New approaches to the sustainable development of agriculture
TransForum - the case of a mode-2 intermediary

B.J. Regeer*, S. Mager[o], V. Beekman*, J.F.G. Bunders*
* Athena Institute, VU University Amsterdam
[o] TransForum, Zoetermeer, The Netherlands

Abstract. The increasingly complex and interwoven nature of various societal subsystems has consequences for analysis and design of intermediaries between science and society. The example of TransForum (The Netherlands) demonstrates the challenges and approaches of such an intermediary in its start-up phase. The main argument is that becoming an effective intermediary implies dealing with two types of dynamics. Dealing with the internal dynamics encompasses the development of strategies to deal with the difference between intentions and actual practices. It involves learning with respect to the intermediary's own role, strategy and competence. Dealing with the boundary dynamics encompasses the development of strategies to deal with the difference between prevailing modes of governance, knowledge development and assessment procedures, and the aspirations of the intermediary. The article concludes that adequate strategies for sustainable development can only be developed in action, with the simultaneous development of agency.

1. Introduction

For a number of decades, pleas for new approaches to sustainable development have been made by academia from different strands of research: ranging from new modes of knowledge production to new modes of governance. To an extent these pleas share basic principles with respect to strategies for joint problem solving in heterogeneous collaboration (e.g. see Jordan, 2008), with their emphasis on knowledge co-creation, adaptive management, and interactive decision making.

This article looks at an example of a new type of intermediary organisation, or boundary organisation, which has emerged in the Netherlands to aid the transition to a sustainable society. Building on research on the science-policy boundary (Gieryn, 1995, 1999, Jasanoff, 1990) Guston (1999) defines boundary organisations as existing at the frontiers of the two relatively different social worlds of politics and science, with distinct lines of accountability to each. Their role is to resolve the tension between policy and science and facilitate the convergence of interests, ideas, disciplinary languages and perspectives (Cash and Moser, 2000). Their importance in the field of sustainable development and environmental management has been stressed increasingly in recent years (e.g. Cash et al., 2003). The notion of boundary organisations (or intermediary organisations as we will call them in this article, see below) is applicable not only to the science/policy interaction, but also to interactions at the interface of more heterogeneous collaborations between scientists from various disciplinary backgrounds, different levels of government, entrepreneurs, NGOs, and citizens. The aim of this article is to explore the challenges of intermediary organisations in shaping relations effectively in order to support sustainable development, through the analysis of the emerging identity, organisation structure, and operational procedures from within one such intermediary in its start-up phase.

A heuristic tool

Some introductory notes on our understanding of the term 'intermediaries', will help to frame the scope and focus of this article. 'Intermediaries' are defined as actors (often organisations) that actively (explicitly as well as implicitly) shape relationships between different domains of society (with an emphasis on the relationship between science and society). In our research we have introduced the distinction between

mode-1 and mode-2 intermediaries as a heuristic tool for developing understanding as well as practice of operating at multiple boundaries (see Table 1).

Table 1. A heuristic tool for developing and understanding intermediaries (Regeer and Bunders, 2007, based on Vasbinder 2002)

	Relationship between science and practice	**Presumed role of intermediary**
Mode-0	SEPARATE Science and practice are separate from one another.	TOP-DOWN Knowledge dissemination
Mode-1	CO-OPERATION Co-operation between science and practice. No change in working methods of either.	MATCHING Matching knowledge supply to knowledge demand and vice versa.
Mode-2	CO-PRODUCTION Practice and science both actively seek the best way to structure and manage complex change processes. Responsibilities differ, but modus operandi start to converge.	DELIBERATION Articulating knowledge demand, facilitating knowledge co-creation as integral part of joint solution process.

We deliberately employ a recursive use of the concept 'mode-2'; the process of developing theoretical understanding of mode-2 intermediaries functions on the basis of the products of its own working (by employing the distinction between mode-1 and mode-2 heuristically). As such we aim to contribute to the need, identified by Jordan (2008), to explore the relationship between sustainable development and modes of governing in an empirically grounded yet theoretical manner. As we are reconstructing the meaning of intermediary organisations, by analysing their inner workings in emergence, we have chosen the more generic term 'intermediary' instead of 'boundary organisation'.

Thus, this article explores the notion of a mode-2 intermediary from a theoretical perspective and from the experiences of TransForum in its start-up phase. The challenges encountered in the process so far, and some of the strategies employed to respond to these challenges, will be described. As the need for intermediaries on the boundaries of science, policy and society to aid environmental management and sustainable development are widely recognised, the insights gained by this case study can be of use to (intermediary) organisations in similar positions and to standing organisations facing the need for institutional change in the light of changing contexts and conditions (e.g. Schiellerup, 2008).

2. Sustainable development: (requires) new ways of governance

The case: TransForum – supporting sustainable agriculture

In 2003 a consortium of scientists and policy-makers formulated a proposal for an interactive research programme on the sustainable development of agriculture. The key challenge was "to speed up the transition to sustainable agriculture by initiating and securing a transition from the existing technology- and supply-driven knowledge infrastructure into a demand-driven infrastructure which transcends boundaries between disciplines and which has a significantly broader scope than at present." (Innovatienetwerk, 2003) The underlying hypothesis was that in order to make the transition from the "current, industrialised agriculture to a sustainable and multi-functional agriculture that anticipates the social needs for a responsible food production and a beautiful rural area" fundamental changes in the existing knowledge infrastructure were required. (Innovatienetwerk, 2003) In order to bring about the necessary changes in both the agribusiness as well as the knowledge infrastructure, a Knowledge Consortium for the Transition to Sustainable Agriculture was to be set up.

