Working paper

From best practice to best fit

Understanding and navigating wicked problems in international development

Ben Ramalingam, Miguel Laric and John Primrose

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Abstract

The methods of complex systems research are increasingly being used and valued by international development organisations. These approaches enable a shift away from existing tools and business processes that reinforce a focus on static, simple and linear problems. The evidence is that these methods can help development partners better navigate the complex, dynamic realities they face on a day-to-day basis. This Working Paper summarises the findings of a series of small-scale pilots of selected complex systems methods in DFID's wealth creation work. The pilots contributed to improved analysis and understanding of a range of wicked problems, and generated tangible findings that were directly utilised in corporate and programmatic decisions. They played a significant role in the design of two large programmes, and provided the evidence base for a root and branch review of DFID processes. The Working Paper concludes that there are considerable opportunities for doing more programming using these methods, with real potential for enhancing development decision-making in the face of wicked problems.

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The perspective and opinions expressed here are the authors' and do not represent the official views of the peer reviewers, the UK Department for International Development (DFID) or any of the agencies involved in the pilot projects.

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Abbreviations

AfT	Aid for Trade
DFID	Department of International Development
DRC	Democratic Republic of Congo
IMF	International Monetary Fund
LFA	Logical framework analysis
PRF	Policy Research Fund
SWOC	Strengths, Weaknesses, Opportunities, Challenges
UNDP	United Nations Development Programme
USAID	United States Aid Agency

Executive summary

Introduction

The tools of complex systems research, which emerged from scientific research, are already used and valued by the private and public sectors to better analyse and navigate a range of wicked problems across many disciplines. International development is starting to catch on, with a number of initiatives and projects in this area.

Many development partner tools and business processes deal with static, simple or linear problems. There is considerable demand for new methods and principles that can help development partners better navigate the complex, dynamic realities they face on a day-to-day basis.

What we did

This project looked at the appetite for these new methods in DFID and tested a number of tools and principles in four small-scale pilots: looking at system dynamics in trade; adaptive management and complexity-informed theories of change in private sector development; network analysis in girls' empowerment; and systems thinking in programme management.

What we found

There is a significant appetite for improved tools and principles that can help DFID better deliver on its programming. The pilots contributed to improved analysis and understanding of problems, provided a valuable means by which to engage with the wicked nature of challenges, and created sound insights about the kinds of interventions that might be appropriate. The pilots generated tangible findings that were directly utilised in corporate and programmatic decisions. They played a significant role in the design of two large programmes, and provided the evidence base for a root and branch review of DFID processes.

The findings were not unanimously positive, however: the pilot recommendations were not always tailored to DFID's organisational realities, and needed some reworking. Moreover, some of the methods did not fit easily within DFID processes and required some adaptation. The terminology and visualisations were in some places hard for DFID staff to understand.

What next

There are considerable opportunities for doing more programming using these methods. Specific pilot approaches are already being used in other contexts in DFID. There is a real potential for enhancing decision-making around wicked problems. There are also opportunities for DFID to strengthen its efforts in operational research, which would involve greater engagement with these methods.

In terms of recommendations, development agencies should:

- improve their understanding of wicked problems in different areas of development work
- trial and adapt new tools to improve analysis and programming in the face of these problems
- ensure their internal systems, processes, skills and capacities can support these improved analytical and programming approaches
- build linkages with complexity specialists in different sectors to support all of the above.

Complex systems specialists should:

- work at adapting tools from other sectors to development work
- simplify terminology and make methods more accessible
- build the evidence of benefits and costs of applying complex systems methods in different contexts

1 Introduction

1.1 Why do we need to think about complex and wicked problems in development?

International development and humanitarian agencies face some of the most complex and challenging problems confronting humankind. The social, economic and political improvements that aid agencies focus on are characterised by 'novel complexity, genuine uncertainty, conflict of values, unique circumstances, and structural instabilities' (Ellerman, 2001, p26). Such improvements need to be induced, shaped, facilitated and supported in situations of limited national resources, weak institutional capacity and, in many cases, endemic corruption and protracted conflict. All of this sits within an increasingly turbulent and unpredictable system of global foreign relations.

Historically, the tendency within foreign aid has been to promote and support development through the identification and rollout of 'best practices'. However, this process has arguably been shaped more by the needs of aid bureaucracies than by evidence and research. There are clear incentives – common to public administration more generally – for agencies to provide clear blueprints and unambiguous answers.

Of course, this is not always problematic. After all, there may be some development gains that can be achieved *only* through the use of a top-down, 'plan and control' approach. To use terminology from the social planning literature, a number of development issues are 'tame' – that is, static, bounded, controllable and therefore optimally suited to the identification and rollout of 'best practices'.

However, there is increasing recognition that not all aid problems are like this. Consider, for example, the challenge of strengthening primary health care in developing countries. This has proved a lot more difficult than simply supplementing such systems through aid interventions. The problem has many different facets – from the human to the cultural to the political – and cuts across and depends on many other social and economic factors. It also changes over time, depending on the population being served and their health needs. Meanwhile, the existing system often 'pushes back' against simple and obvious fixes: short-term improvements may be possible, but many of these prove hard to sustain over time. The features of health systems mean that interventions are better seen as a 'wicked problem'[1].

Table 1 contrasts 'tame' and 'wicked' problems in accordance with various characteristics of a given problem. While many development problems can be seen to be on a spectrum between these two extremes, it has been argued that the *majority* of development problems may well be of the wicked variety.

[1] 'Wicked' here does not have a moral connotation such as 'evil', but rather means difficult to solve because of incomplete, contradictory, and changing requirements that are often difficult to recognise and resist resolution.

Table 1: Tame vs. wicked problems[2]

Characteristic	Tame problems	Wicked problems
Problem formulation	The problem can be clearly written down. The problem can be stated as a gap between what is and what ought to be. There is easy agreement about the problem definition.	The problem is difficult to define. Many possible explanations may exist. Individuals perceive the issue differently. Depending on the explanation, the solution takes on a different form.
Testability	Potential solutions can be tested as either correct or false.	There is no single set of criteria for whether solutions are right or wrong; they can only be more or less acceptable relative to each other.
Finality	Problems have a clear solution and end point.	There is always room for more improvement and potential consequences may continue indefinitely.
Level of analysis	It is possible to bound the problem and identify its root cause. There is no need to argue about the level at which to intervene; the parts can be easily separated from the whole.	Every problem can be considered a symptom of another problem. There is no identifiable root cause and it is not possible to be sure of the appropriate level at which to intervene; one cannot easily separate parts from the whole.
Replicability	The problem may repeat itself many times; applying formulaic responses will produce predictable results.	Every problem is essentially unique; formulae are of limited value.
Reproducibility	Solutions can be trialled and excluded until the correct solution is found.	Each problem is a one-shot operation. Once a solution is attempted, you cannot undo what you have already done.

Source: Adapted from Mason and Mitroff, 1981, pp. 10–12

The typical approach to such wicked problems is to act as if they can be simplified, or tamed, and then made amenable to quick fixes. But the evidence in a number of areas – from disease to urbanisation, from conflict to climate change, from economic growth to governance reforms – suggests that the underlying problems remain untamed. This forces programmes to adapt and change, and adds to both managerial challenges and costs. The mismatch between the reality of the problems faced and many of the assumptions that guide analysis and action poses a considerable challenge to the sector.

It is worth noting that this mismatch is not unique to development, or even the public sector. The 2010 IBM Global CEO Study, conducted annually, found evidence of a 'complexity gap'. This is defined as the difference between the complexity of the challenges being faced in business and the tools and capability available to deal with them. Moreover, for the leaders of FTSE 100 and Fortune 500 corporations who participated in the survey, this complexity gap was the single biggest area of concern about their business.

How best to address this challenge in the context of development work? The scholars who developed the wicked problems framework emphasise the importance of *operational research* methods in understanding such problems and navigating towards improved policy and practice. The argument is that, when dealing with wicked problems, it is essential to use real-time operational research to identify

[2] For a more detailed classification of problems, see Warren Weaver's (1948) classification into simple, organised and disorganised problems. While we used a two-part classification, peer reviewers noted the value of approaches such as the Cynefin model that distinguishes between simple, complicated, complex and chaotic problems.

gaps between project designs and emerging outcomes, and to inform a 'learning by doing' approach to management and decision-making.

In parallel, efforts have been ongoing in science, business and the public sector to identify new tools and techniques for a better understanding of complex problems with wicked features. This has led to growing confidence in a number of policy and research circles that it is indeed possible to address such issues. Even so, it seems that doing so is far from easy: research shows it requires not just new methods and techniques but also new collaborative approaches, new organisational processes and – perhaps most importantly – new mind-sets able to deal with the uncertainty and risk inherent in working on such problems.

1.2 From rigour in evaluation to rigour in design and implementation

Wicked problems are not the only challenges facing aid agencies. The past decade or so has seen a concerted movement to enhance aid effectiveness, through three broad and overlapping areas of emphasis: transparency, accountability and ownership; results and new public management; and improved evaluations of aid programmes and projects. The argument is that, through improvements in these areas, aid agencies can weed out ineffective practices while actively promoting those that do work, becoming better attuned to the realities and needs of poor people and their partners, and being more accountable to taxpayers and donors.

This 'accountability revolution' has made a useful contribution to how we think about and deliver aid, by bringing more focus and rigour to assessments of 'what works'. But it is not without its problems. Much of the accountability revolution has reinforced the long-established emphasis on identifying and applying the 'right solutions' – which presents considerable challenges when dealing with wicked problems. This has led some to call for rigour to be a consideration not just in evaluation and results but also in design and implementation. To put it another way, there is as much need for rigour and science in answering questions of 'how to work' as there is in answering questions of 'what works'.

What might more rigorous and scientific approaches to the 'how' of development look like? Answers abound: there have been calls for 'problem-driven iterative adaptation', for 'science of delivery', for 'building better feedback loops', for 'upside-down governance', for 'good enough governance', for 'navigating complexity' and for 'behavioural approaches'. What unifies all of these is a shift away from 'best practices' towards 'best fit' as a core guiding principle for development. 'Best fit', a concept stemming from governance efforts, describes aid programmes that are optimally *adapted* to the political, social and economic context. Such programmes can take advantage of a *plurality* of possible solutions, which can be deployed *flexibly*. They often work at *multiple levels simultaneously* – from community to national and even global policy levels – in order to facilitate and bring about change.

While programmes exhibiting best fit can readily be described at a conceptual level, they have proved rather harder to operationalise. This is in part because the policy and operational toolkit aid often employs is still grounded in a best practice paradigm (Chambers, 2011). The numerous innovations and adaptations made in the aid toolkit over the decades have not significantly enhanced the 'fit' of aid interventions. Nor have they focused on the challenges wicked problems pose.

This is not to say, however, that suitable methods and techniques are not available. Approaches are being employed in a variety of settings – from academia to business to the wider public sector – that can help us better analyse and navigate wicked problems, and provide insights into the kinds of programmes that might best fit such problems. These include behavioural science, evolutionary economics, complex adaptive systems approaches, adaptive management, evolving strategies, agile programming and so on. As well as drawing on these specific methods, there is an important emphasis on operational research to complement *ex-ante* design and *ex-post* evaluation.

Despite a number of applications, however, there has to date been insufficient investment in or sustained work on these approaches in international development. As a result, their potential to bring rigour to design and implementation, to facilitate the shift towards best fit in development programmes, has not yet been fully realised.

1.3 The DFID Policy Research Fund Complex Systems Tools project

All this provides the background for a small-scale programme of work undertaken in DFID over the course of 2013. The starting premise of this work was that in a broad number of programmatic areas – and with a specific focus on wealth creation – DFID was facing problems that were complex and wicked as opposed to simple and tame. Addressing such challenges was placing a number of non-trivial demands on DFID staff.

However, despite an institutional recognition of the importance of this issue, including the inclusion of 'managing wicked problems' as a key senior leadership capacity, there was for the most part a lack of structured analytical approaches and corporate processes for dealing with such problems in DFID, and within the aid sector more generally. This is not to say that tools for thinking about and dealing with complex and wicked problems have not been employed in DFID. It is more that this has happened on an ad-hoc and case-by-case basis within specific programmes, rather than being supported and encouraged at a corporate level. This increased both costs and delays and diminished the potential for organisations to effectively learn from these efforts.

This very modest programme of work was funded by the Policy Research Fund (PRF)[3] to the tune of some £110,000. It focused on identifying a range of wicked challenges across the DFID wealth creation portfolio. The aim was to identify and pilot new operational research methods, specifically drawing on and adapting from the diverse body of work that covers *complex systems research methods*. The ultimate goal was to learn whether and how such techniques might help DFID staff better understand and navigate these problems, and thereby deliver better results and value for money.

The Complex Systems Tools project had three broad aims:

- to identify how the organisation currently engages with wicked, complex problems
- to identify the demand for new kinds of approaches to dealing with such problems

[3] The PRF supports new policy-relevant research approaches and ideas that are of relevance to DFID and its partners.

- to pilot a range of new tools and techniques drawing on complex systems approaches that might help in better dealing with these challenges.

