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Innovations for Sustainability through Multi-Stakeholder Innovation Initiatives

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Abstract

The purpose of this paper is to provide a conceptual framework for multi-stakeholder innovation initiatives (MSIIs) as collaborative cross-sector alliances driving the generation and realisation of innovations for sustainability. It suggests that MSIIs may initiate innovations that lead to transformation towards more sustainable structures of society.

First, the interdependence of the non-linear, co-evolving innovation process and its surrounding innovation system is described from a micro-meso-macro perspective. This is to emphasise the importance of actors from different sectors integrating innovation initiatives for sustainability.

Second, different types and approaches of innovations for sustainability are outlined, which bear the potential to contribute to the resolution of sustainability challenges and in some cases even bear the potential to initiate societal transformation towards sustainability.

Third, initiatives aiming at generating and realising these innovations and transformations for sustainability are conceptualised as multi-stakeholder innovation initiatives and delineated from other sustainability- or innovation-oriented networks and alliances.

Fourth, the importance of stakeholder integration within MSIIs on a structural as well as on a processual level is highlighted for creating collective learning effects towards solving the sustainability meta-problem.

Finally, coordinated stakeholder integration within MSIIs as well as their coordinated exploitation of more sustainable resources are emphasised. These processes are subsumed into purposive transaction efforts ideally resulting in the generation and realisation of innovations, which may ultimately lead to societal transformation towards sustainability.

Keywords: multi-stakeholder innovation initiatives, innovations for sustainability, societal transformation

1. Introduction

Purely self-interested, rivalling behaviour neglects the opportunities offered by collectively approaching increasingly complex and intertwined challenges of sustainable development. Collective corporate actions (e.g. alliances or co-opetition) and cross-sector multi-stakeholder initiatives support behaviour which is competitive and sustainable at the same time (Nelson, 2007). Multi-stakeholder initiatives indicate companies' participation in alliances with key actors from other sectors, such as government bodies, research institutes, nongovernmental organisations (NGOs) and financial institutes (Bäckstrand, 2006). Companies are opening up their innovation strategies and are getting involved in outside-in and inside-out co-operation in order to obtain and exchange knowledge and other resources supporting the development and market dispersion of innovations (OECD, 2008). Collaboration across multiple organisational boundaries and institutional forms is regarded as an increasingly important core component of corporate strategy (Powell & Grodal, 2006). The innovation process is regarded as being embedded into a system of innovation shaping and being shaped by actors' innovation efforts. Thus, participation in cross-sector alliances targeted at innovations for sustainability, i.e. multi-stakeholder innovation initiatives (MSIIs), can constitute an essential strategic element for firms aiming at behaving competitively and sustainably at the same time.

2. The Process of Innovation for Sustainability

2.1. Phases of innovation

Not only does innovation include the invention and development but also the adoption and dispersion of a novelty. The innovation process can be classified into different innovation phases (Hauschildt, 2004). The phases of an innovation process even start before the invention phase. The initial phase is that of idea generation and initiative. Following is a phase of discovery and observation, which then passes into the phase of research and development. Next, there is the phase of invention of an alternative to what has been existent so far including a definition of its components and a detailed description of its patentable and publishable characteristics. This phase is followed by a so called realisation-attempt, i.e. the invention's conversion into an economically utilisable prototype, which will generally be followed by a marketing research or

piloting phase before the next phase, its actual realisation, i.e. its adoption and, if successfully accepted, its dispersion throughout a mass market or other unit of adoption may begin (Hauschildt, 2004).

2.2. The innovation process as non-linear and co-evolving chain of causes and effects

Having broken down the innovation process into different phases, it needs to be emphasised that it must not be understood as linear, sequential process. Schroeder et al. (1986) mention that an initial idea tends to proliferate into several ideas throughout the innovation process, which is characterised by various setbacks, integration and restructuring procedures and is dependent on the participation of different actors in the innovation context as well as an appropriate infrastructure development (cf. Figure 1).
Individual innovation phases illustrate a complex and dynamic chain of causes and effects going through various feedback loops and being externally influenced by all kinds of actors. Smits & Kuhlmann (2004, p.7) point out "(...) that more and very heterogeneous actors, often at very different levels and operating in various arenas, are involved in (the management of) innovation processes." Due to feedback loops and system dynamics, parallel co-evolutionary, systemic activities take place throughout the different phases of the innovation process.
The innovation process can be divided into two main phases, the invention phase, where a novel idea is generated, researched and developed into a prototype, and the realisation phase, where the innovation is introduced and dispersed either in terms of market penetration or in terms of dispersion throughout an organisation or other adopting unit. Being embedded in a dynamic and interactive socio-technical system, at regime level the innovation process shapes and is being shaped by this system leading to regime level transformation (cf. sections 3.2 and 4.3) and giving importance to what Geels (2004a) calls interconnected social group networks.

