The South African developmental landscape: restricted potentials or expansive, complex adaptive opportunities?

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Abstract

This article argues that the South African developmental landscape is currently locked into an overly technical, path dependent paradigm that is unlikely to be capable of embracing the complex challenges identified by the recent National Development Plan. The article explores the internal logic of the existing path dependent, technical condition from the perspective of complexity, in the context of the Department of Science and Technology's Fifth Grand Challenge and "continuous change". It is argued that drawing ideas from complexity into future developmental trajectories can add value to the National Development Plan: Vision 2030, but to do so will require dynamic mind-set shifts across multiple developmental scales and interfaces if new approaches to managing development that embraces complexity, rather than denies it, is to emerge.

Keywords: development; complexity; path dependency; epistemological vigilance; sense-making, National Development Plan.

Disciplines: Complexity Studies, Transdisciplinary studies, Management studies, Public management, Political studies, Economics, Development Studies.

Introduction

Transformation does not depend on highly technical processes, but rather on the participation of citizens (The National Development Plan, 2011: 429).

In 2009, the Department of Science and Technology (DST) identified five Grand Challenges that they believe will take South Africa towards a globally competitive future. In the guiding document, 'Innovation Towards a Knowledge-Based Economy Ten-Year Plan for South Africa, 2008-2018' five 'Grand Challenges' are identified as being critical mediators for

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achieving this goal. Tackling the fifth Grand Challenge, the 'Human and Social Dynamics', is defined as being able to:

> *"…increase our ability to anticipate the complex consequences of change; to better understand the dynamics of human and social behaviour at all levels; to better understand the cognitive and social structures that create and define change; and to help people and organizations better manage profound or rapid change" (Ten-Year Innovation Plan, DST, 2009: 20) … and affirms the role of 'cross-disciplinary experts' in researching some of the most intractable challenges facing society, such as 'persistent and chronic poverty'* (Emphasis added, DST's Human and Social Dynamics in Development Grand Challenge Science Plan, 2010: 7).

An earlier draft of the fifth Grand challenge stated that Human and Social Dynamics were at the "core of virtually every major challenge facing South Africa in particular and the African continent as a whole .... from improving education and skills levels, to reducing crime; ... HIV/AIDS ... sustainable approach to energy... xenophobic attitudes ... building more inclusive communities" (DST, 2010: 3).

More recently, in 2012, the National Development Plan: A Vision for 2030 was launched. This Plan talks to a number of significant priority shifts but omits an epistemological focus about the way in which the proposed changes are to be managed. This article argues that the way in which the DST has conceptualised the complexity of the Fifth Grand Challenge provides a useful framework for conceptualising many of the other challenges that will need to be confronted if the National Development Plan (NDP) is to reach its' ambitions. The Human and Social Dynamics as conceptualised by the DST does talk to the challenges of building a knowledge economy, but it is also argued here that the conceptualisation is equally relevant to the broader contemporary developmental landscape of South Africa. It is also suggested that if both the DST's Plan and the NDP Vision are to be achieved – by embracing the complexities of change, rather than denying them - will require considerable amounts of "un-learning" of old habits and inventing new ways of working at multiple scales. In order to make the argument, touching on the recent wave of service delivery protests, it is suggested that the existing institutional logic and resulting *modus operandi* of development planners, policy makers and politicians tends to favour technical, linear forms of social theorising which is now institutionally embedded in the developmental apparatus. It is argued that this apparatus is unlikely to be able to create the changes hoped for by 2030 because it is structurally ill-equipped to be confront the complexities of the existing developmental landscape in South Africa, as well as the "external drivers" (The National Development Plan, 2011) which are expected to bring further shocks to that landscape. It is finally argued that there is a risk that unless the developmental apparatus adapts to this emergent context it could exacerbate the complex challenges of today and tomorrow, rather than embrace and ameliorate them.

The focus of the discussion is that while the goals of the NDP are undeniably accurate and necessary, the process of achieving these wins is unlikely to be realised unless there is a radical shake-up of the development apparatus that is expected to deliver these ambitions. This is because the ambitions are, and will probably be nested, within both a conceptual and "real-world" developmental apparatus, embedded within a partially outmoded paradigm, that is structurally ill-prepared to confront the DST's notion of "continuous change". The disjuncture between the development apparatus and events on the ground suggests that a glass ceiling of developmental impact is likely to be reached unless alternative paradigms are

explored and operationalized. While the NDP does acknowledge that these challenges exist, it is less clear from the document as to how to build the momentum required to facilitate a mind-set shift, at multiple scales, that in turn will facilitate a more people-centred approach to development, in the context of "continuous change". It is argued from a complexity perspective that that the DST's Fifth Grand Challenge offers a valuable doorway into imagining a developmental design that will help shift the development apparatus from its current overly technical, path dependent condition, towards a more contextually relevant, people centred style of planning and management.

In order to expose the contradictions within existing development management practices this article provides a theoretical sketch of the internal logic that reproduces the existing developmental path dependency (existing planning and management practices). From this foundation a counter-theoretical suggestion of how to begin to break the existing developmental trajectory is presented that articulates a framework for managing for complexity. It is argued that disrupting the existing developmental trajectory requires both an ontological and epistemological foundation through which to begin to embrace the 'real world' challenges identified by the Fifth aspect of the Grand Plan in South Africa, in turn providing a platform from which to lift the glass ceiling of developmental impact as imagined by the NDP.

Development, participation and citizens

Despite high levels of participation and citizen consultation within most development implementation activities in South Africa, there is a broader presumption that people will the act as neat and tidy variables in a linear equation who will respond to exogenous inputs in predictable ways, regardless of the context within which the development activity is situated, (Rogers et.al., forthcoming). Despite acute awareness by decision makers that development is failing the expectations of many (NDP, 2011: 1), the mind-set that flourishes within the existing developmental apparatus is, all too often, based upon an implicit assumption that communities will stand still while experts probe, diagnose, assess, tinker, plan and attempt to implement activities designed to induce "technicist" changes in complex landscapes (Bloch, 2007: 107).

From the perspective of complexity, communities – and the people therein - are expected to be more dynamic. Communities are conceptualised as complex adaptive systems, situated within particular, emergent and contextually loaded, cultural configurations that selectively incorporate history into imagined futures (Stacey, 2007). People are not presumed to be inanimate bodies that respond to exogenous inputs submissively: people live within active – yet complex – systems that require respectful interaction (co-management) because more often than not the changes that an intervention produces are mediated by almost invisible forces which are difficult to predict.

