, not only of the social context, but also of the methodological logic and principles that emerged and guided the Enkanini transdisciplinary case study research process.

In order to develop a context-relevant set of guiding logics and principles for working in the complex domain, the following diverse body of literature was consulted during ETTDR process:

⁶⁵ This chapter is based on our co-authored paper: “The guiding logics and principles for emergent transdisciplinary research design” (Van Breda and Swilling, 2018).

- Complexity theory (Boulton et al., 2015; Cilliers, 1998; Juarrero, 2002; Mingers, 2014b; Snowden and Boone, 2007; Vester, 2012)
- Emergent design theory (Cavallo, 2000; Hasan, 2006; Hesse-Biber, 2010; Hesse-Biber and Leavy, 2010; Jonas, 2007, 2007; Sanders and Stappers, 2008)
- Assemblage theory (DeLanda, 2006; Farías and Bender, 2012; Harman, 2008; Latour, 2007; McFarlane, 2011)
- Learning theory (Argyris, 2002; Kolb, 2014; Medema et al., 2014; Peter Blaze Corcoran and Arjen E. J. Wals, 2012; Taylor and Cranton, 2012; Tosey et al., 2011; Wals and Rodela, 2014)
- Narrative theory (Czarniawska, 2004; Edelman, 2006; Heinen and Sommer, 2009; Herman et al., 2010; Klein et al., 2011; Kurtz, 2014; Niles, 2010; Snowden, 1999; Snowden, 2010; Van Dijk, 1976)

A key insight drawn from integrating this diverse body of literature for developing an ETTDR approach is to link the notion of human agency in social-actor networks to the broader notion of complex systems change. In our understanding this means that, when complex systems change, social actors not only make sense of what is happening in order to adapt, but they also act to change their context. Context therefore matters (Latour, 2007) in demonstrating not only the social origins of the more theoretical work that culminated in developing the guiding logics and principles below, but also, from a social change perspective, to introduce the notion of context as not just as some 'empty space' or 'background' *in which* things happen, but as something dynamic which is continuously both changing and being changed by us.

In my view, the existing literature on TDR has not as yet generated an adequate set of context-relevant guiding logics and principles. Without this there is no methodology that can be used for navigating ETTDR processes *in* and *under* fluid social conditions like those observed and experienced in urban contexts of the global South. In this regard, as seen through the lens of the Enkanini case study, there are three problems that our research aims to respond to.

The first problem is that the existing principles for designing ETTDR methodology tend to be too general and not sufficient for the purposes of dealing with the challenges of emergent design, particularly when facing highly volatile circumstances in developing world contexts. This does not mean that there is anything 'wrong' per se with current design principles. It is rather a question of their applicability when dealing with the challenge of actual fluid / emergent social conditions as experienced in the Enkanini case. In this regard, the following four principles are a case in point: (a) *reducing complexity*, (b) *effectiveness through contextualisation*, (c) *integration through open encounters* and (d) *reflexivity through recursiveness* (Hadorn and Pohl, 2008b; Pohl and Hadorn, 2007b). As mentioned, it is not that

these principles are completely without any merit and should therefore be discarded. However, these principles are not in and of themselves adequate for designing and conducting emergent transformative ETTDR processes *in* and *under* the types of dynamic circumstances encountered in urban contexts of the global South such as Enkanini. For this, deriving a different set of guiding logics and principles is essential – and this is the main focus of this chapter.

The second problem relates to how ETTDR principles are formulated. This has two aspects. First is the static way in which certain principles have been formulated in more empirically oriented transdisciplinary case study research when dealing with real-world problems (e.g. large-scale industrial contamination). Second is the fundamental preconditions set for using these same principles. A case in point here is the following set of principles proposed by Foley et al.: (a) *trust and willingness to collaborate* (dealing with the problem of mistrust), (b) *momentum* (dealing with the problem of inertia), and (c) *symmetrical power relations* (dealing with the problem of power asymmetry) (Foley et al., 2017).

Related to the first aspect is the non-performative way in which these principles have been formulated, since some of the principles are without any verbs. The purpose behind such principles is that they should be capable of igniting and guiding certain actions and decision-making, especially when working *in* and *under* the fluid social and material types of conditions as encountered in many contexts of the global South such as Enkanini. The way the above principles have been formulated (and presented here) certainly falls short of the performativity aspect of *guiding* principles.

Related to the second aspect is the authors' perception that there is often a fundamental 'flaw' or 'mismatch' between the *ideal* and *reality* of multi-stakeholder ETTDR processes, primarily because of the exclusion of certain stakeholder groups. Consequently, the remedy proposed for overcoming this apparent disparity can *only* be achieved when there is absolutely no exclusion, and when *all* the relevant stakeholder groups have been treated 'equally' and 'fairly' in terms of *all* these principles (Foley et al., 2017). However, experiences and challenges from urban contexts of the global South can be very different to this more normative approach, since it was more a case of pre-stakeholder engagement. In other words, such cases reflect a situation of initiating ETTDR processes with no stakeholder groups *within* the community that could either be *included* or *excluded* in the research process – simply, because there were none. The ETTDR process in Enkanini thus had to be constructed on the basis of building trust, willingness to work together and dealing with huge social and educational inequalities on an individual shack-by-shack basis. In the face of these challenges, the TDR team felt that the existing TDR literature did not provide sufficient theoretical insights and guidance for the

task at hand. We needed to draw on the different body of literature mentioned above which, upon critical reflection, resulted in providing the guiding logics and principles that resonated with the experiences of the researchers in the field.

The third problem has to do with the tendency to conflate the notions of methodology and methods. This seems to be prevalent in the more solution-oriented stream in the TDR literature (Miller et al., 2014; Scholz, 2011; Seidl et al., 2013; Stauffacher et al., 2006; Wiek and Lang, 2016). By using these two concepts rather interchangeably, this body of literature tends to reduce the discussion on methodology to a systematic analysis of a certain body of methods for doing ETTDR. In our view, this is done at the cost of giving sufficient attention to the development of the principles necessary for designing and steering ETTDR processes.

To remedy this situation (and avoid any confusion at both the theoretical and practical levels) it is important to return to the original Greek etymology of the two notions of 'methodology' and 'methods'. The word 'methodology' is comprised of the three Greek roots: 'meta' (μετά) signifying what is 'beyond' or 'above', 'hodos' (ὁδός) denoting a journey and 'logos' (λόγος), When put together they refer more broadly to the reasoning, logic or principles being used for guiding methodological decision-making when facing complex problem situations, such as in the complex domain (discussed in more detail in [Section 4.4](#) above). The word 'method', on the other hand, derives from only the two Greek words 'meta' and 'hodos', and omits the notion of 'logos'. This means that methods have a more performative meaning because they are about acts of *doing* or *performing* certain techniques, steps or procedures when *using* certain tools and instruments for *navigating* a journey.

However, methods on their own cannot tell us *for what* they are or should be used, or alternatively *how* they should be designed and used when tackling complex problem situations, particularly when the end state is not all that clear or when there are many different pathways of getting there. This, however, remains the role and function of the reasoning, logic and principles necessary not only for guiding the decision-making processes when tackling sustainability challenges, but, even more importantly, for informing the thinking that needs go into designing the steps, procedures and tools needed for tackling complex problem situations. This conceptual distinction between methodology and methods is reflected in the formulation of an appropriate set of logics and principles that, as mentioned, *both* emerged from and guided the ETTDR process *during* the Enkanini TDCS.

6.2 Guiding Logics & Principles

6.2.1 The Logic of Abductive Reasoning

In a volatile context, such as the Enkanini informal settlement, what has been achieved today can easily be overturned by a completely different set of circumstances and occurrences tomorrow. This means it is only common sense that the ETTDR process could not be designed and guided by an inductive or deductive hypothesis-proving or truth-seeking type of logic. This is simply because there are no hypotheses to be proven or disproven, even when it comes to what can or cannot be achieved with an incrementalist theory of social change. It was therefore clear from the outset that a very different type of explorative logic was needed for steering the research process incrementally in a broadly-speaking transformative direction, without having a clear-cut point of departure and point of arrival built *into* the transformative research process. It was in this context that the abductive logic became the driving logic of the TDR team. At first, it was used intuitively and subsequently, as the research process unfolded, more explicitly. As participating researchers started reflecting more critically on their research experiences and the type of reasoning that was informing their decision-making incrementally, this steered the research process in a transformative direction.

Turning to the literature (Magnani, 2009, 2011a, 2011b; Meulhauser, L, 2009; Park, 2016; Thagard, 1997; Thagard and Shelley, 1997) on abductive logic intuitively also made a tremendous amount of sense, particularly upon (re)discovering the ground-breaking work of pragmatist philosopher C.S. Peirce (Peirce, 1992, 1974). This way of thinking has become known as the *logic of hunches*, namely of making connections between things on the basis of their plausibility (Snowden, 2011). In this regard, what resonated strongly with both the experiences and reflections of the research team was the central notion that in the abductive mode of reasoning people “*draw a [best guess] conclusion from an array of seemingly disparate and unconnected facts and observations*” (Patokorpi 2006: 71).

From this perspective of making connections and seeing patterns emerging in a context of seemingly disconnected elements and with no history or shared experience, people coming and working together on any matters of common concern in this particular settlement played a significant role in how the research team saw and understood the effects of their own research actions and how to plot the way forward (making the road by walking it). Particularly significant in this regard were the initial observations of some incremental changes in the patterns of the behaviours of the first individual shack-dwellers slowly but surely – five households at a time – beginning to move in the direction of *coming together* to figuring out how the iShack system (described in more detail in [Chapter 3](#) above) should be implemented, maintained and paid for.

In summary, the abductive logic was something that may be described as the emergent outcome of an iterative and reflexive process – i.e. a two-way process of practical explorative

work, on the one hand, and engaging critically with the relevant literature, on the other hand. It was not something that was taken *from* the literature and somehow applied *to* the practical situation of the Enkanini informal settlement. On the contrary, it was based on a more grounded theory or bottom-up approach: at first, working intuitively in an *abductive way* by experimenting with a small-scale safe-to-fail (Snowden, 2011) experiments in co-designing and building the first iShack, and then observing changes in peoples' perceptions and behaviour in response to this, before moving on to building more iShacks and retrofitting existing shacks. It was only when some changes in perceptions and behaviour started to emerge that the critical engagement with and integration of the insights provided by the literature on abductive reasoning became really meaningful. This entailed the development of a deeper abductive understanding at the theoretical level of connections and insights from the experiences of Enkanini residents about the slowly expanding the iShack system, and then feeding these insights back into plotting the next few steps of the unfolding research process.

The question 'What are the next steps?' (Unger, 2007b) became an important and consistent maxim of the research team capturing the abductive way of engaging with the individual shack-dwellers in Enkanini. The question also served as a continuous reminder to the research team that the ETTDR process was conducted in a context with no (facilitated) shared vision of the future from the residents of Enkanini. Rather it was a matter of working in the present and figuring things out as events unfolded. On critical reflection, it became increasingly clear that it would have been impossible to try and do this type of transformative transdisciplinary research with an inductive or deductive hypostudy-testing logic. This is because even the 'incrementalist' theory of change does not lend itself to hypostudy building and testing, but rather favours experimentation as a means of uncovering alternatives that are very different from what can be found in a particular context (Unger, 1998a).

Therefore, initiating the research process with abductive reasoning when facing unknown unknowns in the complex domain is indeed key for it is certainly conducive to establishing mutual learning and the explorative character of the research process, absolutely critical for nudging it in a transformative direction – especially when facing the challenge of having to figure out the next possible steps towards the adjacent possible. However, abductive logic is not transformative logic in and of itself and, therefore, not necessarily capable of guiding our thinking and decision-making in ETTDR processes in a transformative direction on its own. For this to happen, abductive reasoning still needs to be supported by and work together with some more guiding principles – since it is in their complementarity and coherency (Thagard, 2002) that they play the key role and function of guiding our thinking, actions and decision-making in ETTDR processes.

6.2.2 Perturbing the System

The principle of “perturbing the system” comes from complex adaptive systems theory, which holds that systems are self-organizing and self-adapting. As pointed out in [Section 2.5.4](#) above, small changes in one part of a complex system can effect bigger changes in other parts of the system, thereby making possible wider systemic change under certain conditions (Chu et al., 2003; Wright and Meadows, 2012b). Sometimes this change has to be kick-started by perturbing the system, pushing it into a state of dis-order, which can be done consciously by using leverage. Indeed, while it is not possible to bring about total system change in complex contexts, it is possible to focus on strategic leverage points that catalyse change processes that evolve and expand over time (Meadows, 1999; Wright and Meadows, 2012b). These processes usually consist of multiple, contextual, small-scale social experiments over a period of time (Snowden, 2010; Snowden and Boone, 2007).

In other words, the more extended principle here should read as follows: *perturbing the system through multiple small-scale safe-to-fail social change experiments*. Real-life examples of the latter (referred to in more detail in the context of the Enkanini TDCS in [Section 3.5](#) above), which might work or not, are imagined as the co-construction of ‘something’ (Cavallo, 2000) that acts as a ‘boundary objects’ (Star, 2010; Star and Griesemer, 1989) or ‘social attractors’ (Snowden, 2010). They are, or should be, strategically situated at the intersection of particular socio-technical and/or socio-ecological systems in need of broader systemic change. They are very different to large-scale (and usually high-risk) imposed ‘real-world experiments’.⁶⁶ This critical literature, discussed further below, warns that erasing the boundaries between science and society could result in serious harm to people and nature when ‘real-world experiments’ go wrong.

‘Perturbing the system’ in the Enkanini context means exploring and finding alternative, innovative means of bringing about social change. One such way could be through community representatives negotiating with government (but this would assume that there is a readiness and willingness on both sides to enter into such a dialogue). In 2011 the Enkanini settlement was still illegal and there was no duly elected representative body with which to engage. According to Stellenbosch Municipality ([SM](#)), residents of Enkanini were not ‘sufficiently mobilised’ and therefore were not ‘ready’, as it were, to be engaged with as stakeholders. In SM’s view, Enkanini residents still had to be ‘prepared’ for such engagement. In this regard, the municipality involved Shack Dwellers International ([SDI](#)), an international NGO, to

⁶⁶ Such high experiments have been discussed in the well-established literature that emerged after the Chernobyl disaster. For a review see Gross and Hoffman-Riem (2005).

establish the exact number of residents and use this information to prioritise the basic needs of Enkanini residents.

The Enkanini TDR team discussed the possibilities of joining and supporting the emerging SM-SDI stakeholder discussion forum, but decided against it as the research process could conceivably be locked into a two- to three-year process of formal institutionalised stakeholder engagement before generating any real-world solutions. In addition, the enumeration process (e.g. counting exercise of numbers of shacks, people, toilets, water taps) could itself exacerbate existing tensions. Instead, the TDR team searched for an appropriate research strategy with the understanding that any form of research conducted in a fluid social context, such as Enkanini, also had to be transformative. This also implied that the transdisciplinary research strategy would itself be emerging and participative to ensure that it was transformative. This strategy is distinctly different from traditional mono- and/or interdisciplinary approaches that most often formulate problem statements and research questions based only on the literature, in isolation from the tacit knowledge and real-life experiences of local communities (Mintzberg and Lampel, 1999; Mintzberg et al., 2013, 1974)

There were two important consequences to this decision. First, the research team would need to focus on the *informal* and *individual* relationships already formed in Enkanini, as opposed to conducting a formal stakeholder analysis to identify legitimated community leaders to collaborate with. Second, the research strategy would entail designing the small-scale, socio-technical innovations *with* individuals and small groups of shack dwellers. This strategy would make it possible for some residents to gain access to basic forms of electricity, waste removal and sanitation services during the research process. These three elements (i.e. working together in the present, with existing informal relationships, and generating workable innovations) became the crux of the research strategy, supporting the guiding principle of 'perturbing the system'.

6.2.3 Allowing for Emergence

The purpose of perturbing the system by implementing multiple, high-leverage and safe-to-fail social experiments is to create the conditions necessary for longer-term solutions to emerge. It is critical to guide the TRDR processes to avoid premature convergence and enable emergence to occur (Snowden 2006; Snowden & Boone 2007; Snowden 2011).

The aforementioned leverage points are bifurcations, where a process can split in different directions and sites of instability, ripe with potential from which solutions can emerge. Transdisciplinary researchers must allow for solutions to begin morph into new entities, different from their original purpose(s) (in line with the principle of exaptation explained above).

Transdisciplinary researchers must also remain open to taking advantage of convergent moments to source innovative funding options, thus necessitating adaptability, creativity and intuition.

The fuller version of this guiding principle should, therefore, read: *allowing for emergence by avoiding premature convergence*. This basically has three important aspects. The first is an expectation that the emergent property will be more than the sum total of its parts – in this case, more than the combined results of individual research activities and implementation of small-scale interventions. One such emergent property is a newly established culture of *working together* (Sennett, 2012).⁶⁷ Although it could be premature to label this phenomenon as an emergent property, new practices of working together are increasingly visible in the Enkanini settlement.

The role of ETTDR processes is to trigger social change processes by *bringing together* individual households, which in the Enkanini case meant figuring out how to practically improve their current situation in the present, moving far beyond issues related to simply paying and maintaining the iShack, sanitation and waste systems. What is particularly significant in the South African context is that this happened in the absence of any form of overt government administration. It could be argued that this would not have happened if a top-down bureaucratic approach had been adopted in the form of a Track 1 multi-stakeholder approach (Burgess & Burgess, 1997). Powerful stakeholders, such as government, normally want to ‘own’ and direct developmental processes, and so perpetuate or create unequal power relations.

In practice, allowing for emergence by avoiding premature convergence also meant that any practical ideas on what *ought to be* were worked out *during* the co-design and implementation phases. A situational ethics was allowed to emerge through the situation of *working together* on what can be achieved in the present – and not some idealised and deferred point in the future. Situational ethics (contextualism) holds that each case is unique, meaning that ethical decisions should follow flexible guidelines rather than absolute rules or a priori principles, as per Kant’s transcendental ethics (Kant, 2012, 2005, 1996).

⁶⁷ By the time we approached the people of Enkanini in their informal social networks there had not been any shared experience amongst them of having worked jointly on any such project (e.g. electricity, water, waste). In other words, they were ‘un-mobilised’ following the NGO sector discourse. So this ‘culture’ (or shared experience) of working together only emerged *during* our TDR process. As this was not something we intentionally planned for, it is reasonable to claim that it truly *emerged during* the TDR process.

An illustration of this effect is that discussions and decision-making regarding the implementation of each of the three socio-technical innovations also entailed addressing the challenge of fairness. Each small group of shack dwellers had to anticipate the consequences of potential payment defaulters. These groups decided that households with genuine reasons would be given the opportunity to pay back arrears over a period of three to six months. But to guard against people who joined the system and then intentionally refused to make regular payments, the groups volunteered to establish savings accounts based on small, additional monthly payments to recoup losses in this regard.

A second important aspect for the ETTDR approach is that having an idealised version of the future is not a fundamental prerequisite for initiating ETTDR processes. It is possible to start with practical, small-scale projects that aim to change the present and allow for normative discussions of the future to emerge *from* this process. For example, in Enkanini we started with the iShack project and then slowly but surely introduced the Bokashi solid-waste and gravity-fed sanitation projects.

A third aspect was that allowing for emergence implied that culture of *working together* which is in its infancy in Enkanini and so not fixed or stable, and hence it cannot be taken for granted. The attempts to establish the necessary institutions to bolster a collaborative culture should therefore not be seen as a repetitive task, but rather as a task which repeats itself until the next time, which is always the first time (Latour et al., 2012).

Trust is integral to building institutions and it is not a tradable commodity. It is something that must be built and *rebuilt*. This understanding has guided the work of the TDR team in taking on the challenge of connecting each group of shacks to the system, as if for the first time. The results are apparent in more than 1 000 households connected to the system over the four-year period, and the establishment of a socially resilient⁶⁸ system, which has already stood the test of opposition from certain quarters in the settlement.

6.2.4 Absorbing Complexity

It is better to use a research approach that “absorbs complexity” (i.e. making it work for you), rather than reducing complexity especially when working in complex, real-world contexts (Snowden, 2011). Attempts to overly structure the research process to provide certainty in an uncertain environment are likely to lead to premature convergence and hasty conclusions.

⁶⁸ There is a difference between the notions of robustness vs resilience – with the former referring to strategies aimed at avoiding failure or fail-proof planning, while the latter is aimed at early detection and fast recovery, allowing for the possibility of failure (Snowden, 2011a, 2018).

This requires researchers to retain some measure of cognitive agility and be open to the unanticipated.

In the fluid social conditions of Enkanini it was not possible to uncritically accept the two principles of reducing complexity (Pohl and Hadorn, 2007b) and creating conflict-free zones (Scholz, 2011) as guiding principles for ETTDR processes. The research strategy encompassing perturbations of the system (as mentioned in [Section 6.2.2](#) above) warrants an approach that “absorbs complexity”⁶⁹ – “harnessing complexity” (Cohen and Axelrod, 2000) or “embracing complexity” (Boulton et al., 2015) – by finding ways of working *with* unequal power relations in an emerging community like the Enkanini informal settlement. The fuller version of this principle should therefore read: *absorbing complexity by working with asymmetries*, which, in practice, may very well require adopting a two-pronged strategy of taking on powerful vested interests, when required, and not engaging, at other times.

Taking this approach produced unexpected results. At the start of the process in 2011 it met with explicit resistance from certain municipal officials in the form of some heated email exchanges, but eventually, as the research process unfolded, it resulted in endorsement of the project by extending their indigent policy of basic free electricity to people off-grid who generate their own electricity. And, from a completely different angle, mid-way through the project, it also led to a group of residents actively mobilising against the project, as they felt it prevented them from gaining access to the municipal grid system. These unexpected (but unsurprising) responses added to the complexity of the unfolding situation, and demanded that the research team work *with* complexity, as opposed to reducing it.

As articulated in the abovementioned literature about absorbing / harnessing / embracing complexity, the key to this approach is trust (Tait and Richardson, 2010), which, in the context of Enkanini, must be seen as an emergent outcome of the entangled (Hodder, 2012) social and technical relationships that were painstakingly assembled in and around all three small-scale safe-to-fail socio-technical innovations. Trust in the overall research project had to come from and be built both *within* and *outside* the TDR team. First and foremost, this trust had to be developed at the interpersonal level within the TDR team, having *to learn to work together* and trust each other’s work. Secondly, trust within the team also had to be built in and around the renewable and sustainable technologies to be used in the three experimental projects.

⁶⁹ These ideas on absorbing, harnessing and embracing complexity should not be confused and compared with the ideas on reducing complexity in the literature on complex systems thinking, which refer to a much more abstract / high-level engagement with complex systems such as, for example, in modelling relationship when constructing models of complex systems, which can only be done on the basis of reducing complexity (Cilliers, 2008; Rosen, 1987).

This was achieved synergistically through all the teambuilding activities that went into an iterative process of sourcing, testing, piloting, monitoring and evaluating the first small-scale versions of the iShack, Bokashi and gravity-fed sanitation systems.

As the research process unfolded, trust-building was achieved on a shack-by-shack basis, with every individual shack-dwelling family who voluntarily opted to participate in any one of the three small-scale projects. In short, in a fluid social context such as Enkanini, trust should not be seen and treated as a 'resource'. It is better to imagine it as an emergent outcome of the many entangled socio-technical relationships. Recognising this emergent character of trust was certainly key to navigating the dynamic and unequal power relations in the settlement as new stakeholder groupings emerged within the community. In doing so, learning how to absorb and work with complexity was ultimately more important than trying to reduce or minimise it.

The emergent kind of research process experienced and observed in the context of the Enkanini case needs some human energy for fuelling the imagination and experimentation (Unger, 2014, 2007b, 1998a) with the real (adjacent) possibilities present' in said 'in-between' (Vilsmäier and Lang, 2015) or 'third' spaces (Soja, 1996). This energy can be generated by the participants' conflicting needs and interests, values and norms, and experiences and perceptions. Learning how to work *with* the *messiness* of the current situation and harnessing this energy by figuring out how people are drawn and come together *because of* (rather than *in spite of* or *in the absence of*) their differences, is critical for our methodological task of developing some appropriate guiding logics and principles of an ETTDR approach. In this regard, it is important that these design principles are *anticipatory* both in their orientation and execution (Poli, 2010a, 2010b, 2009). In other words, these design principles must be capable of *anticipating* and *working with* uncertainty, emergence and unexpected circumstances, as and when they arise during the unfolding research process.

6.2.5 Multi-loop Transformative Learning

In the literature, the basic idea of "multi-loop learning" comes from Gregory Bateson (Bateson 1972), namely that learning is an iterative process whereby people go through many learning cycles (see Figure 23 below). Although these are iterative cycles that does not mean that they are completely repetitive in the sense of learning exactly about the same stuff and in the same way. Each cycle has its own content matter and unique learning dynamics and, therefore, consists of three distinct levels: "learn", "learn how to learn", and "learn how to learn how to learn". In particular:

- Level 1 signifies the acquisition of new technical knowledge and skills;

- Level 2 denotes the learning of learning, figuring out how to share and transfer newly acquired knowledge to others in order to do things more efficiently;
- Level 3 involves gaining critical awareness of the consequences and direction of the learning process and, consequently, the need for changing the underlying logic and principles driving the learning process. Transformative learning happens at this level.

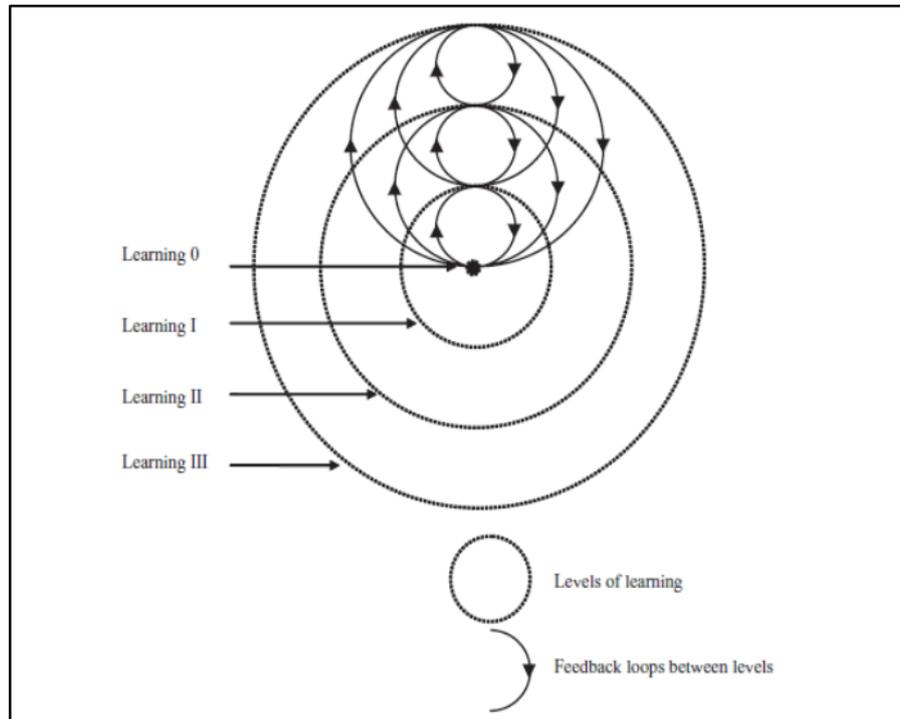


Figure 23: Multi-loop Learning
 Source: Tosey et al., 2012

As already mentioned above, co-producing systems, target and transformation knowledge (Hadorn and Pohl, 2008b; Pohl and Hadorn, 2007a) is considered fundamental to TD in general, and to ETTDR in particular. Learning to co-produce these three different types of knowledge in the fluid, emerging informal settlement context of Enkanini was indeed a major challenge, and the underlying ideas on multi-loop learning were found to be particularly useful (Bateson, 2002, 1972; Medema et al., 2014; Tosey et al., 2011) in this regard as a means of making sense of the continuous flow of experiences, reflections, ideas etc. used for both theorising and taking practical actions in the context of Enkanini.

While all three levels of learning are necessary, transformative learning occurs at Level 3 as the deeper strategic insights and thinking into the learning process itself are generated. Level 3 learning goes beyond cognitive and intellectual skills as it involves the aesthetic and axiological aspects of learning as well.

