Reflexivity in and through evaluation: shedding light on its meaning for system innovation initiatives

Barbara van Mierlo[1], PJ Beers[2], Marlèn Arkesteijn[3]
[1]Wageningen University & Research, [2]DRIFT Erasmus University, [3]Capturing Development

Keywords: reflexivity; evaluation; learning; system innovation; transformative change; reflexive monitoring in action; systemic stability

Abstract
Complex problems need a freeing-up of formal and informal rules and relations that guide problematic standard actions and routine practices. This could take place in an interactive learning process. Several evaluation approaches have emerged to actively support system innovation from a reflexive perspective. The current conceptualisations of reflexivity however, provide insufficient clarity and hence no guidelines for such evaluations. In our paper, we first make a case regarding the need for reflexive evaluation approaches and their key features, based on an earlier paper. We then present a framework to operationalise and investigate reflexivity and its relation with learning empirically, with the purpose of informing reflexive evaluation approaches addressing complex problems. The potential value of this framework is illustrated with a case of a sustainability initiative in the Dutch greenhouse sector, which we supported with Reflexive Monitoring in Action. With an ex-post, secondary analysis of all the data collected, the changes in reflexivity as well as the associated outcomes of learning were traced from a temporal perspective. We conclude that learning among the actors in a system innovation process may indeed contribute to reflexivity. However, the relation between the two is weak; reflexivity is clearly also the outcome of the interactions between initiative and context. This has implications for reflexive evaluation approaches.

1. Introduction

Results of interventions acknowledging the uncertain and contested character of complex problems may be short-lived if the dynamics that provide stability to the current status quo remain untouched. Complex problems need a freeing-up of formal and informal rules and relations that guide standard actions and routine practices through an interactive learning process. Several evaluation approaches have emerged to actively support transformative processes (or: system innovation) from a reflexive perspective. The current conceptualisations of reflexivity however, provide insufficient clarity or guidelines for such evaluations. It tends to remain a highly abstract term and its relations with learning and reflection as the presumed condition to learning, so far have hardly been studied empirically. Moreover, the concepts of reflexivity and learning as well as their relationship are loaded with positive, normative connotations, which may prove to be little fruitful for supporting system innovation strategies through evaluation.

In our paper, we first make a case regarding the need for reflexive evaluation approaches and their key features, based on an earlier paper. We then present a framework to operationalise and investigate reflexivity and its relation with learning empirically, with the purpose of informing reflexive evaluation approaches addressing complex problems. The potential value of this framework is illustrated with a case of a sustainability initiative in the Dutch greenhouse sector, which we supported with Reflexive Monitoring in Action. With an ex-post, secondary analysis of all the data collected, the changes in reflexivity as well as the associated outcomes of learning were traced from a temporal perspective.

As expected, reflexivity may well be regarded as a positive emergent systemic property of an innovation project, programme, or innovation network rather than the indicator of the quality of the learning process. We conclude that learning among the actors in a system innovation process may indeed contribute to reflexivity. However, reflexivity is clearly also the outcome of the interactions between initiative and context. This has implications for reflexive evaluation approaches.

2. The need for reflexive evaluation approaches

PM This paragraph is an extract of part of the article by on Arkesteijn et al, 2015.

2.1 Complexity revisited

Many problems that prevail generation after generation, like for instance the depletion of natural resources and health risks, are characterized as complex, wicked, unstructured or persistent problems (Hisschemöller and Hoppe, 1996; Rittel and Webber, 1973). In vast bodies of literature, such problems are characterized as having two dimensions. The first dimension refers to the lack of certainty about the nature of the problem and its solutions because of limited (scientific) knowledge about the causes and hence the solution to the problematic situation. The other dimension refers to the lack of consensus on relevant values regarding solutions and interventions. Scholars referred to by practitioners and evaluators within development cooperation like Patton (2011) use similar dimensions of uncertainty and dissensus to distinguish between simple, complicated, complex and chaotic problems or interventions.

The dimensions of uncertainty and disagreement emphasize the undefined character of a problem in its current form. They help to explain why people cannot easily define solutions or come to an agreement on a desired future state. They also provide some general guidelines on how to deal with such problems. However, the historic context of the problem is not yet taken into account. Many problems continue to exist, even in cases considered as highly urgent and where generations of interventions have already taken place, if there is no understanding of the way problems have grown historically and are institutionally embedded in society. Kouévi et al. (2013) for instance describe how six decades of fishery management interventions in Benin have failed to improve fishermen's livelihoods. Co-evolutionary theories on innovation processes that emphasize the integration of technological and social change help to explain the perpetuation of an undesirable situation by showing how problems are embedded in society (Grin and van Staveren, 2007). Local and supra-local institutional barriers hinder for example smallholder farmers in West-Africa from taking advantage of available technological options (Hounkonnou et al., 2014; Totin et al., 2012). Choices made in the past guide current actions even if they are far from desirable, since the "institutionally embedded practices pre-suppose and re-enforce each other" (Grin and van Staveren, 2007: page 137). Around social practices, systems have emerged that entail the whole configuration of technology, knowledge, infrastructure, symbolic values and role division (Rip and Kemp, 1998; Tukker et al., 2008).