It is not only the internal, people-centred aspects of approaches to development that emphasise the need to think outside of the developmental box. The necessity to do so is underpinned by increasingly real challenges highlighted by the NDP that are placing further pressure on developmental issues, such as provincial austerity measures – due to perceived excessive mismanagement of government funds in some provinces - the global financial crisis, food security for the southern African region and climate change which are being experienced within thousands of households at multiple frontiers in South Africa. Such a turbulent global

/ local landscape of indeterminable interdependencies is a complex context, as highlighted in the Fifth Grand Challenge and the NDP, which requires a fresh conceptual approach to developmental planning and management if both practical and strategic pathways that embrace these realities are to be forged. Insights from complexity theory may hold some keys to unlocking some of those management potentials.

Complexity and development

Complexity science is not a single theory. It is the study of complex adaptive systems – the patterns of relationships within them, how they are sustained, how they self-organise and how outcomes emerge. Within the science there are many theories and concepts. …. Complexity science is highly interdisciplinary including biologists, anthropologists, economists, sociologists, management theorists and many others in a quest to answer some fundamental questions about living, adaptable, changeable system (Zimmerman, 2009: 3).

Complexity is deeply rooted in the natural sciences and is fundamentally focused on the dynamics of change within naturalistic biological and physical systems (Rosenhead, 2001; Breslin, 2004). In recent years key themes and metaphors, prompted in part by the pioneering work of Niklas Luhman, in particular Social Systems (1995) – and arguably underwritten by Thomas Kuhn's notion of 'scientific revolution' (1970) – have been critically applied to many fields within the social sciences, for example Urry (2005) and in particular: economics, (Scharmer, 2010); education, (Grimmet, *et al.*, 1990); business, (Ostrom, 2002); learning organisations, (Senge, 1990); planning and policy, (Mitchell, 2009); leadership, (Arthur, *et al.*, 2002; Boone & Snowden, 2007; Wheatley, 2006); development, (Chambers (1997; Gilchrist, 2000); health, (Jayasinghe, 2011; Van Beurden, *et al.*, 2011); globalisation(Walby, 2004); water resource management, (Rogers & Luton, 2011); humanitarian aid and development, (Jones, 2011); social movements, (Chesters & Welsh, 2006); inequality, (Walby, 2007) and corruption in South Africa, (Habtemichael & Cloete, 2010).

While there is much diversity within the literature there is growing consensus around some core themes that are detailed in the Table i, below.

Complexity is emerging as a powerful force for understanding and working with behaviours that are not immediately predictable, such as how people respond to climate change, yet often make sense in retrospect. In addition, experiments pioneered by social scientists have demonstrated that the processes of decision making by human beings are far more complicated than presumed by the 'rational choice between alternatives' brigade (Klein, 2008 and Kahneman, 2011). For complexity theorisers a key unit of analysis is the complex adaptive system of interest which is conceived as a malleable entity, permanently interacting with other systems. The future possible trajectories of the system of interest is mediated, and energised, through different types of feedback emerging from the relationships with other interdependent systems. Change making forces – agents – within a system are considered to be anything (an idea, a rumour, a person, an environmental alteration) that affects the system. Hyper-visible examples of complex adaptive systems include politics, stock markets and their institutional responses to their volatile and ever-changing environments. Marginalised rural communities, urban shack dwellers and child-headed households are rarely considered to be situated within complex adaptive systems, yet the landscapes they operate within are as volatile, albeit in different guises, as that of the international financier or politician.

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Complexity and systems: These first three concepts relate to the *features of systems* which can be described as complex.	Systems characterised by interconnected and interdependent elements and dimensions.
	Feedback processes crucially shape how change happens within a complex system.
	Emergence describes how the behaviour of systems emerges – often unpredictably – from the interaction of the parts, such that the whole is different to the sum of the parts.
Complexity and change: The next four concepts relate to *phenomena through which complexity manifests itself.*	Within complex systems, relationships between dimensions are frequently nonlinear, i.e., when change happens, it is frequently disproportionate and unpredictable
	Sensitivity to initial conditions highlights how small differences in the initial state of a system can lead to massive differences later; butterfly effects and bifurcations are two ways in which complex systems can change drastically over time.
	Phase space helps to build a picture of the dimensions of a system, and how they change over time.
	Chaos and edge of chaos describe the order underlying the seemingly random behaviours exhibited by certain complex systems.
Complexity and agency: The final three concepts relate to the notion of adaptive agents, and how their behaviours are manifested in complex systems.	Adaptive agents react to the system and to each other, leading to a number of phenomena.
	Self-organisation characterises a particular form of emergent properties that can occur in systems of adaptive agents.
	Co-evolution describes how systems and the agents within it evolve together, or co-evolve, over time.

Table i: Key concepts. *Source*: Adapted from Ramalingham and Jones (2008)

Further to this, their responsive capacity to a changing socio-ecological landscape has been well documented (Fowler & Wilkinson-Maposa, 2011). One key that complexity holds to unlocking new potentials for the future is to remind managers of development that people shape their environment and are simultaneously being shaped by their environment. As the Fifth grand Challenge and the NDP indicates, people, the 'objects' of development for managers, are both situated within and are agents of a complex adaptive system. People are not independent objects which the reductionist, managerial mind—set implicitly frames them as. The DST have directly talked to the necessity for development managers to alter their ways of working to accommodate these complexities and the NDP hints at it (see above) but changes on the ground are hard to find in many human focused development sectors.[6] The notion of path dependency provides insights into why this might be the case.

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[6] Paradoxically, management of natural resources tends to be drawn to managing for complexity than human centred development.