In the Enkanini case, the TDR team started effectively with a first cycle of Level 3 learning by building relationships through painting shacks and staying over for weekends with individual shack dwellers (i.e. the aesthetic component of Level 3 learning). These activities focused specifically on establishing and building trust. The guiding problem statement of what could be done in the present while waiting for the state-funded grid solutions was both broad and specific enough to allow researchers to connect with individual families at the aesthetic level because people were already beautifying their shacks. This meant that the initial conversations taking place around shared activities of painting and preparing meals together in peoples' homes were more narrative-oriented in that researchers listened to real-life stories and histories; they also observed first-hand the innovations people were undertaking to improve their current situation (through the principle of *innovation through exaptation*, see [Section 5.2.6](#) below). Notwithstanding the social or mutual learning involved here, it was the experience of an individual TDR member (Andreas Keller)⁷⁰ living in a shack and experiencing the daily challenges faced by shack dwellers that gave rise to the really innovative idea of the iShack.

The insights gained from this first cycle of Level 3 transformative learning were critically important in co-generating target and transformation knowledge. Through this process the TDR team could engage in developing and sustaining realistic expectations of what could be practically achieved in the present, as opposed to approaching the present from a normative and delayed point in the future, mediated by the interests of a removed representative decision-making body operating from a distance. This learning “from” and “together” with the individuals in Enkanini had a significant impact on the co-generation of Level 1 and Level 2 learning, respectively.

The second cycle of transformative learning had its origins in the first cycle of Level 1 learning. This confirmed the entangled and interactive nature of the three levels ([Tosey et al., 2012](#)). It was during the process of co-designing, co-constructing and implementing the first few iShacks that it occurred to the TDR team that scaling up the initiative would entail going beyond the mere technical and technological aspects of recycled building materials, PV panels and DC electricity systems. New research questions emerged as it became clear that, in the absence of state funding and support, the institutional arrangements for the payment and maintenance of the iShack system would have to come from the individual households themselves. Besides the apparently simple questions of whether people would be able and

⁷⁰ Also see Andreas Keller's TED Talk here: https://www.youtube.com/watch?v=p_YgOQp2uVM

willing to pay for this, the more complex question arose as how to organise and institutionalise this in a social context that lacked a long and strong history of working together (Sennett 2012).

The institutional arrangements to maintain and collect payment for the system were co-designed with 20 shack dwellers connected to the iShack. This illustrated a second cycle of Level 3 learning, as it became apparent that what was being designed was an integrated socio-technical innovation. In other words, the design aesthetic was a bridging tool.

This Level 3 experience then sparked a second cycle of Level 1 and 2 learning related to how to integrate the social and technical aspects of the iShack system, and how to replicate this socio-technical intervention in the rest of Enkanini among residents who chose to join on a voluntary basis.

In essence, this multi-loop learning process, which by no means proceeds in linear fashion from Level 1 to Levels 2 and 3, produced the ideas (including the combination of renewable and sustainable technologies), the institutional arrangements and the practices for paying for and maintaining the system. It is the real-life social laboratory of Enkanini that made this iterative and multi-level learning process possible.

Understanding human learning as an iterative process contributing materially to co-producing transformative knowledge is absolutely fundamental for working together in collaborative ETTDR processes. For this reason the abovementioned Batesonian notion of triple-loop learning is a preferred term to the way the notion of mutual learning has been conceptualized and applied in the TD literature (Scholz, 2011, 2000; Scholz et al., 2006b). Although this literature focuses on the key aspect of the relationality of human learning, this is not in and of itself sufficient for understanding and working with the different nuances in the learning process – i.e. the different kinds of learning, at different times and at different levels etc.

In short, the way the notion of mutual learning has been used in the literature cited above certainly lacks the dimension of iterative and multi-level dynamics of human learning provided by the Batesonian multi-loop learning perspective. And, very importantly, the emergent context of the Enkanini informal settlement in which the multi-loop perspective has been conceptualised has made it impossible to restrict the learning process to the so-called mutual learning that happens *only* between scientists and researchers and formal legitimated stakeholders. As mentioned, engaging with and making sense of individuals' practical day-to-day informal experiences in the context of the Enkanini informal settlement, as part and parcel of a transformative learning process, have been crucial for the way in which transformative orientation and direction of the research process was conducted in this case study. To be sure, by feeding back the insights and understandings generated during the different learning

cycles of the learning process into the unfolding research process created some critically important positive feedback loops — without which it would be very difficult, if not impossible, to imagine sustaining the transformative orientation and direction of the research process.

6.2.6 Innovation through Exaptation

The combination of two fundamental principles, “innovation” and “exaptation” (Snowden, 2011), has played yet another key role in guiding the Enkanini TDR process. This principle of innovation through exaptation means re-using it innovatively and creatively to serve different purposes and functions than (originally) intended – in short, it could also be referred to as re-purposing or ‘bricolage’ (Kincheloe and Berry, 2004), if the latter term is understood to mean re-using something which is already at hand for a different purpose and function.

Using this principle has meant working simultaneously with existing means and materials to solve existing problems, and using them as innovative solutions for new problems (exaptation). In turn, the process needed to demonstrate the possibility of unlocking the evolutionary potential of the present without having undertaken the traditional TDR practice of first establishing some normative ends (normally in the form of a shared vision and values) and then finding the most effective and efficient means with which to achieve these normative ends, and for co-designing and implementing provisional safe-to-fail experiments relatively quickly (Snowden, 2010; Snowden, 2011).

Despite not participating in the enumeration and stakeholder forum-building process driven by SM-SDI, the TDR team acknowledged that the SM-SDI approach intersected at various points with the TDR approach. This may be the start of a more formal dialogue process between the municipality and Enkanini residents. The TDR team posited that by focusing on implementing the iShack project, and achieving more than 1 200 connections by 2018, it would have brought about a different set of social conditions. This would have enabled residents to engage with the municipality on a different level. Even if the DC-based iShack system is later connected to the state-supplied AC grid, it is thought that the transformative social learning (discussed in more detail in ‘Multi-loop learning’ [Section 6.2.5](#) above) that occurred during the project, and the experience of working together on basic service provision, will have brought about a change in how the municipality and residents interact in future negotiations.

From the outset of walking the streets of Enkanini, the research team observed many practical examples of innovation through exaptation, such as this example (see Picture 2 below) of people using old motor car tyres for building the foundations of their shacks (very effective during the wet winter conditions in the Western Cape / Stellenbosch area).

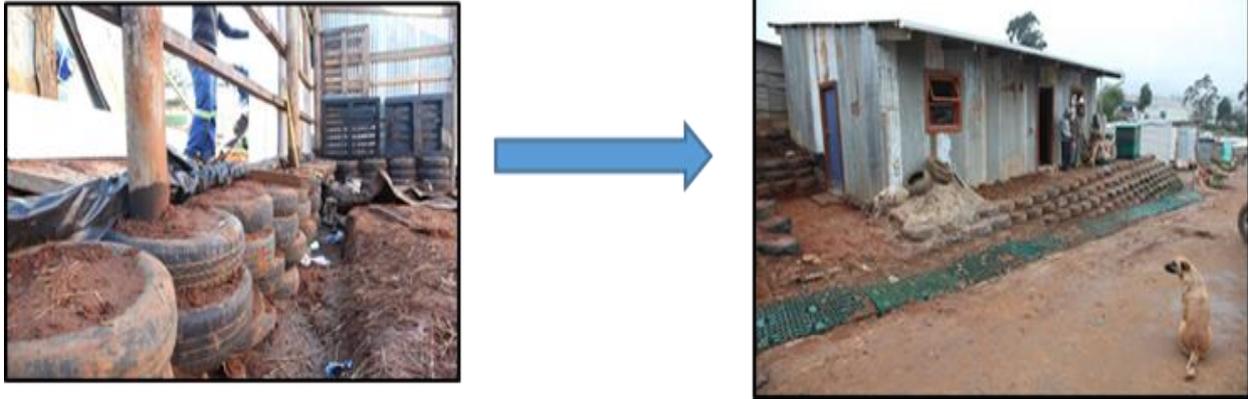


Figure 24: *Innovation through Exaptation*⁷¹

Source: Wessels, 2015

Importantly, though, the research team applied this same principle of *innovation through exaptation* to the ETTDR process itself – thereby, contributing materially to the whole notion of the ETTDR approach. In this regard, coming up with the multi-track approach of at least three different types of research processes (described in more detail in [Chapter 5](#) above) can be seen as a good example of the contribution that real-time theory-building can make towards initiating and conducting real-life ETTDR processes: by taking over some ideas and approaches from completely different areas of inquiry and research (e.g. conflict-resolution and peace-building initiatives) and applying them, to great effect, to a very different social context, the research team made it possible to situate and move ahead themselves with the emerging research process as a different kind of Track 2-type research process aimed at dealing with informality in very fluid socio-economic circumstances, rather than the Track 1-type processes designed for dealing with formal structures in much more stable democracies in the global North.

However, working with the *innovation through exaptation* principle was not limited to dealing with matters at the process level *only*. As they developed their understandings of and insights into the unfolding process dynamics of the Track 2-type process, the research team developed a strategic sense of when and where to start experimenting with the three mentioned socio-technical innovations – the iShack, gravity-fed and Bokhasi organic solid waste-treatment projects. As socio-technical innovations, and not just technical projects, what they all had in common was their ability not only to become deeply rooted into some of the informal relationships / networks of Enkanini, but also creating new ones – and, in so doing,

⁷¹ A practical example of *innovation through exaptation* – using old car tyres as water-proof foundations for shack-building purposes.

demonstrated in real, concrete terms the meaning of the 'adjacent possible' as something which is both embedded in and different from the current situation.

As mentioned, the iShack project took the lead in this with its innovative design and assemblage of using existing building materials, on the one hand, that were already familiar to the shack-dwellers, but also, at the same time, introducing new materials and technologies (e.g. the DC electricity systems) that were unfamiliar to the residents. This, in turn and very importantly, meant that the individual households who wanted to participate in the iShack system had to come together in order to figure out how the system would be maintained and paid for on a regular, monthly basis – without any government support for any of this whatsoever. In other words, by following the principle of *innovation through exaptation*, it was, in particular, the social innovation aspect of it which initiated the social process of bringing together small groups of individual shack dwellers to start collaborating on some concrete interests / needs they had in common.

Viewing the abovementioned socio-technical innovations from the side-casting perspective (Snowden, 2012) provides some more valuable insights and understandings for our purposes of developing the ETTDR methodology, precisely because they were not the outcome of some or other rational-teleological thinking and planning process, presented as the fore-casting / backward-planning approach in the TD literature (Scholz, 2011; Scholz et al., 2006a; Scholz and Tietje, 2002). As mentioned, there are many problems with trying to use this type of approach in complex / fluid problem situations such as the Enkanini informal settlement: firstly, because of the absence of formal, 'legitimated' leaders / decision-makers within the community, and secondly, because of the highly idealized and normative way in which scenarios of the future are being constructed as common ground / shared point of departure from which to approach the present.

As side-casting probes, the three socio-technical innovations were experimented with in the present with a view to explore plausibility in and under the current social and material conditions of the informal settlement – not some or other idealized future scenario(s) that have very little, if anything, to do with the complexities of the current situation. In other words, side-casting is a very important and complementary approach for allowing our decision-making to be guided by the innovation through exaptation principle, because it does not assume some shared vision(s) of the future as a fundamental prerequisite for experimenting with co-creating some 'adjacent possibles' in the here and the now, and then exploring these further to see how these innovations might trigger more similar and/or different trajectories of social change.

6.2.7 Guiding Logics & Principles: Summary

It has already been alluded to above that facing unknown unknowns in the complex domain does not mean / imply a situation of complete relativism or that 'anything goes' (Feyerabend, 1993) – something that might be more associated with the chaotic domain (described in [Section 4.5](#) above). On the contrary, it was argued that there is indeed a need for guiding our decision-making in TTDR processes in a transformative direction – otherwise (without such guidance) the research process may become into all four directions of the wind, as it were, without ever being in a position to actually enable experimentation with the adjacent possibles. However, making a case for the need of some guiding principles by referring to the relativist position of Feyerabend represents only one extreme side of the spectrum on these matters. The other extreme position would be that of rule-making, or just rules for short, as can be found in the writing of theoreticians such as Rene Descartes (Descartes, 1980) and Emile Durkheim (Durkheim, 2013), for example. To be sure, these two thinkers were working on very different intellectual projects, but what they had in common was their *foundational* interest in not only establishing certain domains of knowledge, but also in *guarding* and *protecting* these domains through rule-making. In other words, their concern was with exercising some control and power over the knowledge domains that they had an interest in founding. In the case of Descartes, it was a case of instituting rules for the scientific mind in general – vis-à-vis the stronghold of the Catholic Church over the production and dissemination of knowledge in society – whilst for Durkheim it was much more about a specific disciplinary undertaking aimed at establishing some rules for the founding of sociology – one of a number of new emerging social science disciplines at the time. However, in both cases, rule-making was seen as a key epistemic strategy for controlling both *what* scientific knowledge is and how it should be produced – in particular, protecting the scientific process from any influences of inter-subjectivity at the phenomenological level of human sensemaking: of interpreting and understanding the *meaning* of human experiences, perceptions etc. in and of a particular problem situation. Allowing any resemblance of human subjectivity into the scientific research was definitely seen and treated as a taboo by some of the founding figures of Western scientific thinking (like Descartes and Durkheim) – making very sure of this by way of constructing specific rules for abolishing human experiences and perceptions –the phenomenological-level stuff – from the scientific process.

Against this backdrop, the logics and principles presented in this chapter as examples of the kind of logics and principles needed for guiding our decision-making in ETTDR processes in a manner that can navigate a course somewhere *between* the two polar opposite sides of the spectrum, mentioned above. And, to be sure, the guiding principles presented above in this chapter cannot and should not be compared to a kind of foundational rule-making process, since there is no interest in trying to establish the ETTDR methodology on a so-called firm

foundation of universal principles that can simply be applied 'as is' in ALL emerging / fluid social contexts, such as was experienced and observed in the Enkanini informal settlement (described in more detail in [Chapter 3](#)).

Also, the already proposed idea of methodological agility is a strong antidote, as it were, to any foundational rule-making strategies aimed at excluding other approaches. When facing the twin-challenges of understanding the fundamental ontological and epistemological domain differences between different kinds of problems situations in the Anthropocene, and figuring out how to make the appropriate switching at the methodological level, there is no need for getting involved in foundational rule-making activities at the methodological level. As mentioned, performing the actual switching between the different methodologies certainly involves using some very different concepts, ideas, logics, principles, methods etc., which suggests *learning* how and when to do this appropriately as opposed to pursuing any exclusionary foundational rule-making strategies – least of all barring the rich / dense (Geertz, 1973) context of human experiences and perceptions from the research process.

The specific theoretical language used above with which to describe the guiding logics and principles did not immediately enter into the academic vocabulary of the researchers, especially during the early stages of initiating the project by walking the streets and offering to help the residents with painting their shacks. In other words, it would be incorrect to state that their thinking and actions were guided by as clearly formulated a set of using logics and principles, as presented and discussed above. A better way to understand this would be to say that for quite some time the researchers merely worked *intuitively* and *mindfully* during the research process with a sense of the transformative direction and orientation of the research process – whilst keeping as focused as possible on figuring out the next possible steps of the research process. However, reflecting on the researchers' ideas, observations and experiences, and trying to describe the intuition and mindfulness displayed by them in the actual, real-life context of the Enkanini informal settlement is not an easy task, simply because their responses manifested themselves in many different ways and at different times *during* the *unfolding* research process. In other words, it is not necessarily very helpful to try and imagine what happens at the phenomenological level as a singular, unified or well-integrated body of experiences, perceptions, observations etc. – ready-made, as it were, to be accessed and theorized.

On the contrary, the emergent nature of their responses manifested itself in unexpected and, at times, different and differing (even conflicting) ways. Therefore, it is suggested that *what* emerged *prior to* the articulation of said guiding logics and principles will be referred to below as some research 'sensibilities' or 'senses' for short – both *shaping* and *being shaped* by the

unfolding research process. And this simply means the transformative sense of direction and orientation developed by the researchers through their practical intuitions, insights, understandings etc., whilst figuring out the next possible steps of the research process – without necessarily having clear-cut / measurable ends or goals to work towards. In other words, this practical know-how of figuring out the next steps of the unfolding research process in a transformative direction and orientation is akin to Aristotle's notion of *phronesis* (*practical wisdom*), but, very importantly, without his notion of a definite *telos* (*end goal*) (Aristotle, 2013).

By introducing this notion of emerging research senses into the discussion here certainly helps to better understand the organic or evolutionary nature of the emerging logics and principles and the increasingly guiding role and function they played *during* the *unfolding* research process. In this regard, it may perhaps be helpful to imagine the senses as *preceding* the guiding logics and principles – namely, as researchers' experiences, perceptions and observations etc. *before* or *prior to* any attempts were made to put all of this into appropriate theoretical language. This is not to suggest, of course, that there is something inherently 'wrong' with translating our experiences etc. into (theoretical) language. On the contrary, language matters hugely and for this very reason it means working thoughtfully with/in the signifier–signified relationship – mindful of the fact that we very well have to allow our experiences, perceptions, observations etc. *to shape* and *be shaped* by the research process prior to putting all of this into theoretical words and language.

This means working with the principle of *allowing for emergence and avoiding premature convergence* (Snowden, 2013; Snowden, 2017a) to guide the research process from the very outset (discussed in more detail in [Section 6.2.3](#) above) by deliberately *not rushing* the process of reducing the research experiences, perceptions, observations to theoretical wording / language. If this is done too hastily, the task may very well run the risk of using inappropriate language that is too disconnected from the complexities of the problem situation at hand and, therefore, ceasing to be relevant for figuring out the next steps in the social change process and the transformative direction it should take. In other words, language – including theoretical language – matters hugely, since it plays a crucial role in the way the research process is being imagined, designed and conducted in initiating / supporting social change processes. And it is for this very reason that it is absolutely key to understand the importance of not only *what* wording / language is or should be used, but also, strategically speaking, *when* and *how* to manage the process of translating the phenomenological research experiences, perceptions, observations etc. into theoretical language and more specifically into thought / epistemic objects (Knorr Cetina, 2001; Schutz, 2012) so as to also, at the same time, create feedback loops in / for the unfolding research process.

To be sure, there are no hard and fast rules for knowing exactly how to manage this process of translating phenomenological experiences and perceptions into some appropriate theoretical wording / language. This will be described briefly in [Section 6.3.4](#) below in terms of what Giddens referred to as a double-hermeneutic process (Giddens, 1986), but suffice it to mention here that this a dynamic and context-dependent process during which social actors are continuously *shaping* and *being shaped* by their ‘formative contexts’⁷² (Bateson, 1972; Ciborra and Lanzara, 1994; Garfinkel, 1991; Heritage, 2013; Mills, 2017, 2014; Schutz, 2012, 1973; Unger, 1997). Such dynamic processes certainly involve a lot of trial and error as well and hence the need for a certain ‘awareness’ or ‘mindfulness’ by the researchers of contingency in all of this when searching for the appropriate theoretical wording / language to be included in their theoretical work / theory-building.

As already mentioned, as a broad guideline for working in the context of the complex domain, it is not necessary for the language used to conform to the typical Truth-seeking and hypostudy-testing scientific language – normally associated with the positivist movement in the history and philosophy of science. Instead, the focus should rather be on making sense of any patterns emerging from all the different and differing research experiences and providing some form of coherence (Thagard, 2002) in this regard, before proceeding with the process of looking for the most appropriate theoretical wording / language with which to describe all of this. Following this bottom-up process will hopefully increase the probability of finding the actual wording / language to contribute to the twin-goals of epistemic object development and social change.

6.3 The Six Senses / Sensibilities of ETTDR

As already alluded to above, what has been presented and discussed above as a coherent set of logics and principles that guided the unfolding ETTDR process in the Enkanini case did not necessarily emerge as clearly formulated and in exactly the theoretical terms and language used for this purpose. During the early part of the research process, prior to any attempts to reduce their research experiences to writing, members of the research team merely acted with a general *sense of the transformative direction / orientation* of the research process. What enabled this process of allowing for emergence, and avoiding premature convergence by reducing things too quickly to theoretical terms / language, was the fact that this broad sense of the transformative direction / orientation of the research process was not driven by pre-

⁷² As already alluded to in [Chapter 4](#) above, the notion of formative contexts entails a dynamic understanding of context, which might be likened to Einstein’s dynamic understanding of *spacetime* as something fundamentally integrated (two sides of the same reality) and which can *affect* and *be affected* by the actions / movement of bodies.

determined measurable goals – which of course cannot be performed without some appropriate theoretical wording / language.

However, although it may not necessarily have been possible and desirable to reduce things to writing, in the moment and during the research process, this does not mean that it cannot be done in hindsight. In fact, such an attempt will now be made below to briefly describe some of the key pre-language experiences of the researchers in a theoretical language that would hopefully make it possible to share some of the research team's important learning experiences; this will, in turn, hopefully contribute to deepening our insights into and understandings of some of the key aspects of pursuing an emergent transformative research design and strategy-making approach and the contribution this makes to our overall objective of developing the ETTDR methodology.

Before we proceed with this task of finding the appropriate wording / language, it must be said that what will be described below as the 'six (research) senses' or 'sensibilities' that guided the decision-making and actions of the research team, especially during the early stages of the research process, should not be confused with the way in which others have been thinking and writing about the importance of using our (five) senses (Serres, 2008) in the more general sense of the word. Although the five senses are clearly very important, the way the six senses / sensibilities are referred below signifies more some tacit modes of working together during TTDR processes – including what can be referred to as some research hunches or intuitions.⁷³ These can play a particularly important role during the early stages of the unfolding research process, especially when the guiding logics and principles have not been more clearly formulated as yet. In fact, the senses / sensibilities can act as a basis from which the guiding logics and principles can be further developed.

This was indeed the case in the experience of the Enkanini case study, these senses / sensibilities playing the role of some operational values in the sense that they both emerged from (or were produced by) and guided the daily interactions between the researchers and individual shack-dwellers – in a very tacit, almost unspoken, manner. The term 'values' can be misleading here, however, because of the strong connotation of something like a set of shared values that were somehow (potentially) present *prior to* the experience – in this case *prior to* the start of the research process. On the contrary, nothing of this sort was consciously present amongst the diverse group of researchers and individual shack-dwellers – what is

⁷³ The philosopher A N Whitehead does refer quite specifically to *scientific* intuitions and experiences (Whitehead, 2014, 2011, 2010), but it would be premature to cast these more hybrid-like operational/research intuitions and experiences into such strong, clear-cut terms as scientific senses.

described in the wording / language used below was truly the emergent outcome of the multiple practical challenges faced by the researchers and shack-dwellers.

However, what seemed more important and interesting was some sort of a positive correlation between the intensification of the challenges and interactions, on the one hand, and the emergence of the senses / sensibilities, on the other hand. Still, as mentioned, much of this was experienced and performed in an unspoken / tacit manner – especially in the early phases of the process – in the sense that nothing was formally written up and agreed between the researchers and shack-dwellers as normally happens in some facilitated workshops. In fact, a hall-mark of the Enkanini case was precisely the absence of such facilitated types of workshops.

In fact, this sensemaking process, at the theoretical and conceptual levels, happened much later in the research process during the individual researchers' engagements with their supervisors, directing them towards the varied body of literature referred to in the Introduction of Chapter 6 (see: [Section 6.1](#)) and being challenged to find some appropriate theoretical wording / language with which to describe their research experiences, including the senses / sensibilities and principles that both emerged and guided their decision-making and actions. In this sense, it can be said that the Enkanini research process i both emerged and was shaped by a truly dynamic two-way – bottom-up *and* top-down – process between theory and praxis.

As mentioned, the exercise below to describe the six senses / values with some appropriate theoretical wording / language will only be of an introductory nature – certainly needing some more systematic theoretical work in this regard in future (see [Chapter 7](#) below for some suggestions). The purpose of this description is, therefore, more exploratory with a view to introducing the implications of pursuing the principle of *allowing for emergence* by purposely creating some opportunities – times and spaces – for the pre-articulated experiences to emerge as a guide *during* collaborative ETTDR processes.

To this end, the senses below will be described in terms of adverbs to the verb 'working' in order to capture the way in which different kinds / modes of practical interactions emerged between the researchers and shack-dwellers.

6.3.1 Working Collaboratively

Working together, at both the practical and theoretical levels, is not something which can simply be taken for granted as something like a resource always present and ready at hand just to be accessed and used (like water running from a tap) – or, alternatively, something

which comes ‘naturally’ to people (as if it is our second nature). On the contrary, learning to work together, at all levels, is always a relational or social process, always involving some painstaking relationship and institution-building efforts – which, in the words of Sennett, means developing the ‘rituals’, ‘pleasures’ and ‘politics’ etc. of collaboration (Sennett, 2012). As mentioned, for undertaking ETTDR processes in the context of the complex domain, this means learning together how to figure out what actions / measures / arrangements are needed for taking the next steps forwards or sideways in the research process, on the one hand, and how and what kind of knowledge⁷⁴ needs to be co-produced in order to support the transformative direction of the social change process.

In the real-world context of the Enkanini informal settlement this was indeed a real challenge, because, as already mentioned, this was a so-called ‘un-mobilised’ community with no shared experiences amongst the individual shack-dwellers of ever having worked together on some common issues / matters of concern. At the theoretical level, the researchers faced a similar challenge because none of them had worked together on a research project of this nature, demanding, *inter alia*, figuring out some inter-disciplinary ways of collaborating *across* and *between* the different disciplines. However, what started this social process of *coming and learning to work together* in Enkanini was a deep sense, or mindful awareness, of the need for and urgency of collaboration, if *this* transformative transdisciplinary research project in *this* particular context were to demonstrate what could be achieved in the interim – i.e. whilst waiting for the government to arrive with its grid solutions in future.

In order to explain how this sense of *working together* actually evolved in this context, there is no need to revert to some or other supra-human or vital force⁷⁵ – it certainly can be described as an emergent property or the net effect / result of the multiple interactions that happened from the outset, starting with the seemingly simple joint activities of painting shacks (as mentioned in [Chapter 3](#) above). The implications of this are, needless to say, very important for the design and structuring of ETTDR processes. In this regard, setting up Track 2-type processes in fluid social situations such as the Enkanini informal settlement, there is a need for some flexible structuring, but not over-structuring that would leave very little, if any, room and space for exploration, decision- and strategy-making as things happen in the moment.

However, unintended consequences also played a role in bringing the researchers and shack-dwellers together to collaborate in the research project. In this regard, for example, the

⁷⁴ That is, systems, target or transformation knowledge needed (Hadorn and Pohl, 2008b; Pohl and Hadorn, 2007b).

⁷⁵ What Bergson referred to in French as *élan vital* (Bergson, 2007).

strategic decision taken early in the Enkanini case study *not* to join the SM / SDI multi-stakeholder forum contributed to this in the sense that the researchers realized that this meant that they could not necessarily rely on any immediate or close-at-hand financial or organizational support from so-called developmental experts in the field – on the contrary, the need for any form of ‘outside’ support would have to come and be sourced from *within* the unfolding research project itself – and, for all practical purposes, this meant from the collaborative interactions between the researchers and individual shack-dwellers. In hindsight, it is clear though that this had a profound effect on establishing a collaborative mode of *working together* from the very onset of the research project in 2011.

It must also be said that this collaborative mode of *working together* was not limited to the practical level only. On the contrary, it was extended to the more theoretical level of working *between* and *across* disciplinary boundaries when and where the need for this emerged – such as, for example, during the design and construction of the three small-scale social change projects (described in more detail in Sections [3.5.1](#), [3.5.2](#) and [3.5.3](#) above). However, although, as said, in hindsight this may appear the obvious route to take, nothing, in the absence any previous shared experiences of working together, was straightforward – on the contrary, in practice, this meant a kind of in-the-moment methodological agility – of painstakingly building trust and assembling every interaction and transaction without knowing in advance how, if at all, this might contribute to the broad / guiding research question of what could be done in the interim whilst the residents of Enkanini had to wait for the government to provide them with the much-needed infrastructural services.