Because of the limited resources available for the overall project, a decision was made early on to focus on supporting the design stages of different processes, whether internal or external to the organisation. This was also the most feasible area of focus: design processes are generally where DFID staff have greatest latitude for taking on board new ideas and methods, and where there is also demand for this.

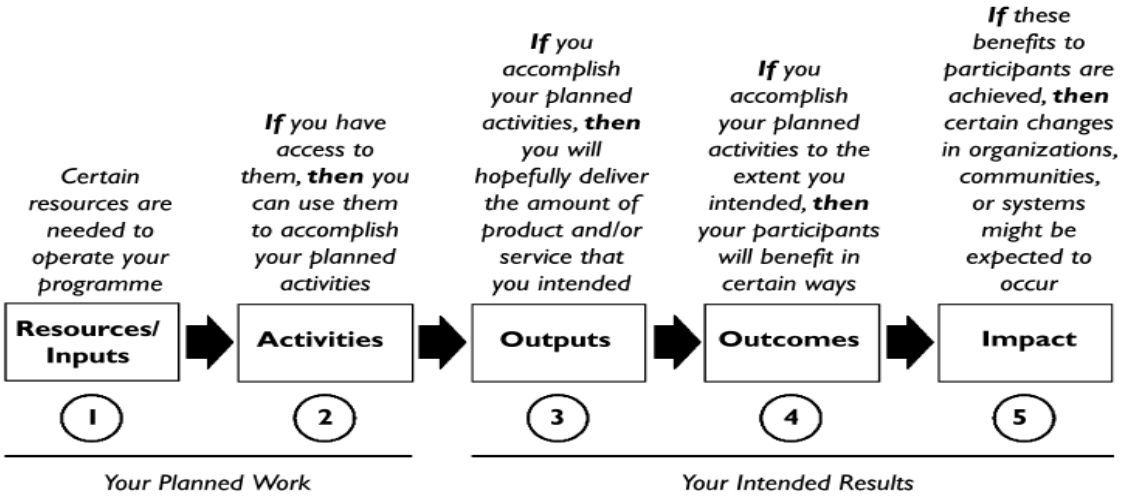
The rest of this Working Paper summarises the project, its rationale and its key findings. Section 2 looks at what complex systems approaches bring to wicked problems, using the example of tackling corruption in trade, before describing a broad family of techniques and methods that might be employed to understand and navigate wicked problems. Section 3 describes the PRF project and its rationale. Section 4 then looks at how DFID currently engages with wicked and complex problems, at what it does well and at what is more challenging. Section 5 looks at the four pilots that formed the core of the Complex Systems Tools project, and sets out key findings on how these helped DFID better work with a variety of wicked problems in its wealth creation portfolio. Section 6 synthesises lessons learnt from the pilots in the form of a 'Strengths, Weaknesses, Opportunities, Constraints' analysis. Section 7 then presents conclusions and recommendations.

2 What does navigating wicked problems look like in practice?

2.1 Learning from what does not work: using the logical framework to 'tame' wicked problems

The vast majority of programmes and projects in development are designed and monitored using logical framework analysis (LFA). The established mainstay of development analysis, planning and implementation, developed and honed in the US military in the 1960s, this approach brings both analytical clarity and a clear sequential approach to thinking about change. Figure 1 sets out the 'logic' of the LFA approach, and shows how an investment in a given intervention can move from inputs to activities to outputs to outcomes to impacts.

Figure 1: The logic behind the logical framework



Source: Rogers (2008).

For some development interventions, notably the *tame* problems described earlier, models like this work well: they provide a clear statement of intentions, help guide implementation and highlight performance indicators that we might use in monitoring and evaluation to prove and improve effectiveness. But for others such as health systems interventions, for example, they are rather less useful.

To explain the limitations, it is worth considering a specific programme and showing how it works. Consider, for example, a programme to reduce corruption in cross-border trade between two Latin American countries, and thereby increase levels of pro-poor trade. Table 2 shows a possible LFA for such a programme.

Here, the LFA provides a high-level means to understand the programme, and to track effectiveness and value for money. But there are also a number of important limitations of using this framework.

Table 2: A LFA for a trade programme focused on reduction of corruption

Resources/ inputs	Activities	Outputs	Outcomes	Impacts
Funds for tackling cross-border corruption Trade management experts Corruption expertise	Training of border staff Design and implementation of new third-party oversight techniques	Knowledge and capacity of staff increases Improved and streamlined regulations and procedures Proportion of trades subject to oversight increases	*Intermediate* Number of trades not subject to corruption payments increases Number of traders from poor communities increases *Overall* Trading volume increases	Increased employment for poor groups Poverty decreases

Five issues arise in relation to the LFA for this fictionalised programme.

Assumption that causal pathways are known in advance of implementation

There is a tendency to assume a great deal of knowledge at the outset about what will deliver the hoped-for outcomes and impacts. It is also taken for granted that the LFA designers or its agents have the ability to identify and work on known root causes. In this case, while there is a wealth of evidence that increased trade can deliver improved economic growth, increased employment and a reduction in poverty, it is not easy to specify upfront the causal relationships among training, oversight and the reduction of corruption payments. It is also not at all clear that decreased levels of corruption and increased oversight will lead to increases in trade value, trade volume and numbers of traders – many other factors need to be taken into account.

The LFA supports convenient simplifications of messy realities that then become entrenched in implementation

The assumption of a known causal relationship between the intervention and the outcome means that identification of the 'right' activities and outputs is paramount in bringing about change. In this case, the right training programme or the right form of oversight should, if applied repeatedly, help bring about the desired outcomes and impacts. The risk is that we misunderstand the very nature of the problem being dealt with; we ignore the dynamic interactions that play out among the various parts of the problem, or deny them for bureaucratic convenience, and the programme ends up irrelevant as a result. In this trade example, focusing efforts on training and oversight assumes that the optimal entry points for tackling corruption are information based, and that by enhancing staff understanding and improving the monitoring protocols being used, trade volumes would increase. However, it may well be that investing in such efforts does not address the underlying incentives for corrupt behaviour, i.e. the organisational culture at specific border crossings. Nor would this address how traders themselves might be able to better navigate such situations. However, the logical framework (log frame) is not associated with the operational flexibility to adapt the programme in significant ways in the face of emerging implementation issues.

The LFA assumes that the problem can be treated in reductionist ways

The LFA structure makes it possible to break problems down into smaller, more manageable pieces, with solutions proposed for each of these, which would then add up neatly to an overall solution. In the case above, the LFA presents trade-related corruption as a gap between 'what is' and 'what ought to be', with known solutions that can help fill this gap. Implicit in this is the assumption that what works can be applied in a replicable and reproducible fashion, with more inputs leading to more outputs and outcomes/impacts.

The LFA process typically engages with contextual factors in delivery only, rather than in design

The LFA tends to engage with contextual factors – including implementation contexts, concurrent programmes and the behaviours and characteristics of recipients (Rogers, 2008) – as issues to be dealt with *in the delivery* of outputs, rather than as considerations that need to *fundamentally shape the selection and design of* those outputs. This is a limitation not of the tool itself but of the way it is typically used, which tends to emphasise certainty on what is going to be done and then use of the tool to justify the actions. For example, many programmes designed with the best intentions then see failures attributed to 'a lack of political will'. The general conclusion drawn is that programmes would have worked better if only the local context was more amenable to what was set out, rather than questioning whether what was set out was in fact appropriate and relevant.

Lack of willingness to adapt the design over time

Finally, and building on all of these previous points, although the LFA can in principle be adapted over time, the reality is that funding typically gets provided on the basis of doing what the LFA says. Major deviations from or corrections to *ex-ante* designs are typically viewed as a clear sign of failure. There are strong incentives to deliver what was stated in the log frame, and to use spin and polish to make the programme fit the original design.

The evidence on trade and corruption suggests these limitations are far from trivial. Corruption is best understood as a property of a social, economic and political system, rather than simply as a variable that can be identified, isolated, targeted and reduced. Because it is woven intricately into the wider system, it is hard to draw clear boundaries around it and thus to identify simple, reliable and replicable causal linkages. As a result, it is difficult to say with any certainty that a series of *ex-ante* interventions of the kind set out above will lead to desired changes in outcomes.

It would therefore be very difficult to respond appropriately to trade corruption using the LFA approach, unless the problem is 'made to fit the model' – or the LFA is applied using principles and protocols that are very different to those that shape its typical application. On this basis, it would seem reasonable to conclude that the LFA structure and approach are much more suited to tame problems, as opposed to those that are wicked. Where, then, does that leave us in the context of our trade programme?

2.2 Dealing with trade as a wicked problem: the potential of complex systems methods and techniques

To address problems such as trade corruption more effectively, we must first have a way of understanding the kind of problem we are dealing with. This corresponds to Table 1 in the introduction, which contrasts tame and wicked problems in accordance with various characteristics of a given problem. On all of these criteria,

trade corruption can be shown to be more of a wicked than a tame problem in the following ways: it is difficult to define and explain, and different explanations lead to different solutions; every problem is a symptom of several other problems; it is hard to definitively prove that solutions are wrong or right; there is no clear end point for interventions; and formulae are of limited use. Trade-related problems are obviously not the only wicked problems, and nor are such problems confined to development. Increasing awareness of the growing 'complexity gap' has led to growing interest in approaches developed in a wide range of different sectors and contexts, in both scientific and policy circles.

Emerging from the natural sciences, complex systems research amounts to a broad set of principles and techniques that researchers and practitioners are using to better understand and deal with a variety of wicked real-world problems. In this, as in any scientific endeavour, there is a great deal of diversity and active debate. Nevertheless, there is emerging agreement about the kinds of techniques and principles involved.

First, there is growing understanding about how best to navigate wicked problems. This means incorporating the following principles into responses:

- accommodating multiple alternative perspectives rather than specific best practices
- looking for multiple intervention points and moving among them dynamically
- working through group interaction and iteration rather than 'back office' designs
- generating ownership of problem formulation and transparency through participation of stakeholders, especially front-line staff and end users
- developing coherent visual representations of the problem that enable systematic and group-based exploration of solutions
- concentrating on flexibility rather than predictability of solutions.

Second, there are a number of tools and approaches – some of them very well developed, others more emergent – for making sense of wicked problems in a manner that supports appropriate representations, discussions and actions. The areas of wicked problems and complex systems thinking have common roots, and are increasingly being drawn together to analyse intractable problems ranging from urban design to military supply chain management.

Table 3 summarises the four main features of wicked problems and the manifestations of these. It also lays out the four complex systems approaches that have been utilised, their potential contribution and specific applications.

Table 3: The value-added of different complex systems methods

Feature of wicked problem	Manifestation and relevance to trade	Approach and potential contribution	Potential for trade example	Wider applications
Systemic challenges	There is a tendency to see development problems as ones that can be boiled down to issues of one or two variables, which can then be dealt with through the application of specific technical solutions.	*System dynamics and systems thinking:* these approaches enable a more sophisticated understanding of problems through a focus on interactions and feedback between components and emergent properties that arise.	The approach should help us take a wide-angle lens on the trade corruption problem and think through the broader factors that will influence programme success.	- Extensive use of system dynamics approaches in business strategies - Central role of systems thinking in organisational learning approaches - Numerous applications in health and public services - Military planning approaches
Behavioural challenges	Assumptions of perfect rationality loom large in development, as in much of public policy. It is believed that behaviour can be changed through simple knowledge, attitudes and practices (KAP) approaches, such that changes in knowledge mean changes in behaviour.	*Adaptive, agent-based models and behavioural principles*: these techniques focus on simulating iterative, trial-and-error behaviours and collective actions, and using these to strengthen outcomes.	The approach should understand the role of behaviours and incentives in sustaining corrupt behaviours, and ways to influence these.	- Agile software development approaches in information technology - Agent-based simulations of disasters, economic crises, hospital admittance, retail trade and conflicts - Algorithms in drug design - Computerised trading
Relational challenges	Much of aid analysis tends to underestimate relationships and networks between actors, and focuses instead on individualised actors and entities.	*Network analysis:* such methods allow the mapping of the relationships among actors or elements of a system and analysis of how the structure of relationships affects behaviours.	The approach sheds light on the networks of influence among traders, border officials, suppliers and customers, and different ways the programme could influence the network.	- Web-based applications of network analysis, including the Google PageRank model, which underpins the search engine - Use of social network analysis in security and counterterrorism - Analysis of urban design/infrastructure
Dynamic challenges	Change is typically seen as linear, additive and proportional to inputs and outputs, so that if an agency generates more of output X, it leads to proportionally more outcomes and impacts.	*Dynamic analytical models:* these help further an understanding of the non-linear nature of change, including tipping points, thresholds and multiple equilibrium states.	The approach would shed light on the history and evolution of the system over time, and help get a realistic understanding of the 'space of possibilities' for change.	- Use of dynamic non-linear techniques in actuarial practices to assess and price risks - Use of threshold analysis to assess tipping points in phenomena such as climate change and conflicts

Drawn and adapted from Ramalingam 2013.

As Table 3 shows, research has identified four distinct families: systems approaches, behavioural approaches, network methods and dynamic analysis techniques. These all use different techniques and assumptions, but all help to think about problems in ways that bring the principles to bear on programmatic responses. These four families of approaches are central to the broad interdisciplinary field of complex systems research as applied to social, economic and political contexts.