Being stuck in a path dependent managerial rut

When contemplating the directionality of potential change within a complex dynamical system much attention has been drawn to the way in which a system can become locked into specific pathways. Economists have noted that "[p]ath dependence is a dynamic theory assuming that initial events can *increasingly restrain present and future choices*", (emphasis added, Koch, Eisend & Peterman, 2009: 67). The notion of 'path dependency' has been emphasised by economists such as David (1985; 1986) who drew attention to the way in which the QWERTY keyboard technology is a "locked–in", yet inferior technology that has become accepted as a norm. Such norms, or path dependencies, are sustained through self-reinforcing mechanisms that reflect multiple other systemic interdependencies, (Arthur, 1989) energised through expansive "loops of positive feedback", (Schreyogg, Sydow & Koch, 2003, in Roedenbeck, 2011: 26). What this means is that as a system interacts with a novel environment positive feedback is selectively incorporated into the system of interest. "These events do build a corridor for future action ... lead[ing] to the phase of 'positive feedback' marked by a 'critical juncture'. The feedback loops are recursively closed circles where actions or decisions perpetuate themselves.... The critical juncture is the point where at least one of these feedback loops is initiated but where the outcome is non-ergodic.[7] The phase of positive feedback itself leads to the second juncture of 'lock-in' which starts the phase of 'path dependence'. This is a "small corridor where only a few possibilities are open for selection and change is nearly impossible. This corridor may be *inefficient*" (emphasis added, Roedenbeck, 2011: 27-28). As such systems, while potentially expansive phenomena are constrained as restrictive feedback selectively incorporates historical influences into the system of interest (Juarrero, 1999). Such pathways, condition the agents' 'sensori-memorabilia' to a narrow range of "context-sensitive" responsive, non-linear possibilities that can "recalibrate internal dynamics and thus bias future behavior" (Juarrero, 1999: 186).[8] From the perspective of formal organisations, this process is illustrated in Figure i.
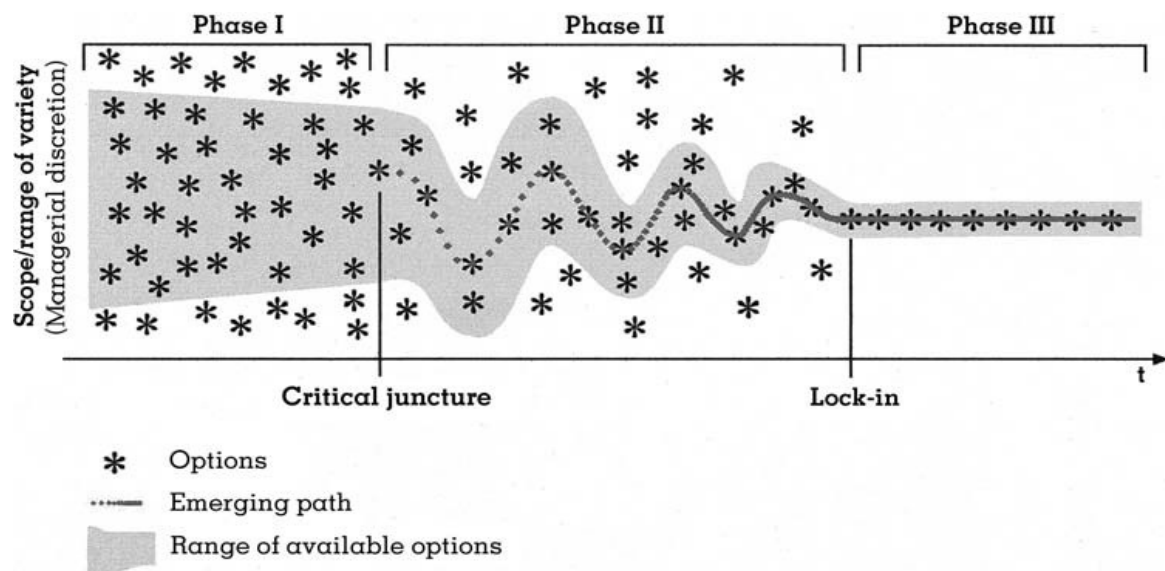
7 Non-ergodic means that these processes of change are "unable to shake free of their history" David, (2001: 19)

8 The expression 'sensori-memorabilia' is used as a metaphor for the historically acquired body of knowledge, information and experience that is used as a sense making repository that is selectively applied as systemic responses to internal or external feedback that seeks to deliberately problematize the popular – yet overly linear - notion of 'sensori-data' in a naive Pavlovian sense.

Figure i: The constitution of an organisational path. *Source*: Sydow & Koch, 2009: 4

For path dependency theorisers, a system of interest is extremely sensitive to the initial conditions that give rise to the existing system and that on occasions the system of interest represents a path dependent condition that has emerged through rapid positive feedback – but may ultimately become inefficient once a phase of 'lock-in' to the new pathway has occurred. It is suggested that management of much human development is currently stuck in a path dependent condition, influenced by outdated feedback that maintains the condition and that the DST's Fifth Grand Challenge is a call to break the existing developmental 'path dependency' and to begin a process of identifying more contextually relevant epistemological stances for the future. From the perspective of epistemology, a path dependent lock-in phase is similar to Kuhn's (1970) notion of resistance to revolutionary scientific change.

'Epistemological Vigilance': When is a situation complex?[9]

> *In the understanding of human activity there are always coherent, alternative explanations, which fundamentally reflect different beliefs in human nature* (Cole, 1999: 265).

> *[L]inear thinking spread beyond the original scientific discoveries to embrace practically all facets of life* (Rihani, 2001: 237).

At a broad conceptual scale, science has been considered to be a diverse, yet traditionally fragmented and contested experience, (Kuhn, 1970), as is 'reality', (Berger & Luckman, 1991). More often than not, scientists from within different paradigmatic fields "tend to create [their] own data and [their] own way of *interpreting* those data in a manner which is so comprehensive and so self-validating that scientists operating within different paradigms seem to exist in altogether different worlds", (emphasis added, Tarnas, 2000: 437; also see Rees, 1998; Arce and Long, 1992; Levins and Lewontin, 1989). Not only is the reality of scientific endeavour an interpreted different world experience, it is one of historically constrained potentials, within which the scientific imagination has struggled to overcome extreme challenges at moments of disorder and change, (Sanders, 1998; Gleick, 1988; Lorenz, 1972). Various authors have attempted to distinguish context-dependent, epistemological parameters in various ways. (See Table ii below).

The left hand, 'Simple', column of Table ii is based upon Newtonian, linear presumptions, and is a dominant mental model for many development policy makers, planners and implementers, regardless of context (Rihani, 2001). This mental model pervades the narrative of development management and it is suggested that this metaphor is an implicit, guiding influence in top-down decision making processes which is gradually being contested at multiple global and local scales because this pervasive metaphor is now recognised by critics to be contributing to some developmental bottlenecks, when applied inappropriately, to complex contexts (Jones, 2008; Kelsall, 2008). Nevertheless, it still holds that the dominant, historical decision making default space of many development policy makers and managers tends to be in the left hand, or centre, column of Table ii - even when the context of the

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[9]   See Mudimbe, 1988, for the notion of "epistemological vigilance".

problem space does not fit with the assumptions (beliefs or values) of that scientific mode of enquiry.

