Transition strategy

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Transition strategy
The niche management framework

Transition strategy. The niche management framework
Tanja Manders, Anna J Wieczorek, Geert Verbong, TU Eindhoven

25 March 2018
Introduction

Background
Connecting Mobility (CM) acts as a catalyst for smart mobility developments in the Netherlands. It is responsible for the implementation of the Roadmap ‘Better informed on the Road’. CM monitors the smart mobility developments, provides overview, facilitates cooperation in the field, and brings other important implementation factors into discussion (e.g. human factors, standardization, legal issues). In May, CM has proposed a small collaborative initiative with the TIS group of the TU/e who are currently carrying out research on smart mobility in The Netherlands. Research of the Technology, Innovation & Society (TIS) group is concerned with the societal aspects of technological innovations from a broader system perspective. The group studies how such innovations can contribute to transformations of existing socio-technical systems by triggering changes in user practices, business strategies, infrastructures, etc.

The research programme ‘from automobility to smart mobility’ is a programme funded by Rijkswaterstaat/Ministry of Infrastructure and Environment (currently IenW). It focuses on better understanding the developments around smart mobility in the Netherlands. 5 PhD trajectories are underway that look at different aspects of smart mobility. One is related with experimentation and smart mobility’s transformative potential. Insights from this research are particularly related to CM’s activities.

The assignment
Specifically, the TIS group has been asked by CM to reflect on the framework that CM uses to understand the developments in the field of what is now broadly defined as ‘smart mobility’ and to advise the different initiatives that emerge in this field. The guiding research question is as follows: How can Connecting Mobility connect, guide, and scale-up, the different activities in the field of smart mobility?

For this, we will propose a practical framework that 1) conceptualizes important transition processes, 2) provides indicators to assess current developments, 3) provides insight in the possible intervention points. The framework focuses on the level of initiatives and clusters of initiatives, but also relates these to the broader context.

The outcome is a theoretically verified, fit for practice, framework. For this purpose, we build on the existing framework of CM and complement it with theoretical insights from transition studies. We aim to make the framework practically applicable by translating theory to a coherent framework, provide guidelines on how to apply the framework, provide clear indicators for every step, and include examples of how the framework can be applied.

Structure of the report
First, we give an introduction to transition studies. Then, we briefly evaluate the framework of Connecting Mobility and propose an adapted framework. We introduce the different elements of the adapted framework. Third, we describe the different assessments separately, and explain what these contain and how these can be applied. We end with three examples wherein we test the framework. We furthermore provide some templates to work with when assessing developments.

NOTE: we use a broad definition of ‘initiative’, this can be an experiment, pilot, test, living-lab, etc.
Transition studies

Transitions

Transitions literature is a rapidly growing and influential field of research (Markard et al., 2012; Chappin and Ligtvoet, 2014). It builds on the argument that the interconnected, complex and global character of current challenges such as climate change or growing social inequalities, requires a radical change in the basic systems providing societal needs for mobility, water or energy (Schot and Kanger, 2016). The term we use to describe such a change is transition, whereas the systems that need to undergo the transformation are conceptualized as socio-technical. See Figure 1 for an example of a conceptualization of a socio-technical system for personal transportation. Socio-technical implies that every aspect of life, from technology, institutions, economy to the sociocultural sphere, must transform for a system change to be effective (Elzen et al., 2004; Wieczorek and Berkhout, 2009; Grin et al., 2010). Thanks to its social, environmental and economic sustainability potential, the notion of socio-technical transition has attracted attention in policy circles. Various models developed in this field aim to explain how transitions unfold and how to govern them.

![Figure 1. Example of a socio-technical system for personal transportation. Adapted from (Geels, 2002).](image)

Models to study transitions

The most fundamental model, which has also formed the basis for other approaches, is the Multilevel Perspective on system innovation (MLP) (Geels, 2002, 2005). MLP distinguishes three levels. The central level comprises of socio-technical regimes: sets of rules and routines that define the dominant ‘way of doing things’. Regimes account for path-dependence, stability and are often locked-in, which hinders radical change. Regimes are stabilised by the socio-technical landscape, a ‘broad exogenous environment’ (Grin et al., 2010, p. 23). Landscape factors, such as climate change and urbanization, can also pressure regimes creating opportunities for radical changes. Available alternatives that can fulfil the same societal function can benefit from such windows of opportunity.

Alternatives are developed in niches, i.e. protected spaces, that facilitate experimentation with novelties. The strategic navigation of the process of niche formation is labelled as Strategic Niche Management (SNM) (e.g. Kemp et al., 1998; Raven, 2005; Schot and Geels, 2008). SNM argues for shielding, networking, learning and alignment of expectations as preconditions of the creation, growth and empowerment of niches (Smith et al., 2014). The Transition Management (TM) perspective (e.g. Loorbach and Rotmans, 2006, 2010; Loorbach, 2007) has been developed to shed more light on navigating this complex process. Its essence lies in influencing, coordinating and bringing together (niche) actors and their activities in such a way that together, they can accelerate change.
The assessment framework

The starting point
CMs approach to the mobility transitions is based on years of experience and expertise in the mobility field, supported by an intuitively designed framework. CM developed this framework as a guiding tool to make sense of the plethora of activities and developments in the field of smart mobility. Additionally, the framework serves as a communicative tool to advise initiatives, legitimize activities, and find possible points for intervention. See Figure 2 for the current framework.

The framework captures a number of relevant aspects related with the upscaling of initiatives:

- it identifies a number of intervention points that would help the initiatives move up in the technological development trajectory and it proposes continuous monitoring and evaluation of the initiatives and broader development along the technological development trajectory
- it focuses on local initiatives and their contribution to larger transformation of the mobility system
- it takes into account the stages of technological development from R&D up to implementation in society
- it notices importance of directionality
- it acknowledges the transformative impact of alternatives
- it includes impact of broad trends on the developments at a micro scale
Transition studies
From a transition perspective the framework sets a good start for further enrichment that would provide a more systemic view on what is going on and where other intervention points can be identified. We build on the transition studies theories to conceptualize the transition process in one figure with an emphasis on the role of experimentation and niches.

Many of the initiatives, niches and activities within or outside of the current system may be emergent in character or stimulated. In case of intervention, monitoring and evaluation (M&E) as proposed in the original framework are critical to stimulating change. This assignment can be seen as part of M&E, but focused on the process rather than content. Furthermore, the different elements of the framework give insight in the possible interventions for different levels and different stages, just like the original framework. See Figure 3 for an overview of the figure, including points for intervention.

