02 **Knowledge Centre for Sustainable System Innovations and Transitions (KCT)**

Deepening, Broadening and Scaling up

A Framework for Steering Transition Experiments

Suzanne van den Bosch, Jan Rotmans

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Preface

In May 2006 the Knowledge Centre for Sustainable System Innovations and Transitions (KCT) published its first practitioner oriented essay entitled 'Transition experiments: Practical experiments with the potential to contribute to transitions' (Kemp and van den Bosch, 2006). This essay presented a new perspective on experiments and made a first attempt to discuss how experiments could really contribute to transitions. Central in this approach was a combination of searching, learning and experimenting. The essay was spread among hundreds of Dutch practitioners working on transitions in different sectors and policy domains (e.g. energy, agriculture, health care, construction, mobility). Follow up discussions between transition researchers and practitioners, showed a gap between state of the art knowledge about transition experiments and practice. Practitioners expressed a need for more specific and practical guidelines for stimulating the contribution of experiments to transitions. The current literature on transition experiments, however, lacks an integrated framework for deriving such guidelines.

Recent research on transition experiments, which is conducted in strong interaction with practitioners, has elaborated on the initial ideas about how experiments could contribute to transitions. Central in this research are the mechanisms deepening, broadening and scaling up. This second KCT essay presents a next step towards an integrated conceptual framework for transition experiments, which is embedded in the existing sustainability transition literature and is illustrated with several examples. It aims to share recent research results with the community of academics, policy makers, intermediaries and consultants, who are actively working on transitions and transition experiments, and who are interested in the theoretical notions that might shed a different light on their work.

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Summary

This essay presents a conceptual framework for analyzing and influencing the contribution of small-scale experiments to transitions towards a more sustainable society. This framework is aimed at providing academics and practitioners with a theoretical and practice oriented perspective to both understand and 'steer' the contribution of experiments to transitions.

The central instrument in this framework are 'transition experiments', which provide an alternative approach to classical innovation projects that are aimed at realizing short-term solutions. A transition experiment is an innovation project with a societal challenge as a starting point for learning aimed at contributing to a transition. First we elaborate on the origin and context of transition experiments. We define what distinguishes a transition experiment from classical innovation experiments and develop process- and substance-criteria for a successful transition experiment. We then build upon the sustainability transition literature by identifying three central mechanisms through which experiments contribute to transitions: deepening (learning as much as possible in a specific context), broadening (linking and repeating in different contexts) and scaling up (embedding the experiment in -new- dominant ways of thinking, doing and organizing).

The developed conceptual framework for steering transition experiments consists of a descriptive and a prescriptive part. To understand how experiments can contribute to transitions and what this contribution encompasses, the framework relates the mechanisms deepening, broadening and scaling up to desired changes in established ways of thinking (culture), doing (practices) and organizing (structure). Furthermore, it elaborates on the conditions under which experiments contribute to transitions. The prescriptive part of the framework translates the identified mechanisms in different management strategies for transition experiments and further specifies this in management guidelines for project and program managers that aim to increase the contribution of experiments to transitions.

The framework has been partly applied in different transition experiments in the Netherlands (in the mobility and care sector). These examples illustrate how the developed concepts and guidelines enable concrete recommendations and actions for steering transition experiments. This type of steering includes more than only managing internal aspects of an innovation project, it is also about managing interactions between projects, managing interactions between the experiment or niche and the broader societal context (regime) and managing interactions between the experiment and developments in the landscape.

Contents

1.
Introduction

Why experimenting for transitions

Present society is challenged by the question how to fulfill societal needs in a more sustainable way and overcome persistent problems such as problems related to climate change, traffic congestion and the ageing of the population. Because in *sustainable development*[1] there is much uncertainty about both the problems and the solutions, it requires experimentation with sustainable practices on a small scale. In the Netherlands, currently various policy domains are applying small-scale experiments as a key instrument for stimulating 'transitions' towards a more sustainable fulfillment of societal needs. Two 'transition programs' in which experimentation plays a major role are: the Energy Transition (initiated by the Ministry of Economic Affairs) and the Transition Program in the Care (initiated by the Ministry of Health, Welfare and Sports)[2]. Simultaneously and in co-production with these developments in the policy domain, social scientists have developed a conceptual framework to better understand, identify and influence transitions towards sustainability (Rotmans et al., 2001; Geels, 2002, Rotmans et al., 2004, Kemp and Loorbach, 2006). The development of a 'transition theory' is directed at explaining a specific type of social change, *a transition,* which is a fundamental change in the dominant way a societal need such as the need for energy, health care, mobility, housing and agriculture is fulfilled. Transitions are characterized by their long time frame (at least one generation). Within the research aimed at *understanding* these long-term structural societal changes, the multi-phase concept was developed to describe the dynamics of transitions in terms of different stages (Rotmans et al., 2001, Rotmans, 2005). Another influential concept is the Multi-Level Perspective (MLP), which describes transitions as interlinked patterns between dynamics at three levels of a societal system: the level of niches, regimes and the landscape (Rip and Kemp, 1998, Geels and Kemp, 2000, Geels, 2002). This was added with the multi-pattern concept, which distinguishes different patterns of transitions (Geels and Schot, 2007, De Haan and Rotmans, 2008). The governance approach of Transition Management (TM) (Rotmans et al., 2001, Loorbach, 2007) deals with

influencing transitions towards sustainable directions. Experimenting in practice to learn about possible and desirable transition pathways is an important TM instrument (Kemp and Van den Bosch, 2006).

Results and questions following from literature

Case studies of historical transitions emphasize the important role of experiments with practices that deviate from dominant regime practices (Verbong, 2000, Geels 2002) . The paradox is that case studies of contemporary experiments with sustainable practices show that small-scale experiments seldomly break through and do not become part of dominant practices (Hoogma et al., 2002, Smith, 2007). Recent transition literature acknowledges that a focus on individual experiments in niches is too limited. This has resulted in more theoretical and empirical studies on the importance of conducting multiple experiments in niche-trajectories (Geels and Raven, 2006), combining experiments with tactical and strategic activities (Loorbach, 2007), aggregation activities (Geels and Deuten, 2006), niche-regime interaction (Raven, 2005) and translating practices between niches and regimes (Smith, 2007).

Although this literature is a valuable contribution to the emerging field of transition studies, we claim that an integrated framework for understanding how experiments in niches contribute to transitions or regime-shifts is still lacking. Furthermore, the literature provides little attention to the question how practitioners that are involved in experiments can influence the contribution of experiments to transitions towards sustainability (Mourik and Raven, 2006, Caniëls and Romijn, 2006, 2008).

Main objective and content of this essay

This essay aims to contribute to both theory and practice by developing a conceptual framework for *analyzing and influencing* the contribution of small-scale experiments to transitions towards a more sustainable society. The central instrument in this framework are 'transition experiments', originally defined as practical experiments with a high risk and a high potential to contribute to a transition process (Rotmans, 2005). We elaborate on the contribution of experiments to transitions and how this can be (partly) managed, by making use of three central mechanisms (deepening, broadening and scaling up).

In section 2 we first elaborate on the origin and context of transition experiments. We define what distinguishes a transition experiment from classical innovation experiments and develop process- and substance criteria for a successful transition experiment. In section 3, we then build upon the sustainability transition literature by identifying three mechanisms through which experiments can contribute to a transition:

(i)   **Deepening,** which relates to notions about (social) learning processes (Röling, 2002, Grin and Loeber, 2007, Wals et al., 2007) and experimenting and learning in niches (Kemp et al., 1998, Schot and Geels, 2007).

(ii) **Broadening,** which integrates notions from transition literature on the importance of diverse experiments in a variety of contexts (Raven, 2005, Geels and Raven, 2006, Rotmans and Loorbach, 2006) and innovation literature on diffusion and the application of existing innovations in new domains (Rogers, 1995, Levinthal, 1998, Nooteboom, 1999).

(iii) **Scaling up,** which builds upon transition literature that refer to the scales in the Multi-Level Perspective, conceptualizing the step from local projects to niches and eventually regime-shifts (Weber et al., 1999, Geels and Raven, 2006) and the translation or societal embedding of sustainable niche practices in the regime (Deuten et al., 1997, Van Mierlo, 2002, Kivisaari et al., 2004, Rotmans and Loorbach, 2006, Smith, 2007).

In section 4 we use deepening, broadening and scaling up as a basis for developing an integrated conceptual framework for analyzing and steering transition experiments. The descriptive part of the framework includes the three *mechanisms,* desirable *changes* in culture, practices and structure and the *conditions* under which experiments contribute to transitions. The prescriptive part of the framework includes different management *strategies and guidelines* for transition experiments, which provide practitioners with a perspective for developing concrete activities to influence the contribution of experiments to sustainability transitions. The framework is developed in strong interaction with ongoing transition experiments (in the mobility and care sector) aimed at stimulating transitions towards a sustainable society. The concluding section discusses the value of this conceptual framework for theory development, empirical research and practice.

This refers to the Brundtland definition, stating that sustainable development is *"Development that meets the needs of the present generation without compromising the needs of future generations."* In this definition societal needs are central. In the current fulfillment of many societal needs, economic development is the main driver at the loss of ecological and social development. A sustainable fulfillment of societal needs would balance economic, social and ecological development (which takes into account intra-generational equity).

2 Also several innovation programs in the Netherlands are explicitly aiming to contribute to transitions, for example: Transumo (focused at the transition to a sustainable mobility sector), PSIB (focused at a transition to a sustainable construction sector), and Transforum (focused at the transition to a sustainable agriculture sector).

3 Such experiments are conceptualised as happening in niches. Recent literature acknowledges that there is a bias of focussing on the role of niches and shows that this is only one of the possible transition pathways.