	Simple	Complicated	Complex
Ackoff, 1974	Puzzles. Have a well-defined, shared problem statement with best practice learning opportunities.	Problems. Have some agreeable structure, with known dimensions and variable, solutions can be argued for dependent upon constraints.	Mess. No well-defined structure or form, little consensus on the crucial aspect of the key issues.
Rittell & Webber, 1973; also see Conklin, 2001; Ludwig 2001			Wicked problems. Problems are unique with no common 'classes' of solution; partial parameters for problem solving; elusive variables and a changing context.
Glouberman & Zimmerman, 2002	Simple. Cake baking, a recipe, ingredients, oven and trained person = same result each time	Complicated. Sending a rocket to the moon, requires expertise and specialisation of tasks and each attempt provides learning / improvement of efficiencies for future application and a reasonable amount of certain of success.	Complex. Raising a child, every situation is unique, previous success is no guarantee of success, expertise may help but is not necessarily sufficient.

Table ii: Contextualising the challenge. *Source*: **adapted from Jones (2011:4)**

One prominent management tool that attempts to explicitly challenge this bottle-neck is the Cynefin Framework below, Figure ii, (Boone & Snowden, 2007).
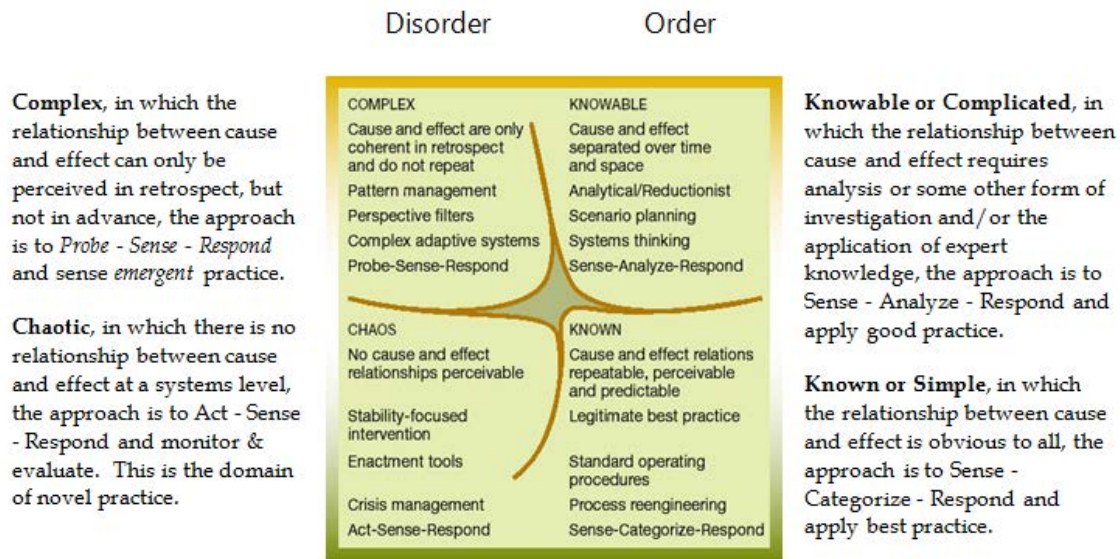
Figure ii: the Cynefin Framework, accessed May, 2013 [10]

The Cynefin Framework was developed as an instrument to assist decision makers in defining the type of challenge they are facing and to guide their response to that challenge. The framework is divided into four principal domains into which different types of challenges may be positioned so that appropriate management responses can be applied, depending on the context.

This management heuristic, allows decision makers, including development managers, to explicitly situate the challenge they are facing within, or between, different domains of the framework (for example, Jayasinghe, 2011). From this platform, decision makers are then more likely to decide upon a course of action that fits the context of their challenge, rather than fall back on the pervasive "simple domain" default setting (Table ii). As such it enables decision makers the opportunity to undo some of the habits that have drawn them to the reductionist epistemological cul-de-sac (when it does not fit a complex context) that is the "simple" or "known" domain and can be used as a mechanism to re-conceptualise developmental challenges, provisioning them with more expansive management opportunities.

Moving beyond epistemology: sense making in a complex space

Complexity can be used as more than just a management heuristic and offers expansive opportunities to embrace the essence of the DST's Fifth Grand Challenge and the NDP. Complexity provides a framework for exploring the way in which development initiatives become an emergent, value-laden dynamic property of the system, in its own right, as people make sense of their developmental experiences. What this means is that the recent historical

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legacy of perceived faltering, failed or disappointing development initiatives that have taken place since 1994 has influenced people's confidence that development will provide broad-based wins that make sense to their "social imaginary" (Appadurai, 1990) in the context of democratic equity and redress. This waning confidence in developmental outcomes becomes the sensori-memorabilia of engagement (feedback), such that when a new development initiative is announced, it is not uncommon for community members to mobilise themselves, and their networks, around the ambition of securing 'something' from the initiative, in ways that the planners never anticipated. This self-organising mechanism sets the stage for rapid shifts away from the relatively "ordered domain" of their normal life worlds into the domain of "disorder" (see the Cynefin Framework, above). While the domain of disorder, from a management perspective, is a relatively neutral, or academic, category that has potentials to assist decision makers, it is a completely different experience if it is a lived experience. Consequently, it should be expected that the way in which normal people make sense of the movement from order to disorder and back to a new form of emergent order alters – and will continue to alter - the sensori-memorabilia of their complex adaptive systems, in the context of their lived realities while they pursue their aspirations for the future.

Invariably this complexity is – in varying degrees - *socially constructed* (in other words the 'social' influences individual behaviour and the individual shapes the 'sociality' of today and tomorrow, but invariably expansive potentials remain); *self-organising* in response to the changing context and *emergent* in that the emergence of new formations reflects the historically framed reality of today. This reality, or "socio-material entanglements" (Garud, *et al.*, 2010: 768), includes discrete sets of partially saturating, nested properties that include the particular sensori-memorabilia of yesterday and the localised expectations for tomorrow as people prepare, through sense making processes, to respond to what is required of them in the perceived socio-economic landscape of today and an imagined tomorrow.