Funding was granted and in 2005 a small organisation (TransForum) was established to run the programme for a period of six years (January 2005 – December 2010).

While the initial project proposal elaborated in great detail the problem definition, key challenges, questions and subsequent research themes, and furthermore the project objectives and targets to be met, it did not explicitly consider the role of the new organisation in the envisioned transition. In its first year of operating the focus in team meetings and reflection sessions slowly moved from discussing and defining the content of the programme to deliberating and reflecting on the process and on the role of TransForum as intermediary between science, (agri)business, government, and society. At the end of 2005 it was explicitly stated that TransForum wanted to act as a 'mode-2 intermediary'.

The TransForum approach to sustainable development reflects the scholarly literature on governing sustainable development in fields ranging from political sciences, environmental sciences, and science, technology & innovation studies. This section will explore the (conceptual) implications for emerging intermediaries, such as TransForum, that can be inferred from current pleas for new approaches. Thus, the question we address in the remainder of this paragraph is: If sustainable development requires new approaches, what characteristics can we delineate for the types of institutions conducting them?

2.1 Sustainable development requires boundary organisations

Environmental problems cannot be solved in isolation; they are connected in a complex system of interacting physical, chemical and biological processes, affecting each other at different scales. Moreover, the biophysical environment can hardly be considered separate from societal development; climate change directly affects the livelihood of millions of people, while industrial disasters (e.g. Chernobyl) destroy the health of generations. The activities that lead to pollution, degradation, and depletion are part of our way of life, embedded deeply in patterns of consumption and production (e.g. Beck, 1986). Thus, the challenge of resolving environmental problems is in essence a socio-ecological challenge, involving biophysical as well as political, institutional, cultural and economical processes. This corresponds to the broader defined challenge of sustainable development as defined by the World Commission on Environment and Development (WCED, 1987), connecting environmental sustainability to the challenges of poverty and desperation in large parts of the world and the obligation toward future generations for being able to meet their needs. New approaches are called for; approaches that are able to address the interdependencies between elements of the complex socio-ecological systems (e.g. Kemp et al., 2005).

Another argument for developing new strategies for sustainable development is that definite knowledge of the properties of the socio-ecological system is inherently impossible. As the system is not 'knowable' in a classical sense, the quest for sustainable development is characterised by uncertainty. There is no consensus about the facts among scientists and there are various and conflicting values surrounding issues of sustainable development. Problems of 'unsustainability' are therefore referred to as 'wicked' problems (Rittel and Webber, 1973), unstructured problems (Douglas and Wildavsky, 1982, Hisschemöller and Hoppe, 1996) or problems of organised complexity (Mason and Mitroff, 1981). These types of problem have no definitive solution, each problem can be considered a symptom of another problem as it has no identifiable root cause, the solution one chooses depends on the problem definition and its perceived explanation, there are no rules to determine

whether the solution is correct or false, and finally there is no stopping rule for such problems; there is always room for improvement. Wicked problems 'defy efforts to delineate their boundaries and to identify their causes, and thus to expose their problematic nature' (Rittel and Webber, 1973: 167).

Scholars of science, technology and society (STS) have argued that the seemingly intractable types of problems, such as those associated with sustainable development, require new ways of knowledge development and a new type of relationship, or 'contract', between science and society (notably Funtowicz and Ravetz, 1993, Gibbons et al., 1994, Jasanoff, 2004). They have advocated an inclusive and responsive science; a type of knowledge production that starts from real-life problems and aims to devise solutions in collaborations with multiple stakeholders. Whereas in normal or mode-1 science, problems are defined and solved in a context governed by the, largely academic, interests of a specific community, in mode-2 knowledge is created in the context of application (see Table 2 for characteristics of mode-1 and mode-2 knowledge production according to Gibbons et al, 1994).

Table 2. Characteristics of mode-1 and mode-2 knowledge production (based on Gibbons et al, 1994)

Mode-1	**Mode-2**
Context of specific academic community	Context of application (and implication)
Disciplinary	Transdisciplinary
Homogeneity	Heterogeneity
Hierarchical	Heterarchical and transient
Autonomy	Reflexivity / social accountability

Primacy for solving persistent problems is not with one institutional domain (e.g. science); different societal actors (including scientists) develop solutions together in heterogeneous collaborative settings. Specifically in the context of sustainable development this has lead to transdisciplinary research (Klein et al., 2001, Regeer and Bunders, 2003, 2007), participative analysis (Kasemir et al., 2003), civic science (Bäckstrand, 2003) and sustainability science (Cash et al., 2003). Policy scientists too have observed an extension of the number of policy actors (multi-actor governance) and levels of governance (multi-level governance). These changes in location of politics have implications for the nature of policy-making. Policy-making is seen to take place in policy networks: relatively stable sets of interdependent actors focused on joint problem solving (Hajer and Versteeg, 2005, Koppenjan and Klijn, 2004). Thus, steering for or managing complex problems is not an exclusive activity of monocentric, national governmental bodies (Jordan, 2008, Rauschmayer et al., 2008).

Cash et al. (2003) argue that little systematic scholarship exists on how to create institutions that effectively harness science and technology for sustainable development. They propose a central role for boundary management, either in specifically designed 'boundary organisations' or in existing organisations. Research shows that boundary organisations connect knowledge to action effectively if they 1) treat boundary management seriously; 2) are accountable to actors on both sides of the boundary (i.e. science and policy) and 3) provide a forum in which information can be coproduced by actors from different sides of the boundary (Cash et al, 2003: 8089).