2.
Defining transition experiments

Within the research on transitions, 'transition experiments' are a key concept to characterize small-scale experiments with a high potential to contribute to transitions (Rotmans, 2005, Kemp and Van den Bosch, 2006, Loorbach, 2007, Raven et al., 2008). The concept is also applied in the Dutch policy domain as an instrument to stimulate transitions towards more sustainable societal systems. However, within the literature on transitions the concept of transition experiments has been mainly addressed as part of broader notions such as Transition Management and Strategic Niche Management. The literature still lacks a precise description of what a transition experiment is, how it can be recognized and how it can be used as an instrument in transitions. This section therefore aims to define transition experiments.

Definition of transition experiments

A transition experiment is an innovation project with a societal challenge as a starting point for learning aimed at contributing to a transition.

The origin and context of transition experiments

The instrument 'transition experiment' was developed as one of the key instruments within the governance approach of Transition Management (TM) aimed at stimulating transitions towards more sustainable modes of development (Rotmans et al., 2000, 2001, Rotmans, 2003, Loorbach, 2007). The development of the transition experiment instrument within the TM approach was part of a co-production process, in which theory development and implementing TM in practice have reinforced each other. An example of such a co-production process is the 'Energy Transition', which was initiated in 2001 by the Dutch Ministry of Economic Affairs to stimulate a transition to a sustainable energy supply system. In consultation with stakeholders, various sustainability visions were developed (where do we want to go?), transition paths were

formulated (how can we get there?) and transition experiments were drawn up (how do we get started?) (Rotmans, 2005).

The theoretical development of transition experiments is based on common notions in *evolutionary theory* addressing the importance of variation and selection (Nelson and Winter, 1977, 1982), *complex systems theory* addressing that small changes can have large consequences (Prigogine, 1987, Kauffman, 1995) and *innovation theory* addressing the importance of developing innovations in niches (Levinthal, 1998). Within Transition Management literature these theoretical notions have been translated in an instrumental perspective on transition experiments, while building upon recently developed concepts such as Strategic Niche Management (SNM) (Kemp et al., 1998, Weber et al., 1999, Hoogma, 2000) and Bounded Socio-Technical Experiments (BSTE) (Brown et al., 2003, Brown and Vergragt, 2008). Experiments in SNM and BSTE differ from transition experiments because these experiments have a *socio-technical* nature in which the starting point is often a technological innovation, for example: experiments with electric vehicles (Hoogma et al., 2002)[4], experiments with photovoltaic systems in housing (Mierlo, 2002), experiments with bio-energy technologies (Raven, 2005) and experiments with zero-energy building (Brown and Vergragt, 2008).

Transition Management literature further extended this concept of experimentation in niches by developing the transition experiment instrument. The starting point of transitions experiments is not a technological innovation, but a societal challenge such as how to meet the need for energy, transportation, housing or health care in a sustainable way. Because transition experiments are guided by broad societal needs, transition experiments cover a broad range of innovations that are not only socio-technical by nature, but also institutional, legal, financial or social-cultural. Examples of transition experiments in practice are experiments with sustainable ways to fulfill the need for: housing and care for the elderly, mobility in urban areas, nutrition for schoolchildren and water management (Luiten and Van Sandick, 2006, Van Sandick and Weterings, 2008).

# Example Housing and care for the elderly (I)

The Dutch healthcare system is facing persistent problems regarding the ageing of the population (the 'grey wave'), increasing costs and a decreasing workforce in the care sector. These problems are specifically visible in the field of housing, care and welfare for seniors, who want to live independently as long as possible, while their need for care increases. Combined with the general need to reduce the environmental pressure in society, these societal needs require a transition in the 'housing and care system' for elderly.

The societal challenge "How can elderly live independent with a higher quality of life, at acceptable costs?" was a starting point for setting up a transition experiment in Hubertus Drieschoten (a district in Apeldoorn). The experiment was conducted by a care institution and housing corporation, working together with TNO (Dutch Knowledge Institute for Applied Science). The transition experiment involved the development of an innovative concept for sustainable 'housing and care for elderly' in the district Hubertus Drieschoten. First, a sustainability vision was developed, which included desirable future images of how elderly in the future could receive care in a domestic environment. Based on this vision, an integrated innovative housing and care concept for the elderly was developed, which will be (partly) realized in 2009/2010. The project puts much emphasis on user participation (both elderly and care professionals) to develop innovative solutions for social issues and eventually contribute to far reaching social change (www.tno.nl).

Another contribution of Transition Management is that it acknowledges that small-scale experiments can only be a successful instrument for stimulating transitions if it is applied in strong interaction with other instruments. Transition experiments are part of a portfolio of systemic TM instruments (Rotmans and Loorbach, 2006): a complex systems analysis, sustainability visions, transition arena & transition pathways, a transition agenda, transition experiments, monitoring & evaluation and transition coalitions & networks. In the transition management cycle (Figure 1) the different instruments for TM are integrated in four activity clusters, which take place at a strategic, tactical and *operational level.* Transition experiments should therefore not be used as isolated instruments, but as part of a broader governance approach including operational, strategic and tactical activities. Activities at the operational level include mobilizing actors and setting up and executing transition experiments with the goal to translate visions and agendas in concrete actions (Loorbach, 2007). Transition experiments are supported by activities at the *tactical level,* including the development of images and paths that give direction to different transition experiments and provide a basis for cooperation. The goal of activities at this level is to develop coalitions and transition agendas, involving larger number of actors and creating broader support. Transition experiments are also supported by activities at the *strategic level,* focused at creating a common understanding of a problem, a shared sense of urgency and a shared direction and ambition.

Hence, while notions such as Strategic Niche Management focus mainly on setting up experiments, the TM instrument 'transition experiments' also addresses the broader management issues of experiments in a transition context.
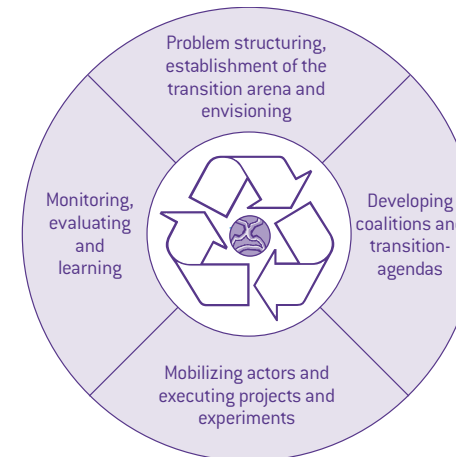
Characteristics of transition experiments

In the literature on transition management the term 'transition experiments' is used to refer to innovative, small-scale experiments or exploration environments for searching and learning that is oriented to societal challenges (Loorbach and Rotmans, 2006, Loorbach, 2007). Based on this literature, we developed the following definition: "A transition experiment is an innovation project with a societal challenge as a starting point for learning aimed at contributing to a transition". We propose this definition because it positions transition experiments as a specific kind of innovation project, which makes it possible to define distinguishing characteristics of transition experiments in comparison to classical innovation projects. Furthermore, this definition emphasizes that while the starting point of conventional innovation projects is often a pre-defined result or solution (project goal), the starting point in transition experiments is a societal challenge related to overcoming persistent societal problems (societal 'transition' goal). Apart from the category *innovation projects* and the starting point *societal challenge,* the definition also describes that the objective of a transition experiment is contributing to a specific transition and the main means for this is (social) *learning.* In this section we first elaborate on the three central concepts in the definition of transition experiments: (i) societal challenge, (ii) innovation and (iii) learning. We then continue with comparing the characteristics of transition experiments to classical innovation experiments.

The starting point of a transition experiment is a long-term *societal challenge* at the level of a societal sector or region (Rotmans, 2005). These societal challenges provide a direction for experimenting and learning aimed at a sustainability transition, in which specific sectors or regions develop in such a way that they can meet societal needs (such as health care or energy needs) in the present ánd nearby future. We define a societal challenge as a question related to a *persistent* societal problem, which guides the search and learning process in a transition experiment. Examples of societal challenges are questions related to the problem of the ageing of the population and rising costs in health care or the question how to overcome persistent energy problems and realize a clean, reliable and affordable energy supply system. These persistent problems are *complex* because they are deeply embedded in dominant practices, culture and structure of society (Dirven, Rotmans and Verkaik, 2002) and therefore cannot be solved in the short term. Furthermore, persistent problems and the possible solutions to these problems are *uncertain.* For example the impacts of the energy problem are highly uncertain (e.g. climate change, shifts in power) and no agreement on a sustainable solution yet exists. And in the healthcare sector both the scale of the problems relating to the aging of the population (resulting in higher costs and a decreasing workforce), and possible solutions to this problem are still not known. Because of this structural uncertainty, it is not possible to learn about these persistent problems from classical innovation projects that typically start from a well-defined problem or a possible solution. Furthermore, because persistent problems are embedded in the dominant practices, culture and structure of society, solutions to these problems can not be found within the dominant way of thinking. Therefore to explore new directions for solutions, the search and learning process needs to be guided by a challenging question (and not a preconceived answer) that is related to a persistent societal problem (and not a possible solution).

Example
Housing and care for the elderly (II)

The societal challenge "How can elderly live independent with a higher quality of life, at acceptable costs?" was the starting point of the "Housing and care for the elderly" project in Hubertus Drieschoten. This societal challenge is difficult to realize within the dominant structure (e.g. financing, rules and regulation) of the existing Dutch care system, which assesses and finances care institutes on the number of care 'actions' that are taken. This dominant 'production paradigm' has not been able to overcome persistent problems related to the increasing costs of care and decreasing workforce. Moreover, this production paradigm increases the workload of elderly care workers, which puts further pressure on the decreasing workforce. An innovative concept for sustainable 'housing and care for the elderly' therefore requires a radically different structure and culture. Central in the development of the innovative housing and care concept in Hubertus Drieschoten, is the quality of life of elderly and the quality of the interaction between elderly and elderly care workers (instead of the quantity of care and housing services provided by institutions).

To support the quality of life and working in Hubertus Drieschoten, TNO has developed and tested several (technological) innovations, such as technologies that facilitate easy communication among residents and elderly care workers and technologies that provide a 'personal indoor climate', which increases the comfort of both residents and professionals.