6.3.2 Working Integratively

Learning to work together at both the practical and theoretical levels went hand in hand with learning how to working integratively. This meant learning how to work with differences – i.e. with different and differing needs, interests, perspectives etc. – in a manner that would bring together / integrate these differences without trying to sweep them, and any tensions that may arise from them, under the proverbial carpet. In other words, it was about learning how to acknowledge the productive and creative tensions in conflicting positions and viewpoints, whilst not trying to negate these just for the sake of having a compromise or integrated synstudy. Or, to put it differently, where integrated synstudy is achieved, this does not imply that the tensions that gave rise to it are automatically and permanently dismissed. In short, this means learning how to bring people together, *because of* their differences and not in spite of or in the absence of any differences.

In the Enkanini case this sense of working integratively evolved in a way as a precursor to the principles of *allowing for emergence and avoiding premature convergence* and *absorbing complexity*. The research team learnt the importance of adopting a strategy of allowing for differences (both *within* the team and *between* the team and individual shack-dwellers) to come to the fore and keeping them in abeyance, as it were, in order to keep on probing and figuring out the next possible steps, forwards or side-ways, in the design and construction of the adjacent possibles – the socio-technical innovations – in the Enkanini informal settlement.

Although the above account captures the gist of this sense of *working integratively*, it is also recognized that this needs some further systematic / theoretical work, for a deeper / better understanding of how convergence or an integrated synstudy can be reached because of differences, rather than in the absence of differences (for some suggestions in this regard, see [Chapter 7](#) below).

6.3.3 Working Adaptively

Clearly, at an intuitive level, there seem to be some important connections between the notions of *adaptation*, *exaptation*, *innovation* and *transformation* – something that will be worthwhile pursuing further with some more in-depth theoretical work. If adaptation basically refers to human sensemaking and learning abilities for figuring out how *to survive* and *fit into* continuously changing environments / contexts,⁷⁶ then it is reasonable to expect that, during the course of doing so, of figuring things out, some form of experimentation with coping and surviving in *different* and *new ways* will in all probability occur along the way. At first, this may very well mean merely being satisfied with using familiar things in the same way(s) and for the same purpose(s) as they were designed and used for *prior to* the change(s) occurring – but then, with the changes in circumstances come new demands and perspectives which, in turn, might result in trying out different and new ways of interacting with others and the environment. This is where and when it makes sense to start speaking of *exaptation* and *innovation*, because they no longer mean merely repeating and doing things in exactly the same way(s) as *before* the change(s) happened.

Doing some more in-depth theoretical work on all of this will, needless to say, have some huge benefits for better understanding and managing collaborative ETTDR processes in the context of facing fundamental unpredictability in the Complex Domain with its non-linear causal dynamics. As already mentioned, it falls outside the scope of this study to undertake such

⁷⁶ Again, as mentioned above (see [Section 5.2.2](#), footnote 65), it is important to acknowledge the dynamic conception / understanding of formative context here as something which is continuously *shaping* and *being shaped* by our embedded presence, decisions and inter-actions.

systematic theoretical work here, but suffice it to say that some suggestions will be made in this regard for some possible directions such work could take (see [Chapter 7](#) below). However, what is important for the moment is to make a few brief observations on how some of these dynamics in adaptation, exaptation, innovation and transformation unfolded in the Enkanini TDCS – with the clear understanding that this is by no means intended to be/come some or other universal / replicable model.

Whilst the individual shack-dwellers were busy adapting to their new situation and physical environment (basically a bare piece of land) and figuring out how to set up and make new liveable homes for themselves and their families, so did the research team. For them, adaptation, especially during the early stages of the research project, meant sensemaking of the complexities in the absence of formal systems and structures encountered in this new, emerging informal settlement. This engagement, as mentioned, was initiated simply by offering some assistance to some of the residents with the painting (beautifying) of their shacks and, in so doing, familiarising themselves as much as possible with real-life conditions in a typical informal settlement.

To be sure, during this early adaptation phase of the research process there were no explicit exaptation and innovation experiences and practices emerging from within the research team. This only happened somewhat later into the research process, when, as already mentioned (in [Chapter 3](#) above), members of the research team were invited into the shacks for meals and stay-overs, which, in turn, resulted in gaining even more of an ‘insider’ perspective on daily life in Enkanini. Very importantly though, all of these first-hand phenomenological experiences, perceptions and observations, taking place *within* the context of the social and physical conditions of this informal settlement, contributed significantly to the individual moments of enlightened insight – also known as eureka or ‘a-ha’ moments – by one of the team members (Andreas Keller – described in [Section 6.2.5](#) above) that it was indeed possible to re-design a typical shack by using ecological design principles for mixing both existing and new building materials.

Needless to say that understanding how this transition happens, both at the individual and team levels, from adaptation to exaptation and innovation and, in turn, how all of this contributes to figuring out (decision-making) the next steps of the research process in a transformative direction are of the utmost importance for initiating and conducting ETTDR processes in a methodologically agile manner. However as mentioned, this is not something that will be undertaken any further in this study, other than to make some suggestions in this regard (see [Chapter 7](#) below).

6.3.4 Working Interpretively

This sense is essentially about human sensemaking at the phenomenological level of everyday lived experience(s) and figuring out how to make this part and parcel of ETTDR processes. It is very important to imagine this as a two-way, mutually constitutive meaning-making process, which occurs between ordinary social actors interpreting and making sense of their *own* lived experiences, on the one hand, and researchers interpreting and making sense of *their*, the social actors', signified lived experiences, on the other hand. Anthony Giddens referred to this as the double-hermeneutic (Giddens, 1986). He argued that this is a fundamentally distinctive and unavoidable aspect of the social sciences vis-à-vis the natural sciences – which is certainly not a generally shared viewpoint – especially by protagonists of the rationalist, empiricist and positivist paradigms in the history and philosophy of science for whom excluding human experiences and perceptions from the scientific process was a fundamental prerequisite for establishing the 'scientificity' of the social sciences⁷⁷.

However, as already alluded to, one of the main reasons why it is absolutely necessary to include and work with human sensemaking in ETTDR processes is simply that this enhances our prospects of grasping and dealing with the complexity of problem situations in the context of the complex domain. To be sure, sensemaking in this domain with its non-linear causal dynamics – and the high levels of uncertainty and unpredictability that come with this – is not something which can be achieved by researchers on their own. On the contrary, the two-way, mutually constitutive process of meaning-making – i.e. the double-hermeneutic process – is indeed a fundamentally important collaborative undertaking for undertaking ETTDR in the complex domain; and for this it is necessary to increase both the number of 'ears and eyes', as it were, in the research process.

In other words, more is better: working with *more* – rather than *fewer* – human experiences, perceptions, observations etc. is not only highly desirable for doing sensemaking in ETTDR processes, but also very necessary – especially for achieving the twin objectives of figuring out the next steps of the social change process, on the one hand, and developing thought / epistemic objects (Cetina, 2009; Knorr Cetina, 2001; Knorr-Cetina, 2013; Schutz, 2012), on the other hand. A particularly appropriate approach for doing this, at both the practical and theoretical levels, is what is called 'distributed ethnography' (Snowden, 2016b, 2016c; Snowden, 2010). In essence this means enabling individual social actors to make sense of a particular complex situation in terms of their *own* lived experiences and in their own everyday wording / language, and then sharing this with others via micro narratives. For the researchers

⁷⁷ As already mentioned, people like Comte, Durkheim, Weber etc. were some of the most prominent founding figures of the social sciences in general and sociology in particular.

involved, of particular importance in all of this are the patterns emerging from the multiple micro narratives, since it is in the process of working with these emerging patterns – interpreting, analysing and visualising them – that the second tier / iteration of sensemaking – in terms of the double-hermeneutic – takes place and that, in turn, can be used for the purposes of developing the thought / epistemic objects in / for ETTDR processes.

As with the other senses, it falls outside the scope of this study to go into any more theoretical depth and detail here, except to say some that some suggestions will be made in [Chapter 7](#) below in terms of how this can be further developed in future. However, before doing so, it is important to link this theoretical interest in the crucial role of sensemaking in ETTDR processes back to the context of the Enkanini TDCS and some of the key research experiences, insights and understandings that emerged during this case study. A consequence of having pursued an emergent research design approach in the case study meant that the members of the research team did not enter the research process with clear-cut and already-decided research methods to be used for data-collection purposes.

Going into the research process without any precise ideas on which methods to use did not, however, mean that no methods were used at all. On the contrary, whilst assisting individual shack-dwellers with painting (beautifying) their shacks, an approach referred to in the literature as deep ethnographic interviewing (Creswell and Clark, 2010; Pelto, 2017; Spradley, 2016) came quite naturally to some of the researchers. In essence, this meant the researchers listened to individual shack-dwellers' real-life experiences and stories in the Enkanini informal settlement in an in-depth and one-to-one manner, and then using their shared stories to develop their own more detailed problem statements and research questions – in line with and supporting the broad guiding problem statement of what can be done in the interim whilst waiting for the government arrive with its grid-based solutions (Wessels, 2015).

However, the immense value and contribution that could be derived from such an approach of working with peoples' lived experiences and stories in ETTDR processes can be acknowledged, but it did, on reflection, raise some important methods-oriented questions about whether this would make it possible to work with more – not just a few – stories, and, if so, whether there were any existing approaches available that could be used for doing ETTDR? Underlying these questions was a hunch, inspired by the actual experiences of using the ethnographic approach that an increase in the number of narratives may also result in an increase in the context-richness and overall quality of the research process.

Be that as it may, it was this quest that led to the discovery of the distributed ethnography approach – which, upon further inquiry, was shown to stress the importance of allowing social actors to interpret and makes sense of their *own* real-life experiences and, therefore, not

merely relying on the researchers' (experts') interpretations and sensemaking endeavours. This is, very importantly, based on the principle of 'self-signification' (Snowden, 2015, 2011b, 2010, 2002). Without going into any further detail on this here, suffice it to say that accepting and working with this principle is absolutely key for working constructively with/in the double-hermeneutic process, since it allows for social actors not only to tell / share *their* real-life experiences, but also to indicate what they signify (what meaning the social actors give to them) – this, in turn, is what the researchers then respond to in *their* interpretive and sensemaking endeavours.

The operational pressures in the Enkanini case did not allow for making a full transition from single, deep ethnography to distributed ethnography and actually experimenting with the latter approach in any detailed way. However, this was done subsequently in other research projects, which will be referred to very briefly in [Chapter 7](#) below – it is more important, though, to reiterate the importance and virtue of being / becoming methodologically agile when facing the challenge of embedding transformative transdisciplinary case studies in emergent social contexts, such as the Enkanini informal settlement we experienced since 2011 – including experimenting with new methods⁷⁸, or using existing methods in new ways.

6.3.5 Working Performatively

This sense of working performatively in ETTDR processes does not only refer to the actual doing of certain activities or actions *in* and *during* the research process, but also to the role and function of the wording / language used with which to describe and make sense of these activities / actions. In short, this notion of the performativity refers to word power or the constitutive power of language. This was something which caught the interest of a wide range of language philosophers who played a key role in ushering in the so-called *linguistic turn* in philosophy (Rorty, 1992), ranging from people such as Austin and Searle (Austin, 1975; Searle, 1995, 1985; Searle and Searle, 2002), who focused very specifically on the constitutive power of the actual words used,⁷⁹ to others such as Heidegger, who attributed to language much stronger powers of *mastery over man* in his fundamental assertion that '*man acts as if*

⁷⁸ In other words, this can be seen, as already alluded to above during the discussion on *innovation through exaptation* (see: [Section 6.2.6](#) above) at the level of methods – in other words, *repurposing methods* by using extant disciplinary methods for different transdisciplinary purposes in a way that may even result in designing and developing completely new methods.

⁷⁹ For example, Austin used the example of using of the words 'I do' in a marriage ceremony, which, according to him actually constitutes or *enacts* the relationship between man and wife (not just in the narrow legal sense of the word).

he were the shaper and master of language, while in fact language remains the master of man' (Heidegger, 1982; Lafont, 2000).

There is certainly no need for us to go any deeper into the philosophical merits of this so-called linguistic turn in philosophy. For our purposes, however, it will suffice merely to recognize the importance of language and, very importantly, figuring out ways and means of working with the *constitutive effects* produced by language on our thinking (theorizing) and actions (doing) in ETTDR processes. The latter, as already alluded to, has the twin objective of not only interpreting and understanding the complex problem situations facing us today, but also figuring out how to bring about social change in / to complex problem situations. It goes without saying that none of this can be done *without* language, but the real challenge in this is to find the *appropriate* wording / language for working simultaneously at theoretical and practical levels.

However, although theoretical and practical languages are very different from each other, it would be wrong to suggest that their differences imply that one is dealing with two fundamentally different 'language games' (Wittgenstein, 2010) that are completely separate and have strictly their own grammars, with no influence or constitutive effects on each other. On the contrary, theoretical and practical languages are both part and parcel of broader human sensemaking processes. For Giddens, in terms of his notion of the double-hermeneutic, we should always expect some concepts and words from every-day, practical language to 'infiltrate' and affect theory building and, vice versa, theoretical concepts and words to find their way into every-day language. For example, what happened before, during and after the French Revolution is a good case in point here when concepts and words such as 'liberty' (*liberté*), 'equality' (*égalité*), and 'brotherhood' (*fraternité*) entered into and became part and parcel of the every-day revolutionary language on the streets of Paris.

However, in the Enkanini case, a reverse example of the double-hermeneutic process was in fact observed: the research team expressed some strong feelings that the theoretical language used in the literature, which, among other things, described the role(s) of transdisciplinary researchers in general as 'change agents' (Pohl et al., 2010), was simply too abstract and irrelevant for the kind of work and engagement in which they were involved in the Enkanini case, and, therefore, they much preferred to use the concept and term 'activists'. Adopting this word certainly contributed significantly to the researchers' better understanding of and performance of their roles and function in the Enkanini research process – especially during the early phases when the social change and research processes were inextricably intertwined. Still, when this very same concept and term 'activists' was presented to and

discussed with another group of transdisciplinary researchers from Nigeria (during a training session held in June 2016), it was strongly rejected in favour of the term of 'change agents'.

Another concrete example which demonstrates the importance of word power in the Enkanini case emerged from the various co-design and construction activities / actions of the iShack and concomitant efforts to find some appropriate terminology / language for naming and branding it. The design and construction of the iShack had to be done in way that, on the one hand, distinguished it from existing shacks in the Enkanini informal settlement, yet, on the other hand, done in such a way that it was not so different from the existing shacks that it could longer be recognized as a shack.⁸⁰ Finding the appropriate wording / language for naming and branding this was on par with the actual designing and construction activities. What emerged from all the practical, day-to-day interactions between the researchers, co-researchers and individual shack-dwellers was the notion that the 'i' in the 'iShack' referred to 'innovation' in the very technical sense of the word – basically trying to capture all the new and existing technological aspects designed and built into the iShack (described in more detail in [Section 3.2](#) above). However, as the research process unfolded and it became clearer to the research team that they were actually working on a *socio-technical innovation* (Geels, 2004, 2005, 2010, 2018; Verbong and Geels, 2010; Wessels, 2015), they started referring more and more to the 'iShack' as an 'improved shack' – thereby, giving it a different and broader meaning, more in line with the deepening and changing of their understanding of the iShack system as a socio-technical innovation – and not just a purely technical one.

However, what this exercise in the naming and branding of the iShack (as boundary object) demonstrated was that this was certainly not a case of just some or other frivolous semantics⁸¹ the research team indulged in from time to time. On the contrary, the search for finding the appropriate wording / language with which to describe the iShack was firmly rooted in the research team's collaborative research activities and actions, namely of *co-designing, exploration, exaptation* and *innovation* – thereby, signifying the performative / constitutive role of language in all of this – especially when negotiating and settling on some appropriate wording with which to capture and describe something that was both very new and emergent – such as the iShack system.

⁸⁰ And therefore losing its relevance and potential as a change agent.

⁸¹ Meaning merely playing around with words, without seriously trying to establish their meaning (either in the contexts or texts in which they are embedded).

In fact, this process resembled something quite close to Wittgenstein's notion of language games:⁸² i.e. using language to describe, report, inform, affirm, deny, speculate, give orders, ask questions, tell stories, playact, sing, guess riddles, make jokes, solve problems, translate, request, thank, greet, curse, pray, warn, reminisce, express emotions etc. (Wittgenstein, 2013). Notwithstanding the fact that this wide range of examples of language games mentioned by Wittgenstein does not necessarily include research activities / actions, it certainly does not exclude the possibility of doing the opposite by extending and applying this notion of language games *to* the research process – thereby, enabling some better insights and understandings in the performative / constitutive role of language – especially when this role is embedded in various theoretical and practical activities and exercises – both *shaping* and *being shaped* by these various research activities . Although the language games in theory-building and practical activities and actions are very different, when viewed through the lenses of meaning-making / sensemaking – in the sense that both theoretical and practical language games are both part of and contribute to meaning-making / sensemaking – then it follows that the notion is certainly important enough to incorporate into our efforts to further develop the ETTDR methodology.

Furthermore, bringing the perspectives provided by the double-hermeneutic into the discussion here on word power in language-games indicates that the meanings of words do not necessarily reside 'in' the actual signs (words) being used, but rather in the social fabric of the formative contexts in which the words are being used (Niles, 2010; Nin, 1975, 1969). This indeed has some far-reaching implications for how to approach and work with the constitutive effects of words / language in ETTDR processes – both *between* and *across* disciplinary boundaries (inter-disciplinarity) as well as *beyond* disciplinary boundaries, engaging with practical, every-day language (trans-disciplinarity). This implies, amongst other things, some hard work and intense negotiations amongst researchers and between researchers and social actors were necessary in order to settle on some appropriate wording / language to be used in and for the contexts in which their theoretical and practical endeavours were embedded. As mentioned, it is beyond the scope of this study to go into any further detail on this important aspect of developing the ETTDR methodology here, except to say that this process of negotiating the meaning of words is certainly not a uniform experience in the research process, but rather one of varying intensities, and it manifests itself differently during different stages /

⁸² There is a significant difference between the common language notion of 'semantics' or 'semantic games' vs. Wittgenstein's notion of 'language games' – the former (as mentioned in footnote 75 immediately above) refers to some frivolous playing around with words (irrespective of their contexts) while the latter refer to meaning-making / sensemaking activities and actions and how they *shape* and are *being shaped* by the wording / language used to describe certain aspects of the said activities / actions, or even things / objects (e.g. the iShack as boundary object) used or constructed during the activities / actions.

phases of the research process, and also, within that, during the different kinds of research activities.⁸³

6.3.6 Working Intuitively / Attuitively

In trying to describe this sense, it is arguable whether we are talking about one, two or three different senses. However, for the sake of systematicity and coherence they are presented in this way as a three-in-one concept, as it were: intuitively / attuitively in order to denote a certain orientation of working in a manner that is simultaneously instinctive (intuitive), mindful (attuned) and probing (explorative). Taken together in this way produces the advantage of imagining how these different aspects were already present in the attitudes and actions before (as a precursor to) the guiding logics and principles were abstracted from the literature (described in more detail in [Section 6.2](#) above).

It is quite difficult, though, to give any additional concrete examples of how all of this manifested in the Enkanini case, other than to refer once again to the research team's penchant / propensity for trusting and working with their hunches (intuition), being mindful of (attuned to) the emerging complexities in the present, and managing to keep focused on figuring out the next steps in / of the transformative research process – rather than adopting an approach of rational-teleological planning too far into the future. It can therefore be posited that there are two distinct, yet not discrete, kinds of phenomenology or levels of experiences, perceptions, observations etc. that it is critical to be aware of and that need to be worked with during ETTDR processes: (a) the phenomenology of the research process, and (b) the phenomenology of day-to-day interactions and experiences. Although they are embedded / intertwined, these two levels of phenomenology are not identical, giving rise to the notion of the two-way, mutually constitutive processes of the double hermeneutic – each level capable of generating its own concepts, ideas, words / language, but also and at the same time capable of infiltrating and affecting each other.

As mentioned, no attempt will be made here to go any deeper into this important aspect of the ETTDR methodology, since such efforts will certainly go beyond the scope of this study. However, some suggestions for taking this further will be made in [Chapter 7](#) below – suffice it to mention here, in conclusion, that what happens at the phenomenological level of the experiences, perceptions, observations etc., remains of great importance and interest in and for knowledge co-production in ETTDR processes. Although much of this happens in a tacit

⁸³ For example, negotiating the meaning of words is a particularly intense exercise during the activities of co-designing and constructing some research methods and instruments to be used for working with the social actors' many different and differing lived experiences and stories (see [Section 7.6](#) below for some brief remarks on this).

and unwritten manner, the challenge is to try and not exclude the immense richness and value in all of this for knowledge co-production, but rather to figure out ways and means of making sense and translating this process into dynamic, context-relevant thought / epistemic objects (Knorr Cetina, 2001; Knorr-Cetina, 2013, 2009; Schutz, 2012). However, responding to this challenge also means not rushing this process of reducing matters phenomenological to words / language too hastily. This certainly runs the risk of falling into the trap of *premature convergence* (Goh, 2003; Snowden, 2015;. Snowden, 2013) – thereby blocking, rather than creating, the positive feedback loops critically needed for enabling and allowing data and information flows between theory and practice – the driver / generator of new insights and understandings.

6.4 The Interconnectedness of the Guiding Logics, Principles and Senses / Sensibilities: Summary

The six senses⁸⁴ have been discussed and described above as six separate senses, but this should not be mistaken for how they are actually experienced and manifested in practice. On the contrary, in reality it can be a very different situation with their interconnectedness as the key stand-out feature. In fact, it is only in their relationality and interconnectedness that the senses produce their phenomenological effects most explicitly as guiding influences in the research process. This means they are acting in a tacit way as guiding factors – something which the individual senses cannot achieve on their own. It is only due to a certain amount of repetition, through multiple iterations of re-enacting and experimenting with the as yet unspoken and unwritten senses, and changing them, that the senses incrementally find their way into language as guiding principles (in, for example, the shape and form presented and discussed above). This is indeed at the centre of acknowledging and working with human experiences, perceptions, observations at the phenomenological level and bringing this *into* the research process – from the very onset, especially when things have not as yet been formalized and written down in words / language – i.e. prior to word power coming into effect. This phenomenological stuff was exactly the target of exclusion from the scientific research process in the rationalist, empiricist and positivist movements in the history and philosophy of science. However, this strategy of exclusion is counter-productive when facing complex problem situations in the complex domain, since human experiences, perceptions, observations are indeed part and parcel of the complex nature of things in the complex

⁸⁴ The six senses described above by no means purports to offer an exhaustive list of all the possible senses. These are just the ones that emerged more clearly during the Enkanini case, which means that there are certainly many more similar and/or different senses that can be extracted and developed in different research projects across the world.

domain. In fact, pursuing a strategy of exclusion would be tantamount to depriving ETTDR processes of the oxygen, as it were, needed to function in the complex domain.

However, this interconnectedness of the senses is not restricted to the phenomenological level; it certainly extends / reaches beyond that in the form of a coherent set of guiding principles for decision-making in ETTDR processes. In other words, there is a link between the interconnectedness of the senses and the coherence of the guiding principles. It is, therefore, critically important for the process of translating the senses into principles, i.e. of finding the appropriate wording / language for the senses, to be as mindful as possible of doing this in a way that sustains the interconnectedness of the senses – rather than letting it slip or getting lost in translation, as it were. The performative effect of word power can easily result in a reductionist focus on the so-called inherent properties of some single words for capturing and translating the individual senses into principles – as if there is a direct one-to-one relationship between them. As important as this process of finding the appropriate wording / language is, it must also be remembered, as already pointed out above, that the meanings of words do not somehow reside ‘in’ the actual signs themselves – as if the signs possess some or other innate ‘magical’ (read powerful) properties – but rather in the context in which they are embedded and used (Nin, 1975, 1969; Snowden, 2011b). In other words, it should be anticipated that some changes will or may occur in the actual words / signs used – especially when there are some changes in the contexts, or in our understandings of the context.⁸⁵

However, this focus on the importance of context in ETTDR processes should not be limited to something which enables a better understanding and explaining (*Verstehen / Erklärung*) of matters / issues / problems / challenges. As mentioned above, the notion of formative contexts (Bateson, 1972; Ciborra and Lanzara, 1994; Garfinkel, 1991; Heritage, 2013; Mills, 2017, 2014; Schutz, 2012, 1973; Unger, 1997) is a dynamic one – suggesting that this is where social change (*Verändern*) is constantly taking place – where ETTDR processes are indeed *shaping and being shaped* by the non-linear social interactions and causal dynamics of the complex domain. It is then against this background, dealing with dynamic formative contexts, that the importance of working with a coherent set of guiding logics and principles comes to the fore. To be sure, in order to perform their *guiding* role and function in our actions and decision-making, some form of coherence in the logics and principles is indeed of great

⁸⁵ In this regard, the notion of brotherhood / fraternity in the French Revolution is quite an interesting example. Of the three concepts, this was arguably the one which was the most problematic – and only, after much intense discussion, negotiation and multiple changes was finally settled on, by using the word ‘*fraternité*’, to be included as part and parcel of the now famous triad: *liberté, égalité* and *fraternité*. However, because of the on-going changes in the context, this was never going to be a foregone conclusion. not quite clear what ‘this’ refers to here

significance and importance. Deriving from the Latin root *cohaerēre*, to cohere (or to be coherent) basically means to stick together, be in contact with, or to be connected or closely attached to etc. In terms of performing their guiding role and function, this means, first and foremost, that the logics and principles should not fundamentally contradict one another, but rather produce a sense of *coalescing* or *coming together*.⁸⁶

However, for the purposes of figuring out what it means to act and make decisions in a coherent manner, when dealing with complex problems and situations, this definition and understanding of coherence should not be restricted to the study of logics only, i.e. to what is considered logically consistent (or without any logical inconsistencies). This insistence on logical consistency will certainly not suffice when facing the challenge of having to act and make decisions in a context where things are fundamentally uncertain and unpredictable (unknown unknowns). In the context of complex real-life problem situations, it makes more sense to imagine this as “moving into something which is more like consensus – especially in the way Thagard uses it (Thagard, 2007, 2002) – which is a space where only *acting* can determine what is valid” (Snowden, 2012).

In other words, when facing the challenge of figuring out the next possible steps in transformative transdisciplinary research processes, embedded in complex real-world situations where nothing can be predicted with certainty, there is no room of subjecting our actions and decision-making to the stringent tests of falsification and hypothesis-testing, à la Popper (Popper, 2005, 2002). And it is for this reason that the interconnectedness of the phenomenological senses becomes so important again – when the consensus needed for our actions and decisions simply cannot be derived from or directed by a set of first principles that may even be completely logically consistent with one another, but rather can only emerge from our efforts of cohering or stitching together our intuitions of going forwards and/or sideways in a transformative direction.

In other words, it is this notion of emergent coherence (emerging from our senses) that provides an antidote, as it were, for any suggestions of *relativism* or that *anything goes* (Feyerabend, 1993). However, this in turn does not imply a kind of decision-making that can only be imagined as moving *forwards* in a linear / straight line, normally depicting the idea of ‘progress’. In a complex environment it may very well be necessary from time to time to

⁸⁶ The German word for this is indeed very informative: *Zusammenhängen* – literally meaning *hanging together* (in Afrikaans: *samehangend*).

consider moving side-ways as well – something which can also be imagined as a process of *random walking with coherence* (Snowden, 2017b).

An appropriate concept and wording for depicting the manner or mode in which to guide / steer our actions and decision-making in such zigzag-like processes with coherence is the notion of ‘nudging’ (Abdukadirov, 2016; Snowden, 2015a; Sunstein and Thaler, 2012), which is indeed very different from the notion of ‘yanking’ – both in its imagery and execution. Yanking implies using very strong, even forceful, top-down ways and means of pushing and pulling our actions and decision-making normally in some or other pre-defined direction(s) – whereas nudging suggests something more akin to some gentle yet assertive ‘prodding’ from all different sides,⁸⁷ when deemed necessary, but always using our guiding senses and principles for doing so.