On closer examination the second and third requirements reveal a paradox: if collaboration between science and other societal domains is characterised by genuine coproduction, as is suggested by requirement 3, the *modus operandi* of both worlds will be affected (also see Table 1). On the other hand, stating that the success of a boundary organisation is determined by principals (those that delegate responsibility to agents) on either side of the boundary, presupposes two distinct worlds each with

their own *modus operandus* and currency. The blurring of demarcations as a result of coproduction and the simultaneous reliance on a clear distinction, results in what we call the accountability paradox. One of TransForum's working hypothesis is that sustainable development requires active participation of and a learning process between actors from knowledge institutions, governmental bodies, societal organisations and the business community (Veldkamp et al., 2008). This is referred to as the KOMBI approach (=Dutch acronym). Hence, TransForum is accountable to and at the same time induces learning in a number of principals. We will show in section 3 how TransForum addresses this paradox.

2.2 Sustainable development requires reflexive governance

Adding to the complexity of the sustainable development challenge, and to the need for new approaches, is that there is no fixed, pre-defined goal. There are no unambiguous criteria to determine the 'sustainability' of human activity. Sustainable development is, by definition, concerned with a range of human activities at different scales, in different sectors, and at different geographical locations, and interconnected with the evolving ecological systems. Depending on place, time, perspectives of stakeholders, and local circumstances, appropriate approaches are context specific. General guidelines do not suffice – there is no 'recipe' to follow. Put positively, sustainable development allows for a variety of transformation paths, with locally defined cultural, political and ecological starting points (Becker et al., 1997, Bruff and Wood, 2000).

In the context of new modes of governance, new steering concepts have been introduced to aid the effective management of resources and the pursuit of sustainable development. Particularly in the case of unstructured problems, characterised by inherent uncertainty and long time horizons, effective strategies should be based on adaptive, iterative, and flexible experimentation. Various authors have sketched the differences between the classical perspective on management and the network perspective of management (Elzen and Wieczorek, 2005, Klijn, 1996, Williams, 2002). New modes of governance are explored and implications for mode-2 intermediaries can be summarised as in Table 3.

Table 3. Characteristics of mode-2 management processes.

	Mode-1 (classical steering paradigm)	**Mode-2 (network perspective on management)**
Characteristic of process	Linear process of problem formulation, alternative specification and decision	Complex interaction processes between different actors
Characteristics of relationships	Authority structures; Principal – agent relations	Mutual dependence; Network of actors
Role of manager (e.g. intermediary)	Implementation of formulated goals	Shaping and changing conditions for successful interaction between actors
Governance instruments	Formal rules, regulations and laws	Stimulate learning by means of experiments, demonstration projects, network building, needs articulation
Organisation	Differentiation of tasks and functions	Interdependencies
Leadership	Takes charge; Provides the right answers	Provides catalyst for action; Asks the right questions

Thus, management strategies for sustainable development, such as those employed by mode-2 intermediaries, are characterised by non-linearity, mutual dependency and experimentation. The challenge is how to create a robust yet flexible process (Cash and Moser, 2000). In their account of reflexive governance for sustainable development, Voβ et al. (2006) shed light on the so called efficacy paradox. The efficacy paradox says that on the one hand to be able to act, complexity must be reduced. In the classical paradigm this was done by a linear process of problem formulation and goal setting and implementation through differentiation of tasks. However, this may easily lead to the neglect of long-term system effects. Yet, on the other hand, consideration of all possible effects, by fully embracing the complexities, interdepencies and value pluralism, reduces the capacity to act (2006: 436). They suggest different combinations of opening up and closing down of the problem analysis, goal formulation and strategy implementation to cope with the efficacy paradox (amongst others those depicted in Figure 1 a, b, c). The strictly linear version in which no opening up occurs (Figure 1a) and the version which only allows for opening up (Figure 1b) together lead to the efficacy paradox.

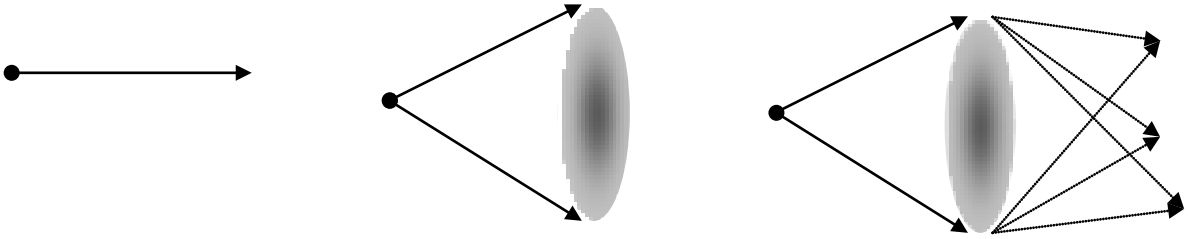

Figure 1 a, b and c. Respectively: No opening, No closing, Subsidiary/experimental closing (Voβ et al, 2006)

An alternative is of the type 'exploring experiment' and pictures a phase of opening-up (of problem, goal and/or strategy) and a phase of experimenting with a number of alternative frameworks of problem definition, goals and options (see Figure 1c). This strategy induces variation and offers experiences from which society can learn what sustainable development is. Moreover, effects can be compared and based on evaluations strategies may be terminated or strengthened. Transition programmes like TransForum are devised just like this: diverse perspectives on sustainable development are explored in interaction between different actors and experiments are set up to support learning. In section 3 we will see how TransForum learned to address the challenges posed by the efficacy paradox.