We distinguish between different levels: from the macro-level of landscape factors to the meso-level of the mainstream (regime), and micro-level of niches and initiatives. The micro-level is the focus of this assignment and we further distinguish herein on the level of the emerging field (global-niche level), and level of initiatives and clusters of initiatives (local-niche level), and single initiative level. Additionally, we also identify different stages of niche development: initiation stage, formation, growth, competition, and stabilization. We mainly use Strategic Niche Management to conceptualize these stages. For the continuing part we will focus on the initiative and niche level. The other levels (point 3-4-5) still play a role in the contextualization, but we do not elaborate on these.

The stages of development:
1. Real-life experimentation is considered as important seed of change
2a. Experiments cluster with other initiatives to create space for like-minded actors and their synergetic activities
2b. Processes of networking, learning, and the articulation of expectations, stimulate the growth of clusters into stronger emerging fields and communities
2c. The critical mass of the niche grows and may at a certain moment challenge the existing system.
2d. If alternatives are developed and able to overcome the inertia of the current systems, these systems transform into new consistencies.

Figure 3. The transition strategy framework (adapted from Loorbach, 2016)
The figure shows a simplified version. In reality, the transition process is extremely uncertain. For example, the emergence of alternatives includes a large diversity of initiatives, from which some might succeed and others fail. Such sequences of initiatives might gradually lead to a more stable emerging field (Geels & Deuten, 2006), as represented in Figure 4. Also, different transition pathways are possible, as the nature and timing of interactions between the landscape, regime, and niche levels differs. (Geels & Schot, 2007). See Figure 5 for a conceptualization.

Figure 4: conceptualization of the emergence of niches

Figure 5: conceptualization of different transition pathways, dependent on nature and timing of interactions.

We mentioned several stages of developments. Although the process is very iterative, the developments should somehow move up from one stage to another. These processes can take place simultaneously and do not follow strictly one after another. However, during some niche development stages, some processes might be more present or it makes more sense to focus on specific processes. Additionally, the framework might suggest that a transition can be managed and foreseen, but this is impossible due to evolutionary and complex character. It can however help to analyze the process and get insight into possible actions.
The stages of development.

1. The strongest point of the framework, used currently by the CM, is its focus on local initiatives, meaning specific pilots/tests/experiments. In the transition literature, initiatives are considered as seeds of radical change. A term often used in that context is ‘transition experiment’ (Van den Bosch & Rotmans, 2008). Such experiments are defined as “an inclusive, practice-based and challenge-led initiative, which is designed to promote system innovation through social learning under conditions of uncertainty and ambiguity” (Sengers, Wieczorek, Raven, 2016).

2a. Experiments alone are rather not able to bring about any radical change. Experiments first cluster with other similar initiatives to create space for like-minded actors and their synergetic activities (Smith & Raven, 2012). The created protective space is called ‘a niche’ and it provides a space for networking, learning and the articulation of expectations, which is important for further development.

2b. The more experiments group together, the greater the network and greater opportunities to learn not only from the experiment but also from other experiments and about the broader context which the alternative activities are challenging. Processes of networking, learning, and the articulation of expectations, stimulate the growth of clusters of initiatives into stronger emerging fields and communities (Kemp, et al., 1998; Geels & Raven, 2006). There may of course be a number of various niches formed.

2c. While the actors agree on their expectations, learn from experimenting, and expand their network, the critical mass of the niche grows and may at a certain moment challenge the existing system (Geels, 2002; Smith & Raven, 2012).

2d. If alternatives are developed and able to overcome the inertia of the current systems, these systems transform into new consistencies.
An example of a niche includes electric car sharing. The current system they challenge is a mobility system based on fossil fuel vehicles and privately owned cars. This system is very stable and embodies a degree of path dependency: infrastructure is developed, policies are in place, it is not difficult to buy a car, culturally we love to drive etc. The system however faces a number of internal challenges such as traffic jams, air pollution, congestion and lack of parking space. Alternatives developed in the niches aim to respond to these challenges by proposing a different configuration of the system, which naturally meets with fierce opposition from the incumbent actors because their vested interests become endangered.

Important contextual factors to take into account are the desired directionality of changes, the system to be challenged, and the broader landscape factors.

The new system, just like the initiatives and niches, can be of an emergent nature, or can be purposefully stimulated. When they are shared, visions and expectations provide a very strong signpost to the actors and help to mobilize resources, attract enthusiasm, and create legitimacy (Borup, 2006). Such visions can be a way for societies to set the developments on a path that would get them closer to the desired endpoint.

Visioning and the sole support of alternatives is likely not enough to trigger fundamental change without parallel activities aiming at the destabilization of the current system. Destabilization of the current system may occur in the form of delegitimization of the dominant technology or artefact, e.g. the car; by the withdrawal of financial resources to build new roads (Turnheim & Geels, 2012).

Activities will not be initiated, and systems will not destabilize, if there are no larger pressures in the form of climate change, or increased urbanization. The broad trends are co-created by societies but they are beyond the direct impact of the individual actors (Geels, 2002). They can, however, be mobilized by them for the sake of promoting the actors’ own interests. Both niche actors and incumbent actors can mobilize these. The broad exogenous developments are called ‘landscape factors’, and their importance has been acknowledged by the original framework.
Relevant assessments
Initiatives and niches
Assessment 1
Experiment Initiation
What kind of initiative is it?

Explanation
In the transition literature, initiatives are considered as seeds of radical change. A term often used in that context is ‘transition experiment’ (Van den Bosch & Rotmans, 2008). Such experiments are defined as “an inclusive, practice-based and challenge-led initiative, which is designed to promote system innovation through social learning under conditions of uncertainty and ambiguity” (Sengers, Wieczorek, Raven, 2016).

How to use
Assessment 1 aims to lead to a better understanding of the initiative’s characteristics in relation to transitions. An initiative, or set of initiatives, can be assessed by using the characteristics of a classic innovation and transition experiment as indicators. The template consists of four sliders that indicate the characteristics of the initiative. On the left side the characteristics of a classic innovation experiment are mentioned and on the right side those of a transition experiment. Depending on the position of the sliders, the initiative can be advised to adapt its set-up, or consider some other factors in a follow-up.

(societal) challenge-led

What kind of function can the initiative fulfill?
What kind of problems can it solve?
Can it be used for a specific use-case?

driven by solution/opportunity

driven by problem/societal challenge

practice-based

What steps need to be taken to experiment in a less controlled test setting?
Are there facilities where you can test in real-life situations?

fully controlled test setting

real-life experiment

inclusive

What stakeholders are relevant for success of the initiative? Are they involved already? Users (ANWB), suppliers (AH), insurance company, schools, municipality, public transport, OEM

involvement of direct initiative team

involvement of broad range of stakeholders

systemic / uncertain

What about other required changes, such as business models, user practices, rules and regulations, infrastructures, related technologies?

single dimension / incremental

multiple dimensions / radical
Assessment 2a
Niche formation
How can the initiative cluster?