[FIGURE 1]

2.3. The relevance of multi-stakeholder relations for innovations for sustainability

Geels (2004a) points out that the importance of interconnected social group networks has become increasingly apparent in innovation processes. They interconnect the processes behind the creation of knowledge and R&D, on the one hand, and needs and claims of users, on the other hand, via "(...) a process of mutual adaptations and feedbacks between technology and user environment" (Geels, 2004a, p.902). From an innovation system approach the market is recognised as being "(...) organized in stable learning relations based on shared understandings and trust that facilitate knowledge sharing and coordinated innovation between innovating companies" (Andersen, 2004, p.15). Not only are inter-company relations emphasised as significant feature of innovation processes but also user-producer relationships (Andersen, 2004) systematically integrating and enhancing novelties created by lead users (von Hippel 2006). Moreover, extant literature on relational capital (Capello & Faggian, 2005) and social capital (Pretty & Ward, 2001) emphasise the deeply interdependent economy (including actors from all kinds of sectors) as a determinant for the capacity to innovate for sustainability, where the sustainability challenge can be understood as one of our world's meta problems (cf. section 4.2.). These meta problems "(...) transcend the boundaries of many individual organisations [... and therefore] must be addressed cooperatively by combining multiple perspectives and resources for

their resolution“ (Heugens et al., 2002, p.41).

When looking for drivers for innovations for sustainability, the co-evolution of society and technology via dynamic networks of social groups is a major issue to consider. Besides shaping the innovation process, networks of social groups are significantly shaped by their interacting actors: “Actors interact (struggle from alliances, exercise power, negotiate, and cooperate) within the constraints and opportunities of existing structures, at the same time they act upon and restructure these systems” (Geels, 2004a, p.907). Geels (2004a, p.909) describes this interplay as follows: “[Actors’ m]oves may lead to improvements of existing technologies or introduction of new technologies. In reaction to new technologies, policy makers may develop new rules to regulate it, and users may develop new behaviour. The consequence of these multiple games is that elements of [socio-technical] systems co-evolve.”

On the one hand, inter-organisational relationships are of essential importance for innovation processes; on the other hand, accompanying cognitive, normative, regulative and formal rules restrain radical change conditions. Webs of interdependent relationships within established networks lead to mutual dependencies and commitments stabilising the existing structures. Moreover, artefacts and material networks within socio-technical systems create stable interdependencies relatively reluctant to change, which may cause path dependent lock-ins resulting in improvement rather via incremental innovation than via radical or systems innovation (cf. Figure 2) (Berkhout, 2002; Geels, 2004a). Nonetheless, inter-company relations and cross-sector alliances can be regarded as drivers for collaborative innovative behaviour facilitating competitiveness on the micro and macro level and sustainable development on the meso level of regimes (cf. section 3.2) (Andersen, 2004; Geels, 2004b; Nelson, 2007; Smith et al., 2005).

3. Conceptualising Innovations for Sustainability

3.1. Categories of innovation

Innovations in general, and thus also innovations for sustainability, can be categorised according to their degree of novelty, type of innovation and degree of contribution to resolving sustainability challenges.

Regarding different types of innovation Hauschildt (2004) distinguishes:
- product innovations, which are the improvement or creation of new goods and services;
- process innovations, which result in an improved input-output relation of organisational or production processes (Rennings et al., 2006);
- organisational or business related innovations, representing, e.g., innovative business models;
- social innovations, which will be called institutional innovations throughout this paper, since they are occurring in an organisation’s institutional environment (e.g. novel regulations).

Regarding innovations’ novelty or innovativeness, Sabisch et al. (1998) provide a differentiation into:
- pseudo-innovations, which are changes not bearing any substantial improvement and thus not to be regarded as innovation at all, e.g. new product names;
- imitation, which is adoption of innovations already existent in other firms, e.g., copies of hybrid car engines and adaptation, which is adoption of customers’ preferences to already existent

solutions, e.g., giving eco-textiles a fashionable style;
- improvements, where individual quality parameters are improved, e.g. a more efficient diesel car engine;
- basic innovations, which will be called radical innovations from here on, since they reflect entirely newly designed means to novel ends, e.g., voluntary flight emissions compensation.

Innovations can additionally be distinguished into:
- incremental innovations, where the means-end relation is improved in already existent markets (Sabisch et al., 1998) and
- functional innovations (Schaltegger et al., 2003), which provide novel means for novel ends with a very high degree of newness and comprehensive change of organisational processes.