This pattern is often repeated because complex adaptive systems are 'created and owned' by the actors in the system and the development apparatus is normally situated at the periphery of the historically constructed, self-organising community system. Not only is the developmental apparatus distanced from the heart of the complex system, it is further restricted by its own internal logic (the epistemological, path dependent, sensori-memorabilia of yesterday). This internal logic does not fit comfortably with the effervescent context of today, so developmental potentials risk becoming straight jacketed by the structural constraints of the existing technical development paradigm leaving it in a weak position to respond to contemporary emergent challenges and the commensurate "Social Dynamics" highlighted by the Fifth Grand Challenge and the NDP. The consequence of this is that the agility of the system (community) to mutate is intuitively recognised by the coal-face agents of the development apparatus, but the seemingly unpredictable changes are largely outside of the control of those agents - and even if the changes are identified by the agents, the apparatus is structurally ill-equipped to respond in expansive ways. This has the effect of contributing to – or even reducing - the sustained "glass ceiling of developmental impact", while sometimes contributing to community turbulence, as the actors within the complex system and the development apparatus compete for control during the "agentic inertia" (struggle) that ensues.[11]

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[11] The expression 'agentic inertia' is used to represent the high levels of energy and drive that exists within the competing factions coupled with the empirical, observable reality that nothing ever seems to change in developmental terms.

Overview

As was noted above, the historical decision making default space of many development experts tends to be one that presumes that people can be managed as if they are inanimate bodies, bereft of context. This default setting is more complicated than just a simple lack of knowledge or inappropriate application of management theory that could be changed through training exercises. From the perspective of complexity, this default space can be conceptualised as a path dependent condition, with historical origins in the social sciences, popularised by publications such as the Brundtland Report (1987) and perpetuated by diverse forms of contemporary local, national and international feedback.

From the perspective of complexity: how are people making sense of this today?

Despite many empirical developmental successes during the democratic transition, South Africa has seen increasing dissatisfaction with service delivery and development in recent years that has now reached a scale which is commanding international attention (Local Government Bulletin, 2012). Despite this wave of protests, the paradigm that continues to underscore the sociality of development initiatives is fundamentally a technical paradigm that deterministically repeats itself in the face of an increasingly disaffected populace. Coupled with this embedded pattern of more and more of the same type of development approach, while hoping for improved outcomes, is the heightened sense of "emancipatory entitlement"[12] from people in diverse communities across the country who are becoming ever more vocal in their demands to see change, that makes sense to them, happen on *their* doorstep after many years of democratic rule. This context of "emancipatory expectation" is thickened by the localised recognition that South Africa has exited the historical moment when policy makers are able to luxuriate in the comfort zone of being able to claim that beneficent change will necessarily materialise with the advent and maturation of democratic rule. This claim no longer has resonance with peripheral communities at the boundaries of prosperity – as the emergent, popular, South African metaphor "*Tenderpreneur*" attests to.[13]

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[12] The expression 'emancipatory entitlement' is an expression that represents the way in which many people expected that democracy would bring them fresh opportunities for enrichment or improved quality of life.

[13] The expression 'Tenderpreneur' has been applied in South Africa by the media to describe the explosion of tenders awarded through political networks. For more detail see http://en.wikipedia.org/wiki/Tenderpreneur
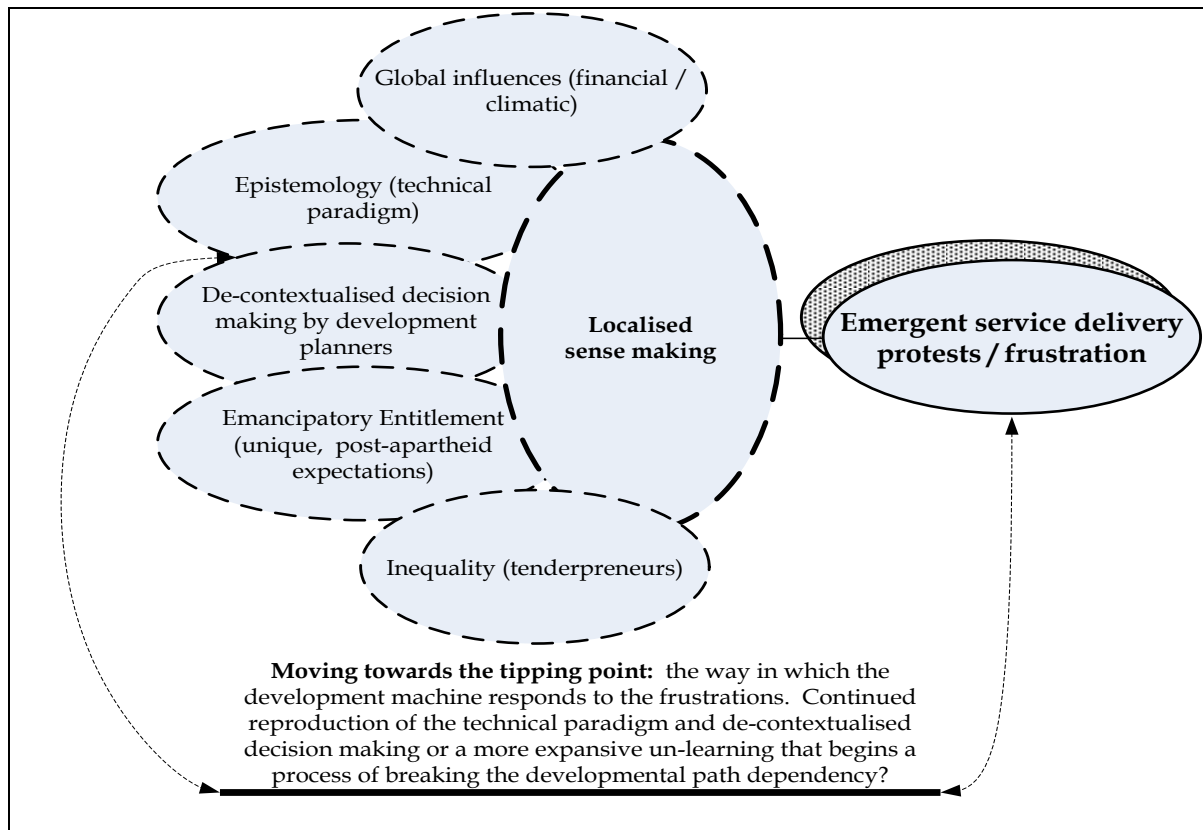
Figure iii: Localised sense making to contradictory systemic changes. *Source:* **Authors' construction.**