Another reason why this idea of nudging our decision-making and actions in ETTDR processes is so important has to do with the co-production of systems, target and transformation knowledges (Hadorn and Pohl, 2008a; Pohl and Hadorn, 2007b). As mentioned, this never involves just one single collaborative process that somehow produces all three these different kinds of knowledges – either simultaneously or at different stages in such collaborative processes. Yet it is true that each of these three knowledges has its own unique epistemic objects, intentionalities and goals / objectives, determined and directed by different social actors with different and differing needs, interests and values – amplified, in many cases, by the high levels of uncertainty and unpredictability inherent in the non-linear causal dynamics in the complex domain.

In practice, this means facing the challenge in ETTDR processes of bringing people together because – and not in spite of or in the absence of – their differences, something which certainly cannot be achieved with a decision-making mode and style amounting to ‘yanking’. A major advantage of ‘nudging’ is that it does not shy away from actual decision- and strategy-making (Mintzberg, 2007; Mintzberg et al., 2013, 2003, 1974). On the contrary, strategy-making is fully acknowledged, but it needs to be done in a way that both encourages and enables rapid mutual learning amongst the social actors in ETTDR processes, when facing the on-going challenge of having to figure out the next possible steps in and of the research process in the direction of the adjacent possibles.

⁸⁷ A good physical example of nudging is perhaps that of a female whale, teaching her offspring how to swim and even breach the water, gently prodding her offspring from all different sides and directions – from the top, bottom, sides etc. – how to perform in the water with little prods / nudges with her nose.

In this regard, nudging means supporting the approach of radical experimentation when facing highly unpredictable / uncertain circumstances in the complex domain – something which a ‘yanking’ decision-making style may not only fail to achieve, but may actually end up being completely counterproductive by undermining and working against the approach of figuring out the next possible steps in the direction of the adjacent possibles. It can therefore be argued that this approach of nudging our decisions and actions in a certain direction – albeit focused on the next steps only – serves as a double antidote, as it were, to two very different but equally untenable positions in trying to avoid the ethics challenge of facing un/intended consequences of any decisions and actions taken in and under highly uncertain / unpredictable circumstances in the complex domain. The first position is truth-production approaches that attempt to justify the failure of decision-making and action-taking in the name of producing the Truth as being the sole role of science in society,⁸⁸ and the second position is a relativist approach justifying the failure of decision-making and action-taking in the name of *anything goes*.⁸⁹

By adopting a strategy-making approach of real-time decision-making and action-taking and finding ways and means of dealing rapidly with the un/intended consequences of this, nudging steers clear of these two diametrically opposed positions: it is not necessary to completely try and avoid (and justify) decision-making and action-taking, nor is there an onerous obligation⁹⁰ of having to strongly and forcefully (yanking) direct decision-making and action-taking in the direction of producing the truth. Nudging is therefore considered an appropriate decision-making mode to adopt when working in collaborative ETTDR processes.

Adopting this (nudging) approach makes particular sense when dealing with *unknown unknowns* in the complex domain (referred to in more detail in [Section 4.4](#) above) – where dealing with high levels of uncertainty and unpredictability is the order of the day and it is not exactly clear what action to take – yet taking no action is hardly an option, or probably the

⁸⁸ In other words, as already mentioned in [Chapter 2](#) above, this approach argues that the role of science in society starts and stops at producing the Truth about the world or a particular problem situation and that we (as scientists) should, therefore, be satisfied *merely* with understanding (*Verstehen*) and explaining (*Erklärung*) the problem situation at hand – and not get involved in decisions and actions aimed at changing (*Verändern*) the world – which is clearly the task of policy-makers in society.

⁸⁹ In other words, the direct opposite of a relativist position that anything goes, namely that in the complete absence of the truth we simply do not have any grounds or foundation for taking any decisions or actions – let alone facing the consequences of taking actions.

⁹⁰ In this regard, it is helpful to refer again to the ideas developed by both René Descartes and Karl Popper; Popper’s ideas on truth-production (using hypothesis-testing) as the ultimate goal of science (Popper, 2005, 2002), and Descartes’s ideas (Descartes, 1980) on the kinds of rules necessary for directing the scientific mind towards producing the truth – the combined effect of which is simply too burdensome for facing and having to deal with the non-linear causal dynamics in real-life complex problem situations in the complex domain in a methodologically agile manner.

worse form of action to take. In this regard, nudging can be seen as closely associated with and giving support to the practice of real-time experimenting with small-scale safe-to-fail social change experiments. In the context of non-linearity in the complex domain, this will almost always involve having to figure out ways and means of rapidly changing direction. And, in so doing, when it is not exactly clear what the next steps are or should be, the practice of nudging may very well mean having to rely on our (emerging) senses for providing some guidance. In other words, in the face of high uncertainty and unpredictability in complex problem situations, nudging can be seen as the connector of the methodological and phenomenological – i.e. facilitating real-time decision-making and action-taking by bringing together the need for methodological agility, on the one hand, and the (emerging) senses, on the other hand.

6.5 A Heuristic for Working with the Guiding Logics, Principles & Senses / Sensibilities

The purpose of this heuristic⁹¹ is to provide a sensemaking framework for better understanding and working with the effects of the double hermeneutic (Giddens, 1986) and the formative contexts (Bateson, 2002; Ciborra and Lanzara, 1994; Garfinkel, 1991; Heritage, 2013; Schutz, 2012; Unger, 2004a) *within* which the two-way / mutually constitutive flow of ideas, concepts and words between the phenomenological and theoretical levels takes place. In all of this, the aim of introducing the heuristic is to specifically focus on the researchers' own experiences, perceptions and observations etc. in and of ETTDR processes in their interactions with social actors.

Since ETTDR processes are always embedded in formative contexts, this means that they are therefore never immune to this dynamic interplay of practical and theoretical languages – as something which needs to be avoided or excluded⁹² from TTDR processes. On the contrary, this (and the effects of word power produced by this interplay) is very much part and parcel of ETTDR processes – providing the very stuff (concepts, words etc.) that needs to be worked with and translated into epistemic objects (Knorr Cetina, 2001; Schutz, 2012). Acknowledging the epistemic objects as a real challenge (for inclusion) *in* and *for* TTDR processes, the purpose of the heuristic presented below is, therefore, simply to help facilitate this dynamic interplay at different times and places *during* ETTDR processes. To this end, the

⁹¹ A *heuristic* technique (from Ancient Greek: εὐρίσκω, to "find" or "discover"), often called simply *a heuristic*, is any approach to problem solving, learning, or discovery that employs a practical method not guaranteed to be optimal or perfect, but sufficient for the immediate goals. <https://en.wikipedia.org/wiki/Heuristic>. In this case the purpose is to facilitate the *interaction* of the double or triple hermeneutic in ETTDR processes – more specifically researchers' experiences, perceptions, observations of these processes and the theoretical language with which to describe this phenomenological-level stuff.

⁹² As per the mentioned research strategies employed / deployed in positivism.

interactions / interconnections between the guiding logics, principles and the senses (described in more detail in Sections 5.2 and 5.3 above) have been specifically chosen as a focal point.⁹³

There are indeed many different ways to present the interconnectedness of the guiding logics and principles: for the sake of simplicity and ease of use a two-dimensional matrix-like structure has been devised in which the abovementioned guiding logics and principles are situated along a horizontal axis and the senses along the vertical axis, thereby creating 36 holding spaces / places for recording (e.g. note-taking) many ways different ways these may interact in real-life TTDR processes (see Table 1 below).

Table 1: Heuristic for using guiding Logics, Principles & Senses in ETTDR

Source: By Author 2019

		Guiding Logics & Principles					
		Abductive reasoning	Allowing for emergence	Absorbing complexity	Perturbing the system	Triple-loop learning	Innovation through exaptation
Six senses of working:	Transformatively	1.	2.	3.	4.	5.	6.
	Collaboratively	7.	8.	9.	10.	11.	12.
	Performatively	13.	14.	15.	16.	17.	18.
	Interpretively	19.	20.	21.	22.	23.	24.
	Integratively	25.	26.	27.	28.	29.	30.
	Intuitively / Attuitively	31.	32.	33.	34.	35.	36.

⁹³ To be sure, a heuristic of this nature is not restricted specifically to working with the guiding logics, principles and senses here. Heuristics like this could very well be developed for different aspects of the dynamic interplay and exchanges between theory and praxis.

As mentioned, each of the thirty-six 'empty' boxes displayed in the matrix-like framework merely signifies some holding places and spaces for capturing the researchers' own research experiences *in* and *of* ETTDR processes. In other words, researchers can use these holding spaces / places to record their interactions with the relevant social actors using whatever wording / language they deem fit for the purpose – in this case, focusing specifically on using wording / language that appropriately captures the kind of logics, principles and senses that guided their own *interactions*. Users of this framework are not necessarily restricted to the actual size of the framework displayed above, but can certainly enlarge it in many different ways by, for example, imagining each of the boxes as an A4 size paper or even a folder with a couple of papers in it, with just some of the key words written in the holding spaces / places above. Practical opportunities for using this heuristic present themselves at different stages of the research process – depending on the methods used (as will be explained briefly in [Section 7.5](#) below).

To illustrate this approach the sense of working collaboratively can be used as an example: at first, this may very well amount to merely noting / describing in ordinary every-day language some of the basic experiences of and reflections on *working together* on very practical matters – including any verbal or other exchanges that may occur between those working together. The need for translating things into more abstract, theoretical wording / language may be triggered by many different occurrences in these organic forms of working together; for example, when facing unexpected challenges prompting some changes not only in the organic work practices, but also in the social actors' experiences, perceptions and observations of these changes. This, in turn, may prompt the need for theorising, resulting in scanning and critical reflection on and discussion of the relevant literature in the hope of finding some appropriate theoretical wording / language for the task at hand. In this regard, for example, the concepts and words settled on for naming and describing the guiding logics and principles that emerged and guided the researchers' collaborative interactions in the Enkanini case were derived from the varied body of literature mentioned in [Section 6.1](#) above.

Very importantly, though, are the institution-making effects produced by working collaboratively and iteratively with/in the double-hermeneutic: i.e. by repeating many cycles of the dynamic interplay and two-way flow between tasks, ideas, concepts and words etc. forming the basis of some context-relevant rituals, practices and institutional arrangements of the politics of working together (Sennett, 2012). Carefully, pre-planned social structures are therefore not a fundamental pre-requisite at the outset of initiating collaborative ETTDR processes. On the contrary, by allowing for emergence and, at the same time, nudging decision-making in a transformative direction may very well be sufficient for initiating some collaborative modes and methods of working together in the research process – which, in turn,

can be adopted and adapted by the relevant social actors involved for use in *their* communities.

Needless to say, this is not a linear process, but context dependent, subject to real-time decision- and strategy-making *within* and *in response to* the specific causal dynamics of the formative contexts (Ciborra and Lanzara, 1994; Unger, 2004a) in which TTDR processes are embedded. In this regard, for example, the role and function played by the three socio-technical innovations (described in more detail in [Section 3.5](#) above) indeed turned out to be of critical importance in the case of the Enkanini experience. As mentioned, the very fact that these were not purely technological innovations demanded, from the start, the need to figure out collaborative modes of *working together* in a context where this was not a well-established institutional arrangement as yet – especially when facing the challenge of having to figure out the social and financial arrangements for paying and maintaining the kind of technologies used in all three small-scale social change experiments. In other words, opting for different strategies with more techno-oriented technologies, capable of being implemented and operated only by experts, would almost certainly have produced some very different outputs and outcomes for both the research and social change processes respectively.

Be that as it may, what is of the utmost importance in all of this are the transformative learning experiences (described in more detail in [Section 6.2.5](#) above) to be gained from the power of sensemaking in emerging formative contexts – not only the Level 1 learning involved in practically *working together*, but also Level 3 learning, i.e. learning how to translate the learning experiences into words, rituals, and the practices into institution-making. As already stated, this is indeed the main purpose with introducing the above sensemaking heuristic: using something *like this*, or even better, learning how to build their own sensemaking frameworks for guiding their own decision-making and action-taking, researchers may very well empower and equip themselves with the necessary insights into and understandings of how to become methodologically agile in the complex domain by creating and sustaining positive feedback loops in and for ETTDR processes. The heuristic (or something like this) introduced above can certainly serve this purpose of bringing in and working with their own phenomenological-level experiences, perceptions, observations etc. as well as those of the relevant social actors participating in the unfolding research process.

CHAPTER 7: FUTURE RESEARCH AREAS

7.1 Introduction

The main thrust behind this study is to contribute to the development of the ETTDR methodology and in this way initiate and participate in collaborative science-with-society processes in a methodologically agile manner – not to go into these collaborative processes on the assumption that ALL problem situations in the Anthropocene are equally complex. In other words, it is necessary to avoid falling into the trap of positing TD as a panacea for each and every problem situation facing us today, but rather to treat this new emerging research approach as one of at least four domain-relevant methodologies: mono-disciplinarity in and for the obvious / simple domain; multi- and inter-disciplinarity in and for the complicated domain; and trans-disciplinarity in and for the complex domain (described in more detail in [Section 4.4](#) above). In this regard, the notion of methodological agility has been broadly defined as the ability to switch⁹⁴ not only *between* these different domain-relevant methodologies, but also *within* a particular domain. In the case of ETTDR in / for the complex domain, this means, inter alia, the ability to implement swift, real-time, decision- and strategy-making efforts, whilst making use of some of the proposed appropriate concepts, practices, logics, principles etc. aimed not only at the understanding (*Verstehen*) and explaining (*Erklärung*) of certain complex problem situations encountered, but also at bringing about some social change (*Verändern*) in and to these situations.

However, it was also mentioned that there are some areas / aspects of an ETTDR methodology that were only briefly touched upon as they fall outside the scope of this study and still need some further theoretical exploration and development in future. The purpose of this chapter is therefore to highlight some of these key areas / aspects that would need some further elaboration with the view to enhancing the understanding of what is required to be methodologically agile in the ETTDR approach when facing and dealing with complex problem situations in the complex domain. The purpose here is not to give an exhaustive list of all the areas still needing some thorough / systematic attention, but rather to make some broad recommendations in this regard and, therefore, leave some room for different and new aspects to emerge. The areas / aspects discussed below are not presented in any particular hierarchical order of importance, although the first three issues discussed under Sections [7.2](#) (meta-theory), [7.3](#) (theory of change) and [7.4](#) (logics, principles and senses) are more of an

⁹⁴ This concept of ‘switching’ should not be confused with the onerous notion of ‘paradigm switching’ à la Thomas Kuhn (Kuhn, 2012).

abstract-theoretical nature and the issues under Sections [7.5](#) (methods) and [7.6](#) (faculty processes) are more process-oriented.

7.2 Meta-Theoretical Aspects & Considerations

The meta-theoretical issues / aspects alluded to in the study basically refer to the underlying ontological, epistemological and ethical assumptions, both influencing and being influenced by methodology in general as well as TTDR in particular. In other words, how are our conceptions and assumptions of what 'reality' is (ontology), how we can *know* this 'reality' (epistemology) and how we should *act* (ethics) in this world (reality) actually impacting on our methodological thinking, decision-making and action-taking? At issue here is the fact that these three areas have traditionally, at least in the history of philosophy, been treated as three separate areas of knowledge. This started with René Descartes's systematic two-world theory of *res extensa* (the external, physical world of nature) vs. *res cogitans* (the inner, subjective world of the human mind) (Descartes, 2010, 2008, 1961). In this binary scheme of things the fundamental (philosophical) question for Descartes was which of these two 'worlds' or 'realities' was the more 'real' or 'objective' and by attributing this quality to the former (*res extensa*) rather than the latter (*res cogitans*), the ethical question of *how we should act* in the world was either completely neglected by the way this ontology vs. epistemology binary was set up / constructed.

One way of understanding this neglect was that the 'realness' of *res extensa* was posited so decisively *over against* that of *res cogitans* that it literally became unimaginable for humans to be seen to intervene in, let alone change, the objective, universal natural laws governing *res extensa* – in other words, the ontological status / prominence given to the object (Nature) over the subject (Mind) was inextricably entangled with the immutability / concreteness of the object (Nature) and the mutability / fickleness of the human mind. The task of bringing ethics into serious philosophical discussion had to wait for the famous German philosopher Immanuel Kant (1724 – 1804) and his systematic theoretical work on ontology, epistemology and ethics (Kant, 2005, 1855). However, Kant still treated ontology, epistemology and ethics as three separate domains of knowledge –dominated by the ontology vs. epistemology discourse – with absolutely no possibility of imagining human actions (ethics) actually intervening or changing the objective, universal laws of Nature – which of course had by now been even more firmly established by the scientific discoveries and work of Isaac Newton (1643 – 1727) in the field of physics – especially with his theory of gravity.

However, as important and interesting as these philosophical discussions may be, they are arguably not all that relevant any longer for the world we are living in today. In short, Descartes, Kant, Newton etc. could not have imagined the dawning of the new geological epoch of the Anthropocene we are living in today. To be sure, though, acknowledging the human-made (anthropogenic) nature of the Anthropocene is by no means an attempt to suggest that humans can intervene / change the four known forces of nature: gravity, electro-magnetism, and the strong and weak nuclear forces. Clearly, these exist not only independently of our epistemological and social constructions, but at the same time there are also *some* planetary Earth systems once thought to be *beyond* the reach of human intervention / change – but which is no longer the case. In this regard, climate change / global warming are arguably the prime examples of a fundamental shift in our scientific understanding of the planetary consequences of the impact of our collective actions since the Industrial Revolution just a few centuries ago.

What this change / transition to the Anthropocene means for our purposes of developing the ETTDR methodology is we should be very mindful of the ontological, epistemological assumptions we bring into in collaborative science-*with*-society processes. Holding onto the view of ontology, epistemology and ethics as three separate domains of knowledge embedded in the assumptions that ALL of Nature (read: Earth systems) is fixed and immutable and cannot be changed by human interventions may very well be very problematic for participating in collaborative science-*with*-society processes – especially if this is presented as fundamental science. This will, at best, translate into an approach of being merely satisfied with understanding (*Verstehen*) and explaining (*Erklärung*) certain complex situations encountered in the Anthropocene today – i.e. deciding a priori on the impossibility of bringing about any change (*Verändern*) in and to the Anthropocene. In the context of the Anthropocene, however, a scientific position of taking no action at all has clearly become completely untenable and irresponsible.

In other words, what is needed for initiating and participating in collaborative science-*with*-society processes are some new meta-theoretical ideas that no longer embrace the notion of the separation of ontology, epistemology and ethics and, accordingly, make possible the engagement with the mutability / plasticity of the human-made (anthropogenic) world of the Anthropocene that we are facing today. Such a meta-theoretical position has already been developed by Karen Barad, also known as onto-ethico-epistemology or *agential realism* (Barad, 2012, 2010, 2007; Gisbourne et al., 2015) – only briefly referred to in [Chapter 2](#) above. What Barad has achieved with her ideas at the quantum level is equally needed for facing the planetary-scale challenges of the Anthropocene today. What this means, inter alia, is holding

onto and elaborating on her ideas about the non-separability of ontology, ethics and epistemology, without merely trying to transfer her ideas for understanding and explaining what happens at the quantum level to the planetary level.⁹⁵ Clearly, key concepts and notions such as the non-separability of quantum entanglement and the uncertainty principle⁹⁶ cannot merely be taken over uncritically and applied to our scientific experiences and observations in the Anthropocene today.

Still, what is clearly and urgently needed for our purposes of developing the ETTDR methodology is the equivalent of an onto-ethico-epistemology meta-theoretical position enabling participants in collaborative ETTDR processes to engage simultaneously with questions relating to the understanding, explaining and changing of the complex situations we are facing today – without feeling the need to deal with these as three fundamentally separate domains of inquiry and knowledge generation. Working with the notion of the non-separability of ontology, ethics and epistemology of said *agential realism* is key for building the much-needed methodological agility enabling us to tackle the complex problem situations in the Anthropocene today.

A useful way of visualising the onto-ethico-epistemology complex is in the form of triad(s) (see Figures 25 – 28 below). Although the three corners in these triads appear to be fixed, the focus should rather be on the shifting positions of the ball in each of the triads – signifying some shifts in emphasis⁹⁷ in our meta-theoretical discussions in terms of the relative importance / prominence assigned to each of the three aspects vis-à-vis each other. In other words, this triadic structure is dynamic in that it allows for simultaneous, three-way interactions between ontology, ethics and epistemology.⁹⁸

This interaction can be illustrated in terms of, but is not restricted to, the following four examples: *Firstly*, an ideal-typical situation (as in Figure 25 below) of complete equivalence where ontology, ethics and epistemology are given totally equal prominence / importance. This is signified by the position of the ball placed right in the middle of the triad – which, in

⁹⁵ In this regard, we also need to pay attention to the ideas developed by Basarab Nicolescu, stating that there are clearly some fundamental discontinuities between the laws and logics governing the microscopic (quantum) vs. macroscopic (Newtonian) levels of reality and, consequently, that they can and should never be understood *in terms of each other* (Nicolescu, 2016, 2008, 2002).

⁹⁶ This refers to Heisenberg's notion that our (scientific) observations have an effect on the behaviour of sub-atomic particles at the quantum level (Heisenberg, 2013, 2007; Stephens, 2017).

⁹⁷ Also referred to metaphorically as the changing *center of gravity* in these meta-theoretical discussions.

⁹⁸ This notion of a dynamic triadic structure between ontology, ethics and epistemology can also be used to counter a repetition of so-called Humean 'is-ought' conundrum in ETTDR processes, namely that it is impossible to derive the 'is' from the 'ought' (Hume, 1874).

percentage terms, could be translated into an equal weight distribution of 33,3% each. *Secondly*, a shift in focus / emphasis takes place in the direction of favouring ontology (as in Figure 26 below). This is signified by the new position of the ball towards the bottom-left corner of the triad – in which case there is also a different and unequal weight distribution, for example: 70% ontology, 20% epistemology and 10% ethics. *Thirdly*, a shift in focus / emphasis takes place in the direction of favouring epistemology (as in Figure 27 below). This is signified by the new position of the ball towards the bottom-right corner of the triad – in which case there is also a different and unequal weight distribution, for example: 70% epistemology, 20% ontology and 10% ethics. *Fourthly*, a shift in focus / emphasis takes place in the direction of favouring ethics (as in Figure 28 below). This is signified by the new position of the ball towards the bottom-right corner of the triad – in which case there is also a different and unequal weight distribution, for example: 70% ethics, 15% ontology and 15% epistemology.

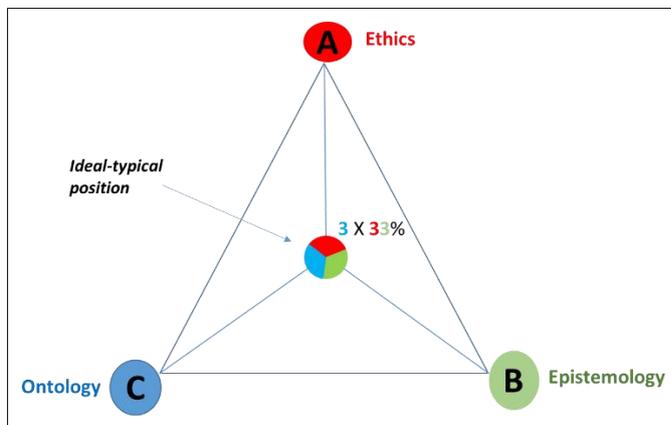


Figure 25: *Ideal-typical Triadic Relationships: Ontology, Epistemology & Ethics*⁹⁹
 Source: By Author 2019

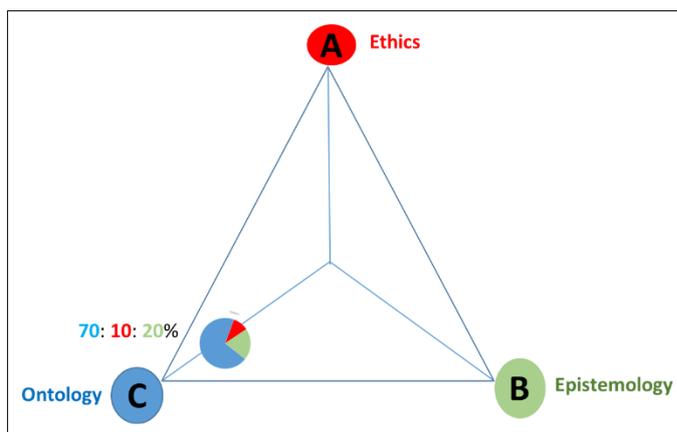


Figure 26: *Focus shifting towards Ontology*
 Source: By Author 2019

⁹⁹ Between ontology, epistemology and ethics which, in the history of philosophy, have been treated as three separate knowledge domains.

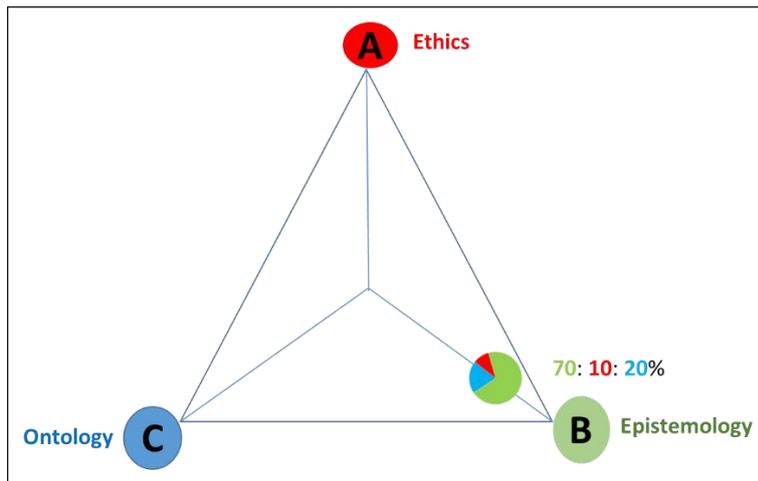


Figure 27: Focus shifting towards Epistemology
Source: By Author 2019

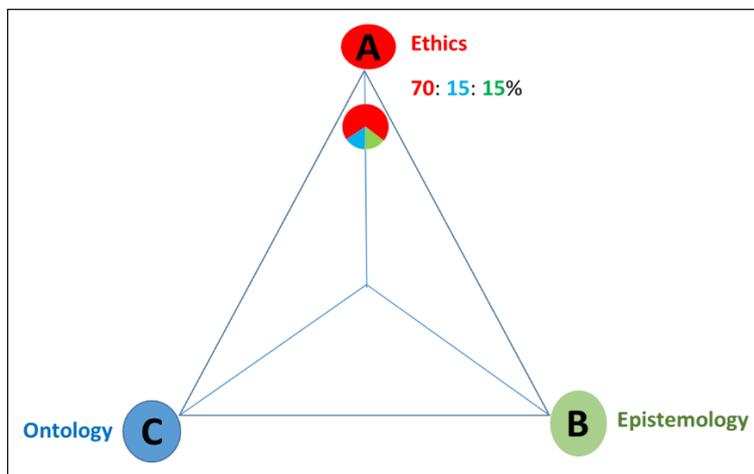


Figure 28: Focus shifting towards Ethics
Source: By Author 2019

All the different positions illustrated in Figures 25 – 28 above indicate some or other abstract, hypothetical situations. However, what is of real importance for our purposes is here is allowing for the possibility of making trade-offs in the face of changing circumstances – but, doing so, in an inclusive manner by purposively retaining at least some measure / degree – albeit disproportionately – of all three the ontological, epistemological and ethical aspects and considerations present in complex problem situations. This way of imagining the interconnectedness of ontology, epistemology and ethics in terms of a dynamic triadic-like structure can certainly play a very useful role for conducting ETTDR processes in a methodologically agile manner – especially when sensing the need for changing the main focus or centre of gravity more towards any one of the said ontological, epistemological and ethical aspects – without, in so doing, falling into the trap of severing any links and discarding with them.

Furthermore, it can also be helpful in dealing with the consequences of any such shifts taking place. For example, a shift *away* from ethics and more *towards* ontology and epistemology may very well indicate a tacit tendency of becoming overly motivated by and interested in an *explanatory* attitude – i.e. merely becoming satisfied with the understanding (*Verstehen*) and explaining (*Erklärung*) of the complex nature (non-linearity) of the problem situation(s) at hand. Therefore, when detecting such shifts, the challenge is not to negate the latter out of hand, but rather to nudge the focus back again in a transformative-ethical (*Verändern*) direction.