Explanation
Transitions literature argues that experiments alone are rather not able to bring about any radical change. Experiments first cluster with other similar initiatives to create space for like-minded actors and their synergetic activities.

How to use
Assessment 2a focuses on the formation of niches. By using specific indicators, the assessment leads to a better understanding of how the initiative relates to other initiatives and whether certain clusters of initiatives are emerging or could be formed. Understanding niche formation can be done by assessing the input, (expected) result, and (aspired) outcome at the level of the initiative and the cluster of initiatives. The input for an initiative or cluster concerns the type of support it receives, e.g. in the form of rule exemption, funding, or trust. Results refer to what the initiative or cluster directly achieves, or expects to achieve, such as developing a new technology, or changing a discourse. The outcome of an initiative or cluster is about the larger aim, such as contributing to a certain vision, or policy goals. Based on the input-result-outcome information of an initiative, one can find other initiatives that are, for example, aiming for the same result (e.g. developing same technology), or that have the same larger aim (e.g. creating sustainable cities). Clustering with similar or complementary initiatives could stimulate networking, learning processes and the articulation of expectations, which is important for further development. A specific initiative can for example benefit from the support that has been given to a cluster of initiatives, and vice versa. The assessment furthermore gives insight to the type of initiatives that are being conducted. The created protective space is called ‘a niche’ and it provides a space for further growth.
**Assessment 2b**

**Niche growth**

**How can the niche be strengthened?**

**Explanation**

The more experiments group together, the greater the network and greater opportunities to learn not only from the experiment but also from other experiments and about the broader context which the alternative activities are challenging. To grow into emerging fields and communities, the clusters of experiments need to be nurtured. Nurturing is based on stimulating network formation, learning processes, and expectation articulation.

**How to use**

Assessment 2b provides indicators to analyze niche growth. It gives insight to the growth of clusters of initiatives into stronger emerging fields and communities. A niche (or set of initiatives) can be assessed by studying the quality of the niche processes: learning, articulating expectations, and networking. For every process, some indicators are provided, such as whether a diverse set of stakeholders are involved, or whether reflexive learning takes place. The attributed ‘score’ of every indicator can be mapped on the spider diagram template. Depending on the final picture, the initiatives and involved actors can be advised.

![Niche processes diagram](Diagram.png)

- **Niche processes**
  - Learning, expectations, and networking follow an iterative process

- **Learning**
  - About multiple dimensions including technical, social, economic, etc.
  - Social, lessons are being shared amongst different involved actors
  - Reflexive learning, ‘are we doing things right’ and ‘are we doing the right things?’

- **Expectations**
  - Aligned and shared
  - Coupled to societal problems
  - Specific and credible

- **Networking**
  - Deep network wherein actors are committed and bring-in resources
  - Involving powerful incumbents (insiders) and new entrants (outsiders)
  - Involvement of diverse stakeholders

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Niche Management Framework – Manders, Wieczorek, Verbong (TU/e)
Explaination
While the actors agree on their expectations, learn from experimenting, and expand their network, the critical mass of the niche grows and may at a certain moment challenge the existing system. However, due to opposition and inertia, actors need to consider what strategies they need to deploy to navigate their way to the incumbent system: by fitting and conforming (symbiotic) or by stretching and transforming (competitive).

How to use
Assessment 2c aims to understand how mature niches start to challenge the existing system. A niche (or set of initiatives) can be scaled up by employing different strategies. There are two distinctive strategies: a symbiotic Fit & Conform strategy that aims at achieving competitiveness within unchanged selection environments; and a competitive Stretch & Transform strategy that argues for institutional reforms that change the selection environment in favor of the niche innovation. Combinations of these strategies are also likely to occur, such as a combination of Fit & Transform or Stretch & Conform. These strategies can be assessed to provide better understanding of how a niche relates to upscaling barriers and how to overcome these.
Assessment 2d
Regime stabilization
How to embed the niche in the regime?

Explanation
If alternatives are developed and able to overcome the inertia of the current systems, these systems transform into new consistencies.

How to use
Assessment 2d focuses on further mainstreaming of the niche. To fully stabilize the alternative niche and embed it, the regime dimensions can be used to assess the level of institutionalization and decide whether a higher level of institutionalization would be required to make the new socio-technical system function more efficiently. Habitualization means a low-level of institutionalization: only a small number of actors is involved, there is no coordination, no consensus on the usefulness of the innovation, and not clear knowledge base. Objectification forms the medium-level of institutionalization. At this level, alliances of actors have formed, resources are mobilized, and usefulness is clear and appropriated. On a high level of institutionalization, called sedimentation, the structure is taken for granted, actors have vested interests, and the structure is maintained (Fuenfschilling and Truffer, 2014).
Additional Assessments
The broader context
Additional Assessment

Envisioning and directionality

How to create a vision for transitions?

Explanation
The new system, just like the initiatives and niches, can be of an emergent nature, or can be purposefully stimulated. When they are shared, visions and expectations provide a very strong signpost to the actors and help to mobilize resources, attract enthusiasm, and create legitimacy. Such visions can be a way for societies to set the developments on a path that would get them closer to the desired endpoint.

How to use

There are different envisioning approaches, such as: exploring possible futures by means of scenarios; predicting likely futures by means of forecasting; and, backcasting by starting from a desired future and from there working backward to the present (Robinson, 1982). Backcasting is especially promising when: problems are complex; radical change is required; prevailing trends are part of the problem; and a long-term perspective is needed (Dreborg, 1996). Additionally, there are several theories about how to organize a visioning process and what constitutes a 'good' vision (Wiek & Iwaniec, 2014). Assessment 3 gives some idea about different envisioning methods and how to assess the quality of the vision and the quality of the visioning process.

VISION QUALITY

<table>
<thead>
<tr>
<th>Construct Quality</th>
<th>Normative Quality</th>
<th>Transformational Quality</th>
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<tbody>
<tr>
<td>Systemic</td>
<td>Visionary</td>
<td>Relevant</td>
</tr>
<tr>
<td>Coherent</td>
<td>Sustainable</td>
<td>Nuanced</td>
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<tr>
<td>Plausible</td>
<td></td>
<td>Motivational</td>
</tr>
<tr>
<td>Tangible</td>
<td></td>
<td>Shared</td>
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</tbody>
</table>

VISION PROCESS

<table>
<thead>
<tr>
<th>Design guidelines</th>
<th>Meaningful sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meaningful sequence</td>
<td>1. Framing the visioning process</td>
</tr>
<tr>
<td>Iterative procedure</td>
<td>2. Eliciting vision statements and priorities</td>
</tr>
<tr>
<td>Creativity techniques</td>
<td>3. Analysing the vision drafts</td>
</tr>
<tr>
<td>Visualisation techniques</td>
<td>4. Reviewing and revising analyzed vision drafts</td>
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<tr>
<td>Participatory setting</td>
<td>5. Finalising the vision and final review</td>
</tr>
</tbody>
</table>
**Explanation**

Visioning and the sole support of alternatives is likely not enough to trigger fundamental change without parallel activities aiming at the destabilization of the current system. Destabilization of the current system may occur in the form of delegitimization of the dominant technology or artefact, e.g. the car; by the withdrawal of financial resources that subsidizes fossil fuels.