Furthermore, Sabisch et al. (1998) specify:
- evolutionary innovations, which are characterised by continuous improvement of already existing solutions keeping their functional effect, i.e. they represent more gradual changes, where either something old is adapted by imitating someone else's innovation or something old is improved via incremental innovation;
- revolutionary innovations, which are characterised as basic and abrupt and as bringing about radical change, e.g. by means of functional innovation.

In order to understand how these different innovation categories may lead to systems innovation and associated societal transformation towards sustainability, innovation needs to be looked at from a multi-level perspective outlined in the following section.

3.2. The systemic multi-level perspective of innovation

Innovation processes are regarded as being embedded into a holistic micro-meso-macro structure (Dopfer et al., 2004), where innovations can be defined as long term multi-level transformation process (Weber et al. 2006). This systems perspective enables the connection of processes taking place at micro-economic level, such as firms' internal innovation activities, via institutional factors at meso-economic level to macro-economic phenomena. This dynamic and multi-level understanding of innovation occurring within a socio-technical system points at the importance of actors and institutions on multiple levels, which are essential to the development, commercialisation and use of innovations.

Systems innovations, i.e. innovations leading to societal change, are of socio-technical nature involving transformations in a whole cluster of elements leading towards the emergence of new functionalities. Traditional core innovation drivers such as economic "market pull" and "technology push" incentives are extended by the idea that a complex network of interacting actors and institutions is indispensible for knowledge genesis and its conversion into systems innovations for sustainability. An exemplary innovating process where this complexity can be noticed is that of digitalising infrastructures. The affected cluster of elements is not limited to technological transformations but also includes co-evolving social aspects such as new markets, user practices, regulations, infrastructures, cultural meanings, maintenance networks and supply networks (Geels, 2004b; Hafkesbrink, 2007).

Within the infrastructure of the wider political and economic landscape (macro), which sends out

important selection pressures (e.g. by new or intensifying laws such as the German Renewable Energy Law (EEG), by demographic challenges or by market selection pressures) so called socio-technical regimes can be detected (Geels, 2004b). These regimes provide orientation and coordination to the activities of relevant actor groups. Furthermore, they deliver the rule set necessary to generate incremental innovation occupying an intermediate meso-level position between the macro-level landscape and micro-level niches. Within niches, which are incubation rooms protected from normal market selection, radical innovation is thought of as being initiated. However, niches do not function completely isolated from the surrounding socio-technical system either. They rather "provide the space to build social networks which support innovations, like supply chains and user-producer relationships" (Geels, 2004b, p.35). The objective is the generation of niche alternatives, which may lead to transformation at regime level, since selection pressures may be articulated towards regimes from these not yet so established innovative niches as well (Smith et al., 2005).

Following the ideas of Dopfer et al. (2004), Geels (2004a; 2004b) and Smith et al. (2005), innovative transition at system level can thus be described as meso level regimes being reproduced along trajectories that are in part conditioned by co-evolving selection pressures emanating from innovative processes in macro level landscapes (e.g. novel regulations) as well as in micro level niches (e.g. niche innovations such as solar-powered cell phones). Since these pressures can be pushing in novel or opposing directions, regimes' limited adaptive capacity requires actors from multiple sectors to explore external resources and collaborate in networks: "[... N]o actors have sufficient resources unilaterally to control a regime. Regime members are bound together in relationships of resource interdependency (...)" (Smith et al., 2005, p.1506). The resulting interaction and governance processes lead to "(...) processes of consent, dissent, inclusion, exclusion and power relations between the different actors involved" (Smith et al., 2005, p.1498) determining a regime's innovation approach towards challenges of sustainability.

3.3. A positioning matrix for innovations for sustainability

The above mentioned different types of innovation, their degree of innovativeness and their potential impact on sustainability challenges can be integrated into different dimensions of innovations for sustainability (cf. positioning matrix in Figure 2). It should be pointed out that the matrix boundary lies at the edge of innovative approaches addressing one confined sustainability challenge, which, if e.g. targeted at contributing to issues of mobility, should not be compared to issues of water consumption in the same matrix.

[FIGURE 2]

Since systems innovations are eligible to alter the structure of a current socio-technical system (e.g. in terms of consumer behaviour / lifestyle), they may be regarded as those with the highest potential contribution to resolving challenges of sustainable development. An altered regime may again impact other innovation processes being embedded into the changed socio-technical system (Smith et al., 2005). Generating and realising innovations for sustainability by a radically new idea, which serves a need by means of a novel, functional innovation (e.g. online visual communication instead of travelling to a meeting), is the first step towards realising systems innovation for sustainability.