Building on scholars who introduced the concepts of lock-in and path dependence in innovation studies, Geels (2004) discerns three mechanisms that provide stability to a socio-technological system. First, the rules in the system, including cognitive heuristics, normative rules and formal regulations, provide stability because they guide actions and perceptions. Established practices of fishing, farming, development cooperation and evaluation are closely associated with these rules. They are deep structures on which knowledgeable actors draw in their actions and therefore provide the context of action. In their actions, they also adapt or redefine these structures. Given that rules are aligned within a system, it is hardly possible to change one rule without altering others. Secondly, the mutual dependence between actors (persons or organizations) contributes to the stability of a system. Once networks have formed around a policy issue, market or programme, the actions of the actors involved, like the suppliers, traders and buyers from a value chain, become increasingly intertwined. In such networks, actors can become locked into their relationships, thus blocking new ideas from

outside and discouraging other potentially fruitful collaborations (Klein Woolthuis et al., 2005). Finally, long lifetimes of the material components of a system add to its stability, as well as the investments sunk in infrastructure and the complementarities of material components of technologies. These mechanisms explain why technological, scientific, political and market developments tend to follow certain trajectories and consist of incremental innovation merely.

So in many situations, it is the embeddedness of a problem in stabilized systems in addition to its undefined character that adds to the difficulty of solving it. In our definition, complex problems display high levels of uncertainty and disagreement on the goals and underlying values, as well as a high level of stability in a system with many interlinked rules, interdependent actors and material components that favour existing, undesirable but normalized practices.

2.2 Reflexive evaluation approaches

The phenomenon of systemic stability is not often acknowledged in evaluation approaches. Soft systems or learning-oriented approaches do regard uncertainty, emergence and coincidence as fundamental characteristics of social change, and also take into account disagreement as a key dimension of complexity. Even in these approaches however, the frequent emphasis on ex-ante formulated impact pathways and programme theories of change, reflects a significant degree of confidence in the possibility to intervene and learn towards achieving socially desirable impacts by means of demarcated interventions and programmes. They are much less geared towards assessing change in systems with less clearly defined boundaries in time and space (Kouévi et al., 2011, 2013). They underrate the complexity dimension of systemic stability, and tend to ignore the interdependencies, power configurations, institutional set-ups and bio-material configurations through which the status quo is reproduced.

An apparent exception is critical system heuristics (CSH) which aims to stimulate critical reflection on system boundary decisions and in this way challenges the stabilizing mechanisms of power relations and explore alternative action areas. It does not however, address the stabilizing mechanisms additional to power relations. Moreover, for promoting fundamental change, we think it is important to go beyond critical reflection on power relations. In the following way, we suggest that reflexive evaluation approaches would enable the identification of stabilizing mechanisms while changing the embeddedness of social practices in relations, rules and material artifacts:

1. By regarding the stabilizing mechanisms, as part and parcel of what needs to change. The core challenge is to find ways to divert from lock-ins. Hence, reflexive evaluation activities need to be firmly embedded in initiatives that seek change in order to overcome path dependency.
2. By making use of and adapt middle-range sociological theories on learning, institutional change, and system innovation that could add to the currently used organisational learning concepts and ecological system thinking in the current system approaches in evaluation.
3. By going beyond participation and focus mainly on the interaction between the initiative and the institutional setting. For the evaluation, it would mean tracking relevant learning and changes in rules and relations over a long period of time, providing feedback and stimulating reflection on and adaptation of the actions in the name of the initiative along the way in the light of the ongoing change processes within an innovation initiative, at its boundaries and in the wider context.

Recently, evaluation approaches have appeared (at times under the heading of 'reflexive') to address systemic stability (Grin & van Staveren, 2007; Regeer et al., 2009; van Mierlo et al., 2010a; Taanman, 2014) by supporting the design and analysis of system innovation processes. As stated before however, the notion of reflexivity in relation to action-oriented evaluation approaches is in need of conceptual elaboration and empirical testing.

3. Conceptual and analytical framework

3.1 Reflexivity versus reflection

Reflexivity is seen as a major asset of learning in system innovation processes, as in the following quote: 'a critical scrutiny of things that are usually taken for granted, in such a way that their historically grown self-evidence … is challenged' (Loeber et al., 2007: 84). With regard to learning in the context of system innovation, especially social learning scholars mention the importance of reflexivity in learning in complex contexts related to diversity in values, interests and knowledge.