**How to use**

Destabilization can be applied to one or more dimensions of a socio-technical system, depending on the context. Destabilization can furthermore take different forms, from ‘hard’ measures like withdrawal of financial support, to ‘soft’ measures like delegitimation by speech.
Additional Assessment

Landscape factors
How to harness trends and other broad developments?

Explanation
Activities will not be initiated, and systems will not destabilize, if there are no larger pressures in the form of climate change, or increased urbanization. The broad trends are co-created by societies but they are beyond the direct impact of the individual actors. They can, however, be mobilized by them for the sake of promoting the actors’ own interests. Both niche actors and incumbent actors can mobilize these. The broad exogenous developments are called ‘landscape factors’. When harnessing such trends, one can think of three type of factors (Driel & Schot, 2005):

1) Factors that do not, or slowly change (e.g. climate change)
2) Long-term changes (e.g. ICT revolution)
3) Rapid external shocks (e.g. oil crises)

Other possibilities when harnessing trends is to look into 4) regime dynamics or 5) new (R&D) developments: are there some internal regime tensions appearing in the current system? Such as the limits to constructing more roads. Or, are there new interesting innovations in other fields or in a very early stage that might be interesting for the mobility system? For all of these different factors, one can assess whether these support the current mobility system or whether these put pressure on the current system.
Applying the framework
Three examples
Three examples

We apply the framework to three different examples to show the potential uses of the framework and to reflect on its usefulness. We relate the different examples to the three main tasks of Connecting Mobility to demonstrate the diversity of the framework and to enhance its practical usefulness. These tasks are: 1) supporting stakeholders; 2) identifying and removing barriers; and 3) providing insight, overview, and advice.

Connecting Mobility has identified several actions for every task. We use these tasks not to advise about the best possible actions for every task. We use these tasks, however, to show how the transition framework can be of support.

We have developed the examples in such a way that each of them relates to a different task. The examples have furthermore been chosen based on the input of Connecting Mobility. Table 1 gives an overview of the relevant assessments for the different tasks. Furthermore, the examples are mentioned in the arrows corresponding to the different tasks. The figure demonstrates how different type of questions can be answered by focusing on different kind of assessment, i.e. focusing on different levels and stages of a transition. The arrows and examples focus on specific parts of the transition process, but of course the different assessments can be consulted freely. One could add a visioning assessment for example three for example, when deemed necessary. Also, some assessment can be skipped, dependent on the type of question and the priorities at that moment. The figure, however, gives some guidance in what could possibly be relevant starting points for the different kind of questions.

Going from example 1 to example 3, we move from a more detailed level of analysis to a more abstract level.

<table>
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<tr>
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<th>1</th>
<th>2a</th>
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<th>2d</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<tbody>
<tr>
<td>Supporting stakeholders</td>
<td><strong>Example 1: Truck Platooning initiative</strong></td>
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<tr>
<td>Identifying and removing barriers</td>
<td></td>
<td><strong>Example 2: MaaS emerging field</strong></td>
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<td>Providing insight, overview, and advice</td>
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<td><strong>Example 3: Mapping activities</strong></td>
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Table 1: overview of examples and relevant assessments
**Example 1: Truck Platooning**

**Imaginary case:** The organization of the European Truck Platooning Challenge is interested in a continuation of the challenge they organized in 2016. They approach Connecting Mobility and ask for advice for follow-up activities and what strategy to follow. Connecting Mobility can use the Assessment Framework to analyze current developments surrounding Truck Platooning, get insight in the stage of developments, and advise how to push the development forward (when deemed desirable).

**European Truck Platooning Challenge 2016**

The initiative, the European Truck Platooning Challenge 2016, has been initiated by the Dutch Ministry of Infrastructure and the Environment, Rijkswaterstaat, RDW, and CEDR [1]. Truck Platooning refers to several trucks driving closely together by means of smart communicative technologies. The trucks form a ‘train’ of trucks, also referred to as a ‘platoon’. By means of platooning, it is expected that fuel costs and emissions decrease and traffic efficiency and safety will increase. It is furthermore expected that truck platooning leads to additional opportunities, such as a strong economic position for Europe in the IT and automotive sector. According to the partners of the initiative, the European Truck Platooning Challenge forms a first step towards large-scale implementation of Automated, Connected Driving (further referred to as Connected, Cooperative, Automated Driving (CCAD), by starting international collaboration and dialogue. During the Truck Platooning Challenge, the platoons had to cross three different countries, before they arrived in Rotterdam, the Netherlands. Six different truck manufacturers, coordinated by ACEA, participated in the Challenge. These manufacturers were: DAIMLER, DAF Trucks, IVECO, MAN, SCANDIA, and Volvo Trucks. The six teams will leave from their own countries. Figure 4 shows the route.

**FIGURE 4 route of the European truck platooning challenge, showing 1 end point for all six teams, in Rotterdam, the Netherlands, and 2 starting points in Belgium, 2 in Germany, 2 in Sweden.[1]**

LOGO from [1]
Assessment 1

Experiment initiation

The initiative seems to be solution-driven. The initiative mainly serves as a demonstration initiative to show the benefits of platooning specifically, and the advantages of CCAD more generally. Some possible benefits are being referred to, such as reduced CO2 emissions, cost reductions, and improved traffic flows and safety. However, the initiative is mainly framed as an opportunity to stimulate CCAD developments in Europe [1][2][3].

The initiative took place on the motorways in normal conditions. In the case of specific local conditions it could be decided not to platoon on specific parts of the road [1].

Many different stakeholders were involved in the initiative, such as public authorities from different countries, national road and vehicle authorities, logistics companies, truck manufacturers, umbrella organisations, knowledge institutes, and some stakeholder organisations and consumer groups [1][2]. Although most of the stakeholders are directly related to the initiative, the network is quite broad.

The initiative focuses on several aspects to clear the way for international implementation of automated, cooperative, and connected driving. The aspects cover technical issues, new organizational forms, and harmonization of legislations concerning liability, privacy, and safety. Although different aspects are taken into account these focus on a quite incremental change: a smooth market introduction of CCAD. The way the initiative and larger ambitions are portrayed does not seem to aim for radical changes along different dimensions [2].