What is at issue here for the purposes of developing and using the ETTDR methodology is the assumption of a fundamental connection between ethics and human action (agency) and social change: it is very difficult, if not impossible, to imagine sustaining the transformative drive in ETTDR processes *without* a basic ethical awareness of both the appropriateness and consequences of any transformative actions taken during ETTDR processes. These ideas on the non-separability of ontology, epistemology and ethics may still sound too abstract and removed from any sort of practical applications for actually doing ETTDR, but this issue will be touched upon again very briefly in Sections [7.3](#) and [7.6](#) below; focusing on some of the other important areas that will be further explored in future in collaboration with others¹⁰⁰ in the interest of using the ETTDR approach in a methodologically agile manner when participating in collaborative science-*with*-society processes. [Section 7.3](#) will focus on the need for grounding an appropriate theory of change (ToC) in something like the abovementioned non-separable onto-ethico-epistemology approach and in [Section 7.6](#) the focus will be more on some of the ideas that need to be further explored for translating the latter approach into more of a contextual ethics when dealing with some specific ‘ethical moments’¹⁰¹ as and when they emerge during ETTDR processes.

¹⁰⁰ For example, co-authoring a paper on anticipatory ethics with [Prof Roberto Poli](#), an expert in anticipatory thinking.

¹⁰¹ In anticipation of what is to follow in [Section 7.6](#) below, suffice it to mention here that this concept of ethical moments has been taken over in a very broad sense from the way Jacques Derrida has used it (Derrida, 2016, 1997, 1978). He argued against the notion that ethics is something which is derived from first ethical principles (à la Kant), but rather emerges in and during certain real-life moments or situations filled with seemingly insurmountable contradictions and tensions, with no straightforward answers of what is right or wrong. The best we can do in these situations is to struggle with its messiness, rather than trying to come up with clear-cut answers. This seems to be an appropriate practical approach to take and further explore for our purposes of doing ETTDR in the context of the complex domain. A starting point has already been made in this regard by adopting the guiding principle of *allowing for emergence and avoiding premature convergence* (discussed in more detail in [Section 6.2.3](#) above). Although this principle was framed earlier more as a guiding principle for methodological decision-making, it is suggested that we can also use it for ethical decision-making when facing ethical complexity or ethically complex situations.

What is key in all of this is our understanding of time and how its effects may impact on our ability to both think and practice engaging with ethical, ontological and epistemological questions at the same time. If, for example, our conceptions of the arrow of time (uni-directionality) causes us to visualize some significant time delays between cause (A) and effect (B), and on top of that, *without* the possibility of reverse causation,¹⁰² then it certainly will be very difficult, if not impossible, to imagine dealing with ontological, epistemological and ethical issues **in real-time** – as and when non-linear causal dynamics produce things and then actually *emerge* in complex real-life situations. In this case, ethics will always be seen as some of other appendix to ontology and epistemology – i.e. something that can only be dealt with once the more important ontological and epistemological questions and discussions have been completed. Clearly, this is not a feasible / desirable situation when dealing with emergence in complex real-life situations, clearly demanding from us real-time engagements and responses – as and when things actually happen.

This problem can indeed be overcome if we imagine and work with the notion of non-linearity, including the possibilities of causal feedbacks or reverse causation **in real-time** – i.e. for all practical purposes very little, or no, time delays between cause (A) and effect (B) and vice versa between (B) and (A). In so doing, it certainly becomes plausible to envisage in theory and practice engaging with ontological, epistemological and ethics *at the same time* – literally affording us the real-time opportunities of both *anticipating* consequences of our actions as well as actually *doing* something about this – as and when things actually occur.

There are no ways of predicting whether these real-time actions and responses will actually create virtuous or vicious cycles. In other words, it is impossible to know in advance whether our (tacit and/or explicit) intentions circulating in our circular ethico-ontological-epistemology deliberations will actually produce something really ‘better’ or more ‘desirable’ than what already exists – what ‘is’ – or merely reproduce the status quo with all its asymmetries / inequalities. However, by bringing ethics into the centre of our real-time ontological and epistemological reflections and discussions, the probabilities of responding to the consequences of our actions, and making the necessary changes, are significantly increased. This, it must be said, is a very different approach from those teleological approaches that would lock ethics into some or other idealised and normative visions or scenarios of the future – that are normally so far removed from the complexities of the current situation that the chances of engaging in meaningful ethical discussions and practices about the current

¹⁰² As e.g. theorised by Talcott Parsons in the way he dealt with the so-called ‘latency’ problem between cause and effect in his theory of social action (Parsons, 1977, 1968).

situation are, for all practical purposes, non-existent – simply because the chances of those idealised visions and scenarios of the future ever being realised are equally very small or non-existent.

In this regard, it is critically important that ethics is seen as something radically practical or empirical in the words of William James (James, 2009) – i.e. *doing* things and not just *thinking* or *talking about* them, and opportunities for doing exactly this reside in the approach of co-designing and experimenting with the adjacent possibles in view – in short, the approach of ‘radical experimentation’ (Unger, 2007a; West, 1986) or ‘radical incrementalism’¹⁰³ (Allen et al., 2015; Halpern and Mason, 2015). In other words, ethics is part and parcel of the process of figuring out the next steps that may lead or contribute to the adjacent possibles – both embedded *in* and (radically) different *from* the immediate context. Real-time ethics is, therefore, both at the core of and driving transformative transdisciplinary research, because it compels us to go *beyond* merely being satisfied with the *understanding* and *explaining* (*Verstehen / Erklärung*) of the complex problem situation(s) at hand. Furthermore, by changing any linear intentions and expectations we might have in the form of safe-fail experiments to safe-to-fail experimentation with the adjacent possibles¹⁰⁴ (Juarrero, 2002; Snowden, 2013; Snowden, D., 2016c) create yet more plausible opportunities not only for thinking about how we should act in the world, but also for facing the *actual* consequences of our actions and *doing* something about this by amplifying and/or dampening the current trajectory / vector of social change it was decided to embark upon.

Therefore, bringing human agency into ETTDR processes in this way and facilitating ethics-oriented discussions and actions is part and parcel of what is required in methodological agility – of switching across to the ETTDR methodology in the complex domain. This may not necessarily be required when facing more clear-cut problem situations caused by linear causal dynamics in the obvious / simple and the complicated domains. However, in the complex domain things change significantly when human subjectivity / agency is integral, as both cause and effect, in non-linear causal relations. In order to deal with these non-linear relations, at both the theoretical and practical levels, it is not possible or desirable to revisit and adopt

¹⁰³ This approach of radical experimentation / incrementalism is merely proposed here one of the best possible options for the theory and praxis of social change for our purposes of working in ETTDR processes. In other words, it is suggested that our attitude should be exactly the same as with the suggestion above regarding the pursuit and further development of the ethico-onto-epistemology – in other words, to see this as yet another challenge and opportunity to engage with and further develop this particular theory and practice of social change – and not to treat it as some or other final / fixed theory.

¹⁰⁴ Practical examples of such safe-to-fail experiments with the adjacent possible (discussed in more detail in [Section 3.5](#) above) This did not deter the social actors from participating actively in figuring out the next possible steps in making things work, which, very importantly, involved some ethical decision-making in the process.

the said Humean is-ought conundrum. Instead, what is required is the proverbial getting one's hands dirty through active engagement in decision-making and actions of figuring out what to do next, without knowing in advance exactly where this may lead.. However, merely acknowledging the non-separability of ethics–ontology–epistemology is not in and of itself sufficient for conducting TTDR processes. What are still needed are some dynamic guiding logics and principles for nudging our decision-making *during* TTDR processes, when participating in collaborative *science-with-society* relationships in the complex domain.

7.3 Theory of Change (ToC)

If the purpose of the notion of the non-separability of ontology, ethics and epistemology – whether in its onto-ethico-epistemology or triadic form, shape or structure – is to ensure an on-going supply of human energy / fuel, as it were, for driving ETTDR processes, then it is the purpose of ToC to support these processes by providing some direction in this regard. In other words, the questions of how we understand and act in our complex world with its complex challenges might not be sufficient for sustaining the continued transformative drive of ETTDR processes: without a sense¹⁰⁵ of direction, these processes may very well run out of human energy and simply dissolve into achieving nothing substantive in the end. In other words, the important question to ask here is what kind of direction can and should be expected to come from any ToC in ETTDR processes? In this regard, for example, any expectations, implicit or explicit, that ETTDR processes should be able to bring about deep structural societal change, may simply be too burdensome and unachievable a goal to pursue for the participants in ETTDR processes. The direct opposite of this is, of course, *no social change*: i.e. the argument that if deep structural change is not plausible, then nothing else is worthwhile pursuing (with the implication that we may as well then be merely satisfied with understanding and explaining the complex issues we are dealing with).

'Radical incrementalism' (RI) (Allen et al., 2015; Halpern and Mason, 2015) was already alluded to very briefly in [Section 2.4](#) above as a possible working ToC for exploring social change in the complex domain – which is indeed a very different strategic position to take than those put forward by those schools of thought advocating deep structural change and systems change. As mentioned before, a distinct advantage of RI is that it does not fall into the trap of becoming fixated on what Unger has called the 'fetish of structuralism' (Unger, 1998b, 2004a, 2007b, 2007b) and, adding to this, a preoccupation with high-level (systems) leverage points

¹⁰⁵ This notion of a *sense of direction* (directionality) is used deliberately here in line with what has already been said about the importance of the six senses of ETTDR in [Section 6.3](#) above.

(Stroh, 2015; Wright and Meadows, 2012b) – as fundamental preconditions for bringing about social change. Instead, RI focuses on the **plausibility** of social / institutional change – even if it is not possible to achieve total systems or deep structural change – the latter, specifically, may only be attempted or achievable through some big revolutionary kinds of change, such as the French or Communist Revolutions in the past.

However, the practical experiences with RI in the Enkanini TDCS were indeed significant for theorising more systematically in future, in that this approach provided a broad working ToC for giving and sustaining a sense of direction and guidance for the way in which experimentation with the three small-scale socio-technical innovations (described in [Section 3.5](#) above) were conducted. As said, in the context of people having no previous experience of *working together* on joint projects and ventures in the Enkanini informal settlement, this approach of RI certainly succeeded in contributing to establishing some forms (and practices) of informal collaboration which outlived the research process, as can still be seen in the way the iShack mini-grid systems are being operated by the individual shack-dwellers involved. However, before RI can be offered as a more substantive¹⁰⁶ ToC for conducting ETTDR processes in future, it seems that quite a lot more theory-building is needed in this regard: for example, developing a more thorough understanding of how *intentional* knowledge co-production, specifically transformative knowledge co-production, can actually contribute to social and institutional changes – even where and when deep structural inequalities may persist – simply because these structural inequalities remain unaffected or too weakly¹⁰⁷ affected by the said social and institutional changes. However, what seems clear is that RI has the potential to provide a sense of direction in a methodologically agile manner for undertaking ETTDR processes, and, therefore, it certainly warrants further exploration, both in theory and practice, with others¹⁰⁸ working in this area.

7.4: Guiding Logics, Principles & Senses / Sensibilities

One of the main reasons for dealing with the senses above (see [Section 6.3](#)) was to acknowledge the significant contribution of the phenomenological-level experiences, perceptions and observations of both social actors and researchers in ETTDR processes – in other words, a move to counter the positivist, rationalist and empiricist strategies that would

¹⁰⁶ By this is certainly not meant a ToC which can merely be applied uncritically to ALL future ETTDR processes. In other words, even if RI will be more fully developed, it still means that such a theory of change will always be subject to the non-linear causal dynamics of specific problem situations in the complex domain.

¹⁰⁷ In terms of the time delays (latency) between the causes (social/institutional changes) and effects (systems/structural changes).

¹⁰⁸ Particularly with CST colleague, Prof Mark Swilling, an international expert in this area and doing some really ground-breaking work in this regard at both the theoretical and practical levels (see: [Swilling et al., 2013](#); [Swilling, 2019](#)).

exclude all of this from the research process. This was done on the assumption of a connection between the senses and the principles and logic(s) – in that the senses can somehow be transformed into guiding principles. However, this needs some further inquiry and theorising in order to better understand the effects of the performativity of language (word power) in the research process – in other words, understanding *how* and *what* happens when pre-articulated phenomenological experiences, perceptions and observations are actually translated into more spoken and written language forms, thereby affirming / asserting their performativity as guiding principles. Doing this more in-depth theory-building will almost certainly help researchers in ETTDR processes to better understand how to develop their thought / epistemic objects based on (the interaction between) their own and social actors' experiences, perceptions, observations during the unfolding research process – and not based just on the literature.

However, there is another reason why this kind of theorising is important, which has to do with better understanding the 'emergence' of transformative social action (change) in the non-linear causal dynamics of complex problem situations. In [Section 6.3.5](#) above it was also asserted that the performativity of language (word power) may provide us with a better understanding of the possible link between phenomenological-level experiences, perceptions, observations etc. and social change – i.e. looking into how and what happens when our senses are also translated into transformative wording / language which, in turn, can become transformative social action / change. In other words, this has to do with better understanding the transformative effects produced by the double hermeneutic (Giddens, 2013) in ETTDR processes – which is, needless to say, of critical importance for methodological agility when pursuing the ETTDR approach.

Undertaking this kind of theoretical work will most probably involve integrating in new / innovative ways at least the following varied body of literature on, inter alia, language theory, action theory and social change theory:

- Austin ~ (Austin, 1975)
- Chomsky ~ (Chomsky, 2002; Chomsky and Chomsky, 2006)
- Gellner ~ (Gellner, 2005)
- Giddens ~ (Giddens, 1986, 1979a, 1979b)
- Habermas ~ (Habermas, 1987; Habermas and McCarthy, 1985, 1985; Honneth and Joas, 1991)
- Juarrero ~ (Juarrero, 2002)
- Marx ~ (Marx, 2004)
- Parsons ~ (Parsons, 1977, 1968)
- Ricoeur ~ (Ricoeur and Kearney, 2007)
- Schutz ~ (Schutz, 2012, 1973; Schutz et al., 1978)

- Searle ~ (Searle, 1995, 1985; Searle and Searle, 2002)
- Unger ~ (Unger, 2004a, 2004b; West, 1986)
- Weber ~ (Bruun and Whimster, 2012; Finch, 2011; Weber, 2009, 1978)
- Wittgenstein ~ (Wittgenstein, 2013, 2010)
- Etc.

7.5 Methods for Doing ETTDR

Being methodologically agile suggests that it is not a fundamental prerequisite to have clear-cut methods at hand when setting up and embarking upon ETTDR processes. On the contrary, being too closely aligned with certain methods may very well hamstring rather than enable the research process. In other words, from a (intra) methodological agility perspective it can be expected that the need for some appropriate research methods will emerge and warrant some theorising and applying. This is exactly what happened in the Enkanini case study, with some of the researchers intuitively using deep ethnographic interviewing (Wessels, 2015) as an appropriate approach for refining their individual problem statements and research questions (epistemic objects) by working with individual shack-dwellers' life-stories and experiences in the Enkanini informal settlement and even before. However, upon critical reflection and further inquiry, it became increasingly clear that the strong point of this approach is also at the same time a weakness, in the sense that it is limited to working with few or single stories only. This, in turn, became the motivating reason for looking for different approaches and coming across "SenseMaker®",¹⁰⁹ which will now be briefly discussed as yet another important area for more in-depth research in future.

After some initial scanning of the literature and the internet, and attending of some workshops (during 2013 – 2015), the team's first more substantive experimentation with the SenseMaker® approach commenced in 2016 in collaboration with Shack Dwellers International ([SDI](#)) and this will most probably come to fruition only during the latter part of 2019. Also, this collaboration was not an intentionally transdisciplinary undertaking, but was more driven by the SDI's practical need for some complementary methods to supplement their already well-established quantitative methods for doing predominantly infrastructural-upgrading type of work with people living in informal settlements in many different locations across the world.¹¹⁰

¹⁰⁹ See: <http://cognitive-edge.com/sensemaker/>

¹¹⁰ See: <http://sdinet.org/projects/>

Apart from the fact that this approach can be used as a complementary method in conjunction with others, the following five reasons also played a key role in deciding why it was appropriate to pursue this particular narrative-informed policy-making approach:

- (a) it is an approach that has already been used in many different countries and contexts on the African continent (see [Annexures B, C and D](#) attached to this document);
- (b) it is a qualitative method that is capable of working with multiple micro narratives based on peoples' experiences, perceptions and observations of a particularly complex problem situation – thereby making it possible to bring the sensemaking event at the phenomenological level directly into the research process;
- (c) in light of (b), it is a method that can be used with so-called 'ordinary' (non-academic) people and their lived experiences in different real-life settings – including informal settings such as the Enkanini informal settlement. This, very importantly, means that ETTDR processes adopting this narrative-based approach and working in the different real-world contexts across the world do not have to feel compelled to work with formal 'legitimised' leaders or decision-makers *only*; as already referred to in [Chapter 3](#), formal legitimised stakeholder engagement is not a fundamental prerequisite for using this approach;
- (d) the approach is a very strong process-driven approach, allowing for certain key aspects of the method *itself* to be co-designed / co-constructed *with* the people (volunteers) involved *before* actually starting to use the method in the field – this is normally part and parcel of the very first design phase of this process-oriented approach, which will be discussed briefly below;
- (e) in addition to the method itself being open to co-design and construction, it is also appropriate for co-producing system, target and, very importantly, transformative knowledge (Hadorn and Pohl, 2008b; Pohl and Hadorn, 2007b) with the individuals involved in the TTDR processes – this can take place during any of the many different phases and steps of this process-oriented approach, and which will be discussed briefly below.

As already alluded to in points (e) and (d) above, the SenseMaker® method is fundamentally a process-driven approach consisting of three iterative phases: Design (I), Collection (II), and Analysis & Sensemaking (III) (see Figure 29 below). Much of the design phase I consists of developing the basic building blocks of the method itself – collectively known as the signification framework of the approach (discussed in more detail below) – which can also be co-constructed with the participants involved in the process. Very importantly, though, is that this co-design and construction work is done at the start of the process – i.e. *before* proceeding with actually using of this tool to collect and analyse micro narratives.



Figure 29: The SenseMaker® Methodology & Process¹¹¹

Source: Snowden, 2002

A more linear version of the above iterative SenseMaker® process will be discussed in more detail in [Section 7.6](#) below. However, before proceeding with this discussion, suffice it to mention here that the reasoning for expressly adopting and adapting the above approach for our purposes of developing the ETTDR methodology is that methods available for doing TDR in the literature (Bergmann et al., 2013; Scholz, 2011; Scholz et al., 2006b; Scholz and Tietje, 2002) have been specifically developed for formal 'legitimised' multi-stakeholder – i.e. Track 1-type – processes, and consequently there are no methods available for addressing the challenge of informality in Track 2-type processes (discussed in more detail in [Section 5.2.2](#) above). In other words, the methods challenge here is one of *how to* co-produce systems, target and transformation knowledge with *individual* social actors in their informal social networks and settings who explicitly say that they do not have a mandate to speak on behalf of others, but only themselves. In view of the Enkanini TDCS experience, this is indeed a severe limitation if we are to face up to the broader challenge of doing science *with* society in radically different developed and developing world contexts across the world.

Although, as mentioned, the SenseMaker® approach was not specifically designed for and used during the Enkanini case, it is something (i.e. the interest in narrative-based methods) arose *from* the Enkanini case – and which has subsequently been experimented with in collaboration with the SDI group in three informal settlements in the African developing world context. It is, then, in the light of this experience that the potential of this narrative-based

¹¹¹ Presented here in terms of an iterative process consisting of three distinct, yet interconnected, phases: design, collection and analysis & sensemaking.

approach will be explored and discussed in some more detail in [Section 7.6](#) below – with a particular interest in and focus on the possibilities presented by this approach for co-producing said system, target and transformative knowledge.

However, it should also be pointed out here that the experimentation with the SenseMaker® method by no means implies that this approach is somehow restricted to Track 2-type TTDR processes *only*. On the contrary, it is certainly versatile enough to be used in Track 1-type processes as well – or even better in hybrid Track 1 and 2 processes in order to compare and highlight, for example, any similarities and (conflicting) differences between ‘legitimised’ decision-makers’ and ‘ordinary’ peoples’ experiences, perceptions and observations of the same complex problem situations – and, very importantly, the decision-making implications of this for considering and embarking upon social change strategies and programmes. From the perspective of maintaining methodological agility, this ability of working simultaneously in multi-track TTDR processes, using similar or different methods complementarily, is of particular importance – rather than pursuing research strategies merely focused on the transferability and replicability of applying the exact same methods ‘as is’ to very different social contexts.

7.6 Toward Narrative-Based ETTDR Processes

As already alluded to above in [Section 7.5](#), the SenseMaker® method is basically an iterative process-driven approach, creating some real opportunities for co-producing systems, target and especially transformation knowledge (Hadorn and Pohl, 2008b; Pohl and Hadorn, 2007b) in ETTDR processes. In order to better understand this, it will be useful to present a more linear version (see below) of the SenseMaker® approach, allowing for a more specific focus on some of the relevant phases and steps of knowledge co-production. This will be done bearing in mind that all of this is still very much part of an on-going experimentation with this narrative-based approach and that it is, therefore, considered premature to come up with any substantive methodological assertions and recommendations at this point in time.

I. Co-Design & Preparation

1. Develop research strategy (for making contact with formal / informal social networks; including gatekeepers)
2. Decide on sampling and capturing strategies
3. Develop operational plan for data (narrative) collection
4. Co-designing signification frameworks
5. Training co-researchers
6. Review sampling and capturing strategies

II. Narrative Collection

7. Decide on capturing methods (audio, paper, online, interviews, iPads, Smart phones etc.)
8. Decide on ways of data (narrative) collection (indirect questions, text, anecdote circles, journaling, naïve interviewing etc.)
9. Doing field work: data (narrative) collections

III. Analysis & Sense-Making

10. Using software for detecting and visualising emerging narrative patterns
11. Returning stories to story-tellers for collective sense-making
12. Discuss and develop social change strategies

IV. Implementation

13. Implement multiple small safe-to-fail social change experiments
14. Amplify what works, dampen what does not work
15. On-going / real-time vector-based monitoring & evaluation

This linear rendition of the circular / iterative SenseMaker® process is in fact the outcome of a reconstruction and integration exercise of integrating the latter with a more ideal-typical TDR-model developed by Thomas Jahn et. al from the Institute for Socio-Ecological Research ([ISOE](#)) in Frankfurt, Germany (Jahn, 2008; Jahn et al., 2012) (see Figure 30 below). The end-product of this integration exercise is a new four-phase process (see Figure 31 below) for the purposes of doing ETTDR, in but not limited to Track 2-type processes. A key feature of the linear version is that the implementation phase (Phase IV) has been added in order to make this important phase / step in the process as explicit as possible – something which is implicit in both the Jahn and SenseMaker® models. Another important aspect about the integrated four-phase model is that the arrows signifying inputs, outputs and outcomes flow both *into* and *from* the four phases, and in both directions of science *and* society: the explicit intension is to illustrate the importance of doing Science *with* Society in the sense that society is both *affecting* and *being affected* by the collaborative interactions *during* and *within* the four phases – including collaborations and exchanges in knowledge co-production.

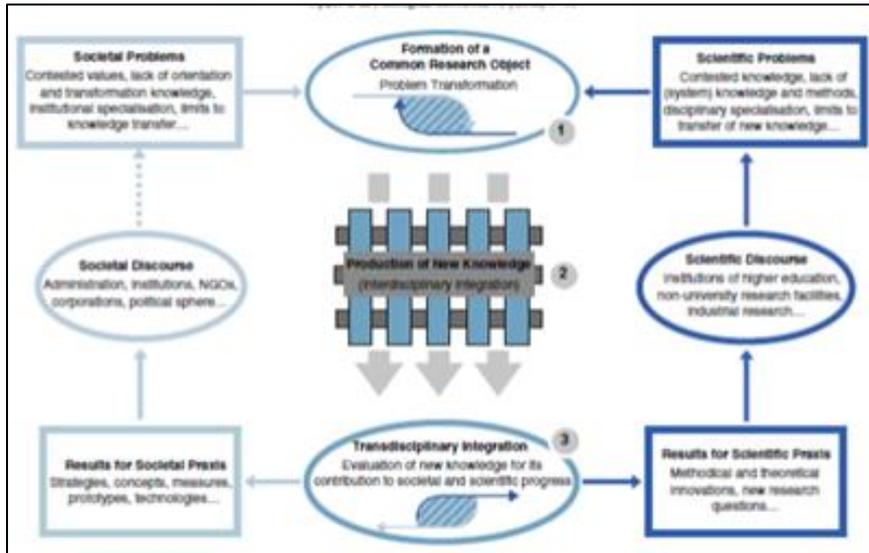


Figure 30: Ideal-Typical Jahn-Model
Source: Jahn, 2008

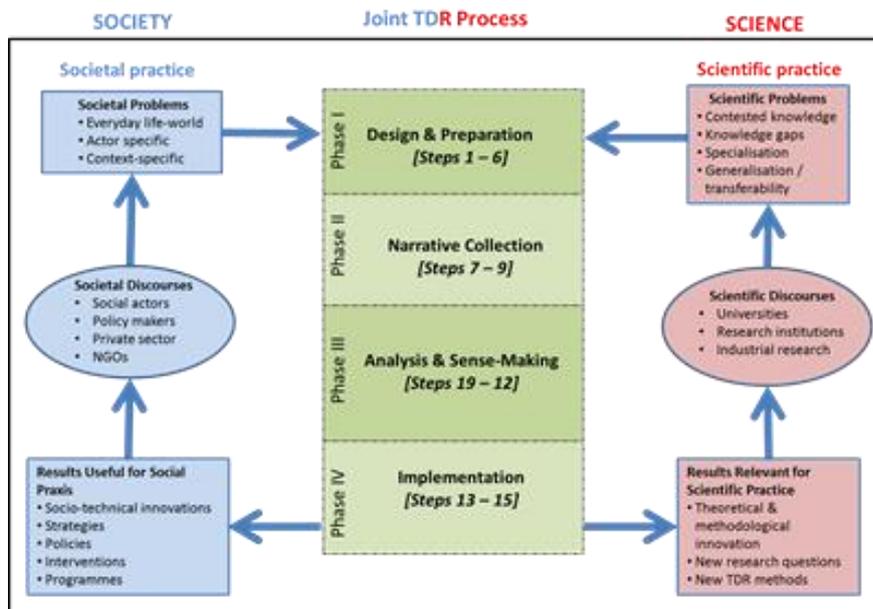


Figure 31: Integrated Four-Phase Model¹¹²
Source: *By Author 2019*

An added advantage of the more linear-like representation of an essentially iterative process is that it can be used for the purposes of submitting research proposals and reports to faculty in those case where the faculty places a particularly high premium on – and has expectations of – certainty and linearity *before* commencement of research projects. However, a disadvantage of such a linear process with its sequential phases and steps is its obvious oversimplification. In other words, it may simply be too abstract to be of any practical use, since it fails to sufficiently account for the actual non-linear causal dynamics of research processes

¹¹² Based on the above mentioned SenseMaker® & Jahn models.

embedded in real-life social contexts. It therefore becomes necessary to explain *upfront* that many of the sequential steps in this linear version of the process should be seen as flexible in the sense that they can be inter-changed or performed simultaneously (in parallel). Steps 4 and 5 (Phase I) are in fact a good example in this regard in that the training of any co-researchers in the narrative-based research approach (step 5) can easily form part of the co-designing of the signification framework(s) of the study (step 4).

Either way, both linear and no-linear versions of the process provide some important opportunities for knowledge co-production together with the social actors participating in ETTDR processes, and to illustrate this, the following important phases and steps will be focused on:

- *Phase I, Step 4: Co-designing the signification framework*

In the SenseMaker® approach, semi-structured frameworks – also known as signification frameworks – are used as a means for participants in the process (the narrators) to signify¹¹³ the meaning of their shared (narrated) day-to-day experiences, perceptions and observations of *their own* real-life situations with the researchers. This is also, very importantly, referred to as the principle of *self-signification* (Snowden, 2015, 2011b, 2010) .