The lived reality for many of these peripheral communities is both a modern and traditional frontier of sustained poverty and deep dissatisfaction which pervades the daily routines of many thousands of lives. Despite the frustrations felt within this expansive frontier of perceived failure, this developmental landscape is still loaded with *complex anticipatory expectations* from development that has origins reaching back into the history/ies of the democratic transition. This landscape is stubbornly dynamic and poses an increasingly sharp challenge for development policy makers and practitioners, fuelled and exacerbated by the increasingly extravagant material inequalities of today and the realisation by many that the process of reproducing that inequality has the effect of reducing opportunities – or capabilities – for the majority. Simply put, South Africa is at an historical juncture where decisions made today will contribute to the 'tipping points' of tomorrow and the NDP's call to embrace this reality is timely. Figure iii provides a sketch of the *tipping point dilemma* that is emerging in much of South Africa today.

Figure iii is a normative representation of how feedback from multiple sources is incorporated into sense making processes. While the developmental apparatus cannot be expected to be responsible for the origins of the "causal thicket" (Whimsatt, 1994) that contributes to the sense making process, this type of feedback is phenomena that complexity theorisers consider to be relevant to outcomes and should be considered as such.

From the perspective of complexity, the service delivery protests and other expressions of frustration are emergent responses to a myriad of uniquely historico-local conditions (sources of feedback), interdependent with more universal influences such as the consequences of climate change or the global financial crisis (sources of feedback), facilitated and articulated through embodied, localised sense making processes that reflect the dialectical challenges

now being confronted by democratic South Africa. However, the decisive "tipping point" (Gladwell, 2000) facing South Africa today is the way in which the developmental apparatus responds to the crisis of grassroots frustration, in the context of austerity measures, absorbing external shocks and delivering to the electorate. If the development apparatus decides to impose stricter measures of efficiency and productivity on the coal-face agents of development without questioning the underlying epistemological deficiencies of the existing developmental approach, then it is possible that the well intentioned attempts at ameliorating the situation could add further fuel to the 'frustration' fire. Figure iv, below, provides a sketch of this possibility.
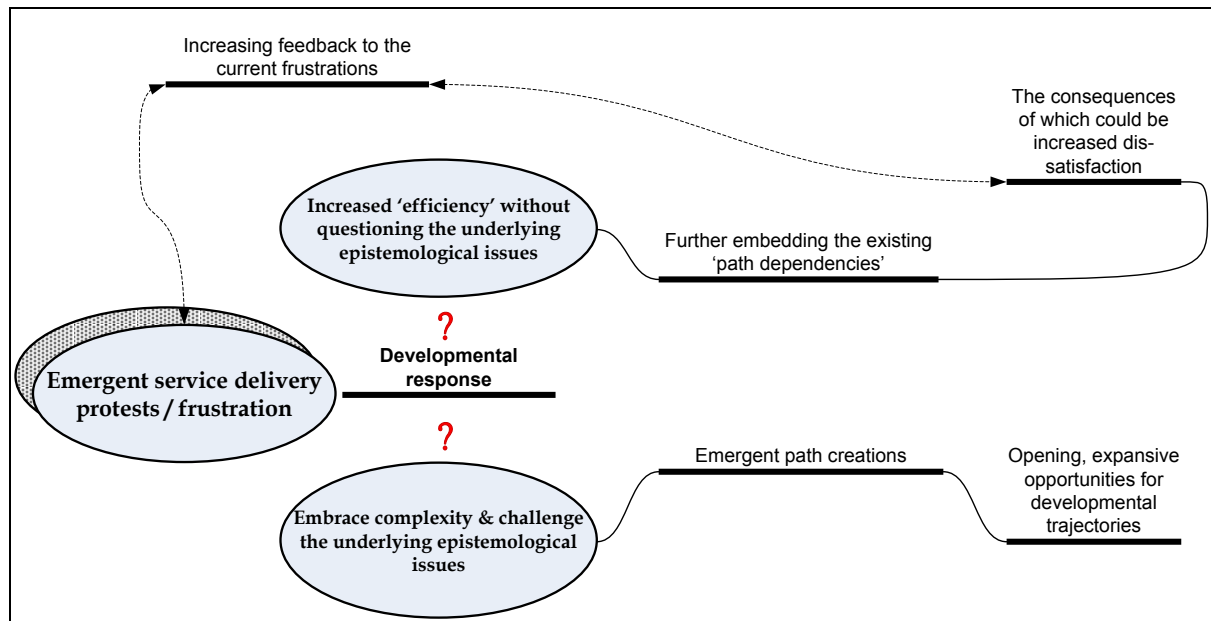
Figure iv: The complex tipping point for the South African development apparatus. *Source: authors' contribution*

Figure iv provides a normative sketch of how the feedback from the developmental response and the compressed local / global challenges landscape could become, in the language of complexity, an autopoietic, self-reinforcing phenomena, energised by inadequate contextual responses to the "continuous changes" that are prevalent today.

The service delivery protests are a product of the relationship between the existing developmental path dependency and other systems. By squeezing, or compressing, developmental approaches in an attempt to improve the productivity of the developmental apparatus without confronting the internal logic and path dependencies of the apparatus could actually contribute to further, accelerated, deterioration of service delivery and fuel further social unrest because the underlying epistemological orientation is unfit for purpose.

A deeper analysis of the complexities being encountered in South Africa is not possible here. However, the above argument suggests that the development apparatus' response to the complex, historico-social aspects of development are stuck within an inappropriate, path dependent paradigm and is at risk of becoming immobilised or even approaching an historical edifice of potential disintegration if the developmental mantra continues along the existing epistemological trajectory of doing 'more and more of the same while hoping for improved outcomes'.

Given this unstable developmental landscape - emergent social protests and path dependent, inappropriate responses - the combination of which is now contributing to a paralytic State of "agentic inertia", it is logical to urgently look for innovative ways to break free from such an inflexible approach to development and change before the existing developmental apparatus inadvertently fuels further dissatisfaction and unrest. It is suggested that such a vision, while an appropriate ambition, will be extremely difficult to achieve without visionary decision making facilitating a shift towards a more reflexive form of development planning that facilitates epistemological introspection that enables development planners and practitioners to embrace complexity, rather than deny it. Table iii provides a sketch of how this might look.