The evidence from a variety of settings indicates that using these approaches can help us deepen our understanding of the intricacies of the issue at hand. Done well, they can inform the design of interventions that are more optimally suited to the context, ensuring best fit rather than best practice.

Armed with this understanding, policymakers in both commercial and public policy arenas have achieved transformational changes in performance in a wide variety of settings, through both better *understanding* of those systems and better policies and programmes for *navigating* those systems. These approaches have been applied across sectors to help scientists, policymakers and practitioners better comprehend phenomena that have long been challenging when using traditional, reductionist approaches.

For growing numbers of advocates in development, these techniques – both individually and collectively – have the potential to address a number of the limitations faced in dealing with wicked problems. Specifically, it is argued that the use of methods, ideas and concepts from complex systems research could strengthen and augment the well-established tools in aid. There is, therefore, a growing movement to bring these ideas and approaches into the mainstream. Applications, including in agricultural development, health programmes, economic analysis and child malnutrition, are already helping aid organisations better deal with uncertainties in complex, challenging, context-specific operating environments (Ramalingam, 2013).

2.3 Applying system dynamics to trade corruption: new models, new principles

So, what might the application of a new approach to a wicked problem look like in practice? Drawing on just one of these fields – system dynamics – it is possible to illustrate the potential in the context of the trade intervention described above. Here, we draw on one of the pilots addressed later in Section 5 of this paper, which sought to better understand trade across the Nigeria–Niger border and how a new DFID programme might better support and facilitate it.

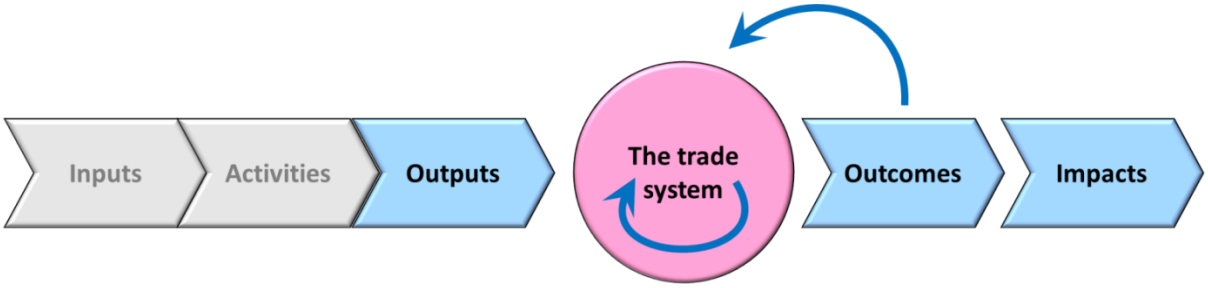
First, based on our framing of the trade problem using the LFA, and our overview of wicked problems, we can conclude that dealing with issues such as corruption requires us to: recognise the systemic nature of the issue; understand the interactions among key actors and their behaviours; identify the dynamics and patterns of the issue; pinpoint the range of possible intervention points; work flexibly with a range of approaches; and adapt over time. Working with such principles means the programme as designed at the outset should not be how it looks at the end. Indeed, such a lack of adaptation should be seen as the true failure in the context of wicked problems.

A range of issues would make the traditional LFA ineffective here, relating both to the intervention logic and to the problem itself. On the intervention logic, system dynamics suggests that, first, the inputs and activities of an intervention do not lead to outputs that are simply ‘delivered’ into a given context; instead, the context

profoundly shapes how and what outputs are generated. Second, this context is a trade *system* with its own history, dynamics and behaviours – it is not a fictionalised laboratory for experimentation. Third, this system is not static but rather responds dynamically to outputs and hoped-for outcomes.

Figure 2 illustrates this in the context of an LFA. The outputs are part of a 'trade system'. There are interactions between the different outputs and the system, as well as within the system itself, that ultimately determine what is achieved and how.

Figure 2: Bringing the system into view



Source: Warren (2013).

Thinking about the trade system using a system dynamics lens means focusing on four aspects central to how such a system behaves: interdependence, feedback, accumulations and thresholds (see Box 1).

What system dynamics tells us about wicked problems

Interdependence: Different activities have an impact on the same or connected parts of the same trade system. For example, improved road links may have a substantial effect on trade volumes or none at all, depending on other factors, such as capacity constraints at border crossings. A single change of hours worked per day by border staff may thus have a substantial impact, none at all, or indeed any amount in between.

Feedback: An unavoidable consequence of interdependence is that any input/activity may cause outcomes that feed back to reinforce or disable the initial change. Traders who find good opportunities across a border will encourage (intentionally or not) other traders to engage in the same activity – reinforcing feedback. On the other hand, quicker border crossing times may encourage more traders to cross, causing those same crossing delays to increase once again – self-limiting, or balancing, feedback.

Accumulations: Key aspects in all such systems accumulate and deplete over long periods of time – the physical capacity of border crossings or ports, numbers and skills of border staff, numbers and activity rates of traders, numbers of businesses, levels of corruption and so on. Outputs and outcomes will therefore reflect changes made many years previously, and continue to do so into the future.

Thresholds: Parts of the system may be unresponsive over a wide range of change to a certain factor, but at a certain point cross the threshold, triggering a substantial response. For example, traders may not feel it is worth trying to cross a border if their potential revenue from that effort is £X-3X, but when that potential reaches £4X traders find it sufficiently attractive that many act.

Source: Warren (2013).

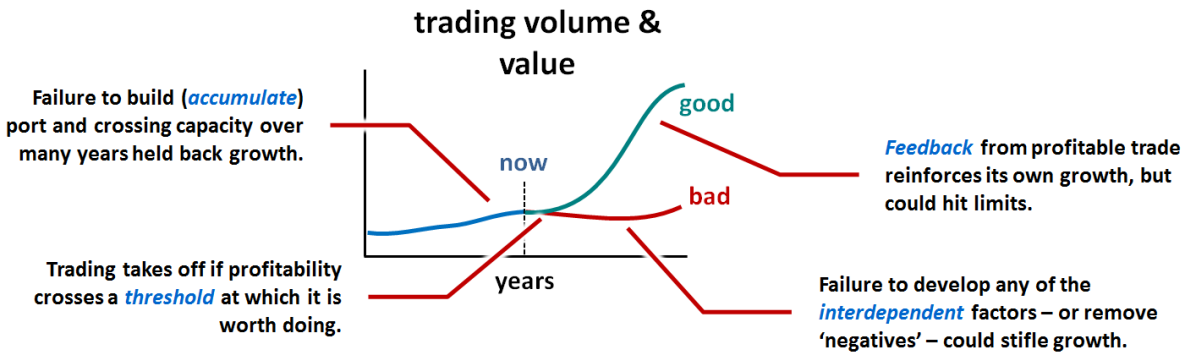
Readers will note the close correspondence between the features listed above and those of wicked problems. As a tool, system dynamics is designed to deal with those aspects of a problem that make it wicked. It has a proven ability to capture and explain the behaviour of an extremely wide variety of physical and social systems. What this kind of analysis enables is a way of understanding and working with the real-world features of a trade system, rather than assuming they do not exist or can be ignored.

In the context of trade, the features of the system that matter should include road capacity, numbers of traders using the crossing, the capacity of the crossing, infrastructure and staffing. The first part of developing a system dynamics model is to develop a series of logical statements about these aspects of the system, and how they relate to each other. For example:

- that trade comes from traders and the frequency with which they trade
- that traders start trading activities if they see profit opportunities and if they are able to do so
- that they can make profits if costs of documentation and corruption are low
- that they are able to trade if they can reach a border and if the border has the capacity (physical and human) to handle with little delay the number of crossings traders try to make

The starting point for the model is thus to enable a better understanding of how each element of the system is shaped by the four features above. Figure 3 shows how accumulations, thresholds, feedback and interdependence might play out for one specific aspect of trade volumes. The time series chart indicates the possible spread of outcomes.

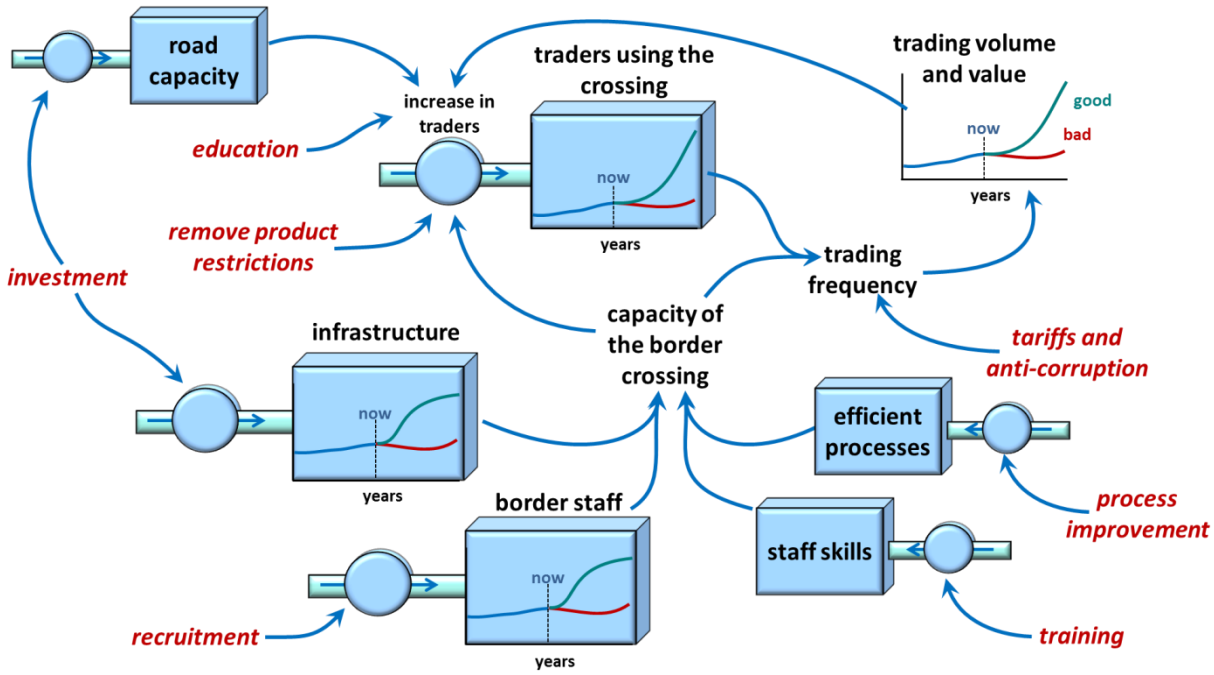
Figure 3: Trading volume as shaped by accumulations, thresholds, feedback and interdependence



Source: Warren (2013)

The model also enables us to relate these parts of the system to each other in logical and testable ways. Figure 4 illustrates both the possible system structure and, in red, the potential interventions that might have an impact on the behaviour of the system. Using this model of the trade system, we can therefore start to make more logical and evidence-based assumptions about how the system works, and how these parts might interact with each other over time.

Figure 4: Illustrative architecture of the trade system at a single land border crossing



Source: Warren (2013).

This overview diagram shows multiple entry points where we might want to focus an intervention. It also demonstrates that the points of intervention are connected intricately to a number of other factors, and that whatever is done has the potential to trigger cascading effects through the system. By making these potential scenarios explicit, the model helps us to think through the conditions under which a particular intervention would be successful or not. To go back to our log frame example, we can see that training and anti-corruption measures are only two possible entry points, and even if these are successful in their own terms, they may not generate the kinds of changes hoped for. There may need to be more staff, process improvements or investments in infrastructure, if we want to see the hoped-for rise in trading volumes.

From this illustrative starting point, it should become clear that the best way forward, short of trying to analyse and predict the system in advance – which is likely to be impossible – is to employ a portfolio approach. This involves identifying possible entry points for interventions, launching multiple parallel interventions and learning in 'real time' to ensure the appropriate sequence and mix of activities. Indeed, the method is designed to support such an evolutionary approach to programming. Together with a continuously refined model of the trade system, and a set of principles for working that are distinct from those underpinning the LFA, this approach will enable real-time tracking and oversight of the portfolio of interventions being put together as part of our imagined trade programme. The programme principles based on this approach are set out in Box 2.

Programme principles based on applying system dynamics

- A continually evolving portfolio of interventions acting in concert to address the potential entry points: road capacity, trader education, product restrictions, tariffs, corruption, process, staff training, staff recruitment and border infrastructure
- A flexible programme approach to respond quickly to emerging opportunities and to amend, augment or abandon interventions
- An ongoing process for identifying and responding to shifts in entry points and interventions
- A process for continually reviewing the understanding of the overall system
- Continual monitoring and evaluation to determine whether interventions are working in concert to influence the system in the chosen direction.

System dynamics provides us with just one specific method to better understand and navigate wicked problems – those that involve many variables, intricately interwoven with feedback loops and interdependencies. This operational tool is quite different to the LFA: it is less useful for describing a flow of work akin to a factory production line, but is instead more useful for the kinds of challenges faced by investment managers or agile software developers. The emphasis is less on *ex-ante* design, specification and control, and more on using an adaptive approach to manage an evolving portfolio of activities.