2.4 From theory to practice

The case study featured in this article can be seen in the light of the experiments that have been set in motion in recent years under several different banners, such as transition experiments, system innovation projects, transdisciplinary research, and deliberative policy analysis. They share a commitment to addressing complex problems by involving multiple actors (notably social and natural scientists, entrepreneurs, administrators and governors, activists, citizens), acknowledging the multi-levelness of the problems and articulating and connecting multiple perspectives. Rather than specifying the differences between these types of strategies, in this article we refer to them all as mode-2 strategies; and their 'agents' as mode-2 intermediaries.

To summarise the implications for mode-2 intermediaries that follow from the accounts of new approaches presented in this section:

- *If* sustainable development is considered inherently complex, situated and contingent, and if sustainable development encompasses social, technical, ecological, political and economical aspects, *then*:
- Primacy for problem-solving is not with one institutional domain. *Therefore* mode-2 intermediaries are required that connect disciplines, perspectives and institutional domains;
    - *Challenge*: How to accommodate the paradox of accountability?
- There is no one route to sustainability. *Therefore* mode-2 intermediaries should maximise variation by supporting experimentation and social learning in niches;
    - *Challenge*: How to accommodate the efficacy paradox?

Striking about the literature review is that it offers many propositions for requirements that are believed to lead to desired new types of knowledge production and related problem solving strategies, but insights on *how* to realise these conditions are rare and ways to address both paradoxes are scarce. Studying a mode-2-intermediary-in-the-making gives us the opportunities to witness the intransigence that becomes apparent at many different levels and places when actually putting these theories into practice. Our findings correspond to Grin et al. who state that reflexive design (as they call what we would refer to as a mode-2 strategy) requires "more than the usual involvement of stakeholders and co-producers in design" (2004, p. 128). They further state that:

> "Institutionally embedded assumptions, knowledge claims, distinctions, roles and identities which are normally taken for granted, must now be critically scrutinised. Given that specific institutional arrangements are needed for reflexive design so as to mitigate the problem of 'institutional void' (Hajer, 2003) and considering that such arrangements tend to be influenced by their wider institutional environment (Grin and Hoppe, 2000), reflexive design presents institutional and methodical challenges that deserve much more attention than they have hitherto gained." (2004, p. 128)

We now turn our attention to one such intermediary – TransForum, and turn our view inwards. This will yield novel insights into the particularly engaging question of How to be a mode-2 intermediary in practice and how to address the paradoxes, complementing the above review on What a mode-2 intermediary would be in theory. Indeed both institutional and methodical challenges will become apparent.

3. TransForum: Ambitions and Intransigence

This section offers a systematic reflection on the evolution of the learning agenda of the staff of TransForum during the period September 2005 (shortly after the general manager was hired) until September 2007 (the publication of the Mid Term Review for the financing committee). During the course of our research we developed several tools to aid the types of learning and reflection processes that are argued to be central to the challenges of sustainable development, such as the Dynamic Learning Agenda (Regeer et al., subm.). The benefits of this tool are that it enables the (collective) articulation of encountered challenges; the analysis of 'tough questions'; (mutual) reflection on learning processes; and the elaboration of subsequent intervention strategies. In this article we employ the Dynamic Learning Agenda retrospectively. Transcribed discussions with staff members of TransForum and notes of staff meetings were analysed at different moments in time and phrased as 'learning agendas'.

We will use selections from the Dynamic Learning Agenda to illustrate how TransForum has learned to address the requirements as formulated above. The Dynamic Learning Agenda shows conceptual changes over time in:

1. the relationship between TransForum's intervention strategy and the broader goal of contributing to the sustainable development in agriculture, and
2. the corresponding role perception of TransForum as intermediary (the identity).

As such we hope to contribute valuable insights into the challenges of governance for sustainable development by mode-2 intermediaries.

3.1 TransForum – setting the scope (2005)

TransForum's intervention strategy is devised like the 'exploring experiments' type of dealing with the efficacy paradox (Figure 1c) by developing 'a variety of problem-handling frameworks into a portfolio of experiments' (Voβ et al., 2006, p. 433). In the case of TransForum, from the outset three alternative frameworks, with corresponding problems analysis, goal formulation and intervention strategy, were developed for supporting the transition towards sustainable agriculture and green spaces; namely Vital Clusters, Regional Development and International Agro-food Networks (Veldkamp et al, 2008). Each of the intended total set of 30 Innovation Projects (IP's) corresponds to one of the innovation strategies. At the TransForum office, three Project Directors are responsible for the innovation strategies.

The unique feature of this approach to developing a programme, which was at its start in essence a research funding programme, was the start with projects in the Practical Programme (referred to as 'no-regret' projects). Its counterpart, the Scientific Programme, was to be defined by the experiences in the projects. This approach thus induces demand-driven rather than supply-driven research. To give some structure to the emerging scientific programme, five themes were defined, each headed by a Scientific Director; a renowned researcher in the field appointed to TransForum for one day a week (for details see Veldkamp et al, 2008). In addition to the Scientific Programme and the Practical Programme, there is a Knowledge Programme, originally aimed at disseminating and anchoring the knowledge developed during the course of the programmes. Significantly, the Knowledge Programme changed its name and scope into Learning Programme in the course of its development, facilitating the learning in projects, between projects and from projects.