Functional innovations are most likely to become systems innovations since their adoption and dispersion does not only imply new products or processes, but a whole chain of novelties in terms of organisation and social interaction. Schaltegger et al. (2003, p.329) describe this approach as "(...) a long-term strategic choice rather than an operational option." The higher the potential impact of an innovation on sustainability challenges within a socio-technical system, the higher the organisational complexity of the transitions and the number of actors involved. "Designing a fuel cell powered car can be done by one company, but changing gas stations to hydrogen stations needs the co-operation of other, sometimes much bigger companies and authorities" (Nuij, 2002, p.50). Hence, a functional innovation which has managed the step from niche market to mass market bears the potential to initiate transformative societal change towards a more sustainable, alternative socio-technical system.

3.4. Innovation approaches for sustainability

Challenges of competitiveness and economic growth are usually approached by means of innovation expressed in "(…) the economic realisation of new ideas or knowledge in terms of products, processes, services, or even concepts and structures" (Beroggi et al., 2006, p.201). Sustainability oriented innovations support sustainable development by making current unsustainable structures and systems redundant through the replacement by more sustainable solutions. Organisational actors may face challenges of sustainability by means of a multi-criteria triple-bottom line approach (cf. Figure 3) reflecting the contextual integration of economic, environmental and social aspects (Schaltegger & Burritt, 2005).

[FIGURE 3]

Challenges of sustainable development can be tackled by means of several innovation approaches. Applying Schaltegger & Burritt's (2005) three pillar approach, a typology of the innovation approaches for sustainability displayed and illustrated in Table 1 emerges:

1) Eco-effective innovations aiming at ecological effectiveness:
Characterised as aiming at achieving the best possible environmental results in terms of making substantial reductions in the absolute scale of environmental impacts, which is measured in terms of absolute ecological performance, e.g. tonnes of CO_2 reduced in a certain period (e.g. Life Cycle Assessment (LCA) method or ecological footprint).

2) Socio-effective innovations aiming at social effectiveness:
Characterised as reducing the absolute level of negative social impact and increasing the positive impact on social, cultural and individual social demands, e.g. in terms of intergenerational and interregional justice, equality of rights, fairness and equity of needs and performance.

3) Eco-innovations aiming at environmental effectiveness in a way as economically efficient as possible, i.e. as eco-efficiently as possible (Nuij, 2002).
Eco-efficiency is characterised as relative measure of performance in terms of a ratio of economic value added to ecological impact added (EVA/EIA). An innovation's increasing eco-efficiency can result in decreasing ecological effectiveness with economic growth overcompensating the undesired environmental effect or, vice versa, decreasing economic effectiveness with ecological effectiveness overcompensating the undesired economic effect. The result can be referred to as

eco-innovation with weak sustainable improvement of eco-efficiency, i.e. weak eco-innovation (cf. arrows B and C in Figure 4) (Schaltegger & Burritt, 2005). Since, in the long-term, weak eco-innovation may lead to environmental degradation or economic failure respectively, sustainable eco-innovation should be efficient and provide economic and ecological effectiveness at the same time, i.e. it should be strong eco-innovations.

4) Social innovations aiming at social effectiveness in a way as economically efficient as possible, i.e. as socio-efficiently as possible.
Social innovations are characterised as relative measure of performance with a monetary efficiency interpretation supplemented by social aspects in terms of a ratio of economic value added versus negative social impact added. Analogically to eco-efficiency, an innovation's increasing socio-efficiency may result in decreasing social effectiveness with economic growth overcompensating the undesired social effect or vice versa, resulting in weak socio-efficient innovations. A long term perspective requires socio-efficient innovations to be efficient and show economic and social effectiveness at the same time, i.e. it should be strong socio-efficient innovations.

[FIGURE 4]

5) Integrative innovations aiming at the strategic, integrative improvement of economic, social and environmental outcomes.
Integrative innovations are characterised as strategically combining and simultaneously satisfying the four challenges of ecological effectiveness, social effectiveness, eco-efficiency and socio-efficiency. Integrative innovations should be categorised as strong in terms of eco- and socio-efficiency (cf. Figure 4) accompanied by actual social and ecological effectiveness, which are not overcompensated by economic performance. Hence, pareto optimality not specifying the particular distribution of improvements is not desired, however, integrative innovations with strong efficiency performance in social, ecological as well as economic terms are required here.

6) Transformative eco-innovations initiating societal transformation towards sustainability in strong eco-efficient terms (cf. type 3).

7) Transformative social innovations, leading to transformation of society towards sustainability in strong socio-efficient terms (cf. type 4).

8) Sustainability innovations, which are integrative and transformative innovations strategically bringing forth integrative societal transformation towards sustainability.

All of these approaches can be classified as innovations for sustainability. Whereas type 1) to 4) innovations show a restricted approach towards sustainability challenges, type 5) innovations are showing a strategically integrated approach towards the economic, social and environmental challenges of sustainability. Type 6) to 8) innovations are distinguished as transformative since they bear the capacity to change a socio-technical system towards a more sustainable alternative. Hence, they can be characterised as systems innovations leading to societal transformation towards sustainable development, e.g., in terms of changed values, lifestyles, consumption patterns, needs and preferences.