The second central concept in the definition of a transition experiment is *innovation,* which can be understood as anything that is perceived as new. A transition experiment is a specific type of innovation project in which the nature of the innovation differs from conventional innovation projects. The type of innovation in a transition experiment can be characterized as a 'system innovation'. System innovations involve changes in societal (sub)systems that go beyond conventional types of innovations such as a product, service or process innovation. The underlying notion of typologies of innovations is that an innovation fulfills a new or existing need in a new way. A difference between innovations and system innovations is that a system innovation fulfills an existing *societal* need in a *fundamentally* different way. These societal needs exist at a very large scale, for example at the scale of a (sub)sector, such as the energy, water management or mobility sector. Transition experiments take place at a smaller scale (for example at the scale of several organizations, a neighborhood or municipality), but can contribute to transitions within a sector or region (e.g. Parkstad Limburg and Flanders in Loorbach, 2007). In transition experiments, actors experiment with radical new (and sustainable) ways to fulfill a societal need in a small part of the total societal system.

In transition literature, the dominant way in which societal needs are fulfilled is referred to as the *regime* (De Haan and Rotmans, 2008). A regime can be defined as the dominant structure, culture and practices with the incumbent power and vested interests in a societal system (Rotmans, 2005). Examples are the fossil fuel regime that is dominant in the energy domain and the automobile regime that dominates the mobility domain. Transition experiments are aimed at deviating from the regime. The nature of the innovation in a transition experiment can therefore be characterized as a novelty in terms of interrelated (radical) changes in *culture, practices and structures.* In recent transition literature these are central concepts to understand what changes in a transition process (Rotmans and Loorbach, 2006 and Van Raak, 2008):

- **Culture:** the sum of shared images and values (paradigms) that together constitute the perspective from which actors think and act. Changes in culture comprise shifts in thinking, mental models and perceptions;
- **Practices:** the sum of activities (routines, behavior, daily practices). Changes in practices comprise changes in what actors actually do, how they work or behave;
- **Structure:** the institutional (legal structures, organizations and power structures), physical (infrastructure, technologies, resources, materials) and economic (financial or fiscal) structures. Changes in structure comprise changes in how actors organize the things they do, either physically, institutionally or economically;

Example Housing and care for the elderly (III)

The innovative housing and care concept in Hubertus Drieschoten can be characterized by the following changes in culture, practices and structure*:

Structure:
- Living and well-being is central, instead of care (elderly receiving care in their home environment instead of living in a care institute);
- Different roles and power structures between elderly and elderly care workers (residents are the main 'director' and the elderly care worker 'works in the world of the customer');
- Changing role of housing corporation and care institute, which for example becomes a 'comfort provider' and produces and provides sustainable heath and cooling.

Culture:
- Elderly people actively participate in social activities in mixed neighborhood;
- Attention for symbolism: within the district mainly living is visible and care institutions are invisible (for example, elderly care workers do not have a front office);
- Organization culture of care institution changes: the customer is central and providing care is not a solo activity but a joint activity (together with welfare organizations, etc.);

Practices:
- Practice of care institution changes: from providing 'supply driven' care to passive elderly to providing 'demand driven' care to active elderly;
- District contains front office where elderly can ask broad questions to a housing, care and wellbeing counselor.

The changes that where desired in the project follow from interviews with the project participants

The third central concept is *learning*. In general, learning can be understood as an (inter)active process of obtaining and developing new knowledge, competences or norms and values[5]. The aim of learning in transition experiments is to contribute to a transition, e.g. a fundamental change in dominant culture, practices and structure. The learning process in transition experiments is therefore characterized by a process in which multiple actors across society develop new ways of thinking (culture), doing (practices) and organizing (structure). Characteristic for a transition experiment is that the experiment does not take place in a laboratory environment, but in a real-life societal context that enables high quality learning. From research on transitions to sustainability, three characteristics of a *high quality learning process* can be identified. Research within SNM (Raven, 2005) explains that successful experiments have learning processes that are (i) *broad* - learning about many dimensions of a problem (e.g. institutional, technological, socio-cultural, environmental, economical) and the alignment between these dimensions (ii) *reflexive* - there is attention for questioning underlying assumptions such as social values, and the willingness to change course if the innovation does not match these assumptions. Furthermore, literature on transitions to sustainability emphasizes the importance of (iii) *social learning* - a process in which multiple actors interact and develop different perspectives on reality (Leeuwis, 2003). In transition processes social learning is specifically aimed at 'reframing', changing the 'frame of reference' (Schön and Rein, 1994) and perspective of actors involved (Rotmans and Loorbach, 2006). An adequate learning process in transition experiments facilitates broad learning about different dimensions of a broad societal challenge; reflexive learning that questions existing ways of thinking, doing and organizing; and social learning to develop an alternative perspective on reality through interaction in heterogeneous groups. This type of learning is one of the distinctive characteristics of transition experiments, as presented in Table 1.

Table 1: Distinctive characteristics of transition experiments

	Classical Innovation Experiment	Transition Experiment
Starting point	Possible solution (to make innovation ready for market)	Societal challenge (to solve persistent societal problem)
Nature of problem	A priori defined and well-structured	Uncertain and complex
Objective	Identifying satisfactory solution (innovation)	Contributing to societal change (transition)
Perspective	Short and medium term	Medium and long term
Method	Testing and demonstration	Exploring, searching and learning
Learning	1st order, single domain and individual	2nd order (reflexive), multiple domains (broad) and collective (social learning)
Actors	Specialized staff (researchers, engineers, professionals, etc.)	Multi-actor alliance (across society)
Experiment context	(partly) controlled context	Real-life societal context
Management context	Classical project management (focused on project goals)	Transition management (focused on societal 'transition' goals)

In Table 1 we compare the characteristics of transition experiments to classical innovation experiments[6] by placing both types of innovation projects at extreme ends. In practice the difference between characteristics are more subtle and characteristics co-exist in one project (for example, in transition experiments not only second order learning but also first order learning takes place). This results in the existence of many hybrid forms, in between innovation experiments and transition experiments. Thus, ideal type transition experiments are rare. Before an existing innovation project can qualify as a transition experiment a process of 'transitioning[7]' is needed to create the conditions for contributing to a sustainability transition. Experiences with applying this perspective to existing innovation projects show that Table 1 can provide a new way of looking at innovation projects and can support in broadening the scope of an innovation project in terms of both process and substance.

Example
People Mover (I)

The people mover project started as a classical innovation, technology push project. It involved the development of self-steering vehicles (without a driver), that are technically speaking safe, cheap, environmentally friendly, fast and efficient to transport people within a city or municipality. The testing place was the city of Almere.

During the project a 'transitioning' process was started in which the central question was: "How to transform such a largely supply-driven project into a more demand-driven transition experiment in such a manner that it might contribute to a more sustainable mobility system?"

In this process of 'transitioning' the people mover project, the project participants learned that their initially technical oriented experiment had potential to contribute to a transition to a sustainable mobility sector. This broadened the objective of the project from testing and demonstrating a technological innovation, to exploring and learning about how a people mover could contribute to a (sub)transition to sustainable mobility. The initially short and medium term perspective on the project was added with a long term perspective and Transition Management (as a process approach) was incorporated in the project management*. A concrete outcome of this 'transitioning process' was that this different way of looking at the project resulted in changing the working packages of the project. Furthermore, the reframing of the project from a technological concept to a broader concept about sustainable mobility in general, created opportunities to incorporate people movers in the political agenda of Almere (Van Bakel, 2007).

*Application of Table 1 in transitioning of People Mover project

	People Mover: Classical Innovation Experiment (pilot)	People Mover: Transition Experiment
Starting point	Sensor technology, traffic mix, municipal parking policy (Almere)	To an environmentally friendly, cost effective, attractive and safe mobility system
Nature of problem	Technological and embedding in municipal parking policy and infrastructure	Complex: scaling up and embedding in mobility system (3P's)
Objective	Technological innovation and municipal market for people movers	Contributing to (sub)transition to 'customer directed collective transport'
Perspective	2-5 years	>10 years
Method	Testing and demonstration on site in Almere	Testing and demonstration on site in Almere, learning for (sub)transition and other applications
Learning	New (technological) insights, behavioural change municipalities	Changing societal perspective on mobility, reflection on objectives of experiment
Actors	Project group	Project group + new parties (companies, governments)
Management context	Project management, adjusting project goal	Transition management (process), Transumo (vision and (sub)transition), adjusting societal- and project goal

Criteria for transition experiments

Apart from the characteristics of a transition experiment, it is also important to define what a successful transition experiment is and how it can be successfully managed. Explicit success criteria can support the selection, execution and monitoring of transition experiments. Based on initial experiences with applying criteria in practice[8], we distinguish two types of criteria for success: (i) process criteria for the quality of the project management and (ii) substance criteria for the quality of the explored solutions.

Process criteria[9]

– room in budget and planning
– space in the process
– quality of learning process
– supportive incentives / assessment mechanisms
– motivation, resources and competences of project participants (transition competences)
– strategic management

Substance criteria[10]

– connection to societal challenge (how the project goals fit with societal 'transition' goals)
– connection to promising paths of development (transition paths)
– innovativeness (in terms of deviating from dominant structures, culture and practices)
– sustainability of explored solutions (in terms of a balance between economic, social and ecological development)

The first type of criteria are mainly about conventional 'good' project (and process) management, such as having sufficient room in the project budget and planning, stimulating a high quality learning process, developing adequate incentives/assessment mechanisms that support the project and selecting project participants with high motivation, resources and competences. Even though these general process criteria are also applied in conventional project management, in a successful transition experiment the specific way in which these criteria are applied is different. For example in conventional project management the 'supportive incentives / assessment mechanisms' are focused at realizing short term results and mainly financial impacts. While in the management of a transition experiment, similar assessment mechanisms

(such as contractual agreements or monitoring indicators) are focused at stimulating learning and a broad societal impact.