To summarise, at the start of the programme (2005) TransForum can be described as an intermediary between science and practice that aims to realise sustainable development in agriculture by diverging from the traditional linear knowledge transfer model, through stimulating a transition in the knowledge infrastructure. The scientific programme has been explicitly set up to address knowledge questions from practice projects, inducing a climate of research which is sensitive and responsive to the research needs of societal parties. The intervention strategy is based on supporting projects (scientific, practical and knowledge), that all in their own way contribute to this overarching goal. A total of 60 million Euro is available to this end, of which 30 million Euro is matched by partners in the practical, scientific and knowledge projects, which further strengthens the transdisciplinary nature of TransForum. Thus, in various respects TransForum-by-design adheres to the requirements of sustainable development as outlined in section 2. We will next look at TransForum-in-action.

In September 2005, when our heuristic tool was presented, it was exclaimed that: 'this is what we have been doing for the past three months; trying to move from a mode-1 to a mode-2 organisation!'. This development continued in the second year of

operation (2006) and is manifest in at least two salient themes on TransForum's learning agenda: the relationship between TransForum and Innovative Projects and the changing identity of TransForum as intermediary. Correspondingly, the relationship between the intervention strategy and the aspired transition towards sustainable development was reconsidered, reformulated and reconfigured. In its third year of operation (2007), the increased ambiguity culminated in two intertwined processes of reification and participation on the one hand, and a further reconsideration of the identity of TransForum and its role in the aspired transition. We will describe both developments below.

4. Changing intervention strategies and the efficacy paradox

In November 2005, the general manager of TransForum and the programme manager conducted their yearly project review. Preceding the interviews, they sent each project leader a list of questions, including: 'How do the project outcomes relate to the goals of the programme?'. The most striking result of the project review in 2005 was that none of the project leaders could answer this question. Moreover, projects felt that TransForum was interfering with, or even intruding in, 'their' projects. Conversely, TransForum felt that all knowledge developed in the projects about realising sustainable development evaporated over time, as the 'real' questions and experiences were not documented. As a consequence, the initial 'no-regret' projects were increasingly regarded as 'regret' projects.

At the start of TransForum (2005) the relationship between the office in Zoetermeer and the projects can be characterised as a principal-agent relationship. Guston (2001) refers to Arrow (1991) to define this relationship as consisting of (a series of) delegations of authority from principals to agents within or between organisations[1]; in the case of TransForum "part of the aspired transition is realised by means of a number of Innovative Projects in a Practice Programme" (May 2005). In principal-agent theory, regular problems with principal-agent relationships are twofold (Guston, 2001 referring to Arrow, 1991). First, it is difficult to select appropriate agents (adverse selection), which in the case of TransForum was manifest by the comprehension that no-regret project were actually regret-projects. And second, it is difficult to assure the conduct of a chosen agent (moral hazard), which in the case of TransForum becomes manifest in the first project-review.

4.1 2006: from executing projects to learning about hampering conditions

Having expressed the wish to become a mode-2 intermediary and reflecting on their own role regularly, the responses to these problems by TransForum staff was not merely to adjust criteria, select new projects and tighten control over the conduct of projects, as a 'principal' in a classical sense would. Rather, it triggered new questions. The focus shifted from 'what do we want project to do for us?' to 'what can we learn from projects?'. It was expressed that knowledge was needed on how to organise transitions, how to organise mode-2 knowledge production, and on the constraining factors in realising the intended transition, both on process level and on institutional level. As the general manager said: "To put it bluntly: I really don't care if project X is realised in the end, because I will not be accountable to the successes of project X.[2] I

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[1] Note that Guston (1999, 2001) uses principal-agent theory to describe the relationship between the boundary organisation (agent) and the two worlds it is accountable to, science and politics (the principals).

[2] The general manager of TransForum supports this statement by recalling that previous BSIK programmes were said to deliver nothing but a whole range of finished projects. "After six years,

will be accountable to the question: If I want to realise another X, do I know how to do this?" (Pers. Comm. July 2006).

Thus, questions of programme coherence and project criteria were replaced by questions on programme aim and programme strategy. This shift in focus had implications for the perception of intervention strategies. Rather than executing projects, TransForum stimulates reflection and learning on constraining conditions within and around projects. The presupposition is that this will lead to the development of useful knowledge and competences for a more sustainable development of Dutch agribusiness. This view corresponds to current literature on sustainability science, which emphasises the need for enriching our understanding of the institutional, social and economical processes linked to the environmental processes (Becker et al., 1997, Kates et al., 2001). And it corresponds to current literature on mode-2 management, which emphasises the importance of creating conditions, asking questions and stimulating learning through experimental projects, rather than taking charge and implementing interventions (see Table 3).

Due to the experiences of the first year, a new line of projects was developed in which project directors play a much greater role in defining them. The procedure for submitting projects was changed. Whereas before complete project proposals could be submitted directly, now a first conversation with one of the project directors takes place after which a one page proposition is developed by the project leader in collaboration with the project director, which is subsequently discussed in the programme team meeting at TransForum. Only then will it be developed into a full proposal. Also projects are stimulated to reflect on their learning process and are asked to make available lessons learned about obstacles, how to overcome them, and necessary conditions for pursuing both transitions (sustainable development and knowledge infrastructure). The process of articulating and documenting learning processes is supported by dedicated monitors (Regeer, Hoes et al. subm.) and invitation to participate in Communities of Practice. Furthermore, a formal split is made between the 'control' relationship between projects and TransForum (administrative issues are henceforth discussed with the business manager) and the 'development' relationship between projects and TransForum (which are built up and maintained by project directors and supported by monitors).