The rest of this paper describes how key tools within the broad family of complex systems approaches were piloted within DFID's wealth creation work.

3 Piloting new approaches in DFID: the Policy Research Fund project

In November 2012, after a successful application to the DFID Policy Research Fund (PRF), a £110,000 project was initiated to undertake four pilots of 'complex systems tools' across the Department's wealth creation efforts. (See Annex 1 for more on the relevance of such approaches for this area of work.)

The project began with a scoping phase, to identify windows of opportunity for trialling new methods and approaches within ongoing processes. Having developed a long list of potential pilots, these were narrowed down through application of a set of criteria, plus feedback from internal and external advisory groups.

The piloting phase saw four parallel applications of a number of tools and principles within ongoing DFID programmes. Each pilot used approximately 25 researcher days plus time from the pilot 'clients' and support from the project managers. As such, the pilots are better seen as short, focused pieces of consultancy work rather than in-depth and systematic research.

For each pilot, direct work with the clients was followed by a reflection and review exercise, including on the costs and benefits of the selected approaches and their contribution to the organisation.

The synthesis and communication phase focused on the write-up of each pilot, with feedback from pilot stakeholders used to write an overall synthesis paper.

4 Preliminary findings

4.1 How DFID *understands* complex wicked problems

Wicked and complex problems, and the challenges they pose, are well appreciated and understood within DFID. A number of staff members use problem assessment frameworks such as 'wicked-tame' or 'simple-complicated-complex-chaotic' to distinguish the challenges they face. Senior managers are also briefed on wicked problems as a core leadership challenge, including coaching on the distinguishing features of wicked problems and how to deal with them.

At the level of policy, there is an appreciation among staff that they are working on different kinds of problems, which need tailored responses. There are many examples of this across DFID. Growth specialists highlight the importance of 'many ingredients, no recipe.' Governance specialists talk about 'best fit, not best practice'. Social development specialists talk about 'context-specific pathways', while private sector specialists highlight 'portfolio approaches'. The livelihoods approach, which has seen a renaissance of sorts in recent years with the growing interest in resilience, also incorporates a number of systems thinking principles and concepts.

Attempts to design programmes that can navigate such challenges are also increasing. A number of principles of systems thinking underpin popular methods for programmatic analysis, including growth dynamics, political economy analysis and making markets work for the poor (M4P). Tools such as network analysis and systems thinking have been used in a number of settings. There has also been a lot of work on theories of change that seek to go beyond the kinds of assumptions underpinning the LFA to help design programmes that are 'complexity aware'. At the other end of the programming cycle, in evaluation and results, work on 'hard-to-measure benefits' is increasingly seen as vital for a more rounded understanding of DFID's successes and failures.

Overall, the scoping phase of the research found good awareness of the ideas of wicked problems, as well as agreement about the need for more systemic theories and practices across DFID. Most staff members know, from a conceptual and philosophical perspective, that development is not simply a matter of 'planning and control'. To achieve results in complex environments, DFID staff know that they increasingly need to be flexible and adaptive in their approach; they need to 'learn by doing'; they need to employ robust, context-specific monitoring and evaluation; and they need to employ and continually update their theories of change.

However, an awareness of problems does not necessarily mean things are done differently. The key question then becomes: How well is this done in practice, with specific attention to wealth creation work, and how well do corporate systems, processes and culture support such an understanding? This is what we turn to next.

4.2 How DFID *manages* wicked and complex problems

DFID staff do have a demonstrable, instinctive grasp of the need to use the right tools for the right problems. Moreover, in certain areas new and innovative approaches are being developed and tested. It was found that, in a number of pockets of good practice across the organisation, advisors and managers were using a range of concepts, tools and methods, as well as common sense and creativity, to think about and deal with complex problems. However, all of the staff we interviewed (30+) flagged the need to improve and enhance the toolkit so DFID could better think about and navigate wicked problems.

For example, DFID's internal thinking on fostering growth suggests that approaches need to be context dependent[4] and should use approaches that are better suited to addressing the complex challenges that underpin the necessary social, economic and political transformations. However, against the context of the planned scale-up of wealth creation efforts, there were also concerns that DFID's existing methods of working may need to be adapted for dealing with the bigger challenges around growth.

This issue was also apparent in other areas of DFID's work, from governance and resilience to health, conflict and innovation. Staff felt that the tools and processes that were most firmly embedded in DFID's cultural and institutional apparatus were those that were best suited to 'tame' problems. In many settings there are no alternatives to existing 'standard operating procedures' such as the LFA and its variants.

All of the problems with this resonate strongly with the issues set out in sections 2.1 to 2.3. All interviewees noted that the existing programme management process is a 'one-size-fits-all' approach that emphasises *ex-ante* design and control. Institutionally, changes and adaptations away from pre-specified goals could at times be seen as a signal of failure, which could diminish the willingness among staff and partners to experiment and innovate.

Examples of flexible and adaptable approaches in DFID were seen to happen *despite* corporate processes rather than because of them. Interviewees saw this, at least in the face of wicked problems, as potentially limiting DFID's ability to deliver relevant and appropriate programmes and to achieve meaningful results. There was some divergence between those who felt the DFID toolkit needed a 'root and branch' overhaul and those who suggested a more incremental approach to expanding the existing toolkit.

Overall, informants saw considerable implications for the organisation of not doing more work to address this. A good proportion of interviewees, especially at the more senior levels, suggested that better dealing with wicked problems was one of the most important overarching issues DFID faced. Some talked about a 'relevance gap': the gap between DFID's understanding of wicked problems and the institution's ability to deal with them. (This concept clearly resonates with the language of the IBM Global CEO Study cited earlier.) A number of staff members saw this relevance gap as especially pronounced in new programmatic areas such as wealth creation and resilience, as well as in contexts where DFID was rapidly expanding its operations, such as fragile states. This perhaps explains the widespread view that there was a real and tangible need for the PRF project and other similar interventions.

[4] See the imminent DFID Economic Development Strategic Framework.

In terms of what this new toolkit would look like, views were again broadly convergent. Most informants suggested that DFID staff have access to a broader menu of tools, a wider network of relevant experts and an institutionally accepted means of analysing and responding to distinct problems in appropriate ways. On this last point there were some emphatic views: a significant number of staff expressed the view that 'problem classification' approaches should become 'hardwired' into DFID's programming and strategic thinking processes. DFID was seen as needing some means, accepted at the corporate level, of interpreting and classifying the nature of the problem and taking different approaches depending on this. At present, wicked problems are officially recognised as such only after several failed attempts to tame them.

Although there was clear demand for more sophisticated tools to better understand wicked problems, there was less clarity on what these were, where they might come from and how best to utilise them. Some highlighted the experiments that were already happening in the organisation. These included:

- efforts to develop and implement systemic approaches, in areas as diverse as markets for the poor and health systems strengthening
- small-scale experiments with network analysis, which had been the subject of a short methodological how-to note
- work on hard-to-measure benefits, which focused on challenges that are hard to analyse and attribute using a simple linear logic
- efforts that focused on 'bringing the system together' into facilitated processes that attempted to tackle wicked problems through collective action.

While there was considerable effort in this broad area, it was seen as preliminary, limited by the lack of joined-up strategies across the initiatives, and not yet widely accepted as the 'way we do business'.

It is also important to note that a minority of staff argued that wicked problems would be best addressed by DFID trying harder to develop the 'right simple models'. Others acknowledged the need for more systemic approaches, but were concerned that such approaches – by their very nature – were not easy to pick up and use.

5 Case studies

5.1 Overview of case studies

It was clear from the outset that attempting to apply the full range of possible complex systems tools (as set out in Table 3) across DFID's portfolio was not feasible, given the project's scope and budget. Therefore, a number of criteria were applied to select pilots from a long list of proposed ideas. These were then finalised with inputs from internal and external advisory groups. The process also involved discussions with a range of methodological experts, mostly from private sector settings, who were available in the timeframe and had relevant thematic experience. The final four pilots were selected after consultation with key stakeholders, including the internal steering group and the external advisory group (see Box 3).

Each pilot was intended to address a problem facing DFID staff or its partners that was seen as amenable to conventional analytical approaches and processes, and that had either a direct or a traceable connection to wealth creation efforts. Of the four pilots, Nigeria Trade, Nigeria Girls' Empowerment and DRC Private Sector all had clear linkages to wealth creation work. The Programme Management pilot was selected because of the relevance of improvements in these systems for future wealth creation efforts.

Box 3: The pilot projects selected

The pilot projects selected

- A pilot of system dynamics principles in Nigeria, intended to apply system principles to the analysis, design, planning, managing, monitoring and evaluation of a range of initiatives in Aid for Trade (AfT). There is a specific focus on efforts to enhance smaller-scale export activity most likely to directly benefit those in poverty (Nigeria Trade, Warren 2013).
- A pilot exercise of network analysis techniques involving the Girl Hub project in Nigeria. The objective is to test the relevance of such approaches for informing stakeholder-based theories of change and strategies for the empowerment of girls in northern Nigeria (Nigeria Girls' Empowerment, Davies, 2013).
- A pilot to develop and apply a process to generate a 'complexity-informed theory of change' for private sector development in the Democratic Republic of Congo (DRC Private Sector, Vogel and Fisher, 2013).
- A pilot application of systems thinking and mapping techniques to underpin the End-to-End Programme Management Review being conducted across DFID. The purpose is to analyse and improve DFID's programme management systems and processes (Programme Management, Curram and Exelby, 2013).

As explained in Section 2, complex systems tools are a broad set, comprising a range of formal qualitative and quantitative approaches. The range of possible techniques that could be applied in the pilots was shaped by the nature of the problem being faced, the time and money available, the available supplier expertise in terms of the application of specific techniques, and the timeframe within which pilot clients had to operate. Annex 1 provides more detail on the set-up of the pilots.

The rest of Section 5 presents each pilot in turn, covering the following four elements:

- problem/challenge
- approach and process
- findings
- conclusions.

5.2 Pilot 1: Nigeria Trade – trade and system dynamics

Problem/challenge

The trade and system dynamics case study focused on AfT and the potential of system dynamics as an analytical tool to inform programme design and delivery. It specifically looked at the potential of system dynamics principles and modelling for planning, managing, monitoring and evaluating a range of initiatives DFID was considering, in the context of a new Nigerian AfT programme in cross-border trade facilitation. The challenge the pilot sought to address was to help inform the design of a new programme, which had already been contracted to an external consultancy, and show how system dynamics might help generate specific operational and policy conclusions and inform subsequent decision-making (Warren, 2013).

Pilot approach and process

As described in Section 2.3, all trade takes place in the context of a system. The features of accumulation, thresholds, interdependence and feedback (as set out in Box 1) mean that the benefits of trade programmes may prove slow or hard to realise, and may also generate adverse unintended consequences. The hypothesis of this pilot was that by making the system a central part of programme analysis and design, system dynamics could help in understanding, anticipating and navigating key programmatic issues. Ultimately, it could also help in decisions about what to do, in what order, to what degree and over what time period, in the face of these systemic challenges. Data were gathered through interviews, literature reviews and assessment of relevant data sources.

Findings

The pilot process began by reviewing the literature on the physical export trade and identifying the key features of the system. The overall volume of a country's trade was defined as the sum of all export activity carried out by all traders through all possible export channels – ports, airports and land crossings. For trade to work, there is a need for *access* of traders to a given crossing facility (proximity, transport links, etc.), *capacity* at the crossings (good procedures, trained staff, etc.) and demand opportunity for traded goods (markets to trade in, absence of barriers, etc.).

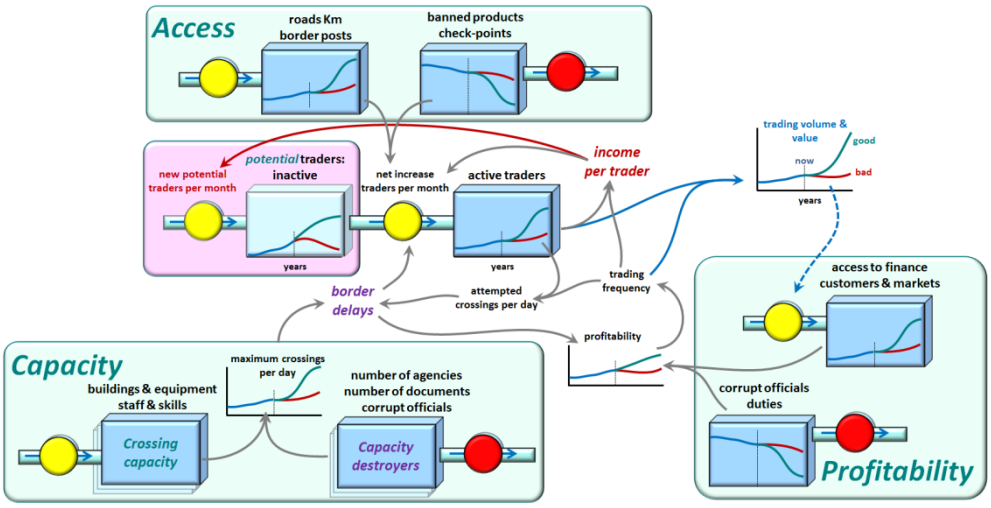
The system dynamics analysis revealed a number of desirable factors that would contribute to the effectiveness of the trade system, as well as drag factors that would do the opposite. It also helped identify potential interventions relating to single elements of the system (e.g. adding border posts, training officials or

rationalising documentation) or several at one time (e.g. developing land corridors). It showed that a system such as trade demanded a systemic programme response – specifically, the development of an evolving package of interventions that could adaptively build and sustain enabling factors, as well as reduce and eliminate disabling factors.