Moreover, 'good' project management in transition experiments differs from classical project management in several ways. The first difference is that in transition experiments it is important to create enough *space* in the process for learning, reflection and different ways of thinking, doing and organizing. In the literature on Strategic Niche Management (Kemp et al., 1998, Weber et al., 1999, Hoogma et al., 2002) this is conceptualized as creating a partially *protected space,* in which an innovation is protected from the mainstream selection environment. This protected space can be either financial (e.g. subsidies, investments), legal (e.g. exemptions from taxes, rules, legislation), institutional (e.g. commitment of powerful actors) or mental (e.g. an inspiring environment that stimulates creative thinking). Another important difference is that actors in transition experiments should have specific *competences* such as having an open mind, being able to look outside the boundaries of their own organization, and being able to communicate and 'anchor' results of the project at a strategic (regime) level (Loorbach, 2007). A third difference is that in transition experiments the project managers should connect the project results to the societal challenge. This requires *strategic management* targeted at connecting the project with a strategic level and linking up with other projects and developments that are oriented towards the same societal challenge.

The second type of criteria addresses the substance of a transition experiment, referring to the quality of the solutions that are explored. These criteria are about how innovative the experiment is in terms of deviating from dominant structures, culture and practices, how sustainable the explored solutions are, how the project goals fit with societal 'transition' goals, and how the experiment fits within promising paths of development (transition paths). All these substance criteria are related to the Transition Management approach and are therefore characteristic for the management of transition experiments.

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4   *Hoogma et al. (2002) not only describe SNM experiments with a technological innovation as a starting point. In the SNM experiments 'organized car-sharing' and 'trucks on rail' an organisational innovation was the starting point.*

5   *This general definition of learning is also used in a practitioner oriented publication on transition experiments published by the Competence Centre on Transitions (Raven et al., 2008)*

6   *A "classical innovation experiment" refers to the dominant instruments to stimulate innovation, such as pilot projects and demonstration projects that are supported by*

subsidies or private R&D investments.

7   The concept of 'transitioning' was introduced by Jan Rotmans as a general concept that
    refers to actively transforming existing activities in activities that can contribute to a
    transition. With regard to activities at the project level, a transitioning process refers to
    "broadening the scope of an innovation project, in terms of process and content, by relating
    it to a societal challenge" (Emmert et al., 2006).

8   Both types of criteria are developed in co-production between theory and practice within
    Transumo, the Transition to Sustainable Mobility Program (Gorris and van den Bosch, 2008)
    and within the Transition Program in the Care (www.tplz.nl). More research is necessary to
    test if these criteria can be generalized to transition experiments in different contexts
    (such as different sectors).

9   The process criteria were developed and tested in a KSI research project (Emmert et al.,
    2006) aimed at supporting project and program managers with transforming existing
    innovation projects in transition experiments with a high potential to contribute to
    transitions (described in section 4).

10 The substance criteria have been partly applied during the selection of transition
    experiments for the Transition Program in the Care (www.tplz.nl).

3.
Mechanisms through which experiments contribute to transitions

The process and substance criteria that have been presented in the previous section can provide a basis for developing management guidelines for transition experiments. However, to be able to make the step from success criteria to management guidelines it is necessary to first develop a better understanding of how experiments contribute to transitions. In the introduction we already claimed that despite of valuable contributions from recent transition literature, an integrated framework for understanding how experiments contribute to transitions is still lacking. In this section we therefore build upon this literature by identifying three mechanisms through which transition experiments can contribute to sustainability transitions: deepening, broadening and scaling up[11].

Deepening

The mechanism 'deepening'[12] is defined as a learning process through which actors can learn as much as possible about a transition experiment within a specific context. It builds upon the literature on sustainability transitions, which emphasizes the importance of (social) learning processes through which actors interact and develop different perspectives on reality (Röling, 2002, Grin and Loeber, 2007, Wals et al., 2007). Deepening also builds upon the concept of experimenting and learning in niches (Kemp et al., 1998, 2001, Schot and Geels, 2007), which deviate from the regime and provide a context for experimenting with sustainable practices. The importance of learning in a context that deviates from the regime, can also be recognized in the work of Nooteboom (2006), stating that "Emerging novelties cannot achieve their potential under the systemic limitations imposed by existing structures, practices and ways of thinking."

What actors learn about when 'deepening' includes (local) shifts in ways of thinking, values and perspectives (culture), shifts in doing things, habits and routines (practices) and shifts in organizing the physical, institutional or economic context (structure). These changes in culture, practices and structure are strongly related with

respect to each other and their broader context. Loeber et al. (2007) emphasize the importance of 'system learning' in innovation projects: "enabling participants to look at the interrelationships between the structures in which they operate and their own practices in a new light". Through deepening, actors can also learn about this complex relation between new practices, culture and structure. For example, the transition experiment Rush Hour Avoidance[13] learns about the effect of a financial reward system (a change in structure) on the mobility behavior of car drivers (a practice). This is based on the notion that "structure produces behavior, and changing underlying structures can produce different patterns of behavior" (Senge, 1990). Within the transition literature 'culture' is distinguished from 'structure' to emphasize that apart from 'hard' physical, institutional or economic structures, also 'soft' ways of thinking, values and perspectives are related to practices in societal systems (Rotmans and Loorbach, 2006). Another important basic notion in transition literature is that new practices can influence related structure and culture and vice versa. Even though this *constellation* of practices, culture and structure has a certain rigidity, it is also dynamic, which make it possible to change in a sustainable direction. A constellation is defined here as a societal subsystem that contributes a specific part to meeting a certain societal need (De Haan and Rotmans, 2008). Deepening results in the development or reinforcement of a deviant (local) constellation. In other words, deepening refers to "learning in a local context how to fulfill a societal need in a deviant way". The outcome of deepening is a (local) constellation of culture, practices and structures that fulfills a societal need in a fundamentally different way. Because of its locality and relative immaturity, this constellation is characterized by low influence, instability and low dominance in comparison to the regime (which is characterized by high influence, stability and dominance).

Within a transition experiment, the learning process is characterized as contextual, because the same experiment in another context with possibly a different social network, different institutions, differences in culture etc, would yield (at least partially) different outcomes (Van den Bosch and Taanman, 2006). Learning in a transition experiment is also characterized as partial, because what can be learned is limited to the specific (real-life) context and small-scale of the experiment. Transition literature therefore emphasizes the importance of *variation;* different experiments need to be conducted in a variety of contexts to learn as much as possible about a societal challenge. Also both transition and innovation literature emphasizes the importance of *selection* processes. A basic notion is that novel sustainable innovations can often not survive in the general selection environment (the regime). Experimentation in niches enables innovations to develop and grow because of two characteristics of the selection process within niches: (1) distinct selection criteria and

(2) substantial resources (Levinthal, 1998)[14].

To understand the role of learning processes in transitions, it is useful to make a distinction between transition experiments and the level of niches. Transition experiments can be understood as a specific type of innovation project and are an instrument of Transition Management. While a niche can be understood as a specific type of societal subsystem and is one of the three levels of the Multi-Level Perspective on transitions. Early literature on transitions mainly described niches as a deviant selection environment or as a space that enables experimenting and learning (Kemp et al., 1998, Hoogma et al, 2002). In more recent transition literature, the niche concept is used to study how from sequences of local projects or experiments a niche level emerges (Geels and Raven, 2006)[15]. From this we learn that experiments also contribute to niche development. Hence, the relationship between transition experiments and niches is recursive: niches enable learning processes in experiments and are also shaped by learning processes (Figure 2).

Figure 2: Recursive relation between niche and experiment: niches make transition experiments possible and at the same time experiments also create or reinforce niches
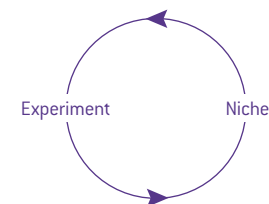
The literature however lacks a clear definition of niches that unites both perspectives. Building on the theoretical work of De Haan and Rotmans (2008) we therefore propose the following definition of a *niche:* a niche is a societal subsystem which can be understood as a (local) constellation of culture, practices and structure that deviates from the regime (or dominant culture, practices and structure). A niche is relatively powerless in comparison to the regime, but can meet quite specific societal needs, often in unorthodox ways (De Haan and Rotmans, 2008). The characteristics of niches (distinct selection criteria and substantial resources) *enable* experimenting and learning about novel or deviant culture, practices and structures[16]. On the other hand, niches are also *shaped by* learning experiences that become aggregated and embedded in new or deviant constellations of culture, practices, structure.

Broadening

The mechanism 'broadening' is defined as repeating a transition experiment in different contexts and linking it to other functions or domains. Broadening is about conducting diverse experiments in a variety of contexts, which is an important notion in transition literature (Rotmans and Loorbach, 2006). Broadening relates to the notion that different experiments that exist simultaneously can build on each other over time and gradually ad up to an emerging field or community (Raven, 2005, Geels and Raven, 2006). Repeating and linking a transition experiment to other domains also relates to important mechanisms in innovation processes, such as diffusion (Rogers, 1995), the application of innovations in new domains (speciation or generalization) (Levinthal, 1998, Nooteboom, 1999) and geographical or spatial 'scaling up'[17] (Douthwaite et al., 2003).

What is repeated or linked is the new or deviant constellation of culture, practices and structure, which is the outcome of innovation and learning processes (deepening). Through broadening this constellation is extended to broader contexts or broader functions and thus increases its influence and stability[18]. The result of *broadening* can be distinguished in: (1) the new or deviant culture, practices and structure get diffused or adopted in a variety of contexts or (2) the new or deviant culture, practices and structure fulfill a broader function. For example, a shift in thinking (culture), new method or routine (practice) or infrastructure (structure) gets diffused within a certain context or to other contexts (for example, application domains, sectors or regions), or fulfills more societal needs (for example, the need for mobility, energy, housing, recreation). In other words, through broadening "new application domains or functions for a transition experiment or a societal subsystem are explored" or "the functioning of a societal subsystem is broadened".