4.2 2007: From participation to reification

As Voβ et al. have described, opening-up (along various dimensions) is required to enable responding to unexpected and changing situations and to create space and energy for new options and possibilities. In the case of TransForum it is through active participation of project directors in projects (as opposed to through *control* on a set of criteria that are believed to foster change) that the particular conditions of the project are incorporated, that timely adjustments are made and that meaning is co-created. As a result, in 2006 the relationship between IP's and TransForum's programme level can be characterised as increased divergence, or opening-up in the terminology of Voβ et al. In his writings about Communities of Practice (as the IP's have been characterised in the context of TransForum), Wenger proposes that visitors (i.e. project directors) must "background" their home membership (i.e. TransForum) in order to advance the boundary relation (1998, p. 112). However, "backgrounding" TransForum's stake carries the risk of losing sight of the focus on the aspired transition as formulated by TransForum, by in stead just supporting separate projects.

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nothing is left."

Project directors indeed moved into a role of creating conditions for change (see Table 3) by supporting learning and reflection *in* projects, and responding to the needs of each project.

A countermovement of closing-down emerged in the third year (2007) through the persistent emphasis on a shared framework, particularly by the general manager. "Our primary aim is not to realise projects, but to learn about changing the Knowledge Infrastructure, organising mode-2 knowledge production, and realising a sustainable development of agriculture." This process of focusing, or closing down in the terminology of Voß et al. (2006), was fostered by the need for producing a Mid Term Review in September 2007, stating the success and deliverables of TransForum to date and for the years to come.

In order to understand how TransForum handles the efficacy paradox, we need to gain insight into the relationship between opening-up (through participation) and closing-down. To this end, let us bring in the concept of reification as used by Wenger (1998). In Wenger's terminology: boundary practices combine reification and participation. By giving form to experiences by producing abstractions, tools, symbols, stories, terms and concepts (in all, processes of reification) we create points of focus around which the negotiation of meaning becomes organised (1998, p. 58-59).

This dialectical relationship between participation and reification is clearly visible in the practice of TransForum, and in particular in the shaping of the relationship between the separate projects and the TransForum programme as a whole. By actively participating in projects (through the involvement of monitors, project directors, exchange sessions between project leaders, etc.) competences and insights on 'how to deal with constraining factors' and 'how to stimulate collaboration between entrepreneurs and scientists' are developed and fostered in practice. This constitutes learning *in* IP's. And, by reifying the experiences in the IP's, fruitful approaches to transdisciplinary collaborations are articulated and a conceptual framework for the work of network managers is developed. This constitutes learning *from* IP's. At the time of writing (medio 2008) the TransForum approach is further abstracted and described as realising 'Metropolitan Agriculture' through 'Shared Valued Development'.

Thus, the efficacy paradox is dealt with through a governance process that is characterised by a simultaneous opening-up (through active participation in projects) and closing-down (through reifying vision, approach and lessons from projects in books, articles, fact sheets, case descriptions, etc.). The question of how to develop and maintain iteration between participation and reification gained a central position on the learning agenda of TransForum.

4.3 Dynamic learning agenda

In the case of TransForum, from the outset three alternative frameworks, with corresponding problems analysis, goal formulation and intervention strategy, were developed for supporting the transition towards sustainable agriculture and green spaces. A governance style of experimentation and interaction was built in by requesting application by consortia of actors in a wide range of Innovative Project's. However, as our case study has shown, it is the enactment rather than the cognitive analysis of an approach that generates insights (and, for that matter, agency as well).

Thus, we see that, starting with a business plan, which is inherently affirmative (or closed down in the terms of Voβ et al.), in the start-up phase a lot of effort is put in opening up. Interestingly, the opening up does not necessarily entail revising the

assumptions with respect to goal and strategy. It rather seems to entail posing the how question which is necessary in order to develop agency, i.e. the ability to act in a meaningful way. To illustrate with an example, the business plan in 2004 states: "Collaboration between knowledge institutions and businesses is guaranteed through the central role of Integral Projects in this proposal." (2004, p. 18). Tracking the formulation and reformulation of questions on the dynamic learning agenda shows that this statement transforms over time from assertion (of the form 'collaboration is guaranteed through …'), via a question to reveal the process behind realising collaboration between a diversity of actors (How can we support collaboration between KOMBI parties?) to multiple questions addressing the different levels at which change is needed or desired (How can we foster learning in projects in order to build capacities to deal with constraining conditions in a growing number of instances? And How can we learn from this in order to be able to 'provide answers' to others that embark on the challenge to guide transition projects or programmes). Hajer and Laws (2006) cite a study by Lester and Poire (2004) on the competence they observed in engineers and other practitioners involved in technical innovation to language development. They argue that "language evolves from clarity to ambiguity – in precisely the opposite direction of evolution one finds in analytical problem solving. Language development evolves, in other words, towards the creation of interpretative space." In the case of TransForum, the interpretative space provided by asking questions contributed to capacity building and emerging (intervention) design on programme level as well as on project level. Hence, the role of TransForum changes from taking charge, to providing catalysts for action, to a set of roles ranging from active participation to experimenting with different forms of reification. Asking questions is combined with providing answers, learning in is combined with learning from, participation is combined with reification.