A typical signification framework consists of a prompting question and four signifiers known as: triads, dyads, stones and multiple-choice questions, illustrated in the figures 32 – 35 below:

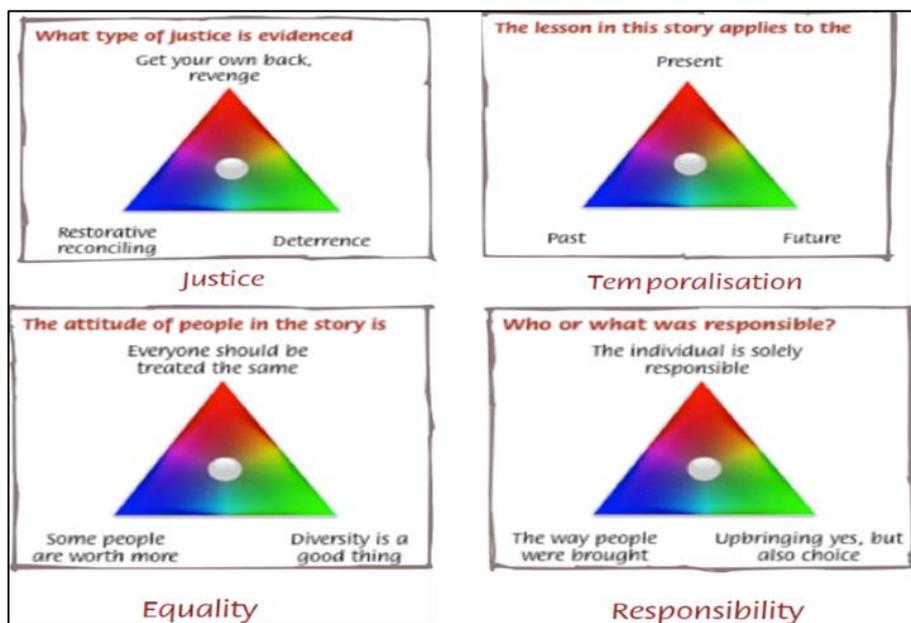


Figure 32: Triads

Source: Snowden, 2010

¹¹³ This is also known as indexing stories (Snowden, 2010).

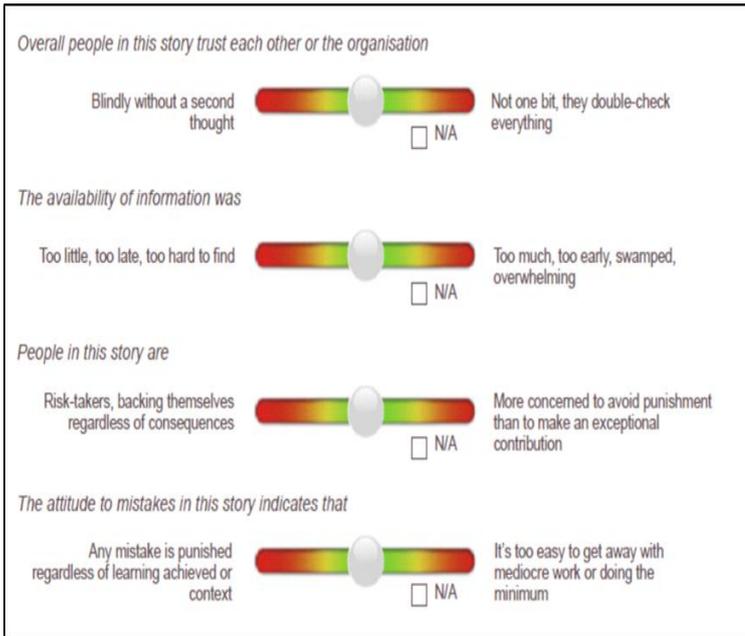


Figure 33: Dyads
Source: Snowden, 2010

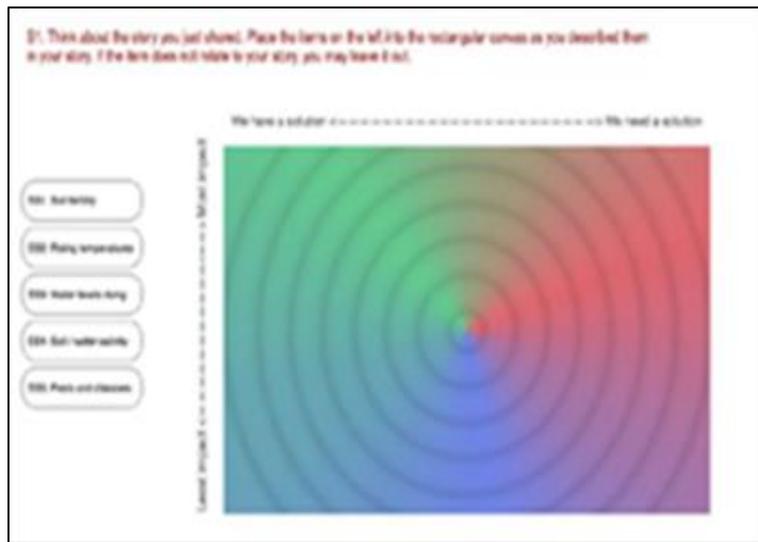


Figure 34: Stones
Source: Snowden, 2010

Write questions about your story. Please answer the following multiple choice questions. Your responses will be completely anonymous. Please note that some questions call for only one response while other allow you to choose multiple responses.

14. Name of the fire or accident if known & you would like to provide it (open-ended)	15. This story occurred in (general): <input type="checkbox"/> January <input type="checkbox"/> February <input type="checkbox"/> March <input type="checkbox"/> April <input type="checkbox"/> May <input type="checkbox"/> June <input type="checkbox"/> July <input type="checkbox"/> August <input type="checkbox"/> September <input type="checkbox"/> October <input type="checkbox"/> November <input type="checkbox"/> December	21. The fuel feeding the fire was (general): <input type="checkbox"/> grass <input type="checkbox"/> brush <input type="checkbox"/> timber
16. The topography in this story (general): <input type="checkbox"/> ridge line <input type="checkbox"/> valley <input type="checkbox"/> canyon <input type="checkbox"/> road edge <input type="checkbox"/> not applicable	22. Events in this story happened (over): <input type="checkbox"/> This year <input type="checkbox"/> in the past year <input type="checkbox"/> in the past 1-2 years <input type="checkbox"/> in the past 4-5 years <input type="checkbox"/> more than 5 years ago <input type="checkbox"/> don't know	23. The fire was (general): <input type="checkbox"/> surface fire <input type="checkbox"/> crowning fire <input type="checkbox"/> spotting <input type="checkbox"/> running <input type="checkbox"/> not out
17. The location of the fire was (over): <input type="checkbox"/> quite familiar <input type="checkbox"/> not at all familiar	24. Primary fire suppression tactics included (general): <input type="checkbox"/> direct <input type="checkbox"/> indirect <input type="checkbox"/> line construction <input type="checkbox"/> hose lay <input type="checkbox"/> pump operations <input type="checkbox"/> striking or split <input type="checkbox"/> other	25. The fire was (over): <input type="checkbox"/> prescribed <input type="checkbox"/> wildfire

Figure 35: Multiple Choice Questions

Source: Snowden, 2010

The co-construction of signification frameworks is of key strategic importance, since they are the symbolic means through which the sharing and communicating of lived experiences, perceptions and observations (at the phenomenological level in ETTDR processes) are done. One way of going about this exercise in *co-constructing* the signification frameworks is to bring some community volunteers into the process from the outset to specifically participate in story-telling or anecdote circles.

When such bottom-up approach is followed, the challenge of dealing with the effects of the performativity of language (word power) *within* the dynamic of the double-hermeneutic (described in more detail in Sections [6.3.4](#) and [6.3.5](#) above) is experienced head-on right from the onset of the process. Very importantly, though, is that this challenge of finding some appropriate wording / language, with which to describe and communicate signifiers, should not be mistaken for merely participating in some or other abstract semantic or language games just in the hope of finding words with some innate meaning(s) that can be sufficiently understood and (seamlessly) transferred between different contexts. This is certainly not what is implied with the notion of the performativity of language (word power) here – namely that individual words in and of themselves somehow possess some intrinsic value or meaning outside their context – just waiting to be ‘discovered’, as it were, if only we search hard enough and with the right intentions.

On the contrary, the challenge we are facing in co-constructing appropriate signification frameworks is a different kind of challenge premised on the assumption (already alluded to earlier in [Section 6.3.5](#) above) that meaning derives from the context and does not lie in the signs per se (Nin, 1975, 1969; Snowden, 2011b). Since context

matters hugely, it is therefore paramount to engage as deeply¹¹⁴ and widely¹¹⁵ as possible with the relevant social actors embedded in *their* formative contexts in order to agree on the appropriate wording / language for the signification frameworks.

What this means, very importantly, for our understanding of the dynamics of narrative-based ETTDR processes is that both theoretical and practical wording / language have an equal chance of resonating well within a particular context of people, or not – in other words, of being understood, misunderstood or not understood at all. In other words, it is not as if practical language has some or other a priori / inherent advantage over theoretical language – just because it has a practical sound and feel to it. In this regard, for example, rather abstract sounding words such as ‘justice’, ‘equality’, ‘responsibility’ and ‘temporalisation’ used to describe the central concepts of the four triads mentioned above raise the question of their comprehensibility and communicability. However, it would be fair to say that these words and concepts are equally context-dependent – as would be the case with any practical, day-to-day language used for this purpose. In other words, the mere fact that they appear at face value to be abstract does not necessarily mean that a particular community of speakers will not be able to engage and respond to them at all. Similarly, the fact that certain concepts and words have a practical, every-day look and feel about them does not mean that they will automatically be better understood by everyone in the same community of speakers.

There are no hard and fast rules for finding the most appropriate balance / mix between theoretical and practical wording and language for constructing signification frameworks: experience with this approach has shown thus far that the meaning of the words to be used will only really emerge during a process of intense discussions and negotiations – mindful of the fact that this needs to be conducted in a spirit of give and take. However, critically important in all these kinds of deliberations is that they should be guided by the principles of allowing for emergence and avoiding premature convergence (discussed in detail in [Section 6.2.3](#) above). A practical way of achieving this is to bring some of the volunteer social actors into the research process with the express view of participating in the co-construction of the above signification frameworks through techniques such as focus group discussions or anecdote circles.

¹¹⁴ This is essentially a qualitative concept, suggesting that we also engage with the specificity or fine-grain granularity of context.

¹¹⁵ This is essentially a quantitative concept, suggesting that we engage with many (not just a few) different and differing contextual situations and perspective.

The advantage of doing this early on in the process is that it creates an important opportunity for the researchers to assume their key roles as facilitators in the research process, including the nudging style of decision-making (referred to in [Section 3.8](#) above). Starting with these discussions and negotiations of agreeing on some appropriate wording / language for co-constructing the signification frameworks is indeed a very good starting point for this whole process. If it becomes apparent that the discussions and negotiations tend to converge too quickly – just for the sake of reaching some compromises – then the facilitator’s role is *to nudge* the discussions and negotiations into a more open / divergent direction by encouraging the participants to consider some other / different wording / language that they might not necessarily have considered as yet. On the other hand, if the opposite becomes clear, i.e. that the discussions and negotiations are starting to drift aimlessly in different divergent directions, without the prospect of converging again, then the facilitator’s role is *to nudge* the discussions / negotiations more in the direction of finding some points of intersection / convergence again.

An added advantage of this kind of engagement with social actors, early in the process, is that it forces researchers to critically reflect upon the assumptions of their initial guiding problem statements and research questions with which they came into the research process. In other words, this early experience in co-designing and co-constructing a critically important component of this narrative-based method is the first of many such opportunities created by this approach for bringing about any changes, if any, to the researchers’ epistemic objects¹¹⁶ – based not *only* the available literature, though, but *also* on the two-way interactions and discussions with the social actors involved.

How some of this work was actually done in the SDI project¹¹⁷ can be viewed in this short video footage here: <https://youtu.be/HECoKeU80g4>

¹¹⁶ Thinking critically about their problem statements and research questions would of course include considering where the major focus point (or *centre of gravity*, as referred to in [Section 6.2](#) above) of their research is situated and the types of knowledge that need to be co-produced for this: system, target or transformation knowledge? These are indeed three very different kinds of knowledge with equally different problem statements and research questions – all of which will have a bearing on the kind of wording / language to be used in the signification frameworks for this.

¹¹⁷ Bearing in mind that this particular project with SDI was not intentionally set up and conducted as a ETTDR project, but rather to assist them[?] with a complementary qualitative research approach that could be used in conjunction with their already existing and well-used quantitative research methods.

- *Phase II, Step 9: Doing field work: data (narrative) collections*

The strategic advantage of this step in a narrative-based research process is that it allows researchers from the outset to engage with individual social actors in the day-to-day settings of *their own* formative contexts – in other words, early engagement with social actors at the phenomenological level (introduced and discussed in more detail in [Section 6.3](#) above). These can be in social places and spaces where people normally gather to interact and share some of their real-life experiences with each other, including spaces and places of worship, food preparation, caring for the young, playing games etc. – as can be seen in the photographs below taken in three different informal settlements in the city in Accra (Ghana) where the SenseMaker method was first tested in 2016/7.



Figure 36: Engaging with people in their every-day situations¹¹⁸

Source: SDI Process 2016 - 2018

These experiences of engaging more directly with peoples' real-life experiences in *their own* social settings provide researchers with some very different strategic opportunities for critical reflection, discussion and changing of their initial guiding epistemic objects than would be the case when participating in some or other artificially / deliberately constructed workshop settings (e.g. scenario-building exercises). As already alluded to in [Section 6.3](#) above, this phenomenological notion of engaging more 'directly' with peoples' real-life experiences in *their own* formative contexts by no means implies

¹¹⁸ Here in urban informal settlements in the city of Accra (Ghana).

attempts at asserting the primacy of perception (Merleau-Ponty, 1964), or trying the impossible Romantic¹¹⁹ notion of phenomenological psychology contending that in order to see the world from different perspectives we need to stand in the shoes of others, so to speak¹²⁰. However, both these directions go no further than mere interpretivism / perspectivism – i.e. merely being satisfied with the interpretation and understanding the meaning (*Verstehen*) of different life-worlds¹²¹ (as an end in itself) – without ever engaging with the transformative question of how to change (*Verändern*) *what* has been interpreted.

However, it is always easier to say what something should *not* be than what it *should* be, and in this case it raises the question of what kind of phenomenological attitude or approach is needed for our purposes of conducting the ETTDR methodology in a methodologically agile manner? Although it is not exactly certain what all of this should entail, some useful pointers / suggestions for further investigation in this regard could be, on the one hand, exploring the possibility of combining *empathy* as creating something sustainable from our sensemaking of seeing things from many different and differing perspectives (Snowden, 2016d), and on the other hand, developing *critical mindfulness* as paying critical attention in a non-judgmental way to experience in the here and now – of both the self and others (Brown, 2017; Brown et al., 2015; Fatemi, 2016; Kabat-Zinn, 1994).

In other words, the phenomenological level is a good starting point for our further explorations and investigations into acquiring a better understanding of the transformative aspect of the ETTDR approach – i.e. engaging with the sensemaking experiences, perceptions, observations, etc. of others – the social actors – in *their* formative contexts.¹²² These kinds of phenomenological engagements with social

¹¹⁹ As espoused by the likes of Schleiermacher (Palmer, 1969; Schleiermacher and Bowie, 1998), Goethe (Goethe, 2013; Seamon and Zajonc, 1998), Dilthey (Dilthey and Rickman, 1979; Palmer, 1969), Schutz (Schutz, 2011, 1973, 1967).

¹²⁰ This normally goes hand in hand with sentimental emotional feelings such as *sympathy*, *pity* or feeling *sorry* for the other (also sometimes referred to as one's *alter ego*) in whose shoes you are standing (Schutz, 2011).

¹²¹ See footnote 106 above.

¹²² The concept of formative context(s) is again deliberately used here in order to distinguish it as clearly as possible from the classical phenomenological concept of *life-world* (*Lebenswelt*) used by theorists such as Husserl (Husserl, 2004; Husserl et al., 2001), Merleau-Ponty (Merleau-Ponty, 1964), Schutz (Schutz, 1973, 1967), to mention just a few, to convey the basic notion that our inquiry and research into others' life-worlds are complete with our interpretations and understandings (*Verstehen*) of the latter – without seriously grappling with the basic transformative question: What are the next steps (Unger, 2014, 2007a; West, 1986) to be taken in order to change our so-called life-worlds and in which directions(s) should such change be undertaken? This resulted in a combined attitude of constructivism-interpretivism-perspectivism, the net effect of which resulting in a position of political quietism or conservatism – i.e. uncritically accepting the status quo 'as is'. This happens

actors can be expected to happen from outset in narrative-based ETTDR processes, but is never just a one-step event, limited to the early field work stages of the research process, which is one-on-one narrative interviews during the narrative collection exercises – as can be gleaned from the above photographs. On the contrary, in practice narrative-based ETTDR processes are always iterative (notwithstanding the linear rendition of the process here), and it is, therefore, certainly something which can be expected to occur at different settings and stages in the research process, as well as with different levels of intensity.

But it must be emphasised that the roles of researchers in all of these engagements with social actors in their own formative contexts are not reduced to a binary situation of having to choose between the two opposing roles of ‘interpreters’ vs. ‘legislators’ *only*, as suggested by Bauman (Bauman, 2013). There is indeed another / third and very important possibility here, namely the role of facilitation / facilitator – which, amongst other things, involves the understanding and embodying the two abovementioned notions of *empathy* and *critical mindfulness* when faced with the twin challenge of having to figure how to *engage with* social actors in *their* situations in a non-judgemental manner – whilst, at the same time, allowing any contradictions / tensions in the social actors’ patterned narratives to surface in such a way that they can determine the nature and direction of any transformative actions to be embarked upon.

Since this double-challenge presents itself most explicitly during the next two steps in the process – of visualising and sensemaking of the narrative patterns – it will be briefly discussed again in the next two steps. However, suffice it to mention here that the different ways in which researchers will take up and respond to the abovementioned roles of facilitation / facilitators during such narrative-based ETTDR processes will certainly have a significant bearing on the insights and understandings they gain during the process. For example, taking up a more narrow / restricted role of observers-*interpreters only* will expose researchers to the real social, institutional, ethical, political

when the interpretation and understanding of others’ life-world(s) is seen and treated as an *end in itself* – i.e. working on some or other imagined holistic reconstruction which can be achieved via sufficient integration of all, or most, of the different perspectives / horizons of the real-life experiences in question. Beyond this end-goal, there is, therefore, no need to go beyond merely interpreting and understanding (*Verstehen*) the meaningfulness of our and others’ life-worlds – least of all trying to understand how to bring about change in / of the different life-world(s) in question. The responsibilities of the researcher / inquirer start and stop with the interpretation and understanding of the meaningfulness of a particular life-world situation. In other words, in terms of classical phenomenology, the notion or possibility of something like a *transformative phenomenology* would be a complete contradiction in terms.

etc. complexities involved in bringing about small-scale social change in very different ways than would be the case when actually facilitating such tricky processes.

Be that as it may, all researchers in whatever roles they decide to take up in these narrative-based ETTDR processes will be afforded with the opportunity for critical and empathetic self-reflexive encounters during some regular research team meetings.¹²³ These are normally specifically set up and arranged as discussion sessions for the purposes of critical reflection and mutual learning and sharing of any new insights and understandings that might have emerged during the fieldwork experiences – including critically scrutinising and questioning their assumptions, and what, if any, the theoretical implications of these new insights and understandings might be for changing the initial problem statements and research questions (epistemic objects). These discussions and exercises in learning how to translate phenomenological experiences into appropriate theoretical wording / language will indeed form an integral part of the future research to be undertaken for the further development of the ETTDR methodology in future.

- *Phase III, Step 10: Visualising and making sense of emergent narrative patterns*
The strategic purpose of this step in the process is for the researchers to make sense of what is emerging from the fieldwork – not only for themselves but also, very importantly, in preparation for returning the stories to the original story-tellers. In practice, this means the co-researchers spending quite a lot of time analysing and visualising the emerging patterns of the indexed stories – using specialised software program known as *Analyst* – for this purpose. Below (see Figures 37 – 41) are some examples of the different kinds of visualisations / representations of the work produced during this step of the process:

¹²³ It is therefore important that both the fieldwork and these research team meetings are well recorded and documented (through video, audio, photographs etc.) for inclusion in their academic work (research reports, theses, articles etc.). The heuristic tool developed in [Section 6.5](#) above for working with and integrating the research senses and principles can also be used by researchers in conjunction with what comes out of the fieldwork and team discussions – together, providing some rich material for using and explaining the reasoning for bringing about any changes to the initial guiding problem statements and research questions.



Figure 37: Pattern Detection: Triads
Source: Snowden, 2010, 2002

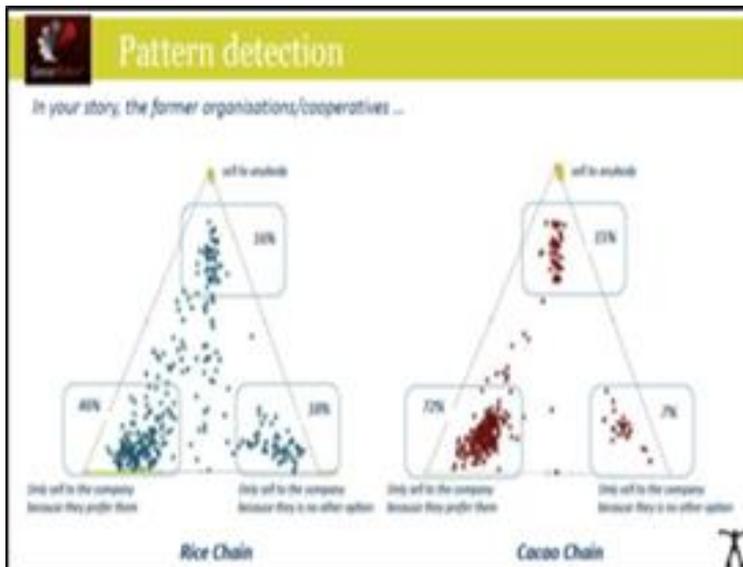


Figure 38: Pattern Detection: Triads
Source: Snowden, 2010, 2002

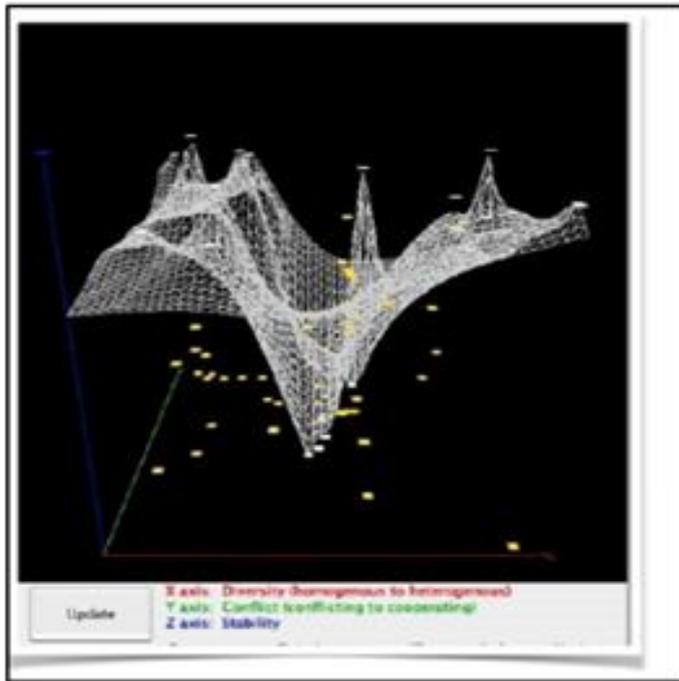


Figure 39: Narrative Landscapes
Source: Snowden, 2010, 2002

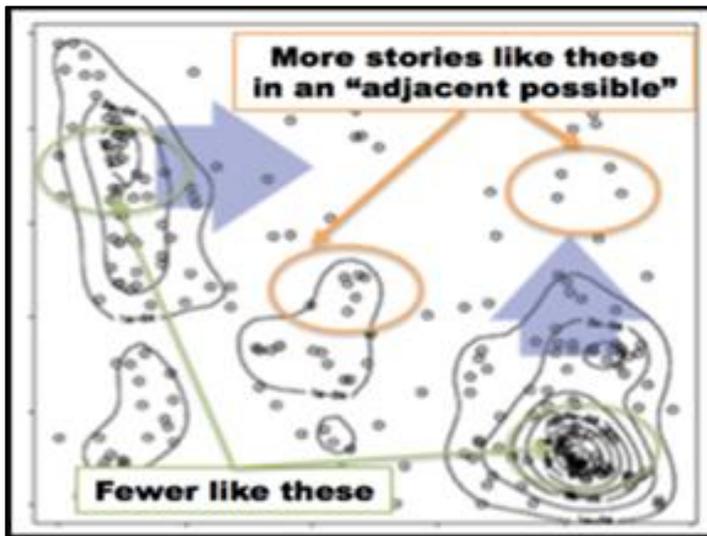


Figure 40: Pattern Detection: Contour Maps
Source: Snowden, 2010, 2002

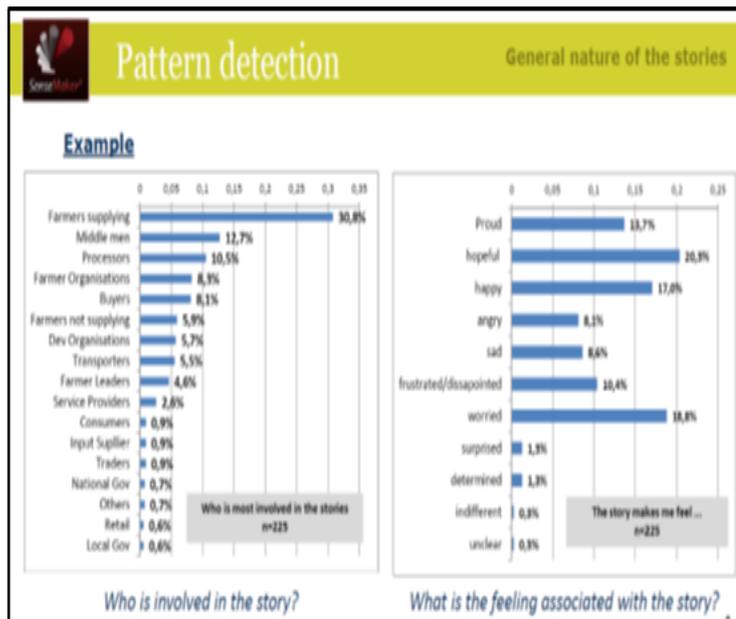


Figure 41: Pattern Detection: Bar-Graphs

Source: Snowden, 2010, 2002

Ideally speaking, these sensemaking exercises should be conducted in small TDR teams under the guidance of their co/supervisor(s), consisting of both researchers and supervisors from many different disciplines. This will ensure that these are very rich inter-disciplinary interactions and exchanges of many different disciplinary ideas, concepts, wording / language etc. However, if this is not practically possible, it is also something that can be conducted between individual researchers and their supervisor(s). Whichever way this step is conducted, it provides yet another very important opportunity for critical reflection and discussion – generating rich visual material for substantiating any changes made to the initial guiding epistemic objects,¹²⁴ based not just on the available literature,¹²⁵ but also on the in-depth inter-disciplinary discussions in this regard.

How this important step of analysis, sensemaking and visualising the narrative patterns was conducted in the SDI project, in preparation for the next step of *returning the stories* to the original story-tellers, can be viewed in these two short videos: (a) <https://youtu.be/WR4ZxuiAAW8>, and (b) <https://youtu.be/ONAVIzsqGIw>.

¹²⁴ Including new ways of formulating relevant problem statements and research questions pertaining to the co-generation of system, target and transformation knowledge.

¹²⁵ Needless to say, this also provides rich material for inclusion into research reports and peer-reviewed articles etc.