Advice | In general, the initiative seems to be set up as a solution driven experiment that is mainly focused on improving truck platooning and clearing the way for CCAD. The involvement of stakeholders is quite broad and real-life experimentation takes place, but the initiative seems to be focused on successfully developing the solution. This could have been a good first step in order to explore the possibilities of truck platooning, but in light of a transition, coupling to societal problems is important. A possible advice, based on this first assessment, could be to develop a more challenge-led follow-up initiative that is more problem-oriented.
Assessment 2a
Niche formation

INITIATIVE

Input
The European Truck Platooning Challenge received strong support in the form of stakeholder commitment and legitimation by agenda setting. During the official start of the Challenge in Bordeaux at the ITS World Congress 2015, several representatives joint forces and agreed to their shared responsibility to make the initiative successful [2]. They were explicitly asked for their commitment and the conditions for their commitment. The close collaboration of several relevant stakeholders is seen as a successful factor to realize the initiative. The initiative furthermore received support by legitimation, since the Challenge is being developed under the EU Presidency in 2016 [2]. By putting CCAD and truck platooning on the agenda, the initiative benefited from having official legitimation.

Result
The European Truck Platooning Challenge mainly achieved technological innovation, and policy and institutional change. The most important aspect of the initiative is the development of platooning technology. The initiative showed the state of the truck platooning technology and the readiness of it for further implementation [2]. The initiative also puts a strong emphasis on the policy and institutional context [2], such as changes in legislation and regulation.

Outcome
There are not many longer-term outcomes mentioned from the initiative itself. The larger outcome that is mainly being mentioned is that the initiative is a first step in providing a leeway for other kind of smart mobility developments that cross national borders and that it contributes to the introduction of mainly CCAD [2]. It remains however ambiguous to which solution it is intended to contribute to, as concepts like smart mobility, logistics, C-ITS, CCAD, and even MaaS are being mentioned. A Truck Platooning initiative contributing to either one of those will look quite differently. In terms of policy goals or visions it remains unclear what the intended larger aims of truck platooning are. It is not explicitly mentioned.
Outcome
The mentioned outcomes vary from CO2 emission reduction, becoming leader as EU in smart mobility truck platooning, economic competitiveness, and contributing to a multi-modal European transport system. The outcomes are quite disperse and ambiguous, hence, clustering on the base of same intended outcome seems not beneficial in this case.

Result
There are several other initiatives that aim to deliver policy and institutional change for CCAD type of developments. The Amsterdam Group for example aims to remove barriers for the implementation of C-ITS services by establishing standards amongst others [2]. Also other C-ITS corridors like the ones of InterCor aim to realize C-ITS implementation across European borders, by especially focusing on policy and institutional change [2][3]. There are furthermore several other initiatives that experiment with similar technological applications, such as the EcoTwin-initiative of DAF and TNO in 2015, the initiatives of the California Partners for Advanced Transportation Technology (PATH), and the Grand Cooperative Driving Challenge (GCDC).
Advice | In general, the Truck Platooning Challenges has contributed to beneficial circumstances for other initiatives. As it aims to harmonize legislation and technologies across different European countries, it provides a leeway for similar type of initiatives. The initiative seems to cluster together with initiatives that develop similar kind of technologies and also aim to push forward the developments of Truck Platooning or CCAD in general. These type of initiatives receive strong support in especially the form of rule exemption and legitimation, such as exemption of rules and regulations to facilitate the experimentation with self-driving vehicles on the (inter)national roads. Another form of support is by the legitimation of Truck Platooning, and CCAD driving in general. The Dutch Minister of Infrastructure and the Environment has placed CCAD high on the European agenda. Clustering on the base of striving towards same larger outcomes remains vague. Multiple outcomes are mentioned that refer to additional benefits or potential advantages. These outcomes, however, are mainly framed as ‘bonuses’ and do not seem to provide a strong driver for the initiatives to cluster together. In sum, the Truck Platooning Challenge created support for several initiatives and activities, and in turn also benefited from the attention and support CCAD receives. It is, however, unclear what larger outcome these type of initiatives aim to achieve. It is advisable to also express ideas about these larger ambitions, which could also open up possibilities to cluster with other type of initiatives. And think about, what is left when removing the strong support?
Network
The initiative, was initiated by the Dutch Ministry of Infrastructure and the Environment, its executive body Rijkswaterstaat, the Dutch vehicle authority RDW, and CEDR, the Dutch Conference of European Directors of Roads [1]. Different Member States joined the initiative and opened-up their roads [1][3]. Furthermore, six truck manufacturers from three different countries joined the initiative [2]. ACEA was responsible for the coordination of the collaboration between truck manufacturers. The RAI association furthermore supported the initiative, because they were in favor of putting CCAD high on the European agenda. Several suppliers and partners are also mentioned [1][2]. The success of the initiative is often ascribed to the constructive collaboration between these different kind of actors, such as EU member states, transport companies, truck manufactures, national road and vehicle authorities, stakeholder organizations, and knowledge institutions. Also insurance companies, and shippers, like Unilever, Jumbo, and Albert Heijn, started to show interest and joined the network [1][6]. Additionally, the user organization ANWB is involved to bring in the perspective of other road users in the implementation of Truck Platooning [6]. Different actors involved in the Truck Platooning initiative became part of a larger network. The Truck Platooning initiative formed an instrument to connect actors and collaborate on clearing the way for the implementation of Truck Platooning/CCAD in Europe. Relevant and powerful actors for this purpose seem to be on board, such as the road and vehicle authorities, truck manufactures, and shippers. These actors are able to bring in the resources, knowledge, etc. and they have showed to be committed [2]. Although involvement of actors is quite limited to involving those actors with a direct interest in truck platooning, the network seems to be relatively broad as different kind of actors are involved.