5. Changing identity: from intermediary to change-agent

In the course of the programme the intervention strategy has changed from executing projects in order to contribute to the sustainable development of agriculture (corresponding to the three frameworks as initially defined as experimental spaces), to inducing learning about hampering factors in projects in order to create conditions for the sustainable development of agriculture (see also Broerse, 1998). This change in strategy has consequences for TransForum's role as intermediary in the aspired transition, as we will illustrate in this section.

Some scholars define the functions of boundary organisations mainly in terms of mediating *between* different actors, adjusting the actions of one to the needs of the other (for instance through funding requirements). TransForum instead states that finding solutions to the problems of sustainable development requires close collaboration between different societal actors (including scientists) in order to generate knowledge that not only addresses societal problems but also contributes to their solution (action oriented). The experience of TransForum shows that this process of coproduction is not unambiguous. Providing a forum for coproduction of information (one of the requirements of boundary organisation, as cited in section 2.1) is not enough to face the hampering factors induced by the differences in culture, currencies, language and reputational system of each of the collaborating parties. What is needed is an intensive process of opening-up problem definitions, goal formulation and intervention strategies, involving frame reflection and competence development. TransForum no longer acts as a neutral in-between; participation is

crucial to facilitate the articulation of implicit needs, knowledge and interests (Hoes et al., 2008) and the development of alignment strategies (Regeer and Bunders, 2007).

Table 5. From intermediary to change-agent.

From intermediary:	***To change-agent:***
Reactive	Proactive
Funder	Partner
Control	Develop
Neutral in-between	Stakeholder

The change of procedure for proposal submission, the formal split between administrative and developmental issues, and the proactive involvement of project directors in the projects are manifestations of a change from TransForum as intermediary, being perceived mainly as funder, to TransForum as change agent (see Table 5). This change was explicitly formulated at TransForum's first scientific conference in October 2006. Not only was this a place to further develop the Scientific Programme together with people from practice. It also gave the TransForum staff an opportunity to present the current state of affairs and declare it aims, position and strategy publicly. With respect to the role of TransForum in the aspired change process, the conference documentation said: "TransForum must not confine itself to the role of an intermediary that serves purely as a link between stakeholders. […] TransForum wants to be a change agent that focuses on the development of knowledge and competences of all stakeholders in order to achieve innovations and a more sustainable development together." (TransForum, 2006, also see Figure 2)

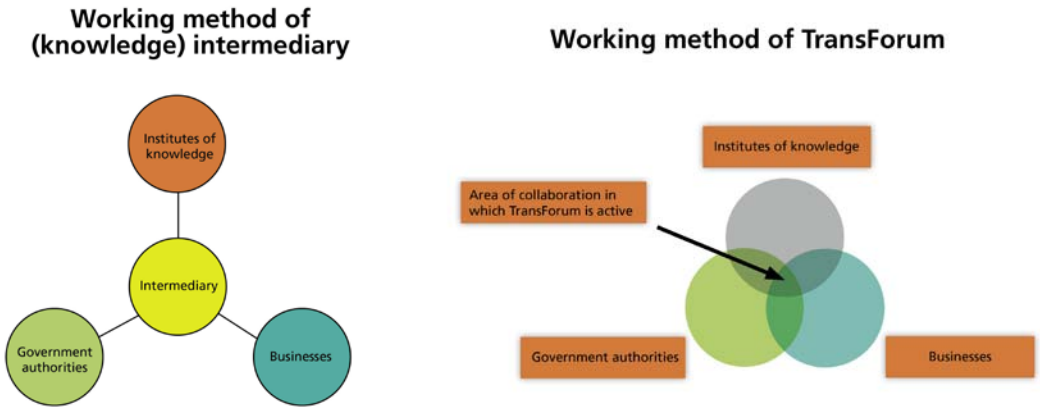

Figure 2a and 2b: Intermediary is connector (a) versus change-agent supports interaction (b) (adopted from TransForum, 2006)

Thus, in the years after the initial statement that TransForum wants to be a mode-2 intermediary, it has become aware of what this implies. In its Mid Term Review it states: In its first year of operation the orientation of the programme shifted from 'doing' to 'learning', particularly with respect to the two challenges: developing new perspectives for the agro sector and adapting the current KIS to become more effective towards those new perspectives. It then follows: "After again one year even this learning approach turned out to be insufficient. Next to doing and learning it was necessary to understand that TransForum is part of the changing KIS." (2007, p. 3).

The accountability paradox naturally arises in this context. Cash and Moser argue that within the boundary organisation they analysed, it is because of faculty appointment of scientists within the boundary organisation that credibility was maintained within the scientific arena and the organisation is insulated from political intrusion (Cash and Moser, 2000). In TransForum, however, the functioning of the scientific arena, and the political one for that matter, is questioned rather than adapted to. TransForum aims for a change from a linear Knowledge Infrastructure to an open-ended and interactive Agro Innovation System. In effect, TransForum is accountable to the same regimes it is trying to change. This is bound to provoke forms of resistance not envisioned in more traditional types of boundary organisations.

How is the accountability paradox addressed in the practice of TransForum? Accountability requires reification of experiences and experiments into concrete results that are meaningful to the 'principals'. From the epistemological position that has emerged in the current analysis, it would be hard pressed to claim that generic successes and results can be determined unambiguously. Rather, again it is a matter of creating meaning, usually through a process of coproduction. TransForum currently experiments with generalising contextualised experiences in different ways, through multiple and dynamic frameworks inferred from the scientific themes, from innovation strategies, or constructed inductively through monitoring and Dynamic Learning Agendas. Moreover, this is done in various configurations of actors, involving KOMBI parties at different levels, from participants in niche experiments to regime players. Accounting to principals is thus a dynamic, constructive and participative process and as a consequence recursive.