In the most general sense, reflexivity entails "some sort of recursive turning back" (Lynch, 2000, p. 34). Beck and colleagues related the concept of reflexivity, as a condition, to persistent societal problems (Beck, Bonss, & Lau, 2003). In their perspective, reflexivity mainly concerns how modern society has come to (unintentionally) impact itself negatively through modernisation processes. While simple modern society "started out from" simple distinctions between society and nature, between insiders and outsiders, and between knowledge and other beliefs, in the process of modernisation people became more and more interconnected, blurring lines between nature and society, ever changing who's in and who's out, and rendering one set of beliefs just as true as any other set. This then is *reflexivity*: the process of modernisation has undercut its own basic tenets, that is, the simple distinctions between for instance society and nature, insiders and outsiders, and knowledge and beliefs. For example, the accelerated burning of fossil fuels has led to possibly irreversible climate change, which in turn forces to rethink many aspects of society, primarily the way energy is produced, food is grown, dwellings are built—all these developments were never intended when people started to produce energy with fossil fuels and as such they are all examples of how the environment is turning back on society. In other words, reflexivity then is the nature of any modern society. This is what Voss, Bauknecht and Kemp (2006) call first-order reflexivity.

Being reflexive refers to having an awareness of the reflexivity of one's situation in reflexive society. This entails knowledge of how society is changing, how those changes may impact oneself, and how one contributes to changing society, as well as attuning one's goals and interests to those changes. In that sense, it goes beyond "merely" reflecting on society, because it also involves drawing consequences from those reflections for oneself. A "reflection-on-reflection", so to speak (Beck et al., 2003, p. 16). Being reflexive thus allows people to act more in accordance with their societal environment. This is what Voss, Bauknecht and Kemp (2006) call second-order reflexivity.

Many authors use the terms reflection and reflexivity interchangeably. They place reflexivity at the core of an interactive learning process engaging multiple actors in issues of sustainability and Natural Resource Management. For Keen et al. (2005) reflexivity (or reflection, Keen et al. use the terms interchangeably) makes up one of the five strands of a social learning process, in addition to system orientation, participation, negotiation and integration. Reflective learning, which involves reflecting on the value of people's knowledge and how they know it, is supposed to lead to new understandings. In line with these scholars, we regard reflection as the mental or communicative activity of considering knowledge, ideas, the outcomes of actions, goals and more. As such, reflection is a conscious individual or social / collaborative activity, that can, to some extent, be organised, facilitated and planned.

Beck, Giddens and Lash (1994) warn not to conflate reflexivity with reflection. They fear the inherent optimism of a conceptualisation of reflection as a conscious activity: the system is expected to open up with more experts, more self-criticism, and more knowledge, while in their view such assumptions themselves are major causes of modern societies' problems. As a consequence, reflection, while necessary, is interpreted too positively. And while it *might* contribute to reflexivity, it is more realistic to expect this to happen rather unexpectedly and to be dependent on many more conditions.

We define *reflexivity* of a system innovation initiative as an emergent systemic property, that is, its ability to interact with and affect the institutional context in which it operates. It is the result of multiple actions and interactions. In this way and in contrast to most literature on reflexivity, we see it as a possible outcome *of* rather than a condition *for* (or asset to) learning.

In the practice of system innovation initiatives, reflexivity can be recognised as 1) the emergence of new (semi-coordinated) practices of participants in the initiative as well as their wider networks, and 2) as new associated rules enabling and constraining these practices. This is in line with, for instance, ideas about reflexive governance involving a change of assumptions, practices, and institutional arrangements (Hendriks & Grin, 2007).

3.2 Learning and reflexivity

In order to be able to separate learning as an outcome of interaction from reflexivity as the condition of a system innovation initiative, we take a discursive perspective on learning (for the explanation of this perspective in the light of existing interactive learning perspectives, see Beers, Hoes & van Mierlo, 2015). We see *learning* as communicative interaction of giving meaning to problems, new technology, social innovations, societal developments, et cetera (cf. Dewulf & Bouwen, 2012; Leeuwis & Aarts, 2011). This means that learning may occur during regular project meetings as well as special learning occasions like workshops.

A learning process in communicative interaction that contributes to system innovation is assumed to include knowledge, actions as well as relations. Knowledge concerns among others individual or shared information and ideas, but also new problem definitions, ideas for how to solve problems, shared / common values, et cetera. In the learning process, knowledge refers to the content that participants exchange and produce: new insights, ideas, changed views, and new visions, while they are pursuing their goals.

A second aspect of learning concerns action. With action, we indicate the agreements, decisions, proposals for real-world actions and other forms of action that are voiced in communicative interactions such as meetings. A third aspect concerns relations, including roles and identities. Authors like Pahl-Wostl (2006) and Leeuwis and Aarts (2011) have noted that interactive learning does not only produce knowledge, but also new relations between actors. This may happen, for example, when external actors are discussed and put in a certain light that changes their relational status. Similarly, when a previously unknown resource or capability of a participant comes to the fore, this may change his / her status within a network.