Classical Development Management	Managing for Complexity	Identity of Emergent Path Creations
Top-down planning	Scanning, anticipating, *interpreting*	Confidence required of decision makers to trust new forms of planning & governance
Assumption that the 'problem' is 'knowable' & that a 'solution' can be found	The problem may not be 'knowable' so looking for a 'solution' is not necessary	Iterative process of 'probe, sense, respond' (Cynefin Framework, see above)
Organising	Shaping context, connecting	Enabling networks to thrive / communicate relevant information (both local and global)
Directing	Influencing, promoting self-organisation	Respecting the significance of emergent networks
Controlling	Monitoring / adapting to new learning	Shift toward more iterative (necessarily participatory) monitoring & evaluation

Table iii: Managing for complexity. *Source:* **adapted from Project Leader's Team (2012: 45)**

The above components (see Table iii) are the type of movements required by a host of development planners and practitioners if the development trajectory is to embrace the complex challenges that currently stifle many developmental endeavours. However, from a complexity perspective, changes happen to a system of interest when the negative feedback that maintains the system is disrupted and positive feedback, which amplifies the potentials for change within, and of, the system, is reinforced (see Figure v). This means that many of the current incentives that are in place to motivate people involved with the development apparatus, including the people of South Africa themselves, will require innovative re-structuring if the current status quo is to be destabilised to the extent that a new developmental era emerges. Figure v, below, represents the way in which alternative "path creations" (Garud, *et al.*, 2010) or development planning models could emerge.
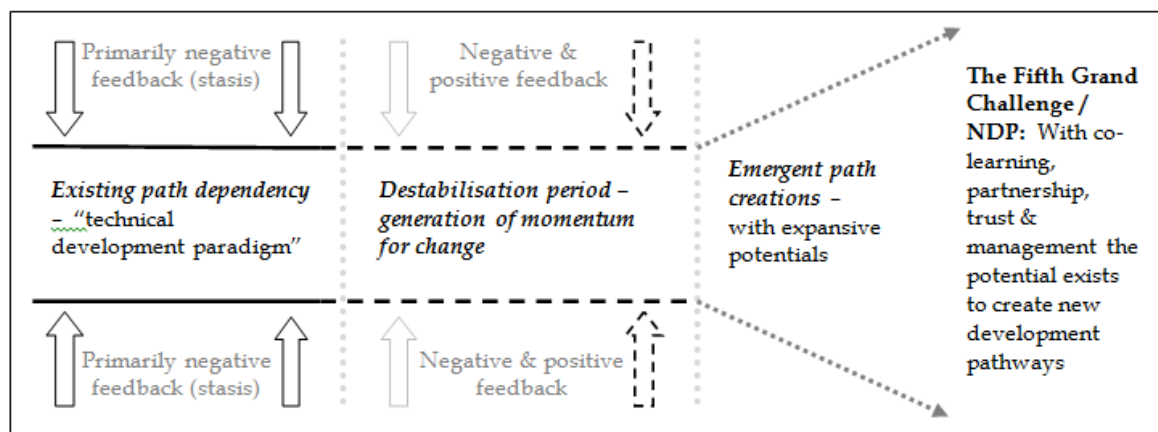
Figure v: Epistemological path breaking and path creation. *Source:* **adapted from Garud** *et al.***, (2010)**

For the existing "technicist" approach to development to be broken, managing for complexity theorists would begin by identifying the feedback the sustains the current system of interest and look for ways to destabilise that feedback. In the early stages it would be acknowledged that the process involves unpredictable or non-ergodic possibilities so the approach would be "probe-sense-respond" (see the left hand, upper quadrant of the Cynefin framework, Figure ii above). By monitoring and evaluating the process of destabilisation and responding to the emergent process it is possible that expansive new path creations that will emerge. This would be the first step in imagining a new form of development that fits the contemporary context of "continuous change".

From the perspective of complexity, understanding and analysing the types of feedback that are likely to generate momentum for change must be empirically 'real' change agents. As has been noted above, agents of change can be anything from a rumour to global climate change. This makes the task of achieving the NDP even more intractable because many of the obstacles to achieving the ambitions are intricately interdependent with individual ambitions, a broad consensus of "emancipatory expectations", high levels of economic inequality and diverse forms of marginalisation, further compressed by the external drivers of change identified in the NDP.

While the National Development Plan makes very bold statements about the need for change and the challenges to achieving the Vision: 2030, it does not state how the momentum will be generated within the "sensori-memorabilia" of South African culture to begin the process of identifying "path creations" that could make the vision a sustainable reality. The NDP (2011: 429) does cite critical issues that contribute to many of the challenges but claims that "Social Cohesion" and an "Active Citizenry" underpinned by "Constitutional Values" (The Constitution of the Republic of South Africa, 1996, Chapter 15) are the bedrock required to begin a process of change because "[t]ransformation does not depend on highly technical processes, but rather on the participation of citizens" (2011: 429). However, there is no indication of how the 'bedrock' or 'participation' will contribute to processes that reinforce or destabilise existing feedback. For complexity theorisers, confronting the feedback that contributes to the way that people frame, filter or make sense of developmental experiences is a prerequisite if the vision: 2030 is to be achieved.

The above account has attempted to articulate some of those challenges of achieving Vision: 2030 from the perspective of complexity and argued that one way to reconfigure the apparent developmental cul-de-sac that South Africa is facing is by 'un-learning' some of the embedded developmental "path dependencies" of yesterday and learning new ways of imagining and managing an alternative developmental pathway.

Discussion

The real voyage of discovery consists not of seeing new lands but in seeing with new eyes
Marcel Proust, French novelist (1871 - 1922).

The DST's Fifth Grand Challenge draws attention to the Social and Human Dynamics of Development and the National Development Plan identifies some of the major challenges facing South Africa if Vision 2030 is to be achieved, but does not provide a clear indication of how to begin to embrace these challenges. Significantly, and perhaps more relevant, is that the NDP also does not articulate how to begin to build the momentum for achieving the ambitions for 2013, other than through an active, cohesive citizenry that buys into Constitutional values. This article has explored the path dependent developmental trajectory that saturates the South African landscape and suggested that complexity is an epistemological force that may allow for new developmental pathways to be explored, which may contribute to beginning the process of building momentum for alternative forms of development.