Learning
Currently, many different CCAD activities are being initiated in several member states, but they lack cohesion and integration, which hampers mutual learning [2]. Within the Truck Platooning initiative effort is being made to work together with different member states and partners from different countries, to enhance learning and stimulate sharing of experiences. These lessons focus mostly on technological elements, but are not limited to technology only. Other type of questions that are relevant for the international implementation of CCAD are being answered too, such as legislative questions, liability questions, issues related to safety, and data security and privacy, user acceptance, etc. [3][1][2] A special booklet was produced about lessons learnt with recommendations for similar kind of initiatives in future [4]. It covered lessons on several dimensions, such as technological, legislative, user perspective, traffic safety, stakeholder consultation, etc. However, it seems that lessons were gathered by a small team and it is unclear whether it is a collection of several single learned lessons, or really the result of mutual learning among all the involved actors. It furthermore remained difficult to stimulate the sharing of lessons among multiple initiatives. The involved actors have nevertheless experienced new ways of working together, which has been a social learning process [2]. Overall, lessons seem to be largely focused on ‘are we doing things right?’[1][3] like which technologies work best, what do users and drivers think about the test, what impact will it have on business models, how to deal with technicalities, what is the legal situation, what changes in laws and regulations need to be made? Learning is therefore targeted to lessons about what hampers CCAD developments and how to implement it with as little negative externalities as possible. Lessons take into account many aspects about successful implementation, but there is limited attention to reflexive learning: ‘are we actually doing the right things?’.
Expectations

During a 24 hour session, organized by Rijkswaterstaat and TNO, 15 experts from several different organizations from the EU Truck Platooning network have worked on a shared vision on truck platooning in 2025 [2]. Furthermore, it is expected that continuous collaboration in various initiatives contributes to the formation of a shared vision on CCAD across EU [2][3]. This vision seems to be shared among the directly involved actors. Alignment in expectations is also found on the expected possible benefits and advantages [1][2][3], such as improving driver efficiency, reducing costs, decarbonizing freight transport, improving the logistics chain, contributing to road safety, and smoothening traffic flows, etc. This plethora of potential benefits also shows that expectations are still rather vague and ambiguous. It is unclear what to really expect from truck platooning and how to shape the experiments according to such expectations. For example, optimizing truck platooning to improve traffic flow asks for different set-ups of experiments than optimizing truck platooning to decarbonize transport. Currently, the strongest driver to invest in truck platooning seems to be the promise that supporting CCAD developments will have great positive impact on European economic growth and competitiveness, because it leads to opportunities for the ICT, telecom and automotive sectors. Also mentioned, although rarely, are the opportunities truck platooning can bring to the quality of life in cities, reducing congestions and contributing to Mobility as a Service. However, also here such expectations remain really vague and broad, which could negatively affect the quality of learning processes. Tuck platooning, and CCAD in general, are somehow coupled to the societal context, but such benefits are more mentioned as nice add-ons. The main driver seem to be the techno-economic opportunities and opportunities for the logistics sector. It is not really clear what is the desirable future and end-goal of truck platooning. Also when considering the created 2025 vision it becomes visible that the developments have a push character, as the vision seems to be created with a forecasting method (what will be possible in the future, based on the current (technological!) possibilities), not so much about backcasting: what is the desired future, how to reason backwards and what is it that we should use our technological capabilities for?

The processes of network formation, learning processes, and expectation articulation seem to follow an iterative process, wherein sequences of initiatives are being developed, lessons and experiences are gathered and shared, and a broader community emerges. Lessons are being turned into requirements for new initiatives [3][1] and new meetings and discussions. Furthermore, more actors joined the network, such as shippers and insurance companies. It shows that the dialogue continues, and gathered knowledge and expertise are used to structure and inform (follow-up) activities, such as the C-ITS corridor, Intercor, and Tulip Program.
Advice | In general, the involved actors are powerful actors and they are committed and able to bring in resources. The involvement of stakeholders is quite diverse and some powerful actors have joined the network. Together these actors share learning experiences which not only concern technical aspects, but are also about economic, legislative, and organizational aspects. Expectations seems to be shared and aligned between these actors. The different niche processes also seem to follow an iterative process in which follow-ups are being developed based on the lessons and experiences of previous initiatives, such as the newly initiated Tulip Truckplatooning program. The emerging field of Truck Platooning could benefit from the involvement of new entrants and other type of actors in the initiatives, who are not only directly related to logistics, traffic management, or trucks. Another recommendation would be to set up the initiative in such a way that reflexive learning is enhanced. In that way, not only lessons are being learned about ‘are we doing things right’, but also about ‘are we doing the right things’? These lessons are important in terms of transition, as actors might realize that Truck Platooning is maybe not the best solution for a certain problem. It could be the solution for a different problem, or maybe it only forms a partial solution, or there might be another solution which is much better. It is therefore also important to couple expectations to societal problems. Currently, it remains rather unclear which problems will really be aimed at to solve, and how. These are currently being mentioned as possible positive benefits and are therefore not specific and credible. It becomes ambiguous how to monitor and evaluate the activities and what results are expected or aimed for. In other words, when can we speak about a successful initiative and when not? What kind of mobility system is been foreseen, and how does Truck Platooning specifically, or CCAD generally, contribute to this?
Conclusive Assessment and advice

For the example case of Truck Platooning initiative we have focused on assessment 1, 2a, and 2b. These assessment were deemed relevant to support stakeholders that are currently working on a specific innovation or initiative. In these assessments we aimed to understand what kind of experiment the initiative is, what support is receives and how it relates to other initiatives. From there we aimed to understand whether and how the accumulation of different initiatives leads to an emerging field by the processes of learning, articulation of expectations, and networking with others. The initiative was the central unit of assessment, hence, we have focused on the contribution of the Truck Platooning initiative to other initiatives and the emerging field, and vice versa.

In general, the European Truck Platooning Challenge seems to be quite well-organized. The technology is being tested in a real-life environment, relevant stakeholders are involved and committed, and there is attention for technological, institutional, and organizational factors. However, these elements are all targeted at the diffusion of truck platooning and CCAD, i.e. on the diffusion of specific innovations. This is different from focusing on system innovation, i.e. transition. Most important difference is the lack of an articulated desired larger outcome and a clear coupling to societal challenges. When such larger ambitions and expectations are not being expressed, other type of actors are not involved, and reflexive learning is not achieved, truck platooning might have a technology push character only. This way, there is a chance that truck platooning and CCAD will largely conform to existing structures leading to efficiency gains and optimizations, without triggering larger change and benefitting from its full potential. In conclusion, truck platooning and CCAD in the Netherlands have a nice foundation with a growing network of relevant and powerful actors, possibilities to experiment, and facilities to use. The technological, organizational, and legislative elements have been explored, just like its possible impacts. For a next step, it is important to start relating initiatives and other activities to the larger context. What is the purpose of truck platooning (and CCAD)?
Example 2: Mobility as a Service emerging field

*Imaginary case:* Mobility as a Service is one of the focus areas of the Ministry of Infrastructuur en Waterstaat. Although there are many initiatives, larger changes have not been visible yet. Connecting Mobility can use the Niche Management Framework to analyze current factors hampering further upscaling of Mobility as a Service, get insight in the stage of development, and advise the ministry about strategic choices.