It is important to note that broadening does not refer to repeating without further variation. In the process of broadening "each experiment is a new adventure[19]". The opportunities a new context provides for further variation is emphasized in the research of Levinthal (1998). He describes how structural change takes place when a substantial period of *lineage development* of an innovation in a particular niche is followed by an *invasion of other niches,* possibly including the mainstream market. From the literature on innovation and transitions we learn that before new practices break through the mainstream context, innovations need to be developed in a variety of contexts. The importance of broadening, as an intermediate mechanism between deepening and scaling up, can also be recognized in other conceptions found in innovation literature, such as the learning cycle of Nooteboom (1999). This learning cycle explains how through a sequence of learning activities (deepening) in a variety of contexts (broadening) new structures may emerge (scaling up) from novel practices.

The interaction between broadening and deepening can be recognized in Nooteboom's central notion that a variety of contexts opens up new 'variety of content'. As a result, a new (sustainable) practice becomes adapted to different contexts. However, as pointed out by Nooteboom, a negative result of broadening might be that a new practice "becomes more and more differentiated across contexts, causing efficiency losses, lack of standardization, economies of scale and increased complexity because of *ad hoc* add-ons". For the success of a new practice it is therefore essential that elements from different practices and contexts become integrated in novel combinations, which Nooteboom refers to as *accommodation*. Finally, in Nooteboom's stage of *consolidation* the variety of content (of the novel concept or practice) is further reduced, and gets consolidated in a new architecture of elements[20]. This new architecture enables the novelty to realize its full potential and develop into a 'dominant design'. These last notions point out the importance of the interaction between broadening in a variety of contexts and embedding an innovation in new dominant practices and related structures and ways of thinking, which we define as scaling up.

Scaling up

The mechanism 'scaling up' is defined as embedding a transition experiment in –new- dominant ways of thinking (culture), doing (practices) and organizing (structure), at the level of a societal system. The mechanism scaling up builds upon the literature on transitions describing similar mechanisms, and resulting patterns, which refer to the scales of niches and regimes in the Multi-Level Perspective. Differences are that some authors focus more on the importance of niche-development and other focus on the importance of interactions between niches and regimes. This results in two types of conceptualizations of scaling up. The first conceptualization understands scaling up as the step from experiments to the level of niches and eventually a regime-shift (Weber et al., 1999) or as the aggregation of learning experiences in local projects to a global niche-level (Geels and Raven, 2006, Geels and Deuten, 2006). The second type of conceptualization understands scaling up as the translation of sustainable practices in niches to mainstream practices in the regime (Smith, 2007), the societal embedding of experiments (Deuten et al., 1997, Van Mierlo, 2002, Kivisaari et al., 2004), the embedding of experiments in the existing structures of a regime (Rotmans and Loorbach, 2006, p12) or niches growing into niche-regimes (De Haan and Rotmans, 2008).

Our definition of scaling up builds upon the second type of conceptualization. What is scaled up is not the activity of experimentation, but the deviant cultures, practices and structures that are experimented with (the constellation). Through scaling up, a new or deviant constellation of culture, practices and structure attains

more influence and stability and increases its share in meeting a societal need. The constellation increasingly becomes part[21] of the dominant way in which a societal need is fulfilled. The outcomes of scaling up are fundamental changes in the dominant way societal needs are fulfilled, which extend the scale of the initial innovation project. Scaling up implies that sustainable practices that are initially deviant or unusual, become the dominant or mainstream practice. Through scaling up, experiments can thus influence the way societal needs are fulfilled in a more sustainable direction. In other words, scaling up refers to "moving sustainable practices from experimentation to mainstream".

Recent empirical research on transitions however demonstrates that sustainable practices in niches are difficult to *translate* to the dominant practice in the regime, because these practices do not work in a mainstream context (Smith, 2007). This research confirms the paradox that niches provide a good context for experiments with sustainable practices, but at the same time adaptation to this specific and deviant context makes it difficult to scale up experiments to the dominant context (regime).

In our view this paradox is partly caused by the dichotomy between a regime context and a niche context. The distinction between a regime and a niche has analytical value; however, in practice the step from niche to regime is not a single step but the result of a process of many intermediate steps. Therefore, *broadening* an experiment in different contexts is an important intermediate mechanism between *deepening* in the context of one niche and *scaling up* to the regime context. By repeating a transition experiment in a variety of contexts and linking it to different functions, broadening helps to strengthen learning experiences (deepening) and increase the influence and stability of niches that can eventually grow into a niche-regime (scaling up). A *niche-regime* fills the gap between the constellations of niches and regimes (De Haan and Rotmans, 2008), and can be defined as a constellation of culture, practices and structure that challenges the power of the regime in fulfilling a societal need. De Haan and Rotmans conceptualize how transitions can occur through the *creation* or *clustering* of niches into a niche-regime or through the *co-evolution* of niches with the regime. These elementary mechanisms underlie transition dynamics and are related to the mechanism of scaling up, which underlies the specific dynamics of transition experiments.

Notions of scaling up within the research on transition experiments differ from general notions of scaling up geographically or scaling up markets. Scaling up transition experiments is less about scaling up products, services or users; it is more about scaling up perspectives, ways of thinking, routines, legislation, institutions, etc. This is supported by the scaling up typology of Douthwaite et al. (2003) that distinguishes scaling up from scaling out (geographically) and spatial scaling up. This typology has been applied in an empirical study of projects that contribute to changes in complex agricultural systems (Douthwaite et al., 2003):

1. Scaling-out *(geographically):* innovation diffusion from farmer to farmer, community to community, within the same stakeholder groups;
2. Scaling-up: an institutional expansion from grassroots organizations to policy makers, donors, development institutions, and other stakeholders key to building an enabling environment for change.
3. Spatial scaling-up: the widening of scale of operation from, for example, experimental plot, to field, to farm, to watershed, etc.

In this typology, scaling up is understood as institutional expansion from 'frontrunners' and 'niche-players' to incumbent organizations and 'regime-players'. It also emphasizes the importance of key stakeholders that can build an "enabling environment for change". Within the literature on transitions, the importance of involving such key stakeholders or frontrunners is also emphasized. However, a basic notion of Transition Management is that no single actor has the managing capabilities to fully control a transition process in a top-down manner (Rotmans and Loorbach, 2006). Examples of key stakeholders for scaling up are actors that have the power and willingness to directly influence the dominant culture, practices and structure (such as Ministries, agencies that develop protocols and standards, policy makers, politicians, directors, etc.) and actors that (in)directly influence the 'regime' because they have an interest in embedding sustainable practices in society (such as sustainability programs, NGOs, sustainability ambassadors, frontrunners in a sector or policy domain, etc.).

Example
People Mover (II)

The process of 'transitioning' the People Mover project in the city of Almere resulted in a series of recommendations in terms of deepening, broadening and scaling up.[22]

The *scaling up* of People Movers in Almere would involve an incorporation in the future mobility policy plans, a cultural acceptance of people movers by the citizens of Almere and a structural role of people movers in the mobility system in and around Almere. In terms of *deepening* the project was advised to formulate explicit learning objectives, with regard to learning about the potential of new solutions for sustainable mobility, and to monitor these. *Broadening* was positioned as to explore different functions for the people mover (individual transport, goods and services) and to include other domains than transport (like recreation and tourism, trade and industry and agriculture). This would require the involvement of different stakeholder partners from outside the transport sector (such as tourism agencies, banks and societal organizations). The broadening of the function of the People Mover provided opportunities to develop a flexible concept for increasing the share of sustainable mobility (and related domains such as housing and trade and industry) in Almere. During the project also opportunities to repeat the experiment with People Movers in other contexts (different cities) were explored.

Example
Rush Hour Avoidance (I)

Rush Hour Avoidance (in Dutch: "Spitsmijden") was set up as an experiment to examine whether car drivers can be persuaded to avoid the rush hour by positive stimuli[22]. The mechanism to do this is providing commuters with a reward for 'good' behavior, which is contrary to the mainstream of punishing people for traffic usage. The overall objectives of the experiment are to create new insights into the mobility behavior of commuters in relation to positive stimuli and to explore in more depth the behavior alternatives and needs for mobility.
Possible examples of deepening, broadening and scaling up in this project are:

– **Deepening:** Learning about the effect of a financial reward system (a change in structure) on the mobility behavior of car drivers (a practice) in a local context.

– **Broadening:** Linking to other mobility domains (public transport, car sharing) and other societal needs (not only sustainable mobility but also housing, spatial planning and corporate social responsibility); and repeating the experiment with different learning objectives and different partners (for example the second Rush Hour Avoidance pilot was also aimed at learning more about alternative modes of transport behavior and also involved employers).

– **Scaling up:** Scaling up Rush Hour Avoidance would imply that avoiding traffic rush hour changes the dominant practice of commuters, and positive stimulation of sustainable mobility becomes part of the dominant culture and structure of companies and government.

11   The mechanisms 'deepening, broadening and scaling up' were first described in (Rotmans and Loorbach, 2006) and elaborated in a paper by Suzanne van den Bosch and Mattijs Taanman (2006).

12   The mechanism 'deepening' should not be confused with 'deep' or narrow learning processes.

13   Consortium Spitsmijden (2007). Effects of Rewards; summary. Utrecht." www.spitsmijden.nl; A more detailed description of Rush Hour Avoidance is provided in the text box at the end of this section.

14   The development of an innovation is driven by the particular demands of the niche to which the innovation must adapt; the pace of development is influenced by the resources that the niche is able to provide (Levinthal, 1998)

15   Geels and Raven (2006) distinguish local projects that are carried by local networks and characterized by local variety from a global niche level that is carried by an emerging field or community and characterized by shared rules. In the process of niche-development sequences of local projects can gradually add up to a global niche level.

16   Learning processes in transition experiments are thus enabled by the characteristics of niches and often constrained by the regime. However, the development of sustainable innovations in niches can also be enabled by external developments or powerful actors within the regime (Raven, 2005, Geels and Raven, 2006).

17   Geographical or spatial 'scaling up' can be understood as spreading change geographically or widening the scale of operation. This differs from the mechanism scaling up, which refers to changes at higher (institutional) levels.