Not only the learning process, but also its outcomes take place in a discursive setting. A learning outcome occurs when knowledge (the what), actions (the how) and relations (the who) become substantively intertwined. The interweavings themselves are the learning outcomes. It is important to note that this definition yields a rather straightforward distinction between learning outcomes and the real-world actions that possibly follow.

4. Research design

Many scholars in natural resource management and sustainability transitions relate reflexivity explicitly to a systems perspective, acknowledging the complexity of change processes, the blurring of boundaries between in and out, overlapping network configurations et cetera. In this paper, we are concerned with the reflexivity of initiatives that aim to contribute to system innovation. For a preliminary empirical analysis of the relations between reflexivity and learning taking place in discursive interaction, we conducted a case study of an innovation initiative in the Dutch greenhouse sector that aimed to change a complete sector.

Our predominant view of learning as a process taking place in communication (leading to learning outcomes) suggests that the moments of interaction as organised by initiatives themselves itself are the main source of data. The data for this paper are a total of nine meetings, of the general board and of the related chain knowledge platform in the period from January to July 2013, all but one attended by one of the authors. These data were used to analyse the moments at which knowledge, relations and actions became interwoven, that is, learning outcomes. First, transcripts and notes were segmented into interaction episodes related to one topic. This procedure led to the identification of 13 episodes with a learning outcome.

Reflexivity was operationalised in terms of 1) rules guiding actors' practices (organisationally, legally, politically, symbolically), 2) relations between actors, and between initiative and context, 3) practices (common ways of working) and 4) discourse related to the future of the initiative's sector. It was analysed by comparing changes in these four dimensions over time with the initial state of the initiative (the baseline). As sources of evidence we used statements about such changes in the meeting transcripts which were triangulated with the documents that were prepared for the meetings and informal talks with key persons in the initiative. The resulting case history constitutes an account of increases and decreases in reflexivity; *the reflexive turns.*

In the final step of the analysis, we identified whether the contents of the learning outcomes related to the changes in reflexivity and in what chronological order. In each period of a reflexive turn, for each of the reflexive turns (in a rule or relation for instance) we explored whether they could be traced back to any of the 13 learning outcomes (see Table 1 in appendix for a listing). This enabled us to detect which learning outcomes were and which were not represented in a reflexive turn and the other way around.

STAP is an innovation initiative of greenhouse growers. STAP means Foundation for Strengthening the Sales and Marketing Position of Greenhouse Vegetable Producers in the Netherlands. It was founded a few months after the so-called EHEC (enterohemorrhagic Escherichia coli) crisis in March 2011 when fresh greenhouse vegetables were contaminated with EHEC, causing hemolyitic uremic syndrome (HUS) in consumers as a complication of infection. A total of 50 people reportedly died worldwide because of the EHEC crisis (Wikipedia). Although Dutch produce was not infected with EHEC, the crisis strongly affected growers' market position when consumers turned away from tomatoes and cucumbers. Because the initiators had been concerned about their market position for a long time, they used the momentum created by the EHEC crisis to stimulate greenhouse growers to innovate. STAP was founded around August-September 2011, to strengthen the market position of greenhouse growers and to prevent another EHEC crisis from happening.

At the beginning of our study (January 2013) STAP consisted of an executive board with three members and a larger general board, both mainly of greenhouse growers. Some of them were also active as salespersons and traders. Meetings of the general board were also attended by representatives of the Dutch Federation of Agriculture and Horticulture. After almost two years, STAP additionally established a platform of research and education institutes and intermediaries: the chain knowledge platform (henceforth: STAP-CKP).

We used Reflexive Monitoring in Action (RMA: van Mierlo et al, 2010b) not only to study learning and reflexivity, but also to support it. RMA is a form of action research in which the researcher acts as a monitor for an innovation initiative. In RMA, monitoring concerns stimulating reflection among initiators, so that they may learn, evaluate the outcomes of activities in the name of the initiative in the light of the system innovation ambition and adapt its actions to increase the reflexivity.

5. Reflexivity turns and learning

In the period of study, three reflexive turns could be distinguished (see Figure 1). For each period, we first describe the reflexive changes that herald that period and then we describe which learning outcomes were substantively related to these reflexive changes.

5.1 Baseline

At the beginning of 2013, the start of our analysis, STAP exists as a formally established organisation, consisting mainly of greenhouse growers. STAP's context is that of production- and efficiency-oriented growers with a bad market position. Product chain partners are seen as both part of the problem and the solution for improving the market position of greenhouse growers. STAP conceives of its role as working towards the transformation of the whole greenhouse sector to become more consumer-oriented. It understands the necessity of good relations and collaboration with the other organisations in the production chain. STAP does not officially represent all greenhouse growers. Rather, it is an initiative of specific greenhouse growers who see themselves as innovative and who worry about the future of the sector as a whole. STAP does not have a clear strategy at that time, since an approach with workshops has not succeeded and no alternative approach is available yet.