However, it is critically important that this step in the visualisation of narrative patterns is not just seen as a technical exercise *only* in learning how to use the relevant software with which to produce appropriate representations / models of the narrative patterns. This step in the process opens up at least two opportunities / moments for critical reflexive thinking and decision-making that should not be overlooked during all the very interesting technical activities focused on making the narrative patterns as explicit and communicable as possible: The first opportunity / moment deals with language performativity (word power) and more specifically the negotiations involved in finding and agreeing on the most appropriate practical and theoretical concepts and words to be used for co-constructing the signification frameworks of this narrative-based approach – for which, as mentioned, there are no clear-cut rules, other than conducting the process in a spirit of give and take, as it were, always mindful of the complexities involved in finding and using context-sensitive concepts, words and other symbolic representations with which to capture and convey meaningful real-life experiences, perceptions and observations – in short, meaningmaking.

However, during this step it is also very important not assume that the written word / language (in this case graphics-oriented representations) is the only way with which to describe and communicate said lived experiences, perceptions, observations etc. To be sure, the meaning of the narrative patterns (expressed in the above examples in Figures 37 – 41) can be equally successfully, perhaps even better, communicated in other creative and non-textual ways – such as skits, plays, drawings, song and dance, etc. These approaches can certainly involve students / researchers from many of the social sciences as well as the visual and performing arts. This is indeed something that will be explored further in future with Master's and PhD students interested in pursuing this kind of research work.

Secondly, another very important non-technical opportunity opened up this step in the process is what has already been briefly alluded to above as an ethical moment (see [Section 7.2](#) above). The crux of this has to do with fact that the researchers cannot be expected to suggest, or even worse impose, *their* transformative ideas onto the social actors concerned, in terms of *what* and *how* things *should be* changed. The ethical responsibility for taking into account both the *need for* and *direction of* social change remains in the hands of the social actors involved in the research process.

However, this does not absolve the researchers of any ethical responsibilities and decision-making, and it is exactly here where the visualisation of the narrative patterns

comes back into play. By making the contradictions and tensions in the social actors' narratives patterns explicit – also referred to in the literature as foregrounding (Law, 2004) – and then pursuing the meaning and consequences of these contradictions and tensions in the situation in which the social actors find themselves, is, or can be, the start of a process of strategy- and decision-making focused on the nature and direction of the social and institutional changes to be undertaken. On the other hand, if these contradictions and tensions in the narrative patterns are not made explicit – also known as backgrounding (Law, 2004) – and consequently not discussed during the collaborative sensemaking exercises, it follows that such exercises may go in a very different direction or in no direction at all – other than remaining at the level interpretation and understanding (*Verstehen*).

Therefore, in this step, researchers in these kinds of narrative-based ETTDR process will be faced with an ethical moment in the Derridean sense of the word (as already mentioned in [Section 7.2](#) above), namely whether and how to tackle the visualising / foregrounding of the contradictions and tensions in the narrative patterns. As Derrida has pointed out, ethics is not necessarily derived from some universal first principles (à la Kant), but is something which emerges *from* and *within* certain real-life moments or situations filled with seemingly insurmountable contradictions and tensions, with no straightforward answers as to what is right or wrong. When visualising / foregrounding the contradictions and tensions in the narrative patterns, there are simply no guarantees for anyone, researchers included, of knowing in advance (i.e. predict) which directions this process may go.

This does not mean (as already alluded to earlier in [Section 4.5](#) above) falling into the trap of relativism or that anything goes (Feyerabend, 1993), but rather highlights the need for exploring Derrida's ideas and suggestions on the on-going struggle with the ethical messiness of complex situations facing us. One way of responding to this from a methodological perspective is to buttress the social actors' grappling with their own emergent complex situations by providing and enabling real-time feedback in the form of data and information with which to make as informed decisions as possible on the way forward – whether to change tack, or not: stay on course or adjust the current trajectory. In short, this is what is known as real-time vector monitoring and evaluation; this will be briefly discussed further below during an account of the next steps in the narrative-based research process.

However, suffice it to mention here that this is not meant to be a merely technical response / solution to an emerging complex ethical moment. On the contrary, co-producing real-time data and information means grappling with any new / emergent contradictions and tensions facing the social actors, and trying to figure out together with them what are the possible next steps in the direction towards the adjacent possible – without necessarily being able to come up with some clear-cut solutions and answers – ready at hand, and just waiting to be discovered and presented. The reason for this is that there are no short-cuts around the double-hermeneutic (Giddens, 1979a) of always having to *work within* the social actors' *own* sensemaking of *their own* worlds. This, in turn, does not imply accepting the role of interpreters *over* legislators, as suggested by Bauman above, as our only option – especially if this means allowing the messiness of the contradictions and tensions in the narrative patterns of the social actors to be pushed into the background (Law, 2004) in the interests of being satisfied only with the interpretation and understanding (*Verstehen*) of the social actors' own sensemaking efforts.

The role of interpreter is certainly not the only option available in and for the ETTDR methodology. As already pointed out, there is also the option of adopting the role of *facilitator* – starting with the exercise of explicating / foregrounding (Law, 2004) the contradictions and tensions in the social actors' shared narratives, and then deciding to remain involved in any ensuing collaborative sensemaking discussions focused on the possible next steps, enabling the social actors to move *away* from their negative narratives and *towards* their positive stories – i.e. engaging in co-determining their sense of direction (directionality).

By approaching the role of facilitator in this way, and being mindful of stepping into and participating in this emergent situation and ethical moment¹²⁶ in the unfolding research process, researchers in ETTDR processes are not expected to come up with and inject

¹²⁶ As mentioned earlier in [Section 6.2](#) (see footnote 105), this notion of ethical moments has been taken over from Derrida ([Derrida, 2016, 1997, 1978](#)) in the broad sense of the way he has developed this idea, arguing that ethics or ethical decision-making emerges *within* and *during* those contextual moments / situations with seemingly insurmountable tensions and contradictions, with no straightforward (neat and tidy) solutions in sight and that we, therefore, may have to struggle with the messiness of the situation at hand, rather than expecting to find some clear-cut right vs. wrong answers in the ethical choices to be made. In agreement with this broad argument, we can confirm that the latter narrowly focused ethical stance is indeed reductionist version of ethics that simply does not make sense when dealing with non-linear causal dynamics – and the concomitant uncertainties – in the complex domain. *Allowing for emergence by avoiding premature convergence* (as discussed in more detail in [Section 6.2.3](#) above) seems to be a more appropriate guiding principle in this regard, because it does not absolve them from the challenge of ethical decision-making; it only cautions us against the risk of coming up with clear-cut solutions too quickly.

their own ideas and suggestions on the nature and direction of the change to be embarked upon. The role of facilitator / facilitation is rather that of enabling / nudging decision-making in a certain direction, and this may very well mean from time to time having to point out possible consequences of certain transformative actions under discussion or serious consideration. However, key in all of this is to remember that when we are dealing with *unknown unknowns* in the complex domain (as discussed in some more detail in [Section 4.4](#) above), there will always be certain things / aspects that fall outside our anticipatory horizon(s). These things include the researchers' own highlighting of some possible consequences not taken into consideration by the social actors concerned. Yet even these well-facilitated interventions are always subject to non-linear causal dynamics in the complex domain and, should, therefore, be done mindful of the inherent uncertainties / unpredictabilities of the complex situation at hand.

Needless to say that the role of facilitator / facilitation in the complex domain is in and of itself a tricky undertaking and is certainly not proposed as an easy way out of the messiness of complex problem situations. On the contrary, it is proposed as only one way of dealing / struggling with such situations – even if it means never being able to come up with final, clear-cut solutions, but rather having to face the consequences of unresolved situations and yet not giving up on struggling with the messiness of the situation at hand.

However, going any further / deeper into the intricacies involved in all of these falls outside the scope of this study. Therefore, suffice it to mention here that these challenges emerging from the ethical moments opened up by and during this step in narrative-based ETTDR processes will be the focus of another important area for future research. In short, of broad interest here is a better understanding of the relationship between ethics and epistemology, and, more specifically, how this relationship is approached and navigated by various researchers in the different ways they may respond to what has been framed above as an 'ethical moment' opened up by this step in the research process.

It is certainly not reasonable to expect that all, or even most, researchers pursuing the ETTDR approach in future will respond to this step in the narrative research process in the same way. In this regard, some researchers may very well, consciously and mindfully, want to adopt the role of facilitator and, consequently, become increasingly engaged in facilitating some of the transformative social actor decision-making

processes as part of the collaborative sensemaking discussions explicitly focused on dealing with the contradictions and tensions in their narratives. Other researchers may prefer the more hermeneutic role of interpreters and not get involved in any such transformative discussions and decision-making exercises. Still others may not see anything like this ethical moment emerging and presenting itself in this step of the process and, consequently, respond to this step in the process in very different ways – not necessarily possible to imagine and describe at this point.

Be that as it may, what will indeed be of great interest in all of this is not only to compare these different responses per se, but to do so in an attempt to find out what, if any, the epistemological effects of these different responses might be – in other words, better understanding the connections between different ethical choices and knowledge production, not only in terms of choosing which of the three different types of knowledge to be tackled – systems, target or transformation knowledge – but also in terms of the different epistemological strategies designed and used for *intentionally* co/producing these different kinds of knowledge (as briefly introduced and discussed in [Section 4.4](#) above). However, a key part in undertaking the systematic theoretical work needed in this regard would be to include the question of the role that performative language (word power) plays in our epistemological endeavours of (intentionally) translating our basic phenomenological experiences, perceptions and observations of a particular situation into different types of knowledge (as introduced and discussed in [Section 6.3.5](#) above). In other words, the assumption here is that the broad relationship between ethics and epistemology can be better understood by keeping a focus on the performative-constitutive role and effect of language in all of this by acknowledging and working with the effects produced by *both* written *and* spoken performative language¹²⁷ (word power) during the process of (intentional) knowledge production; this applies in general as well as more specifically when producing the abovementioned three different kinds of knowledge: system, target and transformation knowledge respectively.

¹²⁷ It is important for our purposes of working with BOTH the written AND spoken forms of language in ETTDR processes to reaffirm that the full performativity of language (word power) can best be understood on the basis of **including** both language forms – rather than setting them up against each other in some or other EITHER / OR binary structure and then having to choose between one over the other – as e.g. happened during some of the fierce exchanges between Derrida vs. Searle (Derrida, 1988) and Derrida vs. Gadamer (Michelfelder and Palmer, 1989) – locking themselves into mutually exclusive positions *for* and *against* intentional speech acts (Searle) and *face-to-face hermeneutic dialogue* (Gadamer) vs. *written texts* (Derrida).

- *Phase III, Steps 11 – 12: Returning stories to story-tellers for collective sense-making (11); Discuss and develop social change strategies (12)*

As mentioned, the strategic purpose of returning the collected and visualised stories to the individual story-tellers is to use this as a point of departure for initiating some transformative discussions on the kind of social and institutional changes considered important and plausible *by* and *for* the community of story-tellers, and within *their* immediate context. This is done, firstly, by reading together some of the individual stories *with* the individual concerned (illustrated in Figure 42 below) and, then, secondly, looking together at finding some emerging patterns (that were generated in the previous step 10 of the process (illustrated in Figure 43 below). In both these exercises it is very important to look at two aspects: (a) both positive and negative stories (especially conflicting stories), and (b) any outlier stories (i.e. ones that do not fit the emerging patterns) – and then to discuss what these conflicting and outlier stories actually mean for the current well-being / health / sustainability¹²⁸ of the community of story-tellers.



Figure 42: Human Sensemaking¹²⁹

Source: Deprez, 2005

¹²⁸ There are no hard and fast rules which of these terms should be used during these transformative discussions. The appropriateness of what is meant by these concepts will emerge during the discussions. In fact, it is an advantage that they are broad normative concepts that are not clearly defined, and can only be figured out contextually and dialogically by the participants involved in narrative-based ETTDR processes.

¹²⁹ Here reading, analysing and discussing individual stories with the original story-tellers.

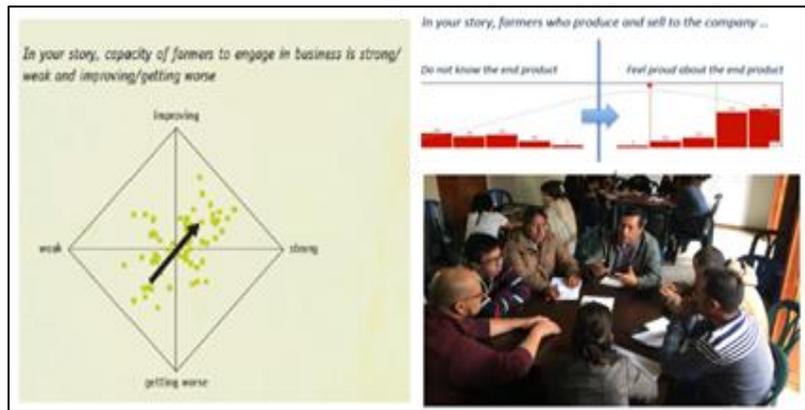


Figure 43: Actionable Insights¹³⁰

Source: Deprez, 2005

These pictures have been included here for illustrative purposes: i.e. to demonstrate the important opportunities created by this step in the process of specifically co-producing transformation knowledge with the individual social actors (story-tellers) concerned. In fact, it is entirely possible that, depending on the context, the individuals involved have never actually worked together on some or other projects in the past, and that this may very well be the first time that they actually assemble *around* this *sensemaking* exercise – i.e. understanding the meaning of the emerging patterns in their *own* shared narratives.

Mindful / skilful facilitation (as suggested in step 10 immediately above) of this step in the process of collective sensemaking with the original narrators is key, with a strategic eye and focus on using the right opportunities for allowing the important transformative question to surface and be discussed, namely what social and institutional changes need to be undertaken *in* and *by* the community of story-tellers? Critical in this is to allow for emergence and avoid premature convergence (discussed in more detail in [Section 6.2.3](#) above) by focusing on the question of what can be done practically (what are the next steps) to encourage *more* of the positive stories and *fewer* of the negative stories – refraining from coming up with any top-down suggestions by the researchers involved.

As mentioned, when dealing with non-linearity in complex problem situations, there can be no straightforward answers to this seemingly simple question. However, what can be expected is that this question, no matter how simple it might be, will almost certainly elicit some very divergent and radically opposing viewpoints and positions

¹³⁰ Here discussing in small groups how to act upon the insights and understandings gleaned from the emerging narrative patterns.

articulated *around* conflicting needs, interests, values, expectations etc. This adds to the complexity of the problem situation at hand – complexity which needs to be absorbed and worked with, rather than reduced or excluded from ETTDR processes (as discussed in more detail in [Section 6.2.4](#) above).

This indeed opens up some important opportunities for skilful facilitation by the researchers involved in ETTDR processes – laying the foundation for generating and gaining some new understandings and insights into the real challenges involved in bringing about intentional social and institutional change in complex problem situations – even at a micro scale – and, as such, produces more rich material to be used by the researchers for inclusion in their own academic work, re-working their epistemic objects and writing up research reports, peer reviewed articles, theses etc..

As mentioned (in step 10 above) the role of skilful facilitation is absolutely critical in ETTDR processes and is therefore considered worthy of becoming another important area for future research in order to deepen and further develop the ETTDR methodology. Of particular interest here, for example, is the question of *how to facilitate* the collaborative sensemaking discussions and decision-making of the returned stories in a way that will enable social actors to imagine both innovative and practical ideas and insights on the next possible steps in the direction of the adjacent possible (Unger, 2007a, 2004a; West, 1986).

A possible model for the kind of facilitation needed here, it is proposed, should be based on the abovementioned two key principles of *empathetic sensemaking* and *critical (non-judgemental) mindful engagement*, and driven by an iterative divergence–emergence–convergence logic – that can be illustrated as follows:

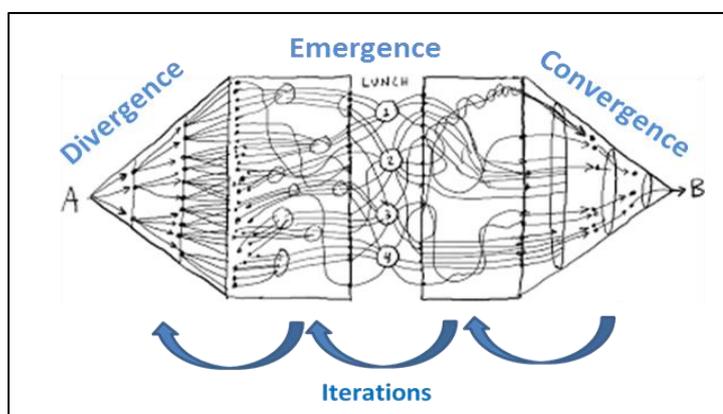


Figure 44: Ideal-Typical Facilitation Process¹³¹

¹³¹ Allowing for both divergence, emergence and convergence.

Source: *By Author 2019*

Very importantly, though, is that the learning assumptions underlying this model suggest that the facilitation skills needed for actual doing / performing this of kind of facilitation in ETTDR processes is something that can certainly be learnt and shared with others – both in actual real-life engagements with social actors, as well as in classroom situations, using relevant training techniques such as case studies, role plays etc. If this assumption is indeed correct, then it follows that the actual *in situ* learning experiences of researchers acquired in this field of work will be significantly drawn upon and used for further developing the necessary facilitation skills and capabilities, which will then be targeted at and offered to any new students expressing an interest in pursuing the ETTDR methodology for their own research work.

- *Phase IV, Steps 13 – 15: Implement multiple small safe-to-fail social change experiments (13); Amplify what works, dampen what does not work (14); On-going / real-time vector-based monitoring & evaluation (15)*

Based on the discussions and decision-making during the previous two steps (11 and 12) regarding the plausibility and kind of social and institutional changes needed, the strategic aim with the next steps (13 – 15) in the fourth and final¹³² phase of this narrative-based research process is two-fold, namely: (a) to actually implement some concrete small safe-to-fail social experiments, and (b) to initiate some real-time monitoring and evaluation of the actual directions of change embarked upon. This is also known as vector monitoring and evaluation (VME). Since it is very difficult, if not impossible, to monitor dynamic, emerging changes against clear-cut pre-defined (quantitative) criteria / benchmarks, VME can indeed be a very useful approach in this regard – i.e. providing real-time data- and information-driven feedback to the community of story-tellers on the actual direction(s) in which the changes embarked upon are moving – thereby providing a basis for on-going decision-making on whether to change tack or stay on course. In theory, VME should then be able to deal with any un/intended consequences as well.

However, the abovementioned steps in phase IV of this narrative-based process and have not been reached or implemented as yet in the collaboration with SDI group. This

¹³² Bearing in mind that in practice these are mostly iterative processes, meaning that some of the steps mentioned here will feed back into some of the previous phases of the process, thereby injecting new ideas, practices and strategies for consideration and implementation. A good example in this regard would be the feeding back of the data, information and ideas generated by the activities involved in real-time vector monitoring and evaluation in this phase.

is very much work-in-progress and should come to fruition towards the latter part of 2019. Therefore, in lieu of presenting any real-life experiences in this regard, the three small-scale safe-to-fail social change projects implemented in the Enkanini project (in Figures 45 to 47 below) are cited here again as good examples of the kind of context-relevant projects that can indeed emerge from some collaborative sensemaking exercises during this phase in a narrative-based ETTDR process:



Figure 45: The iShack Energy Project

Source: Wessels, 2015



Figure 46: The Bokashi Solid-Waste Project

Source: Wessels, 2015



Figure 47: The Gravity-Fed Sanitation Project

Source: Wessels, 2015

As already mentioned in [Section 3.5](#) above, what these three small-scale projects have in common is that they are *socio-technical innovations* in that these projects were not only about the different kinds of sustainable and renewable technologies used for their construction, but also, very importantly, included the social and institutional arrangements needed to ensure their on-going and regular paid-for maintenance.

Although the technical aspects in all three these projects presented their own unique challenges, it is fair to say that it was the negotiations focused on the social and institutional arrangements needed for the maintenance and payment systems in these projects that proved to be particularly tricky and challenging. This was not only because *within* the Enkanini community there was a lack of shared experiences of working together in and on collaborative projects such as these, but also because there were no practical precedents / examples of something like this in the country or even the African continent that could be drawn on and used in the Enkanini case. Every aspect, including the detailed social and institutional arrangements needed for the upkeep and payment of the systems in the three projects, had to be painstakingly discussed and negotiated with the individual shack-dwellers concerned – under the skilful facilitation of the researchers in these projects. To paraphrase the words of Sennett, the meticulous craftsmanship that had gone into establishing the rituals, pleasures and politics of *working together* (Sennett, 2012) in and on these socio-technical innovations, were as intricate, if not more so, than their physical and technical construction.

However, another fundamental feature is the transformative learning (see [Section 6.2.5](#) above) that takes place in this kind of collaborative work – generating new streams of experiences, perceptions, insights, understandings etc. In other words, the these streams of experiences and perceptions provided some fresh, new phenomenological raw material, as it were, for working on micro narratives in yet another iterative cycle of the narrative-based research process of designing, collecting, analysing and sensemaking, implementing etc. enabling both social actors and researchers to draw on and use this material for their own social and academic purposes and communities (described in more detail in [Section 7.5](#) above). For example, for the social actors in the Enkanini case (as already mentioned in [Section 3.5](#) above) this meant turning the iShack project into a new entrepreneurial and job-creating opportunity, and for the researchers in the same project it meant re-working their problem statements and research questions (epistemic objects) for their research

reports / theses and, subsequently, receiving their various postgraduate qualifications. In other research projects this (new cycle in the research process) may very well also entail experimenting with some different and new ways / methods of co-producing system, target and transformation knowledge – facing the real challenge of no longer working on exactly the same situation as the one encountered at the start of the research project, but on a changed and changing situation. This aspect is especially important for when new researchers join the on-going research process¹³³.

There are indeed a number of key areas for future research and on-going development of the ETTDR methodology emerging from some of the ideas raised above as part of the fourth and final phase of narrative-based ETTDR processes. The first is the question of how to turn the transformative ideas and suggestions developed during the collaborative sensemaking exercises in the previous phase into actual workable small-scale social-change initiatives – such as the three socio-technical innovations referred to above. However, this is not just about developing some general project management skills necessary for turning ideas into reality, but more specifically how to do this in the context of the complex domain with its uncertainties and unpredictabilities produced by non-linear causal dynamics (discussed in more detail in [Section 4.4](#) above). In other words, the issue is something more along the lines of complex project management, or managing projects embedded in complex systems – allowing for and working with emergence (as explained in [Section 6.2.3](#) above).

Secondly, and very closely linked to this, is the twin challenge of (a) how to actually conduct real-time monitoring and evaluation, and (b) how to manage the effects of this in terms of the decision- and strategy-making (Mintzberg, 2007; Mintzberg et al., 2013, 2003, 1974) needed to either change direction or remain on course (i.e. the current trajectory of social and institutional change embarked upon). Part and parcel of this could be developing what has been referred to in the literature as ‘anticipatory awareness’ (Klein et al., 2011; Poli, 2017, 2010a, 2010b); this, in turn, may involve the knowledge and skills of knowing when and how to use of relevant agent-based modelling techniques¹³⁴ which, very importantly, must make it possible to work with practical knowledge (including their experiences, perceptions and observations) of the

¹³³ In the Enkanini case, for example, this meant that the research project was seen as involving a medium- to longer-term commitment (at least a 20-year-long project), whilst individual researchers enter and exit the latter as and when their own individual research work commences and comes to fruition.

¹³⁴ Such as system dynamics modelling (Maani and Cavana, 2007), mediated modelling (Belt, 2004), agent-based modelling (Gilbert, 2008), group modelling (Andersen et al., 2007; Maani, 2000; Voinov and Bousquet, 2010) etc.

same social actors already involved in all of the abovementioned phases and steps of the narrative-based research process (especially those involved in the collaborative sensemaking exercises mentioned immediately above). In other words, the model building should also be part of a process of co-construction and co-creation and not be restricted to the experts in the field (specialisation) of modelling techniques *only*. This is indeed a very exciting and new field of research / study – something that would be ideally suited for taking further with Master's and PhD students / researchers¹³⁵ who would also have a key role to play in the facilitation of this kind of research work in future.

7.7 Future Research Areas: Summary

All of the abovementioned areas have been cited as offering opportunities for future research from the perspective of becoming more methodologically agile when engaging in ETTDR processes – i.e. developing better insights into what is involved in switching both *between* and *within* the domain-relevant methodologies of mono-, multi-, inter- and trans-disciplinarity. As mentioned, the need for methodological agility not restricted to inter-methodological agility, but certainly is as important and relevant for intra-methodological switches – which in the context of the complex domain means having to decide and perform methodological changes when confronted with the specificities of particular complex problem situations. Indeed, the need for switching *between* these different methodologies may very well arise *within* a particular research project – as we have seen, for example, in the Enkanini case (see [Section 3.5](#) above) where the need for switching back and forth *between* mono-, inter- and trans-disciplinarity occurred at different times and occasions *during* the unfolding research project – especially as the focus shifted from the co-design and construction of, for example, the iShack to engaging with individual shack-dwellers to co-designing the social and institutional arrangements necessary for paying and maintaining the expanding iShack system.

However, at the methods or methodical level, it must be stressed again that a *sine qua non* for switching to ETTDR in the complex domain is using the appropriate methods enabling researchers to work *with* human experiences and perceptions. In ETTDR processes, the understanding of what happens at the phenomenological level of human experiences and perceptions is not an end in itself, but is simply essential for grasping the complexity of complex problem situations and, hopefully, for co-

¹³⁵ This may not necessarily be limited only to researchers / students using the ETTDR methodology, but anyone interested in developing the knowledge and skills of doing real-time monitoring and evaluation, and how to apply this in real-life case studies / projects embedded in complex situations.

generating some sustainable solutions. In short, as said several times already, there are simply no short-cuts around the challenge of working with/in the double-hermeneutic (Giddens, 1979a) of human experiences, perceptions and observations – and, this applies particularly strongly to real-life problem situations in the complex domain.

Arguably the worst approaches to follow in the complex domain are those pursuing research strategies and methods expressly designed and used for *excluding* the phenomenological dimension from the research process – as in the examples of the positivist, rationalist and empiricist movements in the history and philosophy of science. The objective of such exclusionary strategies is always to try and safeguard the research process from any ‘undesirable’ human / phenomenological influences, and in so doing, end up creating an inversely proportional relationship between increasing the certainty of our knowledge, on the one hand, and reducing the complexity of the problem situation at hand, on the other hand. Efforts to abolish all phenomenological influences from the research process may indeed work when facing challenges in the simple / obvious and complicated domains, but they are certainly not desirable or even possible when facing complex / emergent problem situations with their high levels of uncertainty and unpredictability. As pointed out above, if social actors’ many different and differing experiences, perceptions and observations are acknowledged as part and parcel of the complexity of complex problem situations – and not just some or other external / additional factors – then it follows that pursuing inclusive research strategies and methods allowing for deep engagement with social actors’ lived experiences at the phenomenological is absolutely critical for ETTDR processes.

Be that as it may, it is quite clear from all the ideas and suggestions specifically mentioned above for further developing the ETTDR approach in future that this is indeed a task that would best be tackled in a bottom-up, grounded theory-building manner (Bryant and Charmaz, 2010; Charmaz, 2014, 2006; Glaser, 2017; Strauss and Corbin, 1997). In other words, it should be done by adopting a two-way, bottom-up as well as top-down, theory-building strategy of tackling these questions and suggestions in iterative and mutually constitutive processes – certainly something which cannot be undertaken by theory *alone*. This is indeed the challenge that will be responded to in collaboration with colleagues across the world as well as with many Master’s and PhD researchers.

CHAPTER 8: CONCLUSION

8.1 Introduction: The Limits to Transdisciplinary Research & Experimentation

There are three major criticisms that need to be acknowledged and addressed in some way: (a) what Jacobs (2014) calls the “anti-disciplinarity” of those who favour inter- or trans-disciplinary approaches; (b) the dangers of real-world experimentation in the light of the precautionary principle; and, (c) the muzzling of the critical role of science as the bearer of truth to power.

Of the three criticisms, Jacobs’s (2014) critique of anti-disciplinarity is of particular concern for our purposes. Although he focuses more specifically on those inter-disciplinarians who favour inter-disciplinary research and tend to undervalue mono-disciplinary research, the same critique can easily be levelled against those trans-disciplinarians who tend to present trans-disciplinarity as a panacea for ALL societal problems today. Jacobs contends that the inter-disciplinarians have significantly over-stated the ‘silo-isation’ of disciplines, and largely ignored the non-institutionalised way in which disciplinary researchers actually collaborate in practice. Inter-disciplinarians adopt this strategy to justify the massive increase in funding for the institutionalisation of interdisciplinary research.