18   Influence is increased because the number of contexts in which the constellation influences how a certain societal function is fulfilled is increased. Stability is increased because the constellation is less context dependent, and therefore more robust. Geels and Raven (2006) also describe how in the process of niche-development, global niche rules and expectations, that are initially diffuse, broad and unstable, become more articulated, specific and stable.

19   This is a quote from Michel Callon, with whom I (Suzanne van den Bosch) got the chance to speak about my research during the Midterm Review of the KSI network in which I participate (Amsterdam, March 2007).

20   Geels and Deuten (2006) talk about the importance of aggregation activities, which include standardization, codification, model building, formulation of best practices, etc.

21   To define this 'part', indicators are necessary that refer to how a societal function is fulfilled. For example to fulfill the need for energy, fossil fuels are still dominant and renewables only contribute with a small percentage. Experiments with renewables have scaled up and are embedded in structure, culture and practices of the regime. However, renewables are still "a niche within the regime" and are not fully embedded in the regime. Another example are hybrid cars (Prius) or organic food. Both examples have changed ways of thinking, doing and organizing, but are still not dominant in fulfilling societal needs. The outcome of scaling up is therefore not fixed, but a continuous process with outcomes at different ends of a continuum between niches and regimes.

22   More information about how this experiment was set up can be found in: Knockaert, J. (ed.), Bliemer, M., Ettema, D., Joksimovic, D., Mulder, A., Rouwendal, J. and Amelsfoort, D. van (2007), Experimental design and modelling Spitsmijden, Utrecht, Consortium Spitsmijden.

4.
Integrated conceptual framework for transition experiments

The aim of this section is to build upon the mechanisms, which were identified in section 3, by developing an integrated conceptual framework for transition experiments. The framework consists of a descriptive and a prescriptive part:

(i) To describe *how*, *what* and *when* experiments contribute to transitions, the framework relates the mechanisms deepening, broadening and scaling up to desired *outcomes* or changes in established ways of thinking (culture), doing (practices) and organizing (structure), and distinguishes the *conditions* for transformative change.

(ii) The prescriptive part of the framework translates the mechanisms deepening, broadening and scaling up in different *management strategies* for transition experiments and further specifies this in *guidelines* for project and program managers that aim to increase the contribution of experiments to transitions. Two examples of transition experiments in the Netherlands illustrate how these strategies and guidelines can be applied in practice. The section ends with an evaluation of initial experiences with the framework for steering transition experiments in the 'transitioning instrument'.
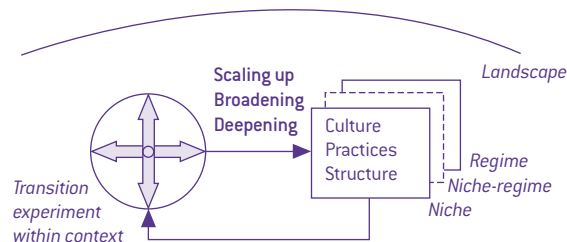
Figure 3: Deepening, Broadening & Scaling up transition experiments in niches in relation to Multi-Level Perspective
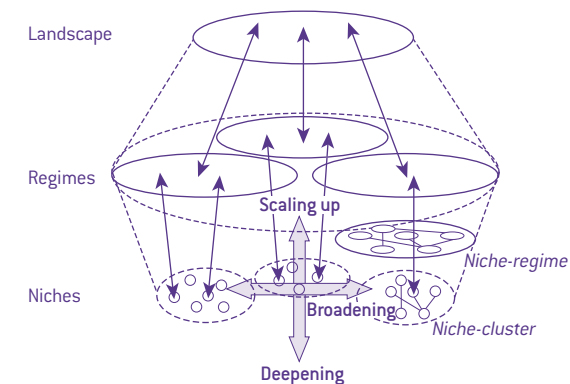
(Based on Geels and Kemp 2000, De Haan and Rotmans, 2008)

Based on the illustration in Figure 3, the contribution of experiments (taking place in niches) to a transition (fundamental change of regime) can be summarized as follows. The mechanism *deepening* is related to the direct context of the transition experiment (the niche). Through deepening the actors in a transition experiment learn about new practices, cultures and structures that deviate from the existing regime (in Figure 3 deepening is therefore illustrated as an opposite arrow that is 'breaking away from the regime'). The mechanism *broadening* relates the transition experiment to other niches, either within or outside the initial domain or function of the experiment. Through broadening different niches get linked, which can lead to a niche-cluster and eventually a niche-regime. Within the conceptual framework the niche-regime exists at a higher scale level, illustrating its higher stability, power and influence which can challenge the power of the regime. The mechanism *scaling up* relates the transition experiment to the regime. Scaling up takes place in many intermediate steps through which initially small changes in niches can eventually 'grow' to broader changes in the dominant culture, practices and structures of the regime.

Figure 4: Simplified framework for analyzing transition experiments

To summarize even further, Figure 4 provides a more simple, schematic representation of *how* and *what* transition experiments contribute to transitions. Through cycles of deepening, broadening and scaling up *(mechanisms)*, transition experiments contribute to changes in constellations of culture, practices and structure *(outcomes)*. A transition experiment can directly influence the level of niches, and through the empowerment of niches it can indirectly influence the emergence of *niche-regimes* and eventually *regime-shifts.* The feedback loop in Figure 4 indicates that the existing and changing culture, practices and structure also influence the transition experiment. The *landscape* provides the broader societal context and cannot be directly influenced.

The combination of mechanisms and outcomes results in different types of contributions of experiments to transitions. For example, 'deepening culture' refers to the contribution of transition experiments to creating local awareness, shifts in local thinking or new local discourse. And 'broadening practices' refers to the contribution of transition experiments to adjusting new ways of doing, methods or routines to other contexts or linking new practices to different functions. The contribution 'scaling up structures' refers to the contribution of experiments to transitions by embedding new infrastructure, financial or legal structures in the dominant structures of the regime.

Analyzing the contribution of experiments to transitions

When analyzing transition experiments, it is important to demarcate the societal system to which the experiment aims to contribute. For example a certain domain, sector or region. A system analysis can provide insight in the dominant culture, practices and structure (regime) of this societal system. This provides the basis for analyzing the 'deepening' of transition experiments, by identifying the desired changes in culture, practices and structure and in which way the transition experiment is learning about these changes. The novel or deviant culture, practices and structure

together constitute a niche, which provides the context for experimentation and learning about novelties and at the same time during this learning process, transition experiments influence and reinforce the niche.

To analyze the 'broadening' of transition experiments it is important to look for linkages with other experiments and niches, and the adaptation of the innovative practices (and related culture and structure) to different domains and functions. If the broadening of the experiment is limited, the experiment will remain an isolated event with limited potential for social learning and limited influence to empower the niche and develop into a niche-regime.

Analysing the scaling up of the transition experiment includes identifying to which changes in the dominant culture, practices and structure of the societal system the experiment contributes. A possible way to identify these changes is by using an *agency* perspective (Giddens, 1987), with regard to: the awareness of actors in the societal system *(do they have knowledge and awareness about a problem? do they talk about the problem and possible solutions?),* shifts in thinking of actors *(do they change their existing way of thinking? do they perceive a problem differently? do they show intention or commitment to change their actions?),* practices of actors *(do they actually do what they say? do they make effort to change their existing behavior and routines?)* and structures that are (re)produced by actors *(do they change existing infrastructure, financial structures, physical structures, etc.?).*

Conditions under which experiments contribute to transitions

To better understand *when* (in terms of conditions) experiments contribute to transitions, we elaborate on the concept of 'constellation' that was introduced in section 3. Each constellation (niche, niche-regime or regime) has a 'functioning' that refers to how it meets a societal need (De Haan and Rotmans, 2008). For example, in the current energy regime, fossil fuels and related infrastructure, powerful actors, technologies, etc. are dominant in meeting the societal need for energy. While renewable energy niches meet the societal need for energy in a different way (with different technology, infrastructure and actors). Societal transitions can also be defined in terms of constellations: "A societal transition is the process through which a different constellation becomes the dominant one, shifting the functioning of the whole societal system" (De Haan and Rotmans, 2008). The functioning of a societal system (the way a societal system meets a societal need) emerges from the dominant practices, culture and structure. Within a constellation structures and cultures are strongly interrelated and are aligned with respect to each other and the environment[23].

De Haan (2008) distinguishes three drivers for transitions. The first condition is *tension;* a misalignment of the functioning of the regime and its environment, the

landscape. An example of tension is the healthcare system that is becoming more and more expensive in the face of the aging population. The second condition is *stress*, which is defined as a misalignment within the functioning of the regime. An example of stress is the recent reorganization of the Dutch healthcare system, which has resulted in a culture of free market thinking where healthcare is firstly thought of as a product. The structures, however, are still based on a system of organized solidarity, providing healthcare as a right. The third condition is *pressure,* which is the result of the presence or emergence of niche-regimes that provide an alternative to the functioning of the regime.

These general conditions for transitions can be regarded as *regime related conditions* for the contribution of experiments to transitions: *when* the regime experiences tension, stress or pressure *then* this provides opportunities for transition experiments to contribute to niche empowerment, niche-clustering and the emergence of niche-regimes. In addition, based on the theoretical work of De Haan and Rotmans, research on the Multi-Level Perspective and empirical research on the role of niches and experiments in transitions, also four *niche related conditions* for the success of transition experiments can be derived:

- A first condition is the alignment within the niche. Raven (2005) explains how alignment in a broad social network is a key process in experiments. He defines (internal) alignment as the degree to which strategies, expectations, beliefs, practices, visions, etc. go in the same direction.
- A second condition is a high level of power[24] of the niche that locally exceeds the power of the regime. This increases the pressure of the niche on the regime, and thus challenges the dominant practices, culture and structure. An empirical example is the historical transition to a car-based transportation system (Geels, 2005): "When the automobile became a practical transport option in the 1920s and 1930s, city governments [in the USA] massively subsidized car transport through construction and improvement of roads. (....) During the 1930s, the car (and the bus) began to replace the electric tram as the dominant urban transport system". This example also shows that powerful actors play a major role in (locally) increasing the power of niches.
- A third condition is the alignment of the niche and the mainstream environment or regime. The empirical research of Smith (2007) identifies the importance of "pragmatic system builders" who make compromises and help *translate* some niche practices into forms amenable to actors in the regime. This research also emphasizes the importance of key actors that are capable of translating niche practices to mainstream practices.
- A fourth condition is the alignment of the niche with events and developments

in the landscape. Geels (2005) describes how the niches of car racing and touring in the countryside grew rapidly in the early 20th century, because they linked up with new cultural values which were related to landscape developments such as the emergence of a new middle class with more money and entertainment needs.