By developing a working demonstration model of a single land border crossing, the pilot showed how the trade system could be simulated. Thus, it took into account the complexities of the export trade system and the potential effects of activities undertaken by the proposed programme, as well as by other agencies and stakeholders. Different starting scenarios could be inputted into the model, along with different kinds and mixes of interventions. The result was a tool that could provide considerable support to the learning process at the heart of effective programme design. The model was also subsequently developed into an online simulation to help formalise and disseminate the learning process.

An example of the high-level architecture of the trade system with a series of such interventions is shown in Figure 5.

Figure 5: Overview of the trade system and potential interventions



Source: Warren, 2013

Conclusions

This pilot project influenced the design of the trade programme by bringing insights into the extent and nature of the complexity of the cross-border trade system, providing more clarity to the programme theory of change, and undertaking a more realistic assessment of risk than a more conventional approach may have done. It proved instrumental in the generation and selection of options.

Specifically, the pilot process and the system dynamics method shed light on the wide range of specific issues that were constraining improvements in the trade system, and how they were both interrelated and dynamic over time. The approach provided a powerful illustration of the system elements and the basic pattern of system behaviour, which could be adapted to different contexts. Understanding the system better led to more in-depth and systematic analysis of the potential entry points for programme interventions.

The model also provided what could be described as a 'living theory of change'. This involved a more detailed understanding of the potential range of outcomes and risks that would need to be taken into account to achieve success.

5.3 Pilot 2: Nigeria Girls' Empowerment – girls' empowerment and network analysis

Problem/challenge

This pilot worked with Girl Hub Nigeria in its work on empowering girls in northern Nigeria. The Girl Hub project is a joint initiative between DFID and the Nike Foundation, focused on the use of communication and advocacy as a means of bringing about social change.

At the start of the process, much of Girl Hub's work was directed at girls as central actors or their immediate peers. Little systematic attention was paid to the networks of familial and social connections that might alternately encourage or inhibit empowerment. This was part of a broader tendency in gender empowerment programmes to pay more attention to how individual actors (i.e. women and girls) could behave in ways that would bring about their own empowerment, and less to the structural issues – socio-cultural, economic, political and historical factors – that might inhibit desired changes in welfare and status (Davies, 2013).

Approach and process

The objective of the pilot exercise was to develop and test the potential of network analysis approaches to help articulate and improve Girl Hub Nigeria's theory of change. The pilot would build on Girl Hub's strategic objectives, which related to the status of girls in relation to different life choices and events. The work was done in collaboration with the Girl Hub team in Abuja and a number of their national and local partner organisations. Initial data were generated using the existing theory of change and strategic frameworks, and through the in-country stakeholder workshops.

Findings

The first level of network analysis identified different categories of the 'first tier' who had direct contact and influence over girls' lives, including family members, teachers and friends. The network analysis looked at the influential interactions between girls and these primary actors, in addition to the influential relationships between the different 'first-tier' actors. Influence was considered in relation to a number of distinct hoped-for outcomes, including educational attainment, age of leaving school, age when getting married, age when first becoming pregnant, and occupation/economic independence. Using a participatory network approach, a number of different aspects of these actors' influence on girls' life outcomes were identified, including:

- how much these actors agreed about the hoped-for outcomes for girls
- how much these different actors directly influenced hoped-for outcomes for girls through their social networks
- how much these different actors influenced each other with regard to their attitudes towards hoped-for outcomes for girls
- the different channels of communication and influence among actors.

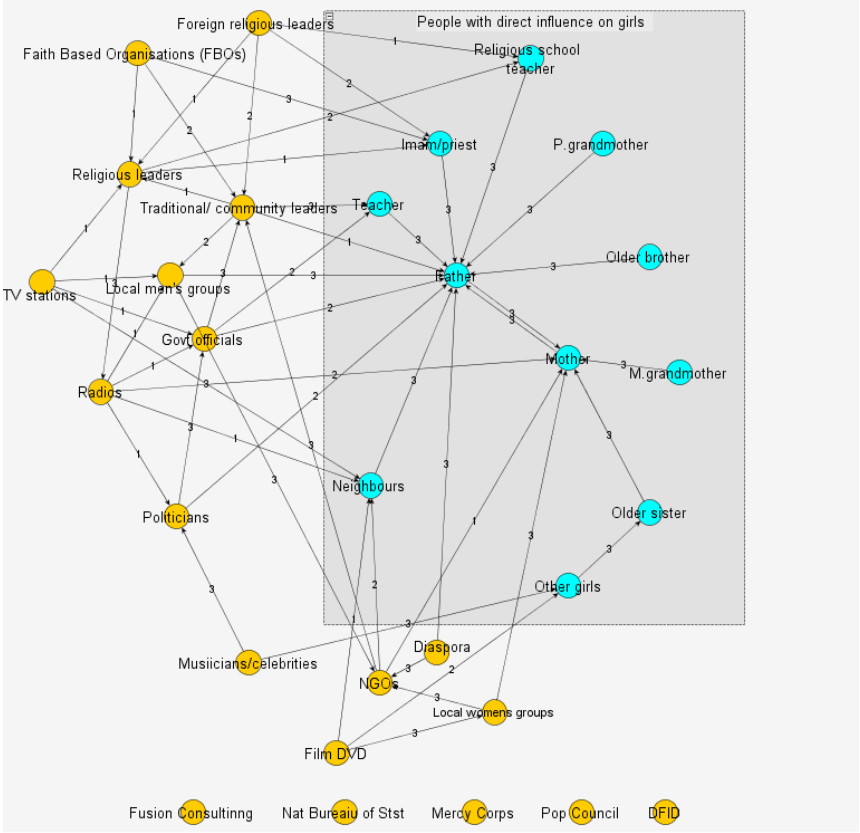
The second level of network analysis focused on those 'second-tier' actors who were not in direct contact with girls but who were able to influence the 'first-tier' actors described above. Here, too, the network analysis looked at two kinds of relationships of influence: those linking actors of the first and second tiers, and

those between different second-tier actors. This web of influences is shown in Figure 6.

A number of important patterns were observed through the analysis. Parents and religious teachers had the most influence overall, but all actors had some degree of influence on at least one of the hoped-for outcomes for girls. The specific influence varied by outcome area. It was clear that no single communication channel, involving any one of the nine actors, was likely to be sufficient to influence all aspects of girls' lives that were of strategic concern to Girl Hub.

The results highlighted the complexity of influence processes within girls' immediate and distant social networks. They also underlined the need for Girl Hub to think strategically about network effects in the context of its communications and advocacy work. For example, any external messages from Girl Hub or any other source were likely to be subject to challenge, moderation, amplification or adaptation through these complex social networks of influence. Therefore, any strategic outcomes will have relevance only if they take account of such effects. It was clear that it would be important, for both accountability and implementation purposes, for Girl Hub to identify the main pathways it hoped to use to influence those actors of the first and second tiers who profoundly shape girls' lives.

Figure 6: Networks of influence that shape girls' life outcomes



Key: Inner box = first-tier actor; Outer box = second-tier actor

Conclusions

The network analysis pilot brought about a more systematic understanding of how the interactions of stakeholders, with each other and with girls, contributed to girls' empowerment around key life choices. The pilot thereby enabled a multi-

stakeholder perspective on the relationships around girls that enable or constrain their empowerment in relation to different life choices and events. The validity of this was supported by feedback from workshop participants, who suggested that this type of analysis form the basis of future empowerment strategies.

Network analysis as undertaken in the pilot was also shown to add value to traditional stakeholder analysis. The network mapping activities could be used as a form of stakeholder analysis that goes beyond categorising types of stakeholder and includes attention to the kinds of relationships connecting them, uncovered thorough specific forms of inquiry.

The results of the network mapping exercise provided a potential *conceptual* baseline for the project, specifically a description of Girl Hub's *current understanding* of the nature of relationships influencing girls' lives. As a pilot exercise, the findings are naturally a partial picture of the network reality of girls' lives. But there was a clear sense that the data and models, if incorporated into programme design and implementation, would become more refined and more evidence based.

At the time of writing, Girl Hub's theory of change is described in a log frame at the international level but this is not yet the case at the national level. The network perspective developed could be used to ensure the theory of change developed in Nigeria is clearly articulated, focusing on which actors will be involved and the kinds of relationships that will be connecting them. This would make the actor/network elements and multiple influence pathways central to the theory of change. This would be an important improvement over the traditional linear, abstracted organisation of logical Source: frameworks. In a DFID review of Girl Hub's work in late 2013, it was noted that the complexity-informed work was helping to 'nurtur[e] a different approach to development [that] represents a key element of Girl Hub's potential for success.' (DFID, 2013a, p16)

5.4 Pilot 3: DRC Private Sector – private sector development and complexity-informed theories of change

Problem/challenge

This case study focused on the design of a major new programme to support private sector development in the DRC. DFID's standard corporate procedures for programme design and management employ a programme logic that progresses in a linear, sequential way from activities to outputs to outcomes. In highly uncertain and rapidly changing contexts such as the DRC, and fragile states more generally, such approaches are increasingly being seen as ineffective (Vogel and Fisher, 2013).

The fundamental challenge was how to use the principles of complex systems thinking to underpin an approach to programme design and management that was more suited to fluid, uncertain contexts. It was clear from the outset that this would need to emphasise adaptive learning and evolving programme strategies. What was less clear was how to develop this into a coherent programme logic that could be approved by DFID at the corporate level.

Approach and process

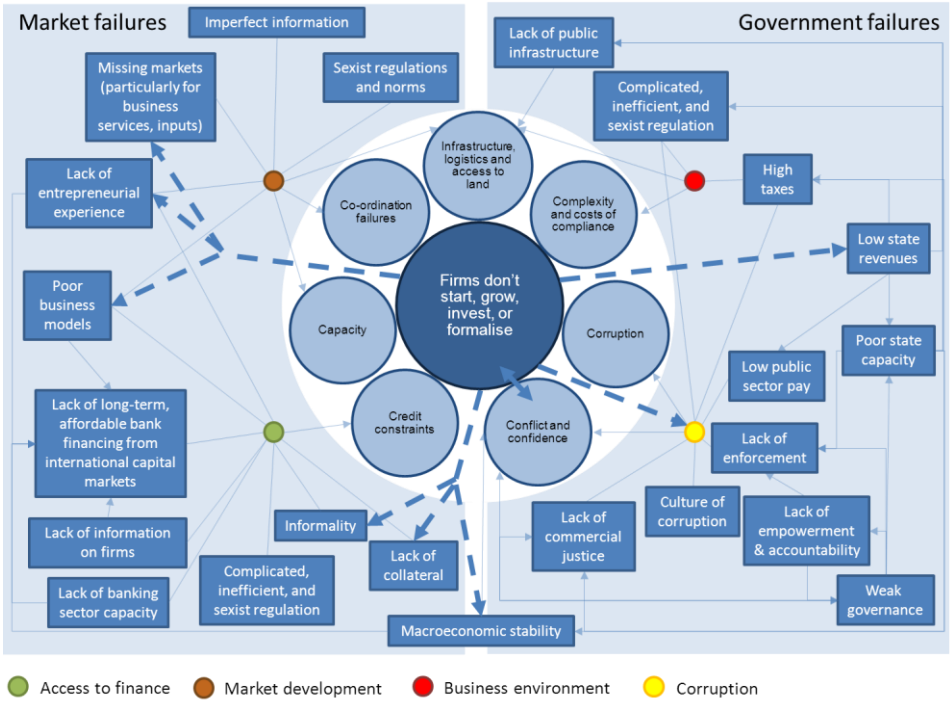
The DRC pilot aimed to develop and test out a 'complexity theory of change' to guide programme design and planning, working within the frameworks of DFID's Business Case and LFA while at the same time staying focused on the complexity and uncertainty of the DRC context as a central driver of the required programme

logic. The theory of change consisted of a range of tools and principles, including adaptive management approaches, complex systems principles for fragile states programming, a problem typology matrix, strategic planning horizons and resilience principles. The pilot worked with a range of stakeholders across DFID DRC and programme partners to develop the theory of change and identify intervention points and options for management, monitoring and evaluation. The data were generated through a workshop with DFID and the wider stakeholder groups in the DRC.

Findings

The starting point was to obtain an overview of the multiple systems that influenced private sector development in the DRC, and how they interacted with each other. A systemic analysis of how change happens in the complex systems of the DRC helped to bring an important 'reality check' to the programme analysis and design process (see Figure 7).