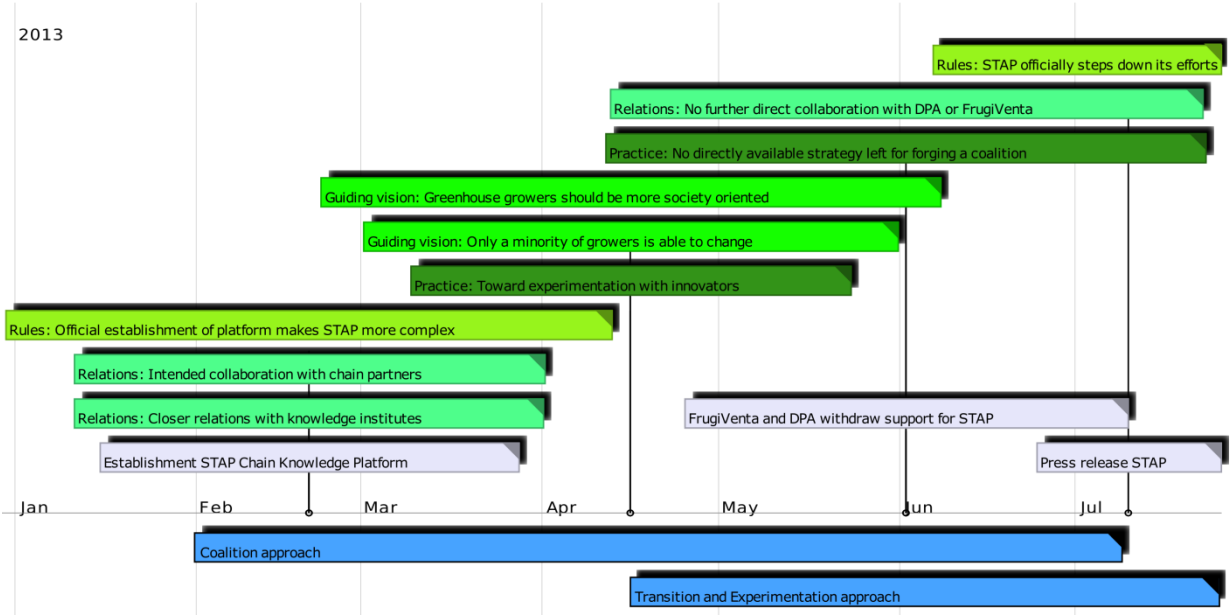

Figure 1: Reflexive turns in STAP

For both the general and executive boards – the CKP was not established yet – the main issue of STAP is the bad market position of greenhouse growers. In their view, growers are too much oriented at decreasing production costs, lack a market orientation and also because financial margins are low. However, because the workshops had not resulted in change and a separate initiative for horizontal bundling in bell peppers had failed, STAP searches for other, more effective strategies. The executive board concludes that it cannot effect this change on its own, because sales and trade parties possess knowledge about the market that growers need to be able to become more consumer-oriented. STAP therefore needs to collaborate with other parties in the sector.

5.2 Increased reflexivity: Established Chain Knowledge Platform

In a general board meeting at February 20, STAP officially establishes the Chain Knowledge Platform (CKP). The idea is that such a platform, of educational and research institutes, will be able to provide knowledge in answer to questions of entrepreneurs and in this way stimulate them to innovate. The

board expects the platform to have a catalysing effect on the innovative capacity of the sector as a whole. This is a new step towards closer organisational relations with these partners.

With the establishment of the Chain Knowledge Platform, the organisation of STAP becomes more complex. In effect, this is a spin-off of STAP, representing a more official relation between STAP entrepreneurs and related knowledge institutes. In that sense it represents an increase in reflexivity, with regard to rules (the official establishment of the platform) as well as relations (strengthening the relations with knowledge institutes).

The first learning outcome related to this increase in reflexivity concerns the topic of "bundling". In an earlier meeting on February 12 with the future members of the CKP the participants first explore the differences between "horizontal bundling"—more collaboration within each of the links of the production chain, especially greenhouse growers, to get a stronger competitive position, and "vertical bundling"—more collaboration *across* the links of the production chain, growers, sellers and traders working together. Many growers have advocated horizontal bundling, but in this meeting vertical bundling is seen as more important. A decision is taken to do a small-scale study of different interpretations of bundling to learn about obstacles to bundling. This learning outcome precedes the reflexivity change in relations in this period.

The main learning outcome in this period emerges during the general board meeting when it is decided to establish the platform. Discussions focus first on what STAP's next step should be. Board members conclude that there is a need to address questions by growers to help them forge more market-oriented production chains. The Chain Knowledge Platform is seen as the answer to these challenges. The board members explicitly see this platform as guided by both STAP and FrugiVenta, an important chain partner. This learning outcome offers a one-to-one mapping to the observed changes in reflexivity.