6. Reflections on the development of an emerging intermediary between science and practice

Both governance and sustainable development are contested concepts (Jordan, 2008). Primacy for problem-solving is not with one institutional domain, knowledge of sustainability is not indisputably obtainable and a blueprint for conduct is not available. This poses several challenges to boundary organisations aimed at supporting a transition to sustainable development. Employing the heuristics of mode-1 and mode-2 to the challenges encountered, we see that being, or rather becoming, a mode-2 intermediary, implies dealing with, or developing strategies for, the intransigence of mode-1 practice at many different levels and places. Intransigence can be seen in two types of dynamics that are central to the workings of mode-2 intermediaries. The *internal dynamics* encompasses the development of strategies to deal with the difference between mode-2 intention and actual practice. It involves learning with respect to the intermediaries own role, strategy and competence and developing ways to handle the efficacy paradox. The *boundary dynamics* encompasses the development of strategies to deal with the difference between prevailing modes of governance, knowledge development, assessment procedures, etc. and the mode-2 aspirations of the intermediary. It thus involves dealing with and resolving the accountability paradox.

We use the phrase 'development of strategies' (to deal with the differences between mode-1 and mode-2) intentionally to emphasise that the challenge for emerging intermediaries is not primarily in defining mode-2 intermediaries analytically and subsequently adhering to the prescribed description. Rather the challenge is in developing an identity of, or becoming, a mode-2 intermediary. As this challenge contrasts with much of the prescriptive writings that increasingly appear in the literature on new governance, sustainable development, and transition

management, we would like to emphasise the distinction between two possible readings of the development of TransForum: bridging discrepancies versus becoming through enactment.

It is tempting to describe the learning history of TransForum as an increased congruency between what Argyris and Schön (1974) have called "espoused theory" (reflecting what people intend to or believe they do) and "theory-in-use" (which can be inferred from actual behaviour). Thus, whilst mode-2 intentions were clearly stated in the initial business plan (e.g. demand-driven knowledge infrastructure, learning-by-doing), in practice the TransForum case shows many different instances of 'defaulting' into mode-1, particularly in its first year (e.g. practising a hierarchical principal-agent relationship). One could justifiably claim that over time, a progressive alleviation of the discrepancies between mode-2 intentions and mode-1 practice in conducting a transition programme took place. Whilst this is an identifiable account of the history of the emergence of TransForum, we would like to propose a different reading of events. A reading that acknowledges the challenges faced by intermediary organisations with mode-2 aspirations, in the light of the inherent uncertainties associated with the 'wicked' nature of sustainable development and the correspondingly proposed reflexive nature of governance.

The Dynamic Learning Agenda of TransForum shows that an understanding of what it means to be a mode-2 intermediary can only be developed through the enactment thereof. TransForum started with a strategy (e.g. support sustainable agriculture by spanning boundaries between science and practice), which is soon turned into a quest (e.g. how to create effective collaboration between science and practice?), with its own role at the centre of this quest (e.g. what intervention strategies and competences are needed to create effective collaboration between science and practice?). Thus, over time, assertions turn into questions and questions become specified, branch out into more questions, moving from one theme to another, and address different levels and locations of constraints. It is the evolution of questions, generated through enactment, that teaches us what it entails to be a mode-2 intermediary.

In writings about the challenges of boundary organisations it has been noted that 'a major obstacle to the implementation of adaptive management is a culture that is unwilling to accommodate the risks inherent in experimentation' (Cash and Moser, 2000). However, in accordance with the above we would rather argue that implementing adaptive management involves developing alignment strategies to deal with surrounding cultures (be it scientific or political) that are unwilling to accommodate the risks inherent in experimentation. As Guston (2001) states: an important characteristic of boundary organisations is their ability to successfully internalise boundary negotiations. Or, as Smith (2006) observes; experimental strategies are more likely to invoke the desired change if they show a degree of compatibility with the incumbent regime.

The role of mode-1 processes, procedures and documents should not be undervalued.[3] Consequently, tensions emerge at many levels: there is a need for coherence and structure and at the same time a need for adaptivity and flexibility; there are formal requirements, but also a need for space to experiment; there is a need for involving regime parties and at the same time these actors bring with them

[3] Without a clear business plan, including projects ready to be executed and a coherent programme, TransForum would not have been approved. Also, as one of the project directors noted: "You don't go to the accountant with a mode-2 story".

constraining requests. Moreover, as no practice equal to the one performed by TransForum exists, none of its staff members can be expected to have all the necessary competences needed for the specificity of the task. The gap between the rhetoric on participation and real-life implementation of participatory environmental governance, as revealed by Rauschmayer et al. (2008) in the case of biodiversity, is an example in case.

In conclusion, what does this tell us about boundary organisations operating amidst the uncertainties surrounding 'wicked' issues such as sustainable development? It tells us that even if informed by theoretical considerations, adequate strategies for sustainable development can only be developed in action, with the simultaneous development of agency. Mode-2 practice includes developing strategies to accommodate the mode-1 contexts, mode-1 habitual mechanisms and mode-1 competences that are inherently part of the endeavour to implement new modes of governance for sustainable development.

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