Complexity, if applied to development, represents a significant change in thinking to technical developmental approaches that are discretely based on a Newtonian paradigm, which presumes that associations between sequenced variables will necessarily produce a desired, pre-planned outcome, rather like baking a cake. While this linear 'cake baking' approach tends to work for well disciplined, top-down systems such as purchasing, logistics, or accounting, this model is not so useful in unpredictable developmental contexts. From the perspective of complexity, the 'unpredictable developmental context' reflects the dynamic properties of the social system (the 'complex adaptive system') which is both a *complex* and an *emergent* system, or even multiple interdependent systems. Such systems are energised by linear *and* non-ergodic feedback loops that develop through discrete, yet agentic, sense making processes that selectively incorporate history/ies into today and tomorrow. Not only are these systems complicated to start with (historical legacy of apartheid, poverty, 'emancipatory expectations', etc.) they are likely to change and mutate, in almost imperceptible, yet powerful, ways the moment the developmental apparatus focuses its attention on a community. This is because the mere presence of the developmental apparatus within a community becomes incorporated, as a partially saturating property, into the community system as the sensori-memorabilia of the system begins a process of articulating a future trajectory for tomorrow, mediated by localised sense making. It has also suggested that this complex developmental landscape is further compressed by the consequences of external drivers of change identified in the NDP.

While the DST's Fifth Grand Challenge draws attention the complexities of development and change and the NDP adds more weight to the challenges ahead, there is no clear statement about the style of planning and practice required to embrace these realities. For Snowden and Boone (2007: 63) "the science of complexity can help all of us address the challenges and opportunities we face in a new epoch of human history".

Such complexity thinkers represent a relatively 'new breed' of often transdisciplinary academics and practitioners who urge that different epistemological approaches can and necessarily should be applied to qualitatively particular developmental contexts (Rihani, 2002 and 2005). For the 'new breed' of transdisciplinary scientists that wish to embrace complexity, rather than deny it, it is deemed essential that the scientist or practitioner has the intellectual agility to identify different contexts and apply appropriate modes of enquiry to that context. It is not necessarily a matter of a paradigm shift (Kuhn, 1970), *per se*, but more a matter of the intellectual dexterity to recognise what type of context one is investigating and respond appropriately (Kurtz & Snowden, 2003; Boone & Snowden, 2007) – although this, in itself, may be a 'scientific revolution' of sorts. Negotiating this terrain between embedded reductionist hegemonies - both the metaphorical and literal default setting of most players in the game - such as the gold standard randomised control trial (Hawe et al., 2004) and decisions makers' reluctance to move away from familiar epistemological turf – despite qualitatively diverse contexts is difficult (see Rogers *et al.*, forthcoming). However, in recent years, complexity and malleable, open systems thinking is beginning to hold a platform of interest to both academics and practitioners alike, as a legitimate alternative epistemological avenue of enquiry in contexts that are described by the DST's Fifth Grand Challenge and the National Development Plan.

From a 'real-world' perspective: the question remains as to where the incentives to begin to build this momentum will come from. For complexity theorisers, it is not possible to deny the power of the existing sensori-memorabilia that filters real world experiences into sense making properties. This means that the first steps required to achieve Vision: 2030 require some serious reflection about the feedback, or social drivers, that have contributed to the current situation. Following the complexity argument provided above: if the developmental apparatus continues to do more of the same and hope for improved outcomes that are aligned to the Vision: 2030, without taking time out to critically scrutinise the compressed context of today it is likely that the developmental potentials will be, at best, restricted and at worst the developmental apparatus will contribute to producing an autopoietic condition of conflict, rather than ameliorate the situation. If, however, the developmental apparatus takes time out to critically scrutinise the 'complexity' of the current situation and responds to that learning, it is possible that more expansive, adaptive forms of development can be imagined that incorporates the contemporary, emergent complexities rather than deny them.

Conclusion

The DST's Fifth Grand Challenge and the National Development Plan: Vision 2013 both acknowledge that the social dynamics of development are complex and that developmental approaches are in need of a conceptual shake up. However, neither of these documents provides a clear statement of how to achieve the conceptual developmental shake-up required if the developmental apparatus is to be better adapted to ameliorating the complex challenges associated with "continuous change". It has been argued that complexity is one such conceptual avenue to begin to think outside of the confinements of the existing developmental box, which has the potentials to provision the developmental apparatus with opportunities to better support communities to manage the complex, unpredictable challenges of today and tomorrow as a contribution to sustainable development. Complexity provides decision makers a viable avenue to begin to shed their unsteady, technical "sensori-memorabilia" of yesterday and begin to re-learn developmental approaches as emergent social

processes, situated in uncertain (or difficult to predict) social practices, embedded in historically constituted, localised contexts, influenced by global systems and compressed (or further stressed) by uncertain global challenges such as the external drivers of change identified in the NDP. Complexity also enables both policy makers and practitioners the opportunity to begin *to acknowledge and work confidently with* the empirical complexities of today – including the responsive vibrancy of marginalised communities - rather than to deny, ignore or work against them. Transferring these insights into the context of development in South Africa simply means that to better manage development it is necessary to embrace the cultural landscape and the patterned behaviours therein, within which these complex socially constructed formations are located (e.g. – communities and their networks), rather than make naive assumptions that the existing technical paradigm that overlooks many of these patterns will provide the wins that frustrated people across South Africa are looking for. However, as Kuhn hinted at some years ago, this process of paradigm shifting is extremely difficult because it requires that entire bureaucracies and sometimes cultures are pushed to the edge of institutional chaos. While the edge of institutional chaos is intimidating for those involved, the alternative is to continue along the "technicist" business as usual pathway. If the latter option of remaining within the technical default setting is taken, the developmental apparatus then implicitly risks autopoietic social movement towards the edge of confrontational chaos.

It remains to be seen whether the political will exists to embrace this possibility of creating alternative developmental pathways, or whether the developmental apparatus will fortify itself against the dynamic, emergent realities that are being played out on a daily basis at multiple frontiers of the democratic transition and continue to do more and more of the same, while hoping for improved developmental outcomes. Either way, movement towards chaos seems inevitable. Whose chaos counts could determine the future direction of development in South Africa.

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