It is important to clearly delineate integrative innovations integrating economic, social and

environmental challenges of sustainability in terms of strong eco-efficiency and strong socio-efficiency (including environmental and social effectiveness) from sustainability innovations, which are integrative systems innovations showing a transformational character in terms of initiating societal change towards sustainability. This typology differs from the definition of sustainability innovation in the extant literature (see, e.g., Schaltegger & Wagner (2008), who also regard integrative innovations highly penetrating small niche markets as sustainability innovations). Innovations merely penetrating niche markets can only have a limited transformational effect on society: “They create the option for purchasers to leave behind the mainstream. The (...) effect of such product and service innovations will remain limited (...)” (Schaltegger et al., 2003, p.191). Thus, for true sustainability innovations the transformational effect needs to be realised on a scale beyond that realisable by innovations within niches.

[TABLE 1]

To illustrate the distinction between different innovation approaches for sustainability, a distinguishing example will be given: Eco-innovations are to be regarded as integrative innovations only if they ultimately integrate an additional positive social effect, e.g., if novel technologies lead to more efficient and environmentally friendly organic pest control opportunities utilising less harmful substances, which eventually have a positive impact on consumers’ health. If those integrative innovations also effectuate societal transformation on a large scale, for instance in terms of permanently changed eating habits that bring about the replacement of previous, less healthy and less environmentally friendly products and processes, which ultimately improves particular public health or epidemiological conditions, sustainability innovation is existent.

Additionally, another type of sustainability challenges, namely eco-justice, needs to be mentioned (see Figure 3) (Schaltegger & Burritt, 2005). The objective of eco-justice is a balanced improvement of environmental and social effectiveness. Socially oriented innovations can only be legitimate if they do not harm ecology in an irreversibly harmful way. Moreover, environmentally oriented innovations should not be realised at a comparably unwarranted expense of social needs and human rights. Consequently, innovations for sustainability should always be eco-just innovations balancing out social and environmental effectiveness in a reasonable manner.

Finally, it needs to be mentioned that innovation for sustainability does not merely come into existence by intention, however, that innovations may by chance prove to be more sustainable than existing alternatives. The challenge is that the concepts “sustainability” and “innovation” can only be determined ex post. An innovation can only be defined as such as soon as it has achieved the stage of being accepted and realised in the market, an organisation, the scientific community, or other unit of dispersion. Determining an invention or innovation as being sustainable is even more complicated, since rebound effects might emerge which had not been anticipated before. Nevertheless, throughout this paper the subjects of interest are those multi-stakeholder initiatives that show a clear determination and focus towards being innovative and sustainable at the same time.

4. Multi-Stakeholder Innovation Initiatives

4.1. Conceptualising multi-stakeholder innovation initiatives

Multi-stakeholder innovation initiatives (MSIIs) are to be defined as collaborative cross-sector alliances aiming at the generation and realisation of innovations for sustainability. Business actors as well as actors from other sectors hold limited resources to face the highly complex and intertwined challenges of sustainable development by themselves. Innovative and sustainability oriented solutions taking into account economic and ecological as well as social concerns are needed. Within this context, multi-stakeholder initiatives comprised of actors from multiple sectors providing, exchanging and sharing complementary resources grow in importance (see e.g. the Forest Stewardship Council, the Marine Stewardship Council, the recent Innovation Alliance Carbon Nanotubes (Inno.CNT)).

As the term indicates, these multi-stakeholder innovation initiatives are comprised of
- multiple stakeholders from multiple sectors having a stake in the generation and dispersion of innovations for sustainability, and
- innovation initiatives. The term initiative is relevant due to MSIIs not only showing a structural and interactive networking character, but also a purpose-oriented, interactive determination towards the realisation of innovations for sustainability. An atmosphere of sustainable entrepreneurship (Schaltegger & Wagner, 2008) is recognisable within these initiatives.

Relevant for the conceptual framework provided by this paper are those multi-stakeholder initiatives which are innovative and sustainability oriented. Non-sustainability oriented as well as sustainability oriented multi-stakeholder initiatives showing a lack of innovativeness and those aiming at the creation of innovation merely for economic reasons but missing out on providing solutions approaching sustainability challenges, will not be further dealt with here. Based on the conceptualisation of innovations for sustainability in section 3.4., MSIIs can show an effective, efficient, integrative and transformative contribution towards resolving sustainability challenges (cf. Table 2).