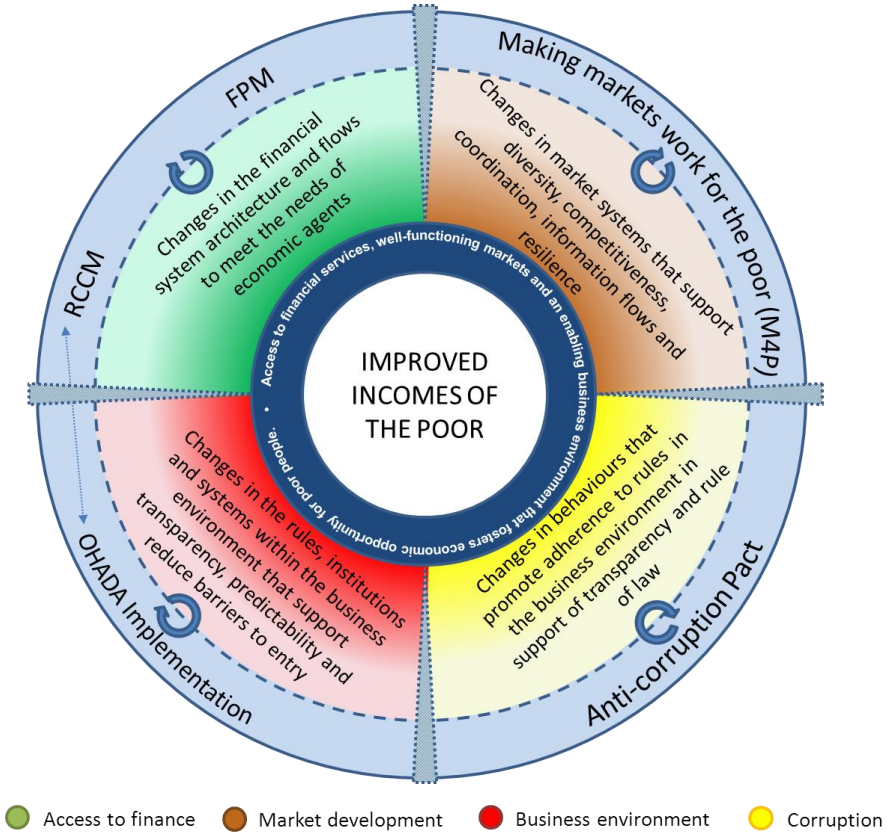
Figure 7: A systemic analysis of the DRC context



Source: Vogel and Fisher, 2013

This 'problematique', or set of related research questions, helped to inform a series of desired specific programme-level impacts and outcomes. Discussion then focused on the kinds of activities that could contribute to these outcomes. It was determined that there would need to be work across a number of subsystems of intervention, specifically access to finance, market environment, business development and corruption. Each subsystem represented a defined set of changes – the 'productive patterns' the programme would like to influence in the future so as to improve incomes for the poor. Productive patterns consisted of behaviours, relationships and institution formation that had the potential to support cohesion and stability and minimise the extremes of exploitation and conflict. To represent this, the pilot designed an overall complexity-based theory of change 'compass' to guide a responsive, iterative, and non-linear programming approach (see Figure 8).

Figure 8: Complexity-based theory of change 'compass'



Source: Vogel and Fisher, 2013

The impact of the programme is at the centre of the compass and the outside of the circle represents the starting point of the programme. All interventions would ultimately work towards improving the incomes of the poor, moving from the outside of the circle inwards. This impact is nested within the outcome target, which is in turn nested at the centre of a complex system of DRC-specific constraints as identified in the 'problematique' analysis (access to finance, market development, business environment and corruption). This system is circumscribed by a dashed line representing the 'short-term planning horizon' – a future date sufficiently soon that results can be predicted with a reasonable degree of accuracy. Moving from the planning horizon towards the impact circle reflects moving forward in time and deeper into 'the fog of uncertainty', i.e. that space where results *cannot* be predicted with a reasonable degree of accuracy.

The outer ring contains portfolios of interventions in each of the four constraint areas. The suggested opening portfolio contains specific interventions, each of which is rooted in a particular constraint but which has the potential to have an impact on all the others, effecting system-wide change. This opening portfolio will be supplemented by further interventions as the programme progresses. These interventions will be identified and designed in response to shifting opportunities and risks, as well as on the basis of constant learning by doing.

At the heart of the theory of change were a number of key principles:

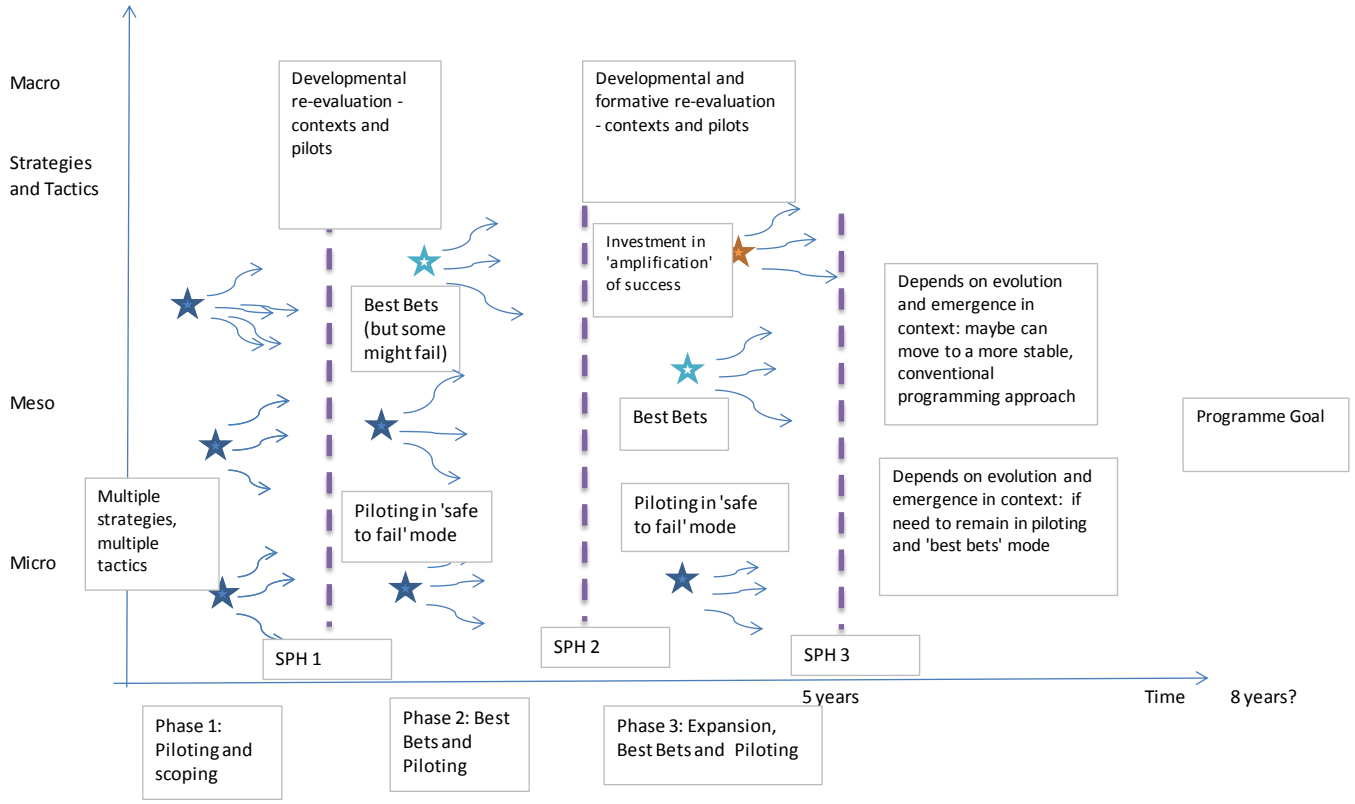
- that there was unlikely to be any linear progressions in the complex system of the DRC's business environment

- that linear intervention might soon become irrelevant, will miss opportunities and may do harm in a fragile context
- that the influence of a single intervention should not be overestimated
- that cause and effect at the system-wide level could not be fully understood upfront, but was the result of multiple changes over time that would gradually bring about systemic change
- that complexity or wickedness in the environment needs to be respected and uncertainty navigated, not retreated from
- that the theory of change needed to guide multiple, iterative small-scale interventions at multiple points in the system.

The programme demonstrated a need to employ the complexity theory of change as a compass to guide its work across these multiple systems. Although the type and mix of interventions could change, the focus would remain on supporting changes that ultimately work towards the desired impact – improving the incomes of the poor.

The implementation design was based on the principles of a 'nested approach', with minimum specifications in the opening phase and deliberately short strategic planning horizons shaped by inherent uncertainty. An 'evolutionary' programming approach (see Figure 9) was developed, based on piloting, iterations and 'amplification of successes' in multiple domains, continuous 'learning by doing' and adaptive management principles.

Figure 9: Evolving programme approach



Source: Vogel and Fisher, 2013

The process illustrated the need for continued investment in strategic and operational intelligence, including the need to track the changing context and emerging effects and to conduct systematic learning and evaluation. The process also highlighted the need for resources for interpretation and continual revision of the complexity theory of change and underlying programme assumptions. It was also recommended that DFID be actively engaged in programme implementation so as to make the adaptation and responsiveness to change as effective as possible.

Conclusions

The principles and tools employed in the pilot allowed for the articulation of a programme logic and approach that were more suited to the dynamic and uncertain context in the DRC than would have been possible using only the techniques previously available to the team. The 'complexity theory of change' was used by the design team as the central plank of the proposed programme. The proposed DRC private sector development programme has since been approved for funding, providing important legitimacy to this new and experimental approach to working in fragile states.

5.5 Pilot 4: Programme Management – programme management and systems thinking

Problem/challenge

This pilot project sought to bring a variety of systems thinking tools to bear on DFID's programme management systems and processes. It was different to the other three pilots in that it was focused not on applying complex systems tools to an external issue or challenge in wealth creation but instead to DFID's internal corporate processes (Curram and Exelby, 2013).

Approach and process

The pilot was embedded within the End-to-End Project Management Cycle Review called for by the UK Secretary of State for International Development, and the outputs were designed to feed into it. The research specifically aimed to help improve understanding of DFID's programme management approach through the use of appropriate and relevant modelling and diagnostic tools. The pilot used a combination of systems thinking tools including process maps, participatory dialogue, concept mapping, business flow analysis, issue mapping, influence diagrams and causal loop analysis. These tools generated data that were then analysed and presented for use by the End-to-End Review team.

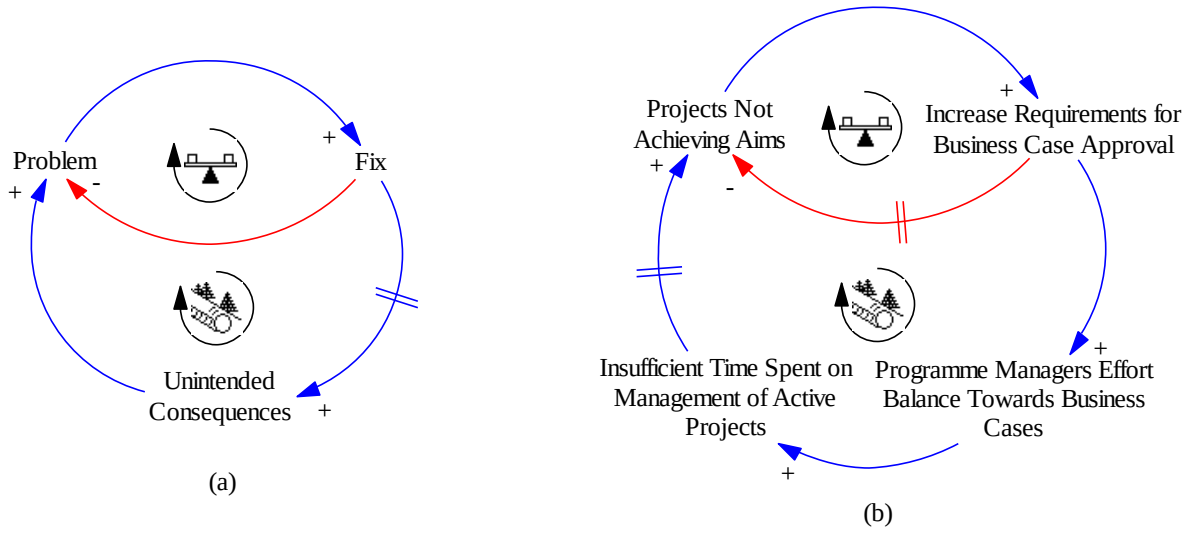
Findings

This range of tools was used to generate a series of conceptual and diagrammatic descriptions of DFID's programme management process. The first of these was a process map, which utilised the 'ideal programme management process' as formally described in DFID procedures. The reality of the DFID organisational system was introduced by mapping the range of actors and factors that influence each stage of the process, the different routes through the process, and the interdependencies and feedback that shape how the process works in reality. It quickly became apparent that the DFID programme management process could be characterised as a wicked organisational problem.

While the diagrams were an important part of the process, their utility came from how they were able to help structure collective thinking and deepen analysis of issues and solutions. They were used as workshop facilitation tools to provide structure when discussing issues raised by workshop participants, and helped provide focus in such discussions. In fact, the process elements proved as important as the methods employed. In particular, the participatory emphasis proved

successful in eliciting cooperation and generating positive attitudes in diverse stakeholder groups. This was critical given the potentially sensitive and conflict-generating topics being discussed.