Enabled by ICT and business model innovations, Mobility as a Service “combines different transport modes to offer a tailored mobility package, similar to a monthly mobile phone contract and includes other complementary services, such as trip planning, reservation, and payments, through a single interface. This bundling of mobility modes presents a shift away from the existing ownership-based transport system toward an access-based one. It offers users a tailored hyper-convenient mobility solution, with a promising perspective to substitute private car.” (Jittrapirom, et al., 2017, p.13)

“Mobility as a Service” (MaaS) is seen as a relevant contributor to solutions for accessibility and sustainability, which attracts the attention of the national and local governments. It is, however, questionable whether MaaS is able to lead to a fundamental change of the existing mobility system (Manders, n.d.). Throughout the years, the mobility system has been reluctant to radical change. For MaaS specifically, as an intermodal mobility service, two factors of the current mobility system are likely to be problematic: 1) the prevailing logic of private car ownership, and 2) the splintered structure of the mobility system into separate modes.

Even though the field of MaaS is not fully developed yet and could also benefit from a focus on niche clustering and growth, we use the example here to demonstrate the use of the transition framework for larger developments when identifying possible barriers and get insight in how to overcome these. We will not be able to assess the developments in great detail, but we will mention some relevant aspects to consider when performing the assessments.

**Assessment 2b**

**Niche growth**

Assessment 2b can be conducted in the same way as for the European Truck Platooning Challenge example, but with a different focus. The focus for the MaaS example is on the level of an emerging community and the emerging field. Therefore, not the separate initiatives and initiators should be considered, or the directly involved actors, but the focus should be on the level of the global niche, i.e., the general lessons and shared rules and overarching actors, like the MaaS global alliance.

https://raivereniging.nl/nieuws/nieuwsberichten/2017-q4/1117-eerste-markconsultatie-ienw-over-maas.html
A more detailed assessment of possible barriers is required, but it can already be argued that two factors of the current mobility system are likely to be problematic: 1) the prevailing logic of private car ownership, and 2) the splintered structure of the mobility system into separate modes. Due to different regime barriers, MaaS has a chance of remaining trapped into small niches, or, to only serve as an ‘add-on’ to optimize the current mobility system. There are different strategies possible to deal with such barriers. For MaaS, it could be advisable to take a Fit and Transform strategy: fitting in with a nice solution to optimize the current mobility system, and from there transforming it.

At a first glance, MaaS-initiatives currently mainly seem to opt for fitting into existing structures. Initiators develop their applications in such a way that these work within existing technological options (API’s), event though these might not always be the most efficient. Furthermore, MaaS-initiatives seem to follow existing regulations, although there are some ‘grey areas’, e.g. Uber (is it a transport company?). In terms of infrastructure, MaaS-initiatives currently do not really argue for institutional reforms. MaaS-initiatives predominantly takes a stretch strategy when it comes to markets, user practices, and cultural beliefs. Initiators, and other MaaS-developers mainly argue for institutional changes in the market, and user practices, and aim to change cultural beliefs (especially about the idea of the ‘need to own a car’).
Things have not institutionalized around MaaS, as developments are still in an early phase, but it is good to be aware of institutional factors, already at an early stage of development. In a paper about prospects for socio-technical transitions in electric mobility in Germany, Truffer et al. (2017) have presented two institutional scenarios for mobility. These scenarios are based on studying important landscape factors, and current regime and niche dynamics. Depending on which elements become more institutionalized, either sharing and inter-modality become dominant in the institutional core, or cocooning and private car ownership. Both portraying quite differentiating, but likely futures for mobility.
Conclusive Assessment and advice

Even though the example of MaaS might not have been the most suitable to show the use of assessment 2b, 2c, and 2d, it gave some indication.

Advice | In general, for the emerging MaaS field it is important to be aware of the sources of inertia. Such sources, like private car-ownership, and the splintered organization of the transport sector, currently hamper further upscaling of MaaS. Depending on the desired direction, it is advisable to pay more attention to creating space (literally and figuratively) for this development. MaaS has potential, initiatives are unfolding, and communities start to appear, but there is a high potential that MaaS will remain stuck in small niches only (e.g., for young high-educated people in cities), or mainly serves as a nice ‘add-on’ (e.g., providing more mobility options for people, next to the modes they already used). It is critical to become aware of the barriers, and think about how to deal with those to overcome these.
Example 3: Mapping activities

Imaginary case: Connecting Mobility is interested in relating its own activities to the transition process to get an overview of activities and more insight in possible points for improvement.

<table>
<thead>
<tr>
<th>Niche manager: assess &amp; act</th>
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</tr>
<tr>
<td>• Assessing single experiments</td>
</tr>
<tr>
<td>• Advise these to take larger context into account</td>
</tr>
<tr>
<td>• Note: a niche manager does not (necessarily) initiate experiments</td>
</tr>
<tr>
<td><strong>Niche formation</strong></td>
</tr>
<tr>
<td>• Assess the input, (expected) result, and (aspired) outcome of an initiative and a cluster of initiatives</td>
</tr>
<tr>
<td>• Cluster initiatives on the base of their (expected) result, and/or (aspired) outcomes</td>
</tr>
<tr>
<td>• Stimulate the development of initiatives by providing input</td>
</tr>
<tr>
<td><strong>Niche growth</strong></td>
</tr>
<tr>
<td>• Assessing processes of networking, learning, and articulation of expectations</td>
</tr>
<tr>
<td>• Stimulate networking by bringing different actors together, either by linking them directly, or providing facilities to meet</td>
</tr>
<tr>
<td>• Stimulate learning by gathering lessons learnt, provide facilities for knowledge exchanges, and feeding back lessons to new initiatives</td>
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<tr>
<td>• Stimulate the articulation of expectations by organizing discussion sessions</td>
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<tr>
<td>• Stimulate aggregation and structuration for the development of sequences of initiatives</td>
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<tr>
<td><strong>Niche competition</strong></td>
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<tr>
<td>• Assess possible barriers for upscaling</td>
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<tr>
<td>• Assess which strategies actors use to overcome barriers</td>
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<tr>
<td>• Control the process of phasing out shielding</td>
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<tr>
<td>• Argue for institutional reforms in selection environment</td>
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<td><strong>Regime stabilization</strong></td>
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<tr>
<td>• Assessing the level of institutionalization for the dimensions</td>
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<td>• Decide whether a higher level of institutionalization would be required, and for which dimensions, and focus attention to this</td>
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<td>• Start processes of envisioning</td>
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<tr>
<td>• Assess whether processes of destabilization occur and how</td>
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<tr>
<td>• Advice, lobby, and argue for destabilization</td>
</tr>
<tr>
<td>• Assessing landscape factors and whether these support or pressure the current system</td>
</tr>
<tr>
<td>• Mobilize landscape factors to legitimize developments and argue for change of current system</td>
</tr>
</tbody>
</table>
Niche development