5.3 An experimentation approach

Half April, as evidenced by transcripts of a meeting on April 16, STAP reconsiders its own position due to changed (perceptions of) relations with chain partners, institutional obstacles (insufficient number of good salespersons) and relations with growers. The discussions at this meeting focus on transition issues. This is the first moment of seeing STAP's challenge in a broader, societal light with a long-term perspective, as opposed to the more consumer-oriented short-term market perspective taken within STAP's general board. Several contributions during the discussion together shape the contours of an alternative innovation strategy; a situation in which radical product changes are necessary but the majority of growers is not able to create these on its own, which calls for an approach of experimenting with innovation and sharing of successful examples of innovation. These changes in proposed goals and practice of STAP are indications of an increase in reflexivity.

An important learning outcome seems to be related to these reflexivity changes. In a later CKP meeting on May 13, a small note on bundling is discussed, a follow-up to the earlier discussion. The note includes a reflection on horizontal and vertical bundling and suggests that vertical bundling better fits STAP's purposes than horizontal bundling, and that horizontal bundling could even pose a risk to vertical bundling. While STAP previously held a neutral position on this issue, the note advises STAP to explicitly favour vertical bundling over horizontal bundling. The CKP agrees. In contrast to our expectations, this substantively related moment of learning does not precede the reflexivity turn, but follows on them. Interestingly, also several other learning outcomes occur during this period (since April 16) that refer to earlier changes in reflexivity, suggesting that the reflexivity turn *precedes* the learning outcome instead of the other way around. These learning outcomes involve 1) that meeting with the chain partners would be urgent and 2) that using a number of exemplary marketing cases for publicity purposes would be helpful.

5.4 Decline in reflexivity: failing network strategy

The first five months of 2013 are characterised by various actions towards more collaboration with other sector organisations, with entrepreneurs in the STAP General Board, and with the partners in the Chain Knowledge Platform. But a few weeks later DPA and FrugiVenta withdraw their support, marking the end of STAP's efforts toward a coalition with them. This also marks a breakdown of STAP's strategy: making the greenhouse sector, as a whole, more market-oriented, necessitates support from and collaboration with DPA and FrugiVenta. In response, STAP announces in a press release July 10, 2013 to become less active in innovating the greenhouse sector, among others because of a lack of collaboration from the chain partners.

The period from February to June can be marked as a stagnation regarding reflexivity, due to uncertain relations and partnerships. Furthermore, the beginning of June 2013 can be seen as a clear decline of reflexivity, because when the strategy to collaborate with chain partners failed (relations) STAP left its previous strategy (practice). The press release is a clear indication of the deteriorated relationships.

No related learning outcomes occur that preceded this decrease of reflexivity. However, learning outcomes occur in a CKP meeting June 3 that followed the previous reflexivity decline. First, a discussion takes place about the mandate of the CKP in relation to STAP. The question is whether the CKP can start collaborations with chain partners after STAP has announced that FrugiVenta and DPA will not collaborate with STAP. The discussion ends with the conclusion that the CKP is related to STAP but also has sufficient independence to set up its own contacts with partners from the chain.

Secondly, a discussion takes place on how to reach the goals of STAP. CKP members state that collaboration with the chain partners is necessary to reach STAP's goals. And even though FrugiVenta and DPA have just closed the door on future collaboration, CKP members say that it should not change their problem analysis. FrugiVenta and DPA should be able to join later on, if they want to. This position is reinforced by some notions about moving beyond the goal of a market oriented sector towards the goal of a society-oriented sector that will also be able to respond to citizens' concerns and deal with environmental issues. This would necessitate even stronger relations between STAP and the chain partners. This learning outcome seems to follow up on the earlier increase in reflexivity in the CKP, and might have been given room by the decline in reflexivity at the level of the whole STAP initiative.

6. Conclusions and discussion

In this paper we set out to critically discuss the often presumed tight, intrinsic relation between reflection, learning and reflexivity, in order to better inform evalulation approaches and methodologies that support system innovation initiatives. Our preliminary conclusions build on a review of the literature on reflexivity and a tentative analysis of the relation between learning and reflexivity in a case study. Since the data used cover a short period with just one obvious reflexive turn in which the reflexivity had increased, our conclusions about the relation between reflexivity and learning are preliminary with the aim to inform further study.

The literature review revealed that reflexivity has hardly been operationalised and seems not to have been studied empirically. The main conclusion is that given the general meaning of reflexivity it should be distinguished from reflection and learning and could perhaps best be seen as a property of the social object to which it relates (monitoring, research, governance or the learning). In the light of the ambition of initiatives to change complete socio-technological systems, we operationalised their reflexivity as changes in rules, discourse, practices and relations.