Figure 10: The DFID Business Case process as a 'fix that fails'



Source: Curram and Exelby, 2013

Figure 10 illustrates the systems diagrams developed for the programme management process. Diagram (a) gives a generic example of a fix that reduces the problem but triggers unintended consequences, typically with delayed impact, and that also make the original problem worse. Since the fix does not reduce the problem as much as expected, there is a pressure to apply it more, which actually creates more unintended consequences. In this case, the more the fix is applied the worse the problem gets, given the unintended consequences.

Diagram (b) shows the 'fix that fails' in terms of DFID processes. Projects are not seen to achieve all of their intended aims, so the approval process is identified as a key leverage point, and submission of more information and work for the approval process is required. More stringent requirements for business cases should result in better-thought-out business cases that produce better results when implemented. The unintended consequence is that more work is required from programme managers in preparing business cases, which reduces the time available for managing existing projects. Eventually, this results in reduced delivery of results by those projects. This then leads to further requirements for business cases to improve project outcomes and even less time on management of projects.

The analysis highlighted a number of further challenges. Specifically, the effort that goes into business cases creates a reluctance to cancel projects. This is also exhibited by a reluctance to propose higher-risk projects (with potentially higher gain) and a tendency to stick to lower-risk but lower-gain projects. It also creates a tendency to water down performance targets once a project is in progress in order to protect projects that would otherwise be cancelled.

There is also a lack of flexibility and a tendency towards premature solution selection. Business cases are too detailed and rigid and solutions are set too early because of the requirements to set budgets and specify details at an early stage. This leads to optimism bias in many programmes, with regular instances of performance targets in LFAs being diluted during the first year of the programme. Clear tensions

are also created in the balance of effort between business case preparation and project management.

Common feedback from programme managers is that they spend too much time on business case preparation and not enough on project management. This has been intensified due to DFID's increased involvement in fragile states. Average deployment durations tend to be shorter, resulting in greater turnover of programme managers in country and thereby reduction of in-country experience at the expense of head office business case preparation.

Overall, the systems thinking pilot helped shed light on specific issues that were constraining improvements and provided a better understanding of the potential entry points for interventions. While all of the pilots involved some degree of group consultation and discussion, this pilot focused on a series of participatory workshops with diverse groups of DFID staff. This demonstrated the key value of bringing multiple perspectives together to broker a common understanding of the wicked problem being faced. The process proved as valuable as the specific tool itself, although of course the tool then determined how insights were documented and reported.

Conclusions

The systems thinking approach involved developing sound and defensible analysis of the issues being addressed in a faster, more efficient, comprehensive and cost-effective manner than would otherwise have been the case. The pilot formed the analytical framework of the End-to-End Project Management Cycle Review, and very quickly generated an assessment of the programme management process and system that could be presented to senior management in DFID. The body of evidence produced was not disputed in presentations to senior management, and has backed up the recommendations that have been made.

6 Lessons from pilots

Following the completion of the pilots, a lessons-learnt review was carried out, with feedback gathered by the overall project managers. This helped to identify the *strengths* and the *weaknesses* of the pilots, as well as the *opportunities* and *challenges* faced in taking this work forward. These are summarised in the form of a SWOC analysis (Table 4), with the more detailed explanations in the subsections that follow.

Table 4: Overview of SWOC analysis of the pilots

Strengths: what did the pilots do well? **- Analysis and understanding of problems improved.** **- There was valuable engagement with the 'wicked' nature of problems through sound analysis and insights.** **- Analysis and findings were utilised in ongoing corporate and programme processes.**	**Weaknesses: what were the issues and problems?** **- Pilots provided snapshots rather than ongoing analysis.** **- Analysis stayed at a fairly high level.** **- Pilot recommendations were not always tailored to DFID organisational realities.**
Opportunities: what is the future potential? - Specific pilot approaches have wider applicability. - Linking methods into ongoing processes in a timely manner enhances use. - There is potential for more engagement with operational research. - The approaches represent good value for money in terms of investment in pilots against the return for the organisation.	**Challenges: what are the obstacles or limitations?** - More time and resources are needed to fit tools to DFID processes. - There are concerns about reducing or taming complexity with methods. - Some elements of pilots are not used, especially the more complex visualisations. - There is potential for methods to be applied and replicated without due care. - Take-up is limited by DFID's role as a commissioning agency. - There may be a rise in costs for future efforts.

6.1 Strengths: what did the pilots do well?

Improved understanding of problems

The four pilots have made a considerable contribution to new and enhanced knowledge of the problems they addressed. The range of tools employed was viewed as especially useful for:

- 'getting inside the black box' of the problems covered
- developing a sharper understanding of how wider contexts shape and influence a given problem
- providing more sophisticated analyses of the potential causal pathways through which a change process might unfold
- bringing multiple perspectives together to broker a common understanding

- supporting the development of strategies to cope with inherent complexity, thereby giving a more systematic way of working towards 'best fit'
- providing an analytical platform for experimentation and learning, as well as supporting a more adaptive management approach with appropriate evidence-based tools.

Increased navigability of wicked problems through sound analysis and insights

A common finding across all the pilots was that they were more effective at enabling an understanding of the inherently complex and wicked nature of a diverse set of problems than much of the existing DFID toolkit. The pilot clients all felt the pilots were of high importance for their initiatives: they helped establish a way of understanding complex problems and designing relevant interventions that was much more grounded in reality and context. This was seen to be because they were based on sound, credible methods and analysis that 'held water', and their outputs could be communicated with others in order to support arguments about appropriate ways forward.

In three of the four pilots, the approaches were described as helping staff reach robust analytical conclusions in a more timely and cost-effective manner than would otherwise have been the case.

Good use of analysis and findings in ongoing processes

In all four pilots, the approaches were found to be useful for making sense of the existing problems in new ways. The overall effect was an incremental one of clarifying and developing individual and shared knowledge. All four pilots saw this kind of utilisation.

The pilot participants also found engaging in the pilot processes very useful. Participating in the process led to individual learning and changes in behaviour, such as improved communication within teams and between partners, as well as enhanced understanding and application of new principles. Engagement in the process also increased users' ownership of new ideas and concepts. The DRC Private Sector and Programme Management pilots demonstrated this. In the Programme Management work, a Nigeria country office workshop facilitated without the help of the pilot team used the same process and materials that the team had used.

Three of the pilots – Nigeria Trade, DRC Private Sector and Programme Management – saw direct implementation of the findings of the pilot by pilot clients. This led to new and enhanced decisions around funding, programme design and engagement with corporate policies and procedures.

6.2 Weaknesses: what were the issues and problems?

Snapshots rather than continuous analysis

The analyses generated by all of the pilots were snapshots of systems at a given moment, and those systems – by their very nature – will continue to evolve and shift. As such, all the pilot findings should be understood as provisional rather than final or conclusive. Of course, the wicked nature of the problems faced means that conclusive findings may not in fact be feasible, but even with this qualification, there is a need in all of the pilots for deeper analysis, data gathering and refinement

of assumptions. Ideally, this would be done on an ongoing basis as part of the monitoring efforts of any interventions that followed.

Relatively high-level analysis

Because of time and resource constraints, the analysis stayed at a relatively high and general level, providing what could be described as a useful basis for generating initial assumptions and ideas and developing emerging hypotheses. While all of the pilots made the case for and provided inputs into the development of more detailed learning frameworks, the available resources meant that this could not be done as part of the pilots. Apart from the data that were available, and that could be gathered through consultation exercises, none of the pilots moved from the conceptual to the more operational side of things. However, all pilots did provide a framework for data collection for the programmes or initiatives that followed.

Occasional mismatch between pilot recommendations and organisational realities

The specific recommendations from the pilots were also felt to vary in terms of the potential to directly make use of them. For some, this was because the suggestions were not necessarily firmly anchored in an understanding of the institutional and political challenges facing DFID. This typically meant that some reworking was necessary by DFID staff to fine-tune the original recommendations for practical application.

6.3 Opportunities: what is the future potential?

Considerable wider applicability of specific pilot approaches

All of the pilot processes triggered subsequent discussions and requests for further support, from the pilot clients and from others across DFID who were seeking similar kinds of methodological innovations.

In the DRC, the 'complexity theory of change' was directly utilised in the business case for a major new £100 million programme of work, as a theoretical and practical basis for how the programme would operate. The programme has now been approved. This is the first time any major programme in DFID has explicitly used complex systems ideas in the design and approval stage. The DFID DRC office is also using the approach to develop new applications in other programme areas, such as health. In addition, the approach has been highlighted as being of potential relevance for private sector development and fragile states work in other settings.

The Programme Management pilot provided the intellectual underpinning for a whole raft of new reforms, including the introduction of a new programme management process and the set-up of a new delivery unit.

Utility enhancement through linking methods into ongoing processes in a timely manner

The value-added of the pilots was ultimately determined by the engagement of the clients with the findings and, in many cases, how they were able to translate the analysis into improved decisions and enhanced processes. The strongest examples of this were in the Programme Management and DRC Private Sector work. By being successfully anchored in ongoing DFID processes, their utilisation was very tangible. Both pilots moved forward sufficiently to show tangible use of the knowledge generated by the pilot.

More generally, there is scope for the tools to be used not just in the design but also in the implementation and management of subsequent interventions, thereby

smoothing what is presently a rather sharp transition. Because of the timeframes of the project, it was not possible to assess this aspect of the pilots in detail. Continuing to track how these approaches are used on an ongoing basis is therefore very important.

Potential high value for money of new methods

It is also clear that the pilots were a reasonably high 'value for money' exercise in terms of the investment in the pilots compared with the benefits in terms of improved decisions and processes. Although the DRC Private Sector pilot's budget amounted to a relatively small £22,500, it clearly made a significant and relevant contribution to how the new programme would be conceptualised and delivered.

As the annual review noted, 'We have established an opening portfolio of interventions, and come to the conclusion that, given the complex, unpredictable nature of DRC, interventions further into the future will have to be complexity-theory informed, based on continual horizon scanning and reassessment of the evidence.' (DFID, 2013b) The Nigeria Trade work for a similar investment helped provide the intellectual platform for the development of a new five-year trade programme. The framework and model are being used at the heart of the design process. The Programme Management work, again for a similar outlay, helped clearly establish the need for programme management reform. It also set out a number of ways forward that will be highly relevant for the organisation as a whole in the short and medium term.

Potential for operational research

It is worth noting experiences across Whitehall, where use of systems tools and techniques tend to reside with operational research professions. This was found to be the case in the Department for Environment, Food and Rural Affairs, the Department of Health, the Ministry of Defence, the Home Office and other government agencies. The Government Operational Research Service is a cross-government network for these analysts, providing a platform for a thriving community across some 24 Whitehall departments. Of the four pilots, three involved suppliers who had previously worked with these other departments. However, DFID is not currently a member of this network, and there is a perception among the network convenors that the department does not employ any operational researchers. This is a real opportunity for DFID in terms of strengthening its ongoing work by building on and learning from the capabilities already present in government.

6.4 Challenges: what are the obstacles or limitations?

Need for more time and resources to fit methods into DFID processes

Despite the value of the new tools and methods for enhancing knowledge, some respondents felt there needed to be more space, time and resources to adapt them to precisely fit DFID's specific needs as a commissioning donor agency. Moreover, DFID itself may need to adapt – and get more involved in implementation and delivery – if it is to make full use of the potential of these techniques.

Concerns about reducing complexity with methods

Across the pilots, there was a tension between analysing complexity using new analytical tools and navigating it using adaptive management and decision-making. There were varying views about how to address this. On the one hand, there were those who felt the main value of complex systems tools lay in facilitating a more detailed, forensic and in-depth understanding of systemic issues, with the Nigeria Trade programme being a good example. On the other hand, there were those who felt trying to develop a precise, data-driven understanding of complex problems ran

counter to the nature of the phenomena in question – that it was a version of trying to 'tame wicked problems' described earlier. Instead, they felt, the focus should be on developing principles that supported ways of effectively responding to the inherent uncertainty without trying to reduce or capture it. This is a key issue. From the perspective of the research team, it should not be assumed that the two approaches are mutually exclusive: an iterative and adaptive approach is most powerful precisely when it builds on a solid data-driven analysis of the complexities and interdependencies of a given problem. It is only through deeper and more systemic analysis of problems that DFID can have a solid platform for iterative experimentation and adaptation.

Some elements of the methods were not used by DFID staff

There were numerous examples of elements going unused across the pilots. For example, the system mapping diagrams in the Programme Management pilot were felt to be too confusing to share more widely, even though the underlying analysis was extensively drawn on. The modelling work done in Nigeria Trade was seen as very valuable by some, but was not universally appreciated by all DFID staff introduced to it. Meanwhile, the network mapping for Girl Hub in Nigeria Girls' Empowerment, while useful and generating new insights around girls' exclusion that informed subsequent work, was not taken forward directly. It did, however, influence how the theory of change was conceptualised and developed. More generally, there were issues around the technical language accompanying some of the methods, which needed careful attention in order to ensure that clients were not overwhelmed by new and abstract terminology.