Noticing that, from a business perspective, innovation is directed at economic growth, innovations which are ecologically effective or socially effective without being economically efficient (eco-effective MSIIs and socio-effective MSIIs) are unlikely to be a strategy followed by MSIIs involving actors from the corporate sector. Then again, innovations which are socio-efficient or eco-efficient, however, not effective in their environmental or social purpose, cannot be a long term solution to society’s sustainability challenges. Hence, eco-MSIIs are ideally aiming at the generation and realisation of strong eco-innovations and social MSIIs at strongly socio-efficient innovations (cf. section 3.4.). Eco-transformative MSIIs and socio-transformative MSIIs additionally show the capacity to initiate societal transformation towards sustainability. Furthermore, MSIIs aiming at the generation and realisation of integrative innovations can be defined as integrative MSIIs. Finally, if an integrative MSII initiates societal transformation towards sustainability, it is to be defined as sustainability MSII. All of these MSIIs integrate stakeholders from different sectors towards achieving the intended goal of innovations for sustainability. Therefore, different types of stakeholder integration occurring within MSIIs need to be identified.

[TABLE 2]

4.2. Types of stakeholder integration within MSIIs

Transferring different types of stakeholder integration (cf. Figure 5) depicted by Heugens et al.

(2002) onto the case of multi-stakeholder innovation initiatives, leads to the identification of those relationships where structure and processes are of dyadic nature (between direct stakeholders) versus those showing a networking character (also including indirect stakeholders). Furthermore, collaboration in MSIIs may be aimed at structural adaptation in terms of creating boundary-spanning structures that provide for closer socio-political or wider cognitive legitimacy, or at processual interaction between stakeholders in order to manage outside pressure via mutual or collective learning effects (Heugens et al., 2002).

[FIGURE 5]

As mentioned in section 2.3., sustainability can be understood as a meta-problem requiring a meta-problem solving approach (see typology in Figure 5). Consequently, MSIIs will probably show a processual, interactive networking character integrating direct and indirect stakeholders and being aligned towards collective learning effects (see benefits in Figure 5). These collective learning effects may lead to innovative sustainability solutions that ultimately spill over to other actors, which again may lead to an innovation dispersion that can actuate purposive societal transformation towards sustainability. Hence, in this context, purposive societal transformation should be understood as a coordinated regime shift towards sustainability, where innovative processes are increasingly decoupled from regime internal, unsustainable resources, processes and structures but external, more sustainable solutions are approached.

4.3. The transformation context

The transformation context in which an MSII operates influences the characteristics of an MSII. Smith et al. (2005) distinguish between regime level transformations where the manner of response to selection pressure is emanating from a regime's adaptive capacity defined as a regime's "system robustness to changes in resilience" (Gunderson, 2000, p.435). This adaptive capacity is based on the regime's capability to exploit regime internal resources or otherwise having to explore regime external resources. Over time, regimes with less adaptive capacity and thus having to explore external alternatives are expected to be subsumed or substituted (Smith et al., 2005). Regime level transformations are distinguished into those "that are intended and purposively governed, and those that are the unintended and contingent outcomes of historical processes" (Smith et al., 2005, p.1498). Consequently four ideal transformation types are identified:
- reorientation of trajectories showing low coordination and low dependence on external resources;
- emergent transformation, showing low coordination and high dependence on external resources;
- endogenous renewal, where the steering of adaptive response is highly coordinated and the resource locus is internal, and
- purposive transition also highly coordinated, however, being highly dependent on external resources.

Applying the identified transition categories analytically and normatively may facilitate the understanding of how multi-stakeholder innovation initiatives may best initiate transition processes towards more sustainable regimes. It should be looked at which adaptive governance (Olsson et al., 2006) and resource allocation procedures, depending on power relations across networks of actors within MSIIs and across MSIIs, are in fact utilised and which are desirable to successfully actuate innovation processes for sustainability. Ideally, it would be possible to actuate purposive transition towards sustainability by means of strategically coordinated MSIIs which detach

themselves from unsustainable resources and processes within their current regime of operation and deliberately utilise regime-external, more sustainable resources. That way radical change might be created by means of functional innovation, which ultimately bears the potential to initiate systems innovation directed at societal transformation towards sustainability.

This highly ideal and complex form of coordinated stakeholder integration towards purposive regime shifts is not the only way to bring about more sustainable solutions. Less ideal forms bear the potential to actuate the development and realisation of innovations for sustainability as well. Less coordinated and rather historically developing incremental improvement (cf. Figure 2) may as well bring about innovations that are more sustainable than existing alternatives and thus contribute to sustainable development.