The preliminary empirical analysis suggests that learning outcomes are indeed not linearly related to increased reflexivity. A few of the 14 observed learning outcomes can be argued to have increased

the reflexivity. Surprisingly, some other relevant learning outcomes seemed to be following on a reflexivity turn rather than preceding it. Furthermore, the other observed learning outcomes (seven in total) are mainly in line with the dominant rules that guide participants' practices and interaction, without an apparent stimulus to increase the reflexivity. This indicates that not all interactive learning outcomes contribute to system innovation. Furthermore, whereas sometimes learning indeed contributes to an increase of reflexivity, some other learning outcomes are directed "inwardly," at substantiating reflexivity, rather than at (further improving) the initiative's position vis-à-vis the wider societal context.

Secondly, since there are signs that reflexivity of an initiative can increase without any internal learning preceding it, a second question is how these reflexive changes come about, if not through learning? Obviously, the position of FrugiVenta and DPA is not under STAP control. The ongoing changes in the relations with the chain partners are illustrative of the fact the innovation initiatives have only limited control over their environment, and that they are affected by changes occurring around them. While this is no new insight, our study indicates –to be validated later – that the reflexivity of an initiative is not only relatively independent of learning, but also a contingent outcome of both internal as well as external developments. This confirms our conceptualisation of reflexivity as a systemic property of a system innovation initiative.

In conclusion, our study suggests that it is possible as well as relevant to distinguish learning and reflexivity and investigate their relationship and interaction more in-depth. It provides initial evidence of the rather loose relation between the two; as two rivers springing from the same mountain following their own flow to the same sea and at times intersecting. Reflexivity of a system innovation initiative can best be understood as a systemic property, or condition of the initiative that may follow, but may just as well precede important learning moments. This conceptualisation links to ideas of reflexivity as a condition or property of a social network or societies rather than a human capacity and awareness.

To reflexive evaluation approaches, the study contributes the insight that planned, conscious reflection on assumptions, values and the basic premises of the system that is supposed to be in need of change may not be the key leverage towards system change. The familiar strategies of supporting reflection and learning in workshops and other special learning events are likely to be a hit-and-miss strategy. Scholars of learning perhaps have overestimated the relation between organised learning and transformative change and collective action. Our results suggest a more modest expectation regarding the importance of organised learning within an innovation network or group.

Tracking learning in the discursive interaction of a system innovation initiative along the way of the innovation trajectory, and combining it with an analysis of the reflexivity turns and their relations with learning, may provide an intensive, but valuable way to stimulate learning towards system innovation. We think (and at this point we recognise in our thinking the same ambiguity as in the literature we criticise) that collective reflection of the initiators on the reflexivity history of an initiative, will help to increase its reflexivity.

References

Arkesteijn, M., van Mierlo, B., & Leeuwis, C. (2015). *The need for reflexive evaluation approaches in development cooperation. Evaluation*, *21*(1), 99-115.

Beck, U., Bonss, W., & Lau, C. (2003). *The theory of reflexive modernization. Problematic, hypotheses and research programme. Theory, Culture & Society, 20*(2), 1-33.

Beck, U., Giddens, A., & Lash, S. (1994). *Reflexive modernization: Politics, tradition and aesthetics in the modern social order*. Stanford, CA: Stanford University Press.

Beers, P. J., van Mierlo, B., & Hoes, A. C. (2016). *Toward an Integrative Perspective on Social Learning in System Innovation Initiatives. Ecology and Society*, *21*(1).

Dewulf, A., & Bouwen, R. (2012). *Issue framing in conversations for change: Discursive interaction strategies for "doing differences". The Journal of Applied Behavioral Science, 48*(2), 168-193.

Edwards, D., & Potter, J. (2001). Discursive psychology. In A. McHoul & M. Rapley (Eds.), *How to analyse talk in institutional settings*. London, UK: Continuum.

Geels, F. W., & Kemp, R. (2007). *Dynamics in socio-technical systems: Typology of change processes and contrasting case studies. Technology in Society, 29*, 441-455.

Grin, J. (2006). Reflexive modernisation as a governance issue, or: designing and shaping *re*-structuration. In J.-P. Voss, D. Bauknecht & R. Kemp (Eds.), *Reflexive governance for sustainable development*. Cheltenham, UK: Edward Elgar.

Hendriks, C. M., & Grin, J. (2007). *Contextualizing reflexive governance: the politics of Dutch transitions to sustainability. Journal of Environmental Policy & Planning, 9*(3-4), 333-350.

Keen, M., Brown, V. A., & Dyball, R. (2005). *Social learning in environmental management. Towards a sustainable future*. London, UK: Earthscan.

Klein Woolthuis, R., Lankhuizen, M., & Gilsing, V. (2005). *A system failure framework for innovation policy design. Technovation, 25*(6), 609-619.

Leeuwis, C., & Aarts, N. (2011). *Rethinking communication in innovation processes: Creating space for change in complex systems. Journal of Agricultural Education and Extension, 17*(1), 21-36.

Lynch, M. (2000). Against reflexivity as an academic virtue and source of priviliged knowledge. *Theory, Culture & Society, 17*(3), 26-53.

Pahl-Wostl, C. (2006). *The importance of social learning in restoring the multifunctionality of rivers and floodplains. Ecology & Society, 11*(1), art.10.