Connecting Mobility advises new initiatives, but not necessarily about the initiative’s set-up. They could try to also take into account characteristics of a transition experiment, when advising. Connecting Mobility has furthermore made a great effort in stimulating the clustering of initiatives, especially by developing the ITS/Smart mobility overview. The overview does not only provide a list of initiatives, but also allows one to filter the initiatives on their intended outcome in terms of the Roadmap’s vision and transition paths. It furthermore clusters initiatives on the base of the innovation they are developing (results). While the overview provides a great tool, in the field, initiatives mainly cluster around certain technologies. Connecting Mobility could make attempts to also connect initiatives aiming for different type of innovations (e.g. behavioral change), or aiming for a same larger outcome (e.g. livable cities). Furthermore, some clusters of initiatives seem to receive quite some input (e.g., CCAD), but other type of initiatives (e.g., MaaS) could also benefit from certain facilities.
Connecting Mobility has put quite some effort in stimulating processes of networking, learning, and articulation of expectations. By cooperation within a shared communication strategy, #smarttogether, and the smart mobility embassy, for example, expectations have to be negotiated among different involved actors. It furthermore creates a sense of community and brings together actors. The Community of practices/ITS roundtables are great facilities for actors to meet others, share experiences, and negotiate expectations. Connecting Mobility furthermore aims to gather lessons from single initiatives and feed these back to other or new initiatives, for example by the use of a Monitoring and Evaluation framework. Connecting Mobility could try to steer more on reflexive learning processes and learning about multiple dimensions.

Although many activities of Connecting Mobility are aimed at nurturing the emerging field/community, it remains difficult in practice to really get involved. For others to take advice into account, CM has to earn the respect, which seems to have been going quite well, but they also need to be backed-up by getting mandate. This is a critical element for a niche manager; others have to let you ‘manage’. You furthermore need to have expertise, skills and knowledge yourself, to deserve the respect of others and show your value. This has been a highly valued asset of Connecting Mobility.

Not that many activities of Connecting Mobility have been geared towards the competition and stabilization stages of development. This is quite understandable, as developments are still quite immature. It is however advisable to give more attention to the identification of possible barriers to smart mobility developments and assess what kind of strategies could be used to overcome these. More attention can be geared towards forces of inertia rather than forces of change.

Contextual factors

In terms of contextual factors, Connecting Mobility is collaborating often with incumbent actors to create awareness of smart mobility and to let them anticipate to possible changes in the future. Destabilizing the system is beyond the control of a niche manager, but with very soft and indirect measures, a niche manager can influence incumbent actors. Connecting Mobility seems to have been doing this, but more on an ad-hoc basis. It is advisable to take a more structured approach, identifying most dominant barriers, and target these more strategically. The same applies to the mobilization of landscape factors. Connecting Mobility follows trends and identifies these, but it would be an interesting exercise to assess whether these factors either support or pressure the current mobility system.

In terms of visioning, Connecting Mobility has mobilized the existing vision to relate developments to. However, the vision was developed by a specific group in a specific context and needed some adaptations. This could be something a niche manager could organize, however, they need to get the mandate to do so.
Conclusive | In general, Connecting Mobility seems to play an important role in orchestrating different initiatives and strengthening the development of the field. Transitions are uncertain and multi-actors processes, but an actor like Connecting Mobility can still play a crucial role. We can only speculate what would have happened without Connecting Mobility, but the transition literature emphasizes the relevance of the type of activities, currently performed by Connecting Mobility.

A transition? | The framework can also be used to get a first impression about the stages of development. A complete understanding requires a very comprehensive analysis, but a quick overview of the framework and relevant dynamics in a transition process already gives some idea. For example, many initiatives are being conducted. There seems to be a large activity in the phase of experiment initiation and clustering. Also, more and more initiatives come into place that provide way for smart mobility, such as declaration of Amsterdam, the ‘regeerakkoord’ that mentions smart mobility, MaaS and CADD, various programs, like regional MaaS initiatives, Automotive campus, Innovatie Centrale, Smart Mobility Embassy, Smart wayZ, etc. These are also signs that a certain community starts to develop. However, in most cases, these communities, such as MaaS, and CCAD, do not always meet and currently develop in parallel (let alone other developments such as Electric Vehicles). Also, the mobility regime seems to be very stable and resistant to fundamental changes. Although willing to experiment, incumbent actors seem to not wanting to change too much. This could result in aligning smart mobility innovations with current mainstream practices, rather than giving these the opportunity to develop into mature competitive alternatives. There is a risk of too early ‘afschieten’ of certain alternatives when taking away shielding at too early stage. What also remains unclear is what do we do it for? What is the larger vision? Currently mainly forecasting is used: what is possible, arguing from the existing situation, and not so much about backcasting: what is it that we want, how do we want to live and move in future and what does that mean for current innovations? Hence, although things are moving, the broader contextual factors need to be taken into account too. Smart mobility developments seem to be inbetween formation and growth.
Assessment 1

Experiment initiation

(societal) challenge-led

- driven by solution/opportunity
- driven by problem/societal challenge

practice-based

- fully controlled test setting
- real-life experiment

inclusive

- involvement of direct project team
- involvement of broad range of stakeholders

systemic / uncertain

- single dimension / incremental
- multiple dimensions / radical
**Assessment 2a**

**Niche formation**

**INITIATIVE**

- Location
- Other rules, regulations
- Funding
- Trust and time
- Legitimation
- Knowledge, competences
- Space for failure

**INPUT**

**RESULT**

- Changed discourse
- Policy and institutional change
- Infrastructural change
- New business practices
- New technology
- New market
- New user practices

**CLUSTER**

**OUTCOME**

- Visions
- Policy goals
- Other desired outcomes
Assessment 2b

Niche growth

Niche processes
Learning, expectations, and networking follow an iterative process

Learning
About multiple dimensions including technical, social, economic, etc.

Networking
Deep network wherein actors are committed and bring-in resources

Learning
Social, lessons are being shared amongst different involved actors

Networking
Involving powerful incumbents (insiders) and new entrants (outsiders)

Learning
Reflexive learning, ‘are we doing things right’ and ‘are we doing the right things?’

Networking
Involvement of diverse stakeholders

Expectations
Aligned and shared

Expectations
Are coupled to societal problems

Expectations
Specific and credible
Assessment 2c

Niche empowerment

Competitive strategy (trying to change the existing structures)

Symbiotic strategy (going along with the existing structures)

Regime dimensions / possible barriers

- Technology
- Infrastructure
- Policy and regulations
- Markets and user practices
- Knowledge
- Industry
- Cultural beliefs
Assessment 2d
Regime stabilization

Niche Management Framework – Manders, Wieczorek, Verbong (TU/e)

2d

Regime stabilization

NICHE

- Cultural beliefs
- Technology
- Industry
- Infrastructure
- Knowledge
- Policy and regulations
- Markets and user preferences

LOW
MEDIUM
HIGH