(ii) Prescriptive: Management strategies and guidelines for transition experiments

The second part of the framework for transition experiments builds upon the descriptions of how, what and when experiments contribute to transitions, by translating this in *management* strategies and guidelines for project and program managers involved in transition experiments. The term 'management' does not refer to classical command-and-control, top-down management, but builds upon notions from Transition Management (TM). Within TM, managing refers to creating space for frontrunners and first movers and empower them gradually (Rotmans et al., 2007). Recently, initial guiding principles for transition experiments were developed in a state-of-the-art essay on transition experiments targeted at practitioners (Kemp and Van den Bosch, 2006)[25]. These guidelines are grounded in practical experiences with the implementation of TM in various sectors in the Netherlands (Loorbach, 2007) and were conceptualized by relating them to the mechanisms deepening, broadening and scaling up (Van den Bosch and Taanman, 2006). The guidelines for transition experiments were further developed and tested in a KSI[26] research project conducted by TNO and DRIFT aimed at developing practical methods and tools for transition experiments (Emmert et al., 2006). In this project a 'transitioning method' is being developed that provides an addition to other recently developed methods and tools aimed at setting up transition experiments (Competence Kit Transition Experiments; Raven et al., 2008) or 'societal innovation experiments' (MiXT; Van Sandick and Weterings, 2008). The transitioning method is aimed at supporting project and program managers with transforming existing innovation projects into transition experiments, to increase the chance that a project scales up and contributes to a transition. Because the transitioning method is targeted at managers with limited theoretical knowledge on transition management, the method translates theoretical concepts, which are developed within KSI research on transitions, into practice oriented concepts. Central in the transitioning method is a practical framework, in which deepening, broadening and scaling up are applied as central steering dimensions. This framework consists of 6 management challenges for transition experiments (Table 2), which are supported by

management guidelines (Table 3). An example of a management challenge is how to move from focusing the process on realizing short term results to focusing the process on searching and learning. In practice, a manager will have to find a balance between both sides of this challenge. The potential added value of this framework with regard to classical project management, is that it focuses on the importance of making space for *learning processes,* while at the same time stimulating *interaction processes* between the experiment and its broader context and actively working on *embedding processes* to increase the impact of the experiment at a higher scale level.

Table 2: Management challenges related to 6 clusters of guidelines for transition experiments[27]

Steering dimensions / Project characteristics	Deepening Learning as much as possible from a project in its context	Broadening Replicating and linking to other contexts and functions	Scaling up Embedding in dominant ways of thinking and doing
Process	**From:** realizing results **To:** searching & learning	**From:** coincidental links **To:** directed linking	**From:** operational… **To:** strategic management
Substance	**From:** incremental innovation **To:** developing new ways of thinking and doing	**From:** context specific results **To:** adapting to other contexts	**From:** handing over results **To:** changing dominant ways of thinking and doing

We continue this section with elaborating on the management challenges and guidelines for transition experiments, utilizing both the theoretical insights from the previous sections and the first practical experiences with the transitioning method. First it should be noted that we do not aim to provide a 'cook book' for how to manage transition experiments in a successful way. The aim of this section is to present general management strategies and guidelines for 'steering' transition experiments that provide practitioners with a guide along their own path. Because every transition experiment is unique, the implementation of the developed strategies and guidelines should be sensitive to the specific character and context of each experiment.

A second notion is that the management strategies and guidelines are not focused on regular project management but are specifically aimed at increasing the 'transition potential' of transition experiments. In other words, increasing the chance that a transition experiment is successful and contributes to a transition or that a niche practice becomes a regime practice.

A third notion is that the three central dimensions for steering transition experiments (Table 2) are not related in a sequential or chronological way, but can act upon a transition experiment simultaneously. For example, during the start of a transition experiment it is essential that the management pays attention to creating the conditions to learn as much as possible in the specific context, while at the same time creating conditions to extend the experiment to broader contexts and functions and involving regime players to anticipate scaling up. When making strategic choices for focusing on deepening, broadening or scaling up, the timing of actions (for example, adapting to a sense of urgency) and being sensitive to barriers and opportunities (for example, stress in the regime or developments in the landscape) is crucial.

Example Assertive Community Treatment (ACT) for the youth in Rotterdam

This transition experiment is part of the Dutch Transition Program in the Care (www.tplz.nl). The starting point of this experiment is the societal challenge of youth with complex social problems that can not be solved by existing care institutions. The learning goals of this experiment were phrased in terms of desired changes in structure (e.g. changing power structures between professionals and youth), culture (e.g. changing organizational culture and meeting youth culture) and practices (e.g. an integrated and outreaching approach). To realize the societal challenge ACT-youth works together with other institutions and other experiments. The Transition Program in the Care fulfills an important role in facilitating interaction with other experiments (broadening) and supporting in developing a strategy to realize the desired changes in structure, culture and practices (scaling up). For the scaling up of this experiment it seems crucial that the experiment demonstrates what the social ánd economic value of this approach is. At this moment the experiment mainly follows a strategy of learning as much as possible in the context of Rotterdam, and initial steps are made to extend the approach to other cities in the Netherlands. A strategic choice is made to start up activities for scaling up in a later phase when the experiment in Rotterdam has gained stability and influence.

Based on Table 2, the three steering dimensions for transition experiments can be distinguished in 6 management strategies[28], which are interrelated in a non-linear way:

- **Deepening-process:** The essence of this strategy is to transform an innovation project into a transition experiment, by creating the conditions for an open search and learning process in which a societal challenge is a starting point.
- **Deepening-substance**: Essential in this strategy are formulating explicit learning goals that are connected to societal (transition-)goals in order to develop new ways of thinking, doing and organizing.
- **Broadening-process:** This strategy is directed at linking the innovation project to a broader context, by interacting with new domains and partners.
- **Broadening-substance:** The essence of this strategy is assigning new functions to the innovation and adapting to other contexts.
- **Scaling up-process:** Essential is strategic management, which involves key actors (with power and willingness to change) at a strategic level from the outset of the process.
- **Scaling up-substance:** This strategy is aimed at changing dominant ways of thinking, doing and organizing, by stimulating structural support and resources for the innovation.

In Table 3[29] these management strategies are further specified in concrete management guidelines, which build upon the *process* and *substance* criteria for successful transition experiments (section 2).

Success criteria / Steering dimensions	Deepening — Actions aimed at learning as much as possible from the experiment in the specific context	Broadening — Actions aimed at repeating the experiment in other contexts or connecting to other functions and domains	Scaling up — Actions aimed at embedding the experiment in dominant ways of thinking, doing and organizing
Process			
Room in budget and planning	– allocating resources (time, money, knowledge, etc.) to an open search and learning process;	– allocating resources to interaction with other domains and partners;	– allocating resources to (early) involvement of key actors at a strategic level;
Space in the process	– building in space for reflection on and adjustment of the vision and learning goals;	– building in space for reflection on the connection to the broader context;	– building in strategic reflection on barriers and opportunities in dominant ways of thinking, doing and organizing;
Quality of learning process	– organizing a broad, reflexive and social learning process;	– focusing the learning process on how experiments can reinforce each other;	– focusing the learning process on how learning experiences can be embedded in dominant ways of thinking, doing and organizing;
Supportive incentives / assessment mechanisms	– developing supportive incentives / assessment mechanisms that increase the quality of learning;	– developing supportive incentives / assessment mechanisms that stimulate interaction with other domains and partners;	– developing supportive incentives / assessment mechanisms that stimulate feeding back results to key actors at a strategic level;
Competences of project participants	– selecting project participants with an open mind and willingness to learn;	– selecting project participants that are able to look outside the borders of their discipline and are strong 'connectors';	– selecting project participants that are able to communicate and 'anchor' project results at a strategic level;
Strategic management	– the management guarantees that project results are related to the societal challenge;	– the management guarantees the interaction with other domains and partners;	– the management guarantees connection to key actors and developments at strategic level;
Substance			
Connection to societal challenge	– connecting project goals explicitly to societal (transition-)goals;	– cooperating with partners and developing new partnerships to realize shared societal goals;	– adapting to sense of urgency with regard to societal challenge;
Sustainability vision / future perspective	– project participants share a long term sustainability vision;	– developing an overarching sustainability vision to provide guidance to different experiments;	– drawing attention to the sustainability vision at a strategic level;
System analysis (dominant culture, practices, structure in sector)	– project participants share perspective on dominant ways of thinking, doing and organizing in the sector (from which the experiment deviates);	– identifying similar experiments and potential new partners, application domains and functions;	– identifying key actors with power and willingness to influence dominant culture, practices and structure;
Learning goals/ desired changes (innovation)	– formulating explicit learning goals with regard to desired (interrelated) changes in culture, practices and structures;	– repeating the experiment in other contexts and experimenting with new functions is part of the learning goals;	– anticipating and learning about barriers and opportunities in dominant culture, practices and structures is part of the learning goals;
Intended results	– distinguishing results in generic and context specific;	– sharing results with other experiments and potential application domains;	– stimulating structural (regime) support and resources for results;

The management strategies and guidelines for transition experiments have been partly tested in several innovation projects[30] within the Transumo Transition Program. To conclude this section, we describe the first experiences within the project Rush Hour Avoidance (in Dutch 'Spitsmijden'), added with an evaluation of the transitioning method that was recently published in a working paper by Teije Gorris (Transumo) and Suzanne van den Bosch (DRIFT).