Patton MQ (2011) *Developmental Evaluation. Applying Complexity Concepts to Enhance Innovation and Use.* New York/London: The Guilford Press.

van Mierlo, B., Arkesteijn, M., & Leeuwis, C. (2010a). *Enhancing the reflexivity of system innovation projects with system analyses. American Journal of Evaluation, 31*(2), 143-161.

van Mierlo, B., Regeer, B., Van Amstel, M., Arkesteijn, M., Beekman, V., Bunders, J., de Cock Buning, T., Elzen, B., Hoes, A., Leeuwis, C. (2010b). *Reflexive monitoring in action: A guide for monitoring system innovation projects*. Oisterwijk, The Netherlands: Boxpress.

Voss, J.-P., Bauknecht, D., & Kemp, R. (Eds.). (2006). *Reflexive governance for sustainable development*. Cheltenham, UK: Edward Elgar.

Wals, A. E. J. (Ed.). (2007). *Social learning towards a sustainable world*. Wageningen, The Netherlands: Wageningen Academic Publishers.

APPENDIX 1: Table 1: Learning outcomes

Topic (Knowledge, Relations and Actions in **bold** typeface)	Date (MM-DD)
1. **Vertical bundling** (collaboration across the value chain, in contrast to horizontal bundling, i.e., collaboration among primary producers) is **mentioned** for the first time. The proposed **action**, that is, to carry out small-scale study on bundling, is oriented at changing the relation between the STAP Executive and General Boards and creates a new relation between the KKP and a researcher who recently entered the platform to conduct this study.	12-02
2. A new **action** is decided upon. Inholland students will advise small-scale (~ 4 ha.) greenhouse growers about innovation, based on the **idea** that students speak the growers' language and therefore will be able to strike good **relations** with them. In line with this **relations** between students and small-scale growers are discursively created.	12-02
3. The discussion starts with the **idea** that STAP's previous strategy of creating awareness hasn't sufficiently paid off and that it is better to collaborate with chain partners. As a new, intermediate **action**, the board decides to establish a Chain Knowledge Platform (CKP) for exchanging / sharing pre-competitive information and to invite DPA and FrugiVenta, two organisations that represent chain partners, to **co-guide** the platform.	20-02
4. The Chamber of Commerce (CoC) **propose** to organise **match-making meetings** with greenhouse growers and the creative sectors. The CKP-members **mention** many drawbacks to the original idea. It is **decided** that the CoC will address these drawbacks in a new proposal.	05-03
5. While the CKP members still exchange **ideas** about the CKP's role, STAP is under time pressure for leaving its mark on the sector. STAP **decides to join** a project to make the product chain more secure, **independently from the CKP**.	05-03
6. We present our **analysis** of obstacles to bundling, which include distrust among growers, board members and chain organisations as important obstacles. During the discussion, the **question** arises why knowledge is not listed as an option. The CKP **decides** to have us, the authors, do additional analysis of the role of knowledge in "bundling".	16-04
7. To secure funds, STAP will present a plan with **ideas** to innovate the greenhouse sector, in collaboration with DPA and FrugiVenta. They don't support STAP yet, but are expected to step in line, changing their **relation** to STAP, when the others voice their support. As an **action**, STAP decides to ask for financial support, and else STAP will cease its activities.	08-05

8. The CKP discusses how to **use** one of its members' **new** presentations of **knowledge about innovation**. The CKP **decides** to **favourably impress DPA and FrugiVenta** with STAP's capabilities as evidenced by the first 15 slides of the presentation. 13-05

9. The CKP discusses our suggestion for STAP to explicitly favour the **idea** of "vertical" bundling, instead of remaining neutral on the issue of bundling. The CKP concludes that STAP should take an explicit position, changing its **relation** with the sector. As an associated **action**, it is decided to approach the media with our note on bundling, which itself favours vertical bundling. 13-05

10. The CKP discusses **ideas** to spread the note on bundling in the media, **to inform the sector**. As new **action**, they decide to approach journalists with the suggestion to interview us, the authors. 03-06

11. A discussion of STAP's financial problems leads into discussing **ideas and actions about** CKP communication: What to communicate, and, how, without funds? Regarding communication, the CKP decides to share knowledge with STAP and others based on whether it would be meaningful to them, in other words, whether it **relates** to them. 03-06

12. The CKP shortly discusses the performance of Inholland students when they advise greenhouse growers. Impressions (**ideas**) are that students can carry out projects but not if they're put in a creative role. Inholland will act to put students in a creative-operational role only, improving its **relations** with the sector. 03-06

13. A guest shares the **idea** of extending shelf life as a way to improve the market position of greenhouse growers. The CKP discusses whether extending shelf life can also contribute to make the greenhouse sector more sustainable. As **action**, the CKP decides to use its **relations** to visit a sales organisation, to learn more about reasons for extending shelf life. 25-06