However, there might be a paradoxical situation of interdisciplinary specialisation expressed in the rise of a new generation of interdisciplinary institutions with specialist research agendas (Jacobs, 2014). Instead of institutionalising interdisciplinarity, the disciplines should be reinforced and collaboration between disciplines incentivised. Jacobs (2014) argues that the institutionalisation of interdisciplinarity will result in the replication of the same problem that is seemingly being solved, i.e. excessive specialisation and competition between increasingly large specialised interdisciplinary programmes. But it should be pointed that Jacobs’s (2014) very broad argument focuses on interdisciplinary research in North American contexts, and not on collaborations *with* society, which is what transdisciplinary research emphasises. Yet there cannot be inter- or trans-disciplinary research *without* strong basic disciplines. In the Enkanini case, researchers from different disciplines (e.g. architecture, engineering, ecological design, economics, finance and anthropology etc.) were intimately involved in the co-design and construction of the three small-scale socio-technical experiments and found a way to collaborate based on mutual respect and a shared research methodology.

Another way of responding to Jacobs's (2014) valid argument(s) is at a more conceptual level by referring back to the central proposition developed in this study, namely the need for developing the necessary capabilities for **methodological agility** – namely methodological adeptness to be able to switch both *between* and *within* the four equally domain-relevant methodologies (as illustrated again in Figure 48 below). As mentioned, this means that no one of said methodologies has some or other a priori theoretical superiority over any of the others, and that any decisions made in respect of their appropriateness is a matter of context / domain dependency. In other words, any arguments levelled against using mono-disciplinary approaches *only* when facing complex challenges in the context of the complex domain is valid in the sense of being inappropriate and by no means suggests that all forms of mono-disciplinarity are somehow 'wrong' and should be discarded and replaced with inter- and/or trans-disciplinarity. On the contrary, as mentioned, mono-disciplinarity is entirely appropriate for working on problem situations that are certain and predictable in the obvious / simple domain.

This critique of mono-disciplinarity, therefore, pertains only to the complex domain, and certainly applies in the same measure against trans-disciplinarity not necessarily being the most appropriate approach for the simple / obvious and complicated domains respectively; and none of these considerations in favour of working with domain-relevant approaches should be confused with any kind of 'anti-disciplinary' sentiments whatsoever. Equally, the arguments mounted in this study emphasising the fundamental differences between the different methodologies in terms of the internal logics, principles, practices, methods etc. driving and guiding them should also not be mistaken for any 'anti-disciplinary' stance.

Therefore, none of the attempts in this study to develop some guiding logics, principles, practices and methods for the ETTDR approach should be construed as deploying some subversive tactical moves, tacitly or explicitly, aimed at undermining any of the other equally domain-relevant methodologies. On the contrary, as mentioned, the work undertaken in this study has been done in order to promote the notion of **methodological agility**, which entails flexibility and complementarity: working side-by-side with the other domain-relevant methodological approaches. To be sure, approaching and participating in collaborative *science-with-society* processes with any hidden or explicit 'anti-disciplinary' ideas in mind can only turn out to be counter-productive, because instead of spending time and energy on figuring out how to tackle the complex challenges being faced, they will be spent and wasted on efforts trying to establish trans-disciplinarity at the cost of the other equally valid domain-relevant methodological approaches.

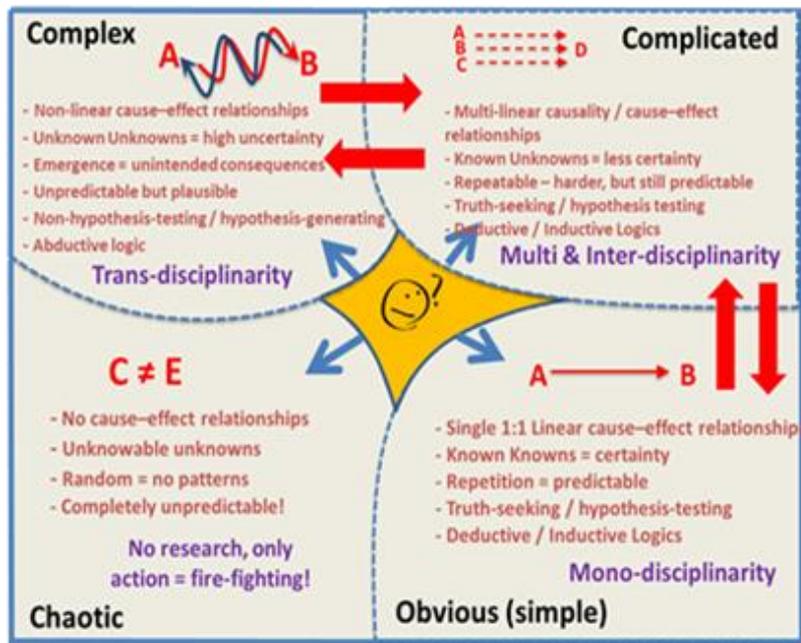


Figure 48: Methodological Agility¹³⁶

Source: By Author 2019

In fact, the notion of equally valid domain-relevant methodologies is what creates the need for methodological agility. And, what this means more specifically for ETTDR methodology in the complex domain is that it opens up exciting opportunities for further developing the ETTDR approach in future – at both the theoretical and practical levels. In this regard, a starting point was made with the areas mentioned in [Chapter 7](#) above. More such opportunities can be created for researchers to develop the ETTDR approach in a methodologically agile way by allowing them to construct and rework their own multi-ontology decision-making frameworks during their own research processes. In other words, rather than presenting the Cynefin framework (introduced and discussed in [Chapter 4](#) above) as an already ‘given’ entity, just ready to be applied ‘as is’ (see again Figure 48 above), researchers will be given the challenge of figuring out for themselves what kinds of real-world problems they are tackling in their own individual research work.

Using the core concepts and principles of the Cynefin framework, the challenge for researchers will be to contextualise their research work within any one of the four domains, *before, during* and *after* or *on* completion of their individual research journeys – and to provide some good reasoning for their decision-making in terms of any changes made in this regard.

¹³⁶ As mentioned throughout this study, this means switching between domain-relevant methodologies.

Opportunities for some facilitated discussions¹³⁷ between individual researchers and their co/supervisors and/or in small group sessions / research team meetings can be purposefully set up and conducted during any of four phases of a typical ETTDR process (introduced and discussed in some more detail in [Section 7.6](#) above).

An advantage of starting with this type of discussion and decision-making at the outset of the design & preparation phase is that it provides researchers with a starting point from which to launch and navigate their individual research projects. After that, however, more opportunities for critically engaging with developments and changes in their individual research processes through their own, self-constructed multi-ontology decision-making frameworks will become available, for example, during steps 10 – 11 and 13 – 15 of the research process dealing with the analysis and sensemaking (Phase III) and returning of the stories (Phase IV) respectively (discussed in more detail in [Section 7.6](#) above). Any changes in the understanding of the emerging issues being worked on may very well prompt the need for making any methodological changes / switches during any of the abovementioned steps.

A start has already been made in this regard, affording researchers some learning opportunities in how to go about (co)constructing their own multi-ontology decision-making frameworks. Figures 49 – 55 below show some of the important steps in this regard with a group of PhDs from the Copperbelt University (Zambia) mid-way through their individual research projects.

¹³⁷ These discussions could be between the individual researchers and their co/supervisors and/or in small group sessions / research team meetings facilitated by co/supervisors – in other words, small group or team supervisory meetings.



Figure 49: Step 1: Co-constructing Context-relevant Decision-making Frameworks¹³⁸
Source: By Author 2019



Figure 50: Step 1: Individual / Small-Group Work¹³⁹
Source: By Author 2019

¹³⁸ In Step 1: researchers are requested to place the real-world issues they have encountered in their practical research experiences in the four different corners of the conjoined flipchart paper. The bottom-right hand corner resembles issues for which there are clear-cut / well-established single disciplinary theories, hypotheses and methods which only require correct application. The top-right hand corner signifies areas where there is less clarity – i.e. issues with competing theories and hypotheses – but which can ultimately be sorted out by bringing together disciplinary experts to collaborate in multi- and inter-disciplinary ways. The top-left hand corner resembles complex issues for which there are no well-established theories and hypotheses as yet, warranting exploratory / probing kind of research, including the need for working with social actors' lived experiences and practical knowledge of the problem situation at hand. The bottom-left corner denotes areas where things seemingly happen purely randomly and, therefore, are un-researchable.

¹³⁹ Researchers can choose to work individually or in small groups throughout the interactive process – here they are seen to work in pairs of two.



Figure 51: Step 2: Co-constructing Context-relevant Decision-making Frameworks¹⁴⁰
Source: By Author 2019



Figure 52: Step 2: Completion¹⁴¹
Source: By Author 2019

¹⁴⁰ Step 2: Course facilitator introduces ropes / strings with which to create some flexible boundaries.

¹⁴¹ Step 2: An example of the completion of Step 2 – signifying flexible boundaries around the re-organisation of previously randomly placed issues (in Step 1).



Figure 53: Step 3: Theoretical Inputs¹⁴²
Source: By Author 2019



Figure 54: Step 4: Making Changes¹⁴³
Source: By Author 2019

¹⁴² Step 3: Course facilitator explains theory behind the exercise of co-constructing their decision-making frameworks with a hand-drawn version of the Cynefin multi-ontology framework.

¹⁴³ Step 4: Researchers are given an opportunity to bring about any changes to their own self-constructed frameworks in light of the explanation of the Cynefin framework in the previous Step 3 of the process.



Figure 55: Step 5: Presenting Own Decision-making Frameworks¹⁴⁴

Source: By Author 2019

Any new insights and understandings gained by researchers into their own research projects by using their own multi-ontology decision-making frameworks can certainly be extended to their interactions and engagements with the social actors participating in their research projects. In other words, researchers can use similar exercises to these in order (a) to develop a better understanding amongst the social actors of the contextual challenges they are facing, (b) to build on this by developing some innovative ideas and suggestions on some domain-relevant social and institutional changes, and (c) to identify some opportunities for creating real-time feedback loops in and for the social change process by, for example, introducing vector monitoring and evaluation of the directions in which the social and institutional changes are actually going / moving – thereby, ensuring that new ideas and actions created by the research process flow back into the social change process.

Any on-going interactions between researchers and social actors like these can occur during planned training workshops, for example, or spontaneously in one-on-one exchanges with individuals during field excursions – at many different times, occasions, locations and settings. There are no hard and fast rules for determining exactly *how*, *what* and *when* these mutual learning sessions should be structured and conducted. They are indeed context-dependent and are, therefore, part and parcel of researchers' reading / interpretation of the emerging situation and strategic sense of when the most opportune occasion would be to introduce and facilitate any of the abovementioned discussions / interactions with the social actors involved. In so doing, by involving themselves in these kinds of mutual learning activities and interactions with the social actors, researchers are in effect creating more opportunities for

¹⁴⁴ Step 5: Researchers present the outcomes of the exercise based on their own practical research experiences in and knowledge of the field.

gaining more in-depth insights into and understanding of the research process and how it can contribute to some social and institutional changes in the problem situation at hand – thereby, generating and bringing new perspectives and insights *into* the research process in a way that certainly cannot come from consulting the available literature only.

In conclusion, none of the above ideas for further developing the ETTDR methodology will be worth pursuing from a so-called ‘anti-disciplinary’ point of view. On the contrary, as we have seen in the Enkanini case, methodological agility is something that is required at all levels, particularly at the more micro or project level as well – in other words, working *with* mono-, inter-, and trans-disciplinary approaches during different phases and steps of the research process and, hence, the need for developing the capabilities of switching *between* these different domain-relevant methodologies as and when required during the unfolding research project.

To be sure, being ideologically wedded to just *one* approach at the cost of other approaches – i.e. reductionism – is arguably the worst possible position that can be adopted, requiring very little knowledge and skills development – other than dabbling in some or other repetitive / rhetorical argumentation *for* and *against* anti-disciplinarity – thereby, limiting / obstructing our understanding of the methodological implications and challenges facing us when dealing with the multi-dimensional ontology of fundamentally different kinds of problem situations in the Anthropocene today – including, inter alia, simple / obvious, complicated, complex and chaotic problem situations. This, as we have seen, requires the knowledge and skills necessary for doing ETTDR in a methodologically agile manner, a facility which cannot simply be assumed to be somehow present and just ready to be used whenever there is a need to switch *between* the different domain-relevant methodologies, or, more specifically, for doing context-sensitive research *within* the context of the complex domain. On the contrary, this kind of agility is something which needs to be mindfully developed, both in theory and practice.

This is indeed the central proposition and intellectual project emerging from this study. Yet this is not a task which can simply be reduced to an understanding of the appropriate methods to be applied as needed in the obvious / simple, complicated, complex and chaotic domains. On the contrary, there are in fact many different aspects involved in developing the capabilities for doing ETTDR in a methodologically agile manner, including, inter alia, the understanding of the role of some meta-theoretical assumptions *affecting* and *being affected* by the ETTDR approach, as well as the guiding logics, principles and senses necessary for navigating ETTDR processes. The task at hand of further developing the ETTDR approach in a methodologically agile manner is therefore easier said than done. Still, such further work is

needed and I feel greatly encouraged by this worthwhile challenge to continue pursuing my research in these areas (as mentioned in [Chapter 7](#)).

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ANNEXURE A

Some Perspectives on the Anthropocene

“There is only a perspective seeing, only a perspective ‘knowing’; and the more affects we allow to speak about one thing, the more eyes, different eyes, we can use to observe one thing, the more complete will our ‘concept’ of this thing, our ‘objectivity’, be.” (Nietzsche, 1897).

The core of Nietzsche’s ideas on perspectivism is premised on the principle of *more is better*, i.e. the possibility of arriving at a complete or objective concept / understanding of something can be achieved by coming up with multiple views or perspectives of the same thing. However, he is not too clear about whether this implies some or other mutual understanding or, alternatively, what the role of conflicting perspectives in this might be. Still, what does seem important for arriving at a complete or objective concept / understanding of something is the willingness and ability to see things from the perspective of the other. This is because we literally see things *from* and *with* a particular perspective. Our eyes are located at a particular point in time¹⁴⁵ and space, *from which* some things are visible and others are not; this is either a fundamental prerequisite or outcome that invites us to come up with as many as possible *views* or *perspectives* of the same thing or object. For example, a table will look very different if viewed or perceived from the top vs. from beneath: both are equally valid points of view and therefore both perspectives are needed in order to come up with a more complete / objective view of the table.

The above example of a looking at a physical object like a table is, needless to say, quite a straightforward exercise that works well for illustrative purposes. However, things get a lot trickier when looking at *complex problem situations* with non-linear causal dynamics and emergent systemic properties – with the prospect of developing a complete / objective concept or understanding looking a lot more uncertain. The Anthropocene – the new human-induced planetary epoch – serves as a good example of such a complex problem situation that makes it very difficult, if not impossible, to come up with a complete / objective perspective on it. Therefore, the intention in presenting some key perspectives on the Anthropocene is certainly not to suggest or provide some or other foundation from which to launch such a perspectivist undertaking. This is simply not possible at this point in time, because the Anthropocene is in and of itself an emerging concept – the different perspectives / viewpoints on it are just too diverse to suggest that there is something like a shared / complete / objective viewpoint currently emerging. Instead, the intention is to list just a few key *disciplinary perspectives* on the Anthropocene – specifically for the purposes of developing a new transformative transdisciplinary research (TTDR) methodology, capable of working both *across* and *beyond* disciplinary and non-disciplinary boundary perspectives on the causes and effects of the Anthropocene in search of some durable, sustainable solutions.

What follows below is a purely random selection (in alphabetical order by surname) of disciplinary perspectives on the Anthropocene, with no particular hierarchy or order of importance implied in this whatsoever:

¹⁴⁵ Although Nietzsche’s ideas on perspectivism are not too explicit on the role of *time* as such but focus more on space, they are still included here to allow for Einstein’s important ideas on time – in so doing, giving an even broader / deeper perspective on perspectivism. To this end, one should also introduce the notion of motion / speed of the perceiver / viewer, but for the sake of brevity this will not be discussed here.

“For the past three centuries, the effects of humans on the global environment have escalated. Because of these anthropogenic emissions of carbon dioxide, global climate may depart significantly from natural behaviour for many millennia to come. It seems appropriate to assign the term ‘Anthropocene’ to the present, in many ways human-dominated, geological epoch, supplementing the Holocene — the warm period of the past 10–12 millennia. The Anthropocene could be said to have started in the late eighteenth century, when analyses of air trapped in polar ice showed the beginning of growing global concentrations of carbon dioxide and methane” (Crutzen et. al, 2002).

Comment: Crutzen et al. were the first to introduce the notion of the Anthropocene in 2002, announcing the fundamentally important anthropogenic (human-made) cause and effects of this new geological epoch. In essence, they posited a bio-chemistry perspective, very similar to that of James Lovelock in his book *Practical Medicine for Gaia* (Lovelock and Lovelock, 1991) by focusing on and explaining how Earth’s self-regulating temperature system has been adversely affected by the ‘unnatural’ (i.e. human-induced) amounts of CO₂ and CH₄ levels in the Earth’s atmosphere (since the inception of the Industrial Revolution in the 18th century).

“Unless there is a global catastrophe — a meteorite impact, a world war or a pandemic — mankind will remain a major environmental force for many millennia. A daunting task lies ahead for scientists and engineers to guide society towards environmentally sustainable management during the era of the Anthropocene. This will require appropriate human behaviour at all scales, and may well involve internationally accepted, large-scale geo-engineering projects, for instance to ‘optimize’ climate. At this stage, however, we are still largely treading on terra incognita.” (Crutzen et. al, 2002).

Comment: From the abovementioned bio-chemistry perspective, Crutzen et. al suggest that the planetary-scale challenges in the Anthropocene should be addressed in the form of large-scale geo-engineering interventions (projects), without specifying exactly what these could be in practice. Whatever form and shape these might take in reality, such techno-scientific ideas are premised on the central notion of doing SCIENCE FOR SOCIETY – which is, indeed, the direct opposite of the idea of DOING SCIENCE WITH SOCIETY that will be developed in this study, promoting the theory and practice of working with different societal interest groups, formal as well as informal, in order to come up with integrated sustainable solutions at all levels of society.

“We explore the development of the Anthropocene, the current epoch in which humans and our societies have become a global geophysical force. The Anthropocene began around 1800 with the onset of industrialization, the central feature of which was the enormous expansion in the use of fossil fuels” (Steffen et al., 2007).

Comment: This geological perspective frames the Anthropocene in two important ways: (a) the planetary scale at which the societal has become the equivalent of global geophysical forces (like tectonic plate movements) and (b) dating the ushering in of the Anthropocene around 1800 at the start of the Industrial Revolution.

“The Anthropocene ... the slice of Earth’s history during which people have become a major geological force. Through mining activities alone, humans move more sediment than all the world’s rivers combined. Homo sapiens has also warmed the planet, raised sea levels, eroded the ozone layer and acidified the oceans ... the Anthropocene is an order of magnitude more complicated than the stratigraphy” (Monasterksy, 2015).

Comment: This perspective is very similar to the abovementioned geological perspective by also emphasizing the planetary scale of the Anthropocene by giving the striking comparison of the amount of earth / sediment that has been moved as a result of humans' mining activities vs. all the Earth's rivers combined.

"Since we have defined service as an anthropocentric concept, we do know that it can be dramatically affected by human presence and use and not just by abuse. For example, a highly degraded forest in an urban setting may offer more water regulation and more recreational and cultural services (as measured by benefits to humans) than a pristine forest remote from human populations. Forests near orchards or other insect-pollinated crops may offer far more valuable pollination services" (Daly and Farley, 2010).

"The increasing scale of human activities has become a major influence on the Earth's biophysical processes and led to an imbalance in the human-earth relationship, leading some to suggest that we are entering a new era, the Anthropocene. This intensified human impact is destabilizing the Earth's life support systems, resulting in urgent environmental problems such as climate change and the loss of biodiversity, and compelling us to re-ground the human-Earth relationship." (Daly in Brown, 2017 – McGill Course: Economics for the Anthropocene)

Comment: Taken together, these two quotes from Herman Daly posits the economic perspective of imagining the Anthropocene and Earth systems, in general, in terms of certain ecological services provided by the latter for continued human life on Earth, and calling for a 're-grounding' of the human–Earth relationship, without specifying what this might mean more concretely.

"Human reflexivity is inextricably linked to analysis, the analysis of human-nature relations in our contemporary age of the Anthropocene (Crutzen and others, 2002).

"...a new geological epoch, where human activity is the main driver of planetary evolution ..." (Glaser et al., 2012).

"Humankind has now set foot in most places on earth. Over a decade ago, Vitousek et al. (1997) documented the increasing proportion of the biosphere appropriated by humans. The term 'Anthropocene' was then coined by Nobel Prize-winner Paul Crutzen (Crutzen and others, 2002). Over the past 300 years, human activities have become an increasingly significant force affecting the evolution of the earth system in its geological, hydrological, bio-geochemical and atmospheric realms" (Glaser et al., 2012).

Comment: Taken together, these comments by Crutzen, Glaser et al. confirm the notion of human domination of the Earth systems at the planetary scale, but also, very importantly, they introduce the notion of human reflexivity in all of this, thereby opening the proverbial door for overcoming the human domination of Earth systems, without being too specific about how this can be achieved.

"The human being has become the 'Unbound Prometheus' (Landes, 2003). After less than 200 years, the innovations shorten the travel time and lengthen the distances between the producers and consumers by orders of magnitude. Population growth, due to better nourishment and health care, is increasing dramatically in the context of human development during the past 10,000 years" (Baccini and Brunner, 2012).

Comment.8: This is yet another version of the economic perspective (producer–consumer relations), but using a re-interpretation of Greek mythology for dramatic effect to drive the core message of the Anthropocene home.

“Many of these crises can themselves be looked on as polycrisical sets of interwoven and overlapping crises: So it is with the crisis of development, the crisis of all societies, in which some are shaken from their lethargy, their autarchy, and their immobility, and others accelerate at a dizzying pace, carried forward to a blind tomorrow, and moved by the dialectic of the developments of techno-science and the outbreak of human deliria” (Morin and Kern, 1999).

Comment: This complexity theory perspective by Morin and Kelly does not explicitly mention the Anthropocene, but frames the planetary challenges we are facing today as a so-called ‘polycrisis’ – meaning that there is not just ONE BIG CRISIS staring us in the face today, but rather multiple ‘interwoven’ and ‘overlapping’ crises. This notion of the polycrisis is something that will be referred to again below in Bhaskar’s more meta-theoretical perspective.

“The Earth’s biosphere teems with organisms that use materials for more than just their metabolism; moreover, in aggregate mass terms the material flows commanded by humanity do not appear to be exceptionally high when compared with the work of marine bio-mineralizers. But it is the combination of the overall extent, specific qualities, and increasing complexity of material uses (extraction, processing, and transformation to particular inputs destined for infrastructures and myriads of products) that is a uniquely human attribute.” (Smil, 2016)

Comment: This metabolic flows perspective on the Anthropocene is different from both the abovementioned economic and bio-chemistry perspectives with its emphasis on human-produced material flows that certain of the earth systems (e.g. biosphere) can no longer ‘naturally’ cope with.

“The Anthropocene a man-made world ... for humans to be intimately involved in many interconnected processes at a planetary scale carries huge risks. But it is possible to add to the planet’s resilience, often through simple and piecemeal actions, if they are well thought through. And one of the messages of the Anthropocene is that piecemeal actions can quickly add up to planetary change ... humans have changed the way the world works. Now they have to change the way they think about...” (A man-made world: The Anthropocene | The Economist, 2011).

Comment: Confirming the anthropogenic nature and planetary scale of the Anthropocene, this perspective importantly introduces the prospect of the cumulative effect of multiple small-scale actions capable of contributing to larger / systemic change at the planetary scale – something that will be returned to during this study when discussing ‘radical incrementalism’ as a possible theory and praxis of change when conducting TTDR processes.

“The Anthropocene places the ‘human agency’ (still undifferentiated, taken en bloc and generically) smack in the center of attention” (Latour, 2014b).

“This is what the definition of the Anthropocene could do: it gives another definition of time, it re-describes what it is to stand in space, and it reshuffles what it means to be entangled within animated agencies” (Latour, 2014b).

“To have common facts, you need a common reality ... It is not about post-truth, it is about the fact that large groups of people are living in a different world with different realities, where the climate is not changing” (Latour, 2017).

Comment: For Bruno Latour the Anthropocene re-introduces the notion of ‘human agency’ as something which is, and always has been, inextricably entangled with nonhuman or inanimate things and objects (in this case CO₂ and CH₄ molecules in the atmosphere). In this sense of always being entangled, or never being un-tangled, as it were, it can also be asserted that we have never been ‘free’ from Nature as per the Enlightenment vision and understanding of ‘freedom’, and therefore we as humans have never been ‘modern’ in the sense of being dis-connected from Nature (Latour, 1993). Acknowledging this position in fact has far-reaching implications for our methodological reasoning, as will hopefully be demonstrated throughout this study.

“We live in a time when humanity's powers have become so powerful and ubiquitous that our impact on nature has literally reached tectonic proportions. Welcome to the Anthropocene (Crutzen, 2002): a new epoch marked by the profound and far-reaching causal power of human, social life in shaping the trajectory of Earth system processes, including the climate system. The state of the world is thus profoundly influenced by the shortcomings of our dominant philosophies and metatheories and the collective self-understanding(s) they have produced” (Bhaskar et al., 2019).

“[The Anthropocene represents] a ‘metacrisis’, because it is not just a ‘polycrisis’ (Morin and Kern, 1999) in the sense that there are multiple interconnected ‘objective’ or ‘exterior’ problems (e.g. political, economic, ecological etc.). These interconnected crises are also situated within an inter-subjective context of ‘interior’ meaning-making, which includes philosophical, scientific, existential, religious, worldview, psycho-spiritual dimensions that are essential to include in an adequate understanding of the complex dynamics in play in order to facilitate more effective responses ...” (Bhaskar et al., 2015).

Comment: In these last two quotes the Anthropocene is framed by Bhaskar et. al as a ‘meta-crisis’ with very important meta-theoretical implications for the understanding of our being and place in the world today. In other words, for them the Anthropocene is just a ‘polycrisis’ (as per Morin’s complexity perspective above) or sum total of some complex interconnected exterior problems / crises (e.g. socio-political and ecological crises) existing independently from our consciousness and actions, as it were. This study posits that, on the contrary, the Anthropocene is very much *integral to* our so-called interior worlds of inter-subjective (social) meaning-making – i.e. our worldviews as developed by our theoretical efforts in the natural and social sciences and arts as well as by our phenomenological or everyday experiences, perceptions and observations. This will indeed form a key aspect of this study, namely the challenge of developing a transformative transdisciplinary methodological approach capable of bringing human sensemaking at the phenomenological level *into* the research process, not only for the sake of better interpreting and understanding the world (*Verstehen*), but also for figuring out how to change (*Verändern*) ourselves in the world.

In summary, all of these above perspectives converge on the fact that the Anthropocene is an unprecedented planetary-scale anthropogenic / human-made challenge, never experienced before in the ± 4.8 billion year history of the Earth. However, what these different perspectives (albeit in their very limited quoted forms) have not been made explicit is the question of the mutability or immutability of the Anthropocene today: in other words, does it mean that the anthropogenic changes of some of the Earth systems are irreversible or can they still be changed / transformed? How we respond to these questions

methodologically is important and is, indeed, at the core of this study: if we respond to the Anthropocene merely as some or other polycrisis – consisting only of some objective / external interconnected crisis – will certainly steer us in a very different direction, than approaching it as a meta-crisis, in the way framed by Bhaskar et al. above. In this case, we simply cannot ignore our inter-subjective sensemaking of daily experiences, perceptions and observations of the Anthropocene today. A combination of these different perspectives and responses will indeed be at the core of this study, namely developing a transformative methodological research approach, capable of contributing to both the understanding (*Verstehen*) and the changing of the complex societal challenges we are facing at the time of the Anthropocene today.