5. Conclusive thoughts on MSIIs as driver for innovations for sustainability

This paper shows that being involved in multi-stakeholder innovation initiatives bears the potential for business and other actors to create innovations for sustainability that may lead to societal transformation towards sustainability. Selective pressures emanating from protected niche processes at micro-level as well as from societal trends, political regulations or market mechanisms at macro-level compel stakeholders to integrate within MSIIs. Here they can collaboratively share and exchange knowledge and other resources and create collective learning effects, which may lead to competitive advantage through the generation and realisation of innovations as well as contribute to the resolution of the sustainability meta-problem. Successful coordination of stakeholder integration mechanisms and the capability to utilise alternative, more sustainable resources may synthesise into purposive transition towards sustainability.

Belonging to an MSII can support actors in gaining legitimacy for their actions, which makes the actual adoption and dispersion of innovative ideas and developments throughout the surrounding socio-technical system more feasible. That way sudden and unexpected constraints emanating from involved stakeholders can be alleviated or avoided. Obstacles throughout the innovation phases are expected to be better manageable if involved actors from different sectors are supporting each other by means of sharing resources and knowledge contributing to the successful development and realisation of innovations for sustainability.

The interdependence between governance mechanisms and collective learning processes within MSIIs shows to be a highly interesting field of research. Especially, 1) motives and objectives for MSII formation, 2) governance processes regulating power and agency among MSII actors, 3) applied controlling and monitoring mechanisms ensuring transparency and accountability of MSII activities, 4) conflict management approaches as well as 5) success factors ensuring the performance and helping to avoid the failure of MSIIs should be investigated and further elaborated on.

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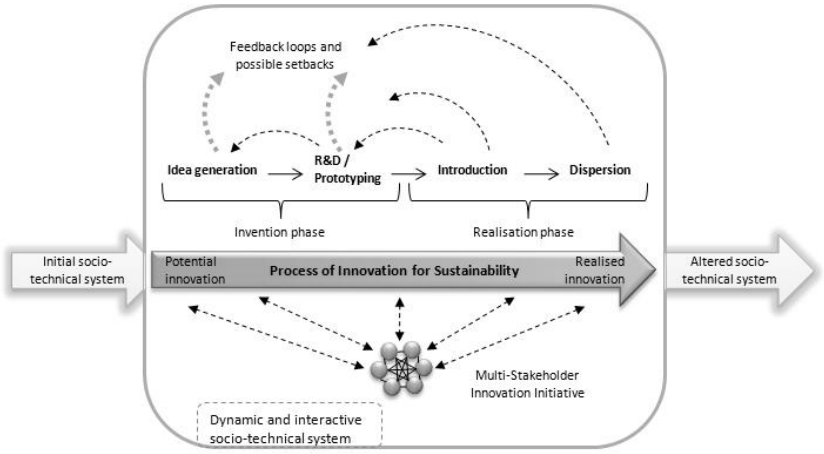

Figure 1: Regime level transformation actuated by innovations for sustainability.

Figure 1: Regime level transformation actuated ...

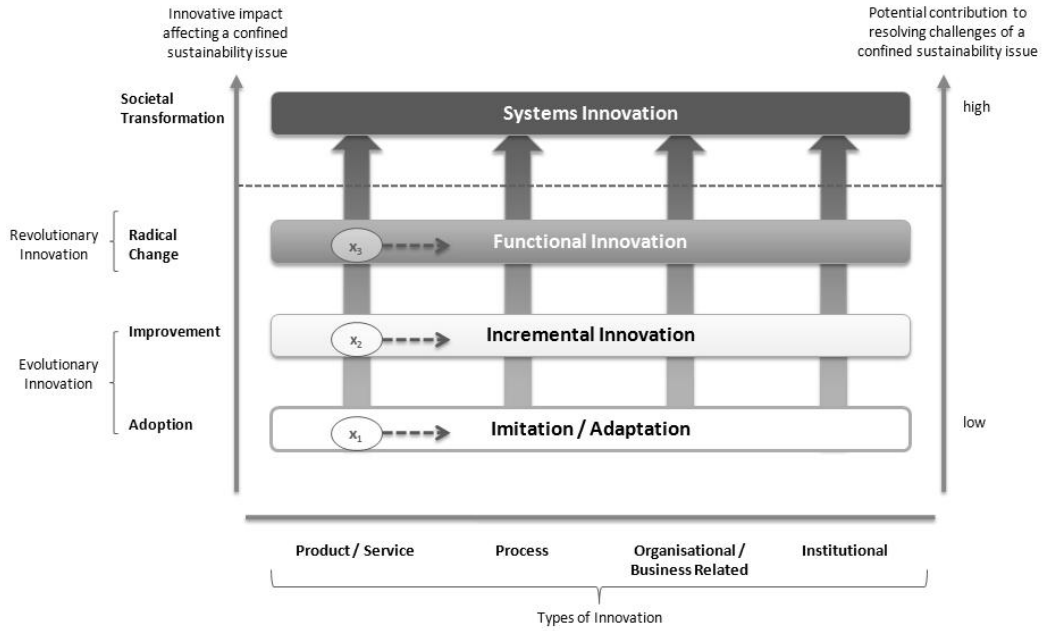

Figure 2: Positioning matrix for innovations for sustainability.

Figure 2: Positioning matrix for innovations ...

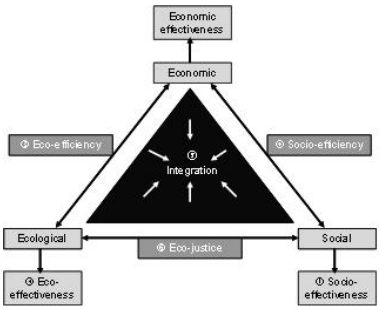

Figure 3: Corporate sustainability challenges.
Source: Schaltegger & Burritt 2005, 189; BMU et al. 2002

Corporate sustainability challenges.

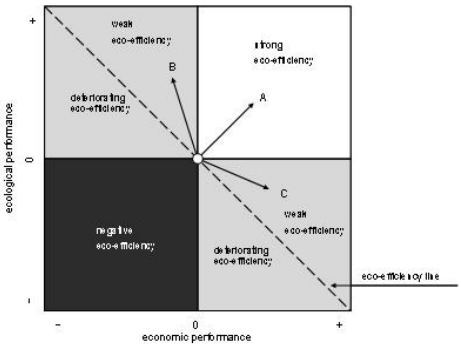

Figure 4: Eco-efficiency portfolio matrix.
Source: adapted from Schaltegger & Burritt (2005, 195)

Eco-efficiency portfolio matrix

Table 1: Typology and illustrative examples of innovation approaches for sustainability.

	Innovation Approach for Sustainability	Innovation Contribution to Sustainability					
		innovative	economic	ecological	social	integrative	transformative
1)	Eco-effective Innovation	x		x			
2)	Socio-effective Innovation	x			x		
3)	Eco- Innovation	x	x	x			
4)	Social Innovation	x	x		x		
5)	Integrative Innovation	x	x	x	x	x	x
6)	Transformative Eco-Innovation	x	x	x			x
7)	Transformative Social Innovation	x	x		x		x
8)	Sustainability Innovation	x	x	x	x	x	x

Illustrative Examples of Innovation Approaches for Sustainability

1) Environmental laws such as the German sustainable energy law EEG aiming at the integration of regenerative sources for energy production.
2) Fair trade labelling, e.g., for chocloate or coffee aiming at effective social improvement of labour and living conditions for farmers.
3) New water management processes allowing for reduced water use and cost savings across the food supply chain.
4) Calcium added yoghurts successfully selling the idea of nutrition to the poor in emerging markets, e.g., sold by Danone Grameen Foods in Bangladesh.
5) Organic farming, which aims at employing more environmentally friendly farming processes and providing more healthy food to consumers.
6) FSC-certified products changing afforestation and deforesting processes towards more sustainable wood consumption.
7) Microfinancing, which is changing the conventional financial investment system and providing venture capital for the poor to set up their own business resulting in improved living conditions and new market structures.
8) The internet having changed the socio-technical system towards being a digitalised one. For instance, the internet bears huge resource saving potentials (e.g. by providing the opportunity for digital communication instead of traveling or snail mail) as well as social benefits, especially in terms of providing infrastructures and opportunities for social inclusion. Internet has major effects on behaviour of markets, organisations, politics, scientific progress and consumers and therefore offers great potential capacity for further sustainable development.

Table 1: Typology and illustrative examples of ...

Table 2: Categories of sustainability oriented multi-stakeholder innovation initiatives.

MSII-Category	MSIIs' Contribution Towards Sustainability			
	effective	efficient	integrative	transformative
Eco-effective MSII	x			
Socio-effective MSII	x			
Eco-MSII	x	x		
Social MSII	x	x		
Integrative MSII	x	x	x	
Eco-transformative MSII	x	x		x
Socio-transformative MSII	x	x		x
Sustainability MSII	x	x	x	x

Table 2: Categories of sustainability oriented ...

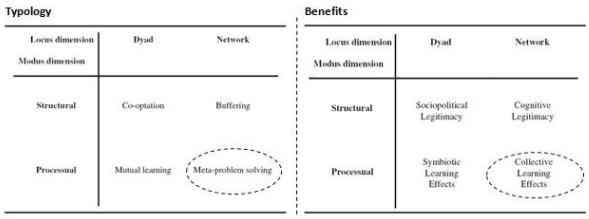

Figure 5: Typology and benefits of stakeholder integration mechanisms.
Source: adapted from Heugens et al. (2002, 40, 54)

Figure 5: Typology and benefits of stakeholder ...

Presentation Preference
Additional information