Example Rush Hour Avoidance (II)

The first pilot was conducted during 50 weekdays in October to December 2006, in which 340 frequent car drivers looked for alternatives to driving in morning traffic over the stretch of the Dutch A12 motorway from Zoetermeer towards The Hague. They were rewarded (by either a financial reward or credits for a free smart phone) if they were successful in avoiding the rush hour. This type of positive stimuli had a significant effect on changing driving behavior. The number of participants driving in peak morning traffic was cut in half. While the initial objective was to stimulate 6% of the pilot participants to avoid the rush hour, the result revealed a 50% avoidance[31]. The first phase of the RHA experiment therefore was a success (it confirmed the hypothesis that a rewarding system persuades car drivers to avoid the rush hour). Another part of the success was the successful deployment of the technical system and the organisation of the back office. An unexpected success of the first phase of the RHA experiment was the active involvement of Dutch employers that wanted to stimulate sustainable mobility behaviour (as part of their Corporate Social Responsibility ambitions). After the first phase of the RHA experiment, the perspective of the project consortium was broadened from 'avoiding rush hour' to contributing to the transition to sustainable mobility in the Netherlands.

In this process of 'transitioning' this innovative project, a transition analysis[32] was conducted which emphasized the importance of making a first estimation of the potential societal costs and benefits of the project on a large scale, developing with stakeholders a long term vision with regard to its contribution to sustainable mobility, developing a smart strategy for scaling up this experiment, and implementing an innovative actor strategy: a mapping of relevant niche-players and regime-players which could play a role in a transition arena to be established. Major recommendations from a transition management perspective with regard to follow up experiments with Rush Hour Avoidance were: (i) to include from onset on regime-players to anticipate already future resistance; (ii) to engage also stakeholders with a general interest rather than a particular interest resulting from their institutional affiliation; (iii) to broaden the composition of the steering group which task it is to create enough innovation space for these experiments; (iv) to develop a sustainability vision for mobility as a vehicle for a scaling up strategy; and (v) to emphasize that learning is the most important result of the project.

Gorris and van den Bosch (2008) draw several lessons with regard to the ability of the transitioning method to translate the theoretical concept of transition experiments to practice: "First, initial experiences within the Rush Hour Avoidance (RHA) project (and also European Networks) show that the project participants recognize the management challenges for transition experiments (Table 2). Second, the framework provides project managers and participants with a new perspective on addressing these challenges; the transitioning instrument enables them to make strategic choices with regard to focusing more on activities aimed at learning (deepening), repeating & linking (broadening) and/or embedding (scaling up). Third, the distinction between process and substance relates to existing project management language and supports practitioners in focusing on concrete characteristics of the experiment. (…) A final lesson is that (…) the transitioning instrument should (…) include a set of supportive tools, but should also pay attention to the competences that are needed for handling these tools."

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23   *De Haan (2008) distinguishes structure and culture from practices, stating that the functioning of a regime or niche is described by structures and cultures and the functioning is produced through practices. Structures enable and constrain practices and cultures give meaning to practices.*

24   *Power refers to the capacity to mobilise resources to realise a certain goal (Avelino and Rotmans, 2008).*

25   *During various practitioner meetings facilitated by the Competence Centre for Transitions. (www.transitiepraktijk.nl), practitioners that participate in various transition programs have expressed a need for specific management guidelines for transition experiments.*

26   *KSI is the Dutch Knowledge network on System Innovations and transitions. It comprises over 80 researchers from a dozen universities and research institutes with specific knowledge and expertise of transitions and system innovations (www.ksinetwork.org).*

27   *Table 2 was developed as part of the KSI research project on "transitioning" conducted by TNO and DRIFT. In September 2007 Suzanne van den Bosch and Martin van de Lindt presented a first version of this table at a meeting with the project European Networks. Based on the first experiences with the transitioning method, in January 2008 Emma van Sandick and Suzanne van den Bosch presented the current version of table 2 in a follow up meeting with European Networks and in a separate meeting with the Rush Hour Avoidance project.*

28   *Within the Transition Program in the Care, initiated by the Dutch Ministry of Health, Welfare*

Discussion and conclusion

and Sports and several care sector organizations, the mechanisms deepening, broadening and scaling up have also been used as a basis for monitoring the progress of transition experiments (www.tplz.nl).

29 *The management guidelines that are presented in Table 3 are an elaboration of the guidelines that were developed by Martin van de Lindt and Suzanne van den Bosch (2007) as part of the transitioning instrument.*

30 *Cases in which parts of the steering framework for transition experiments were tested are the Transumo projects People Movers, European Networks and Rush Hour Avoidance.*

31 *More information about the learning experiences of this experiment can be found in: Consortium Spitsmijden (2007). Leerervaringen Spitsmijden. Utrecht. www.spitsmijden.nl*

32 *Source: Transitie-aanpak: groot denken, klein doen. Presentation by Prof. dr.ir. Jan Rotmans, Den Bosch, May 6, 2006.*

This essay has presented a conceptual framework for analyzing and influencing the contribution of small-scale experiments to transitions towards a more sustainable society. Before discussing the value of this framework for further theory development and empirical research, we first discuss the potential practical value of the framework. We have developed this framework with the aim to provide academics and practitioners with a theoretical and practice oriented perspective to both understand and 'steer' the contribution of experiments to transitions. Hence, we have tried to integrate a theoretical and practical perspective in one framework. However, because this essay is part of a relatively young research field, the amount of cases and related concrete practical examples of steering transition experiments are still limited. Therefore we acknowledge that this essay has mainly contributed with providing a theoretical perspective, in which several existing and new theoretical concepts have been integrated. The practical value of this framework is that it provides a managerial perspective on transition experiments, which has not been addressed in detail in the existing literature. To further increase its practical value, the developed framework needs to be elaborated with more concrete guidelines and tools. The first experiences with the framework show that practitioners are interested in specific tools that they can use to actively work on deepening, broadening and scaling up. For example a visioning tool that prescribes how a vision in a transition experiment looks like, how it can be developed and how it can be strategically used. Such concrete tools for steering transition experiments, can be derived from existing tools and recent scientific research on transition management. In this process intermediate organisations such as TNO, the Competence Centre for Transitions or consultancies could play an important role. Furthermore these organisations could participate in follow up 'action research,' which should be aimed at further developing and testing the framework in different cases (we come back to this point later in this section).

With regard to the theoretical value of the developed conceptual framework, we claim that the central concepts – transition experiments, the desired outcomes in

culture, practices and structure, the mechanisms deepening, broadening and scaling up, the conditions under which experiments contribute to transitions and the management strategies and guidelines for transition experiments – furthers our theoretical understanding of how experiments can contribute to sustainability transitions. The framework adds to the sustainability transition literature, by linking the Transition Management instrument 'transition experiments' to the Multi-Level Perspective concepts of niches, niche-regimes and regimes. In this way it contributes to filling the gap in literature with regard to the interaction between niches and regimes, which Smith (2007) refers to as a theory of 'linking'.

Still, to develop a theory that not only describes but also explains the contribution of experiments to sustainability transitions requires substantial empirical research. The developed framework can provide a starting point for conducting more empirical research that is focused on three types of processes: learning processes (does broad, reflective, social learning take place?), interaction processes (do experiments interact with other experiments or domains and are repeated in other contexts?) and embedding processes (do learning experiences get aggregated to general knowledge and do experiments get embedded in dominant culture, practices and structures?). In addition to these processes, the framework also provides an integrated perspective to identify what transition experiments contribute to transitions in terms of changes in culture, practices and structure at different scale levels, and when the conditions for these types of changes are right.

It can be concluded that both the theoretical and empirical value of the developed conceptual framework is promising, however, this essay also brings forward a number of unanswered questions that need to be further researched. A first question is brought forward by the various parts of the developed conceptual framework that address the role of actors in influencing the contributions of experiments to transitions. The current framework lacks concepts for a detailed and 'subtle' analysis of how the personal competences and characteristics of these actors influence the success of transition experiments. A starting point for this type of research is the study of Timmermans et al. (2008), which shows that policy processes involving radical change attracts individuals with specific personality profiles.

Another question for follow up research follows from the notion that the timing of activities and events in transition experiments influences the success or failure of the experiment (Kivisaari et al., 2004). The developed conceptual framework includes conditions under which experiments contribute to transitions; however, these conditions have no predictive value in terms of explaining when (in terms of time) experiments contribute to transitions. Follow up research can build upon the research of Raven (2005), who explained that parallel and continuous development patterns are

crucial factors for niche development. Possible research questions that address the role of time and timing in transition experiments are: with regard to deepening: 'How long do learning processes in niches take place before the results are embedded in the regime?', and with regard to broadening: 'What is the right timing for repeating the experiment in different contexts?', and with regard to scaling up: 'When do influential actors from the regime need to be involved in a transition experiment?'.

A more general question for follow up research is related to the notion that transition experiments are contextual, and therefore the concepts that are developed and partly tested in this framework need to be further tested in different types of cases (for example, in transition experiments in different sectors or in different phases of a transition). The existing examples that where used to illustrate the framework are mainly derived from a setting in which consultants and researchers supported ongoing innovation projects, by introducing elements of the steering framework. Within follow up research the framework could be applied in a 'modus 2' setting in which practitioners and academics together set up transition experiments that pay attention to deepening, broadening and scaling up right from the start. This type of 'action research' could elaborate on the strategies and guidelines for transition experiments by further developing and reflecting on the framework in strong interaction with practice.

We hope this essay provides a conceptual basis for ongoing empirical, theoretical and practical work on transition experiments. To summarize, we would like to emphasize that steering transition experiments includes more than only managing internal aspects of an innovation project, it is also about managing interactions between projects, managing interactions between the experiment or niche and the broader societal context (regime) and managing interactions between the experiment and developments in the landscape. This notion of management asks for a new way of organizing innovation projects; not as a project with fixed results in a limited context, but as an open search and learning process in continuous interaction with the societal system in which transition experiments are to be embedded.

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Colophon