Potential for methods to be applied and replicated without due care

Another key challenge is to ensure that the use of these tools and techniques does not become automatic and less thoughtful and considered than it should ideally be. There was one example given, in the DRC, of the 'complexity theory of change' being adapted for use in another DRC programme, without much thought as to how it would work in practice. The nature of complex systems methods demands considerable engagement and discipline in how they are used. This explains the focus on operational research where these tools have been widely applied, such as in the military and the private sector. However, this is not traditionally one of the areas of strength for development agencies, whose corporate valuation of implementation feedback and learning processes has lagged significantly behind the valuation of approvals and disbursements. The challenge to overcome is to ensure these tools are only used in settings where there is a commensurate investment of time and resources so that programmes that develop from such analyses are able to work in a rigorous yet flexible fashion. Without this, the benefits of these tools will not be realised, and their use will risk creating the same kinds of problems faced by blanket and un-strategic applications of existing tools such as the logical framework or randomised controlled trials. While this is a challenge for all methods, including mainstays such as the logical framework, it is worth being aware of such potential risks.

Possibly limited take-up due to DFID's role as a commissioning agency

Perhaps the most significant issue is that the tools by their very nature focus on how to undertake appropriate design that feeds into programming. As DFID is more of a commissioning donor than an implementing one, there is not a perfect fit between the value-added of the tools and current incentives in DFID, which gear efforts more strongly towards upstream design and approval.

More generally, there may well be structural issues in terms of how much DFID itself can make full use of these tools: in most cases, partners have to be engaged

and closely involved. Much of the analysis could be seen as providing a baseline for implementation/operational research; in order to achieve the full utility of the approaches, there is a need for DFID to get the ball rolling but also to ensure implementing partners utilise such methods.

Potential rise in costs for future efforts

There were questions about the tools themselves and how amenable they are to scale-up in DFID, as well as the investments required to get to this stage. A number of the pilots were supported at subsidised rates by private sector consultants, which also raised questions about scale-up. It would be sensible to anticipate an increase in costs, were a market to develop, for the provision of methodological expertise in these areas.

7 Conclusions and recommendations

7.1 Conclusions

There is a lot of talk about complex systems in development, a few influential publications and a number of dispersed applications, the majority led by development researchers. There are also growing numbers of applications within development agencies: UNDP, the World Bank, IMF, USAID, Oxfam, Plan and the Red Cross have all been experimenting with complex systems methods in their research, policies and programmes.

The projects documented here present a modest attempt to undertake such experiments within DFID, narrowly focused on the design phase of four distinct processes. The overriding conclusion is that this has seen significant results. The pilots have broadly helped to increase DFID's understanding of wicked, complex problems, supported a more systemic understanding of the underlying issues, and directly informed the design of new programmes and processes that are more relevant and appropriate to such problems.

The PRF project and related pilots have been a very useful and instructive first step for DFID in exploring a particular path through which its staff may be able to better deal with the diversity of the development and humanitarian problems they face. The experience suggests new tools, methods and mind-sets can help in:

- developing a more rounded understanding of the systemic and dynamic nature of problems, and how this might affect potential strategies and interventions
- informing better programme design through the identification of more relevant and appropriate approaches
- supporting more flexible and iterative approaches, which are urgently needed in many of the challenges and contexts DFID faces.

Together, the methods used in the four pilots amount to a set of new and potentially innovative ways to better understand the inherent wickedness of development problems and to respond to them with more appropriate interventions. The project has reinforced the finding, also raised through other initiatives, that a one-size-fits-all approach to how DFID does its work is not feasible or desirable. DFID is starting to recognise that many of the systems and problems it works on are not 'tame', and that many of the tools used as standard are simply not useful enough in such contexts.

There is potential for these approaches, along with others, to help make design and implementation more rigorous, and to move towards the goal of 'best fit' described in the introduction. The four pilots did this by testing a range of methods, frameworks and principles that could help DFID staff move beyond existing analytical and operational mainstays.

Perhaps the most important finding is that the tools and principles of complex systems research can indeed be applied in the context of a major development agency, and can fit well into both programming and institutional initiatives. Done right, they have considerable potential to permit staff to be clearer about the kinds of problems they face. That is, they can be explicit about *and* continually test and probe their intervention logic and assumptions, to work towards programmes that are 'best fit' rather than 'best practice'. These methods can help navigate a middle ground in the face of complex and wicked problems: to ensure development professionals neither have to surrender to uncertainty on the one hand nor construct convenient but false and potentially unhelpful log frame 'fictions' on the other.

However, it would be remiss to turn this way of working into a 'best practice' or a silver bullet. There are also a number of important caveats to be made. The tools do need to be adapted for use in development settings – there are issues of terminology, technical issues and skills. Indeed, there is a clear message that the tools may need to be continually revised and adapted for different contexts. The tools also all require active brokerage by individuals who understand both development processes and the technical potential of the methods. The tools require better collaboration, dialogue and trust between those seeking to address complex problems and those with expertise in a range of possible methods.

The pilots focused on the design stages of four ongoing processes, because of practical, resource and feasibility considerations. This of course raises the issue that the *full* potential of these tools and methods can only be developed by application in implementation processes and drawing of comparative lessons against standard procedures. However, from this modest application there is sufficient evidence of positive value-added to warrant an expanded set of experiments that will explore the value of these methods across the programme cycle. This is consistent with how these tools have been applied in other settings, for example across other government departments, where the emphasis of these approaches is less on *ex-ante* design and more on learning by doing. Such experiments will need to be seen not just as methodological experiments but also as disciplinary experiments bringing operational research more firmly into development work.

There is a relatively steep learning curve to complex systems approaches and this was apparent across the pilots. On the other hand, the investments to date have been very modest in comparison to what DFID typically spends on analysis and design efforts. Meanwhile, there are other issues about how the tools and outputs can be usefully shared within DFID without people being overwhelmed by the complexity of the issues or leading to 'analysis paralysis'. There are also potential issues about development agencies attempting to establish a 'cookie-cutter' approach to wicked problems, which would be highly counterproductive.

There are, however, enough positive findings to suggest this area of work is worthy of further exploration and investment. The positive results of these initial experiments indicate donors such as DFID should be investing more resources in understanding the range of tools and methods available for analysing and modelling the problems it works on, and bringing these approaches to bear on real-world programmes and interventions. Overall, it would seem to be very worthwhile for development actors to make this an area of innovative programming and research, so as to enhance and improve strategic and operational decision-making. Complex systems approaches are indeed potentially important and relevant for development actors. It will require effort, investment and systematic learning to realise their considerable potential.

7.2 Recommendations

A number of recommendations should be considered by way of follow-up to the PRF project. These recommendations are at two levels. We need to see development actors engaging more on these issues, and we need to see complex systems researchers working to adapt their approaches for development settings in ways that have not yet happened.

For development actors

Recommendation 1: Improve understanding of wicked problems in development and the need for new tools and techniques. The DFID PRF project focused on wealth creation efforts in one agency, but there is clear indication of demand for new methods and tools from other organisations and other sectors, including environment and climate change, health and governance, as well as work within fragile states. This would lead to the identification of specific entry points across the sectors for subsequent experiments and learning in complex systems approaches.

Recommendation 2: Establish further programming to explore the potential of tools and methods within design, implementation and evaluation processes. Based on the entry points identified in (1), there is a need to trial new tools to enhance both understanding and decision-making, ensuring synthesis across initiatives and organisations.

Recommendation 3: Ensure organisations have systems, processes, skills and capacities for dealing with wicked problems. There is a need for greater institutional recognition of the challenges posed by wicked problems. This calls for concerted efforts to deal with such problems within policy and operations as well as at a conceptual level. This requires senior management and leaders to embrace and encourage such efforts, as well as investment in necessary staff capacities and skills.

Recommendation 4: Build better and more strategic partnerships and networks within organisations and existing partners, as well as with scientists, the private sector and the wider public sector. Interested development actors should be working collaboratively across their organisations as well as with key partners inside and outside the sector to take this work forward. Some form of learning network, which works to bring key actors together to share experiences and challenges, would be a useful platform for continued work in this area.

For complex systems specialists

Recommendation 1: Develop an evolving toolkit of complex systems tools and approaches appropriate to development efforts. This will involve drawing on existing tools and techniques that are used in the private sector, science and government and will require expertise from operational research in these settings.

Recommendation 2: Adapt methods, representations and terminology based on applications in development contexts. For this kind of work to be scaled up to achieve its potential, there is a need to enhance how the methods and concepts are communicated and the kinds of terminology and language that are used. This will mean working with development actors to trial different approaches and new ways of presenting analyses, then using these experiences to adapt the techniques accordingly.

Recommendation 3: Build the evidence base. Complex systems researchers should be identifying the positive lessons from the use of such tools and techniques

in development and further afield, so as to make the argument more solid and evidence based. These tools have both benefits and costs, and both need to be weighed up and understood. This also means developing learning frameworks that can help to evaluate the contribution of these new methods to improved policy and practice.

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Appendix

Appendix 1: Wicked complex problems and wealth creation

There are a number of specific reasons for exploring these formal tools in the context of wealth creation efforts. First, there is a track record in applying new and innovative approaches to wealth creation. The Spence Commission's conclusions (Commission on Growth and Development, 2008) and influential studies such as Dani Rodrik's work on growth dynamics (Rodrik, 2003) all highlight growth as precisely the kind of non-linear emergent phenomenon in which complex systems researchers specialise. There have also been influential books and publications making explicit links between the two areas. In his 2006 book, Eric Beinhocker showed that economic growth can be better understood by using tools of complex systems than by using many traditional economic tools. In particular, he highlighted the importance of systems, networks, evolution and dynamics as critical areas where conventional economic thinking needed to be challenged and enhanced (Beinhocker, 2006).

More recently, Ricardo Haussmann of Harvard University has led work on the Economic Complexity Index, which analyses the economies of 135 countries using network analysis techniques and ranks them according to their economic complexity (Hausmann et al, 2011). The Index has been shown to be a powerful descriptive tool, which also has far greater predictive power than World Economic Forum indicators of competitiveness and World Bank good governance indicators. From a microeconomic perspective, analysis of corporate strategies highlights that conventional efforts suffer from a lack of understanding of interdependencies and feedback effects. The widespread application of system dynamics to business growth strategies is based on addressing precisely these gaps.

Appendix 2: The pilot process

There was a lot of enthusiasm for the pilots across DFID. A range of staff members highlighted numerous 'live' projects they were working on that could potentially be a focus of a pilot, and several made very strong cases for selection. The proposed pilots numbered over 20, outstripping the actual available pilots offer by a factor of more than five. This indicates that the demand for this project in particular, and for new tools more generally, by some way exceeded the resources available.

In all four pilots, a degree of dialogue was needed between the project managers and the pilot clients in order to clarify the exact nature of the problem being faced and the kinds of methods that could be employed. Once this was determined, a separate dialogue needed to be initiated with a range of potential suppliers, which then triggered another round of discussion with the pilot clients. The process was less one of identifying a problem that could be matched precisely with a known supplier and tool, and more one of active knowledge-brokering in order to reach a mutually agreeable way forward. Although on the surface this may seem a prosaic finding, it is worth reflecting on. In seeking to broker a more unconventional

approach to a given problem, a number of challenges are highlighted. Specifically, there are issues with:

- how given problems are defined and by whom
- the kinds of analytical options that are typically considered or ignored in responding to such challenges
- the kinds of designs and methods that are usually acceptable for downstream use in programming
- the extent to which the needs of different groups, especially senior decision-makers and quality assurance teams, are considered.

This process of identifying the space and potential for new tools and techniques contrasts with usual practice around techniques such as the LFA, which typically involves far less debate and discussion because of fit and acceptance within the organisation.

It was agreed upfront that a set of common *principles* should inform the pilots. Specifically, each pilot should:

- align with existing and ongoing programming or institutional **processes**
- apply new and innovative **tools and techniques** specifically designed to address such issues
- deepen **knowledge** of **and insights** into the nature of the problem faced
- generate evidence and recommendations that can be **utilised** to move the specific processes forward
- generate **value-added** for the pilot clients.

Having identified the problem in question and the nature of the challenges faced, it was then often necessary to bring in experiences and skills from outside the traditional development research and consultancy community. While all of the pilots were to some extent supported by development researchers, there was a need to engage private sector specialists or those with public sector experience outside of international development. Thus, Nigeria Trade was led by a business strategy consultant and academic, Nigeria Girls' Empowerment involved a development researcher and a leading thinker on network economics, DRC Private Sector involved both a development theory of change specialist and a private sector specialist on finance and complexity, and Programme Management was led by private sector systems thinking specialists.

Each pilot was designed in response to a specific stated need. In order to ensure the work was as targeted and focused as possible, each involved the development of a problem statement and concept note that were reviewed and agreed with the pilot clients. These went through numerous iterations and revisions, in order to gradually home in on the specific focus of the pilot in terms of the challenges faced and the approach that would be taken. At the point that a specific methodology was chosen, it was typically because there was reasonable confidence that it could be applied within the constraints and that it would help move the clients forward in terms of the challenge they faced.

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