



Forum for Sustainability
through Life Cycle Innovation

in collaboration with



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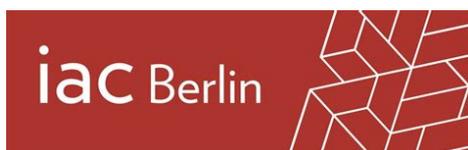
Workshop Report

Defining Sustainable Innovation from a Life Cycle Perspective

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Defining Sustainable Innovation from a Life Cycle Perspective

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Foreword

The topic of sustainable innovation has gained attention ever since the Rio Declaration in 1992. However, there is a relatively poor understanding of what it means for decision makers and what the implementation barriers for science, research, business and policy might be. More than ever life cycle thinking is needed in order to better achieve the social and environmental dimensions of sustainability.

The Forum for Sustainability through Life Cycle Innovation (FSLCI) is a global independent community representing a global voice that proactively promotes the uptake of life cycle information and approaches. FSLCI aims at accelerating the transition towards a sustainable society by promoting global, systematic and effective application of life cycle innovation. The innovation for sustainable development network is a new global initiative funded by the European Commission (www.inno4sd.net). Inno4sd aims at disseminating the global knowledge around the role of innovation for a green and inclusive economy and the fulfilment of the sustainable development goals (SDGs). Our collaboration aims at fulfilling a joint mission to promote innovation and change for sustainability.

This document presents the intellectual outcome of a joint 2-day workshop held in Berlin that gathered practitioners, academics and private sector organisations with a special interest and specific knowledge and experience around this topic. We trust this initial dialogue will inspire others to continue building the required knowledge and experience for the design and implementation of sustainable innovations following a life cycle perspective. The exchange of ideas, experiences and information is a vital component of the knowledge economy. And the so called policy-science knowledge brokerage events and platforms are one of the most powerful ways to connect people and ideas. In this way, we hope to help to the identification of relevant knowledge and solutions that can bring about transformative change towards sustainability.



Martina Prox M.A.
President of the Board of Directors FSLCI



Dr. Fernando J. Diaz Lopez
Director inno4sd

Introduction

On 17.05 and 18.05.2018, the Forum for Sustainability through Life Cycle Innovation (FSLCI) organized a lunch-to-lunch workshop in collaboration with Innovation for Sustainable Development Network (inno4sd.net). The objective of the workshop was to understand the link between innovation processes and sustainability from a life cycle perspective, from both, a conceptual as well as practical perspective.

During the workshop, which took place at iac Berlin, participants discussed the barriers, drivers and stakeholders of sustainable innovation within different innovation processes such as technological/ product innovation, process/ management innovation and business model innovation. Participants also discussed why and how life cycle thinking is important for sustainable innovation.

This report provides a summary of the key outcomes of their deliberations and is meant to serve as a starting point for a broader discussion around the sustainable innovation within the life cycle community and beyond. It is also meant to inform the discussion at the FSLCI's first "Life Cycle Innovation Conference" which takes place from 29-31 August in Berlin, Germany.

During both workshop days, a variety of keynote speakers offered valuable input which was then taken up by workshop participants in their respective group discussions. The first day focussed on introducing the concept of innovation and helped participants understand the broad range of innovation types and definitions. Prof. Dr. Klaus Fichter presented a conceptual overview of how to link sustainability & innovation and outlined what drives and influences (both positively and negatively) sustainable innovation. Following this overview, Dr. Fernando J. Diaz Lopez gave a presentation on TNO and the innovation for sustainable development network (www.inno4sd.net), some considerations about research and practice of sustainable innovation and related opportunities and future challenges of this novel field. Andreas Wade from First Solar then explained sustainable innovation applied by his company in the photovoltaics (PV) sector. Finally, Elisa Naranjo provided relevant insights

into sustainable innovation from a start-up perspective, outlining the story of Einhorn and highlighting the collaborative approach with suppliers Einhorn takes.

As outlined by the speakers on the first day, innovation, much like sustainability, is a word with many different meanings and interpretations. It can refer to the changes within the organization for improved efficiency, to the application of a new technology, to using an existing technology in a different place, time and/or context; to the implementation of a new idea, method or device. Still, the focus on innovation in companies and businesses could offer an avenue to advance sustainability by addressing sustainability considerations as part of innovation processes. This could be achieved for example by creating cross-domain teams, recruiting people with diverse backgrounds or by benchmarking any innovation against sustainability criteria. Putting both together thus requires not only a good understanding of what constitutes innovation, but also sustainability. To this end Dr. James A. Fava presented an overview of how to apply life cycle thinking to advance sustainability on the second day of the workshop, which thus focussed more on the sustainability part of the equation.

Innovation is a broad term and different innovation types exist

As outlined previously, workshop participants agreed that innovation has many meanings and interpretations. In line with the definition of the OECD's Oslo Manual (2005) it was agreed that innovation can be defined as any new or significantly improved process/product/business model that adds value (not necessarily monetary value) to an organization, product or service. Innovation is thus not limited to the general understanding of "R&D" innovation, but can cover processes, products (goods and services), business models, and organisational changes. Participants also concluded that while innovation is often technology driven, innovation can also occur without a technological focus or driver such as leasing same products instead of buying them. Workshop participants discussed innovation from three main perspectives:

- 1- Technological/ Product Innovation

2- Process/ Management Innovation

3- Business Model Innovation

Participants agreed that technological/product innovation refers to “what” changes whereas process/management innovation refers to the question of “how” it is implemented.

Process/management innovation refers to the change in the facilities, skills and technologies used to produce, deliver and support a product or service. Participants also agreed that technological/ product innovation or process/management innovation can happen separately but business model innovation may require technological/product innovation and/or process/management innovation because in order to change the whole business model, product and/or business processes often need to change as well. A car manufacturer might for example stop selling cars and instead start to charge per kilometres being driven. The business model would thus change even though the old product would remain the same or similar but become a part of the new product.

Besides categorising innovation on how and where it happens, participants noted that it can be categorised in terms of impact and scope such as break through, disruptive and incremental innovation. However, due to a lack of time participants decided not to discuss the differences in between these innovation types at this time.

Entrepreneurial and Intrapreneurial Business Model Innovation Have Different Dynamics

After discussing what innovation means and what kind of innovation types exist, participants decided to focus on business model innovation when addressing the link between innovation processes and sustainability. They also stressed the importance of differentiating between entrepreneurial and intrapreneurial business model innovation, especially as they usually have different starting points: entrepreneurial business model innovation happens with the emergence of a new company whereas intrapreneurial business model innovation happens within an existing company.

Intrapreneurial business innovation can be driven by societal demands or the emergence of new and disruptive technologies which cause established businesses to change or adapt their business models. Telecommunication companies in developing countries for example broadened their business to offer an infrastructure to transfer money, because of the lack of banks in rural areas despite the societal demand for the service (Mohammed 2015). Another example is companies producing copy machines who have gone through an intrapreneurial business model innovation process by changing the business model from e.g. per-sale to per-copy. And one of Germany's biggest retailers of clothes, Tchibo, recently introduced a new service which rents out new and used children clothes in various qualities (Sheahan 2018).

The sharing economy business model is often given as the main example for the entrepreneurial business model innovation. Examples are the emergence of the companies such as Airbnb or Uber which built their business model around an existing service or product but added a new and innovative component to it. They also follow an open access and platform model which are often also associated with entrepreneurial business model innovation. Emergence of new technologies such as broadband mobile internet along with smartphones and their applications enabled Uber and similar businesses to become service providers without the need for intermediaries.

Despite its different starting points, both entrepreneurial and intrapreneurial business model innovation is thus often driven by the emergence of new technologies, market pressure or changes in societal needs.

Sustainability from a Life Cycle perspective

Innovation and innovative business models per se however are not linked to an enhanced sustainability performance of a product, service or business. However, to change from our currently unsustainable development towards a more sustainable economy, innovation processes need to be linked to sustainability considerations so as to decouple sustainability impacts from economic growth. However, much like innovation, sustainability is a rather widely used term with various understandings. To have a common understanding of what

constitutes sustainability from a life cycle perspective, Dr. James Fava outlined the key concept of life cycle thinking on the second day of the workshop. He highlighted that “business as usual” was no longer an option because of the scarcity of resources, the constant population growth and the increasing sustainability challenges around the world. He also outlined that in today’s complex world, global value chains carry substantial risks but also opportunities. Taking a life cycle perspective helps to identify, assess and address the risks and opportunities associated with any product or service along its life cycle and thereby helps to make more informed decisions.

A product’s life cycle begins with the extraction of the raw materials and goes through various life cycle phases including production, packaging, transportation, use, maintenance and finally recycling, reuse, recovery or disposal as shown in figure 1. In each of the life cycle phases, different sustainability indicators are assessed and thus a complete picture of a product’s impacts over its full life cycle is developed. Life cycle thinking thus refers to going beyond the traditional production and manufacturing processes and instead considering all the environmental, social and economic impacts over the whole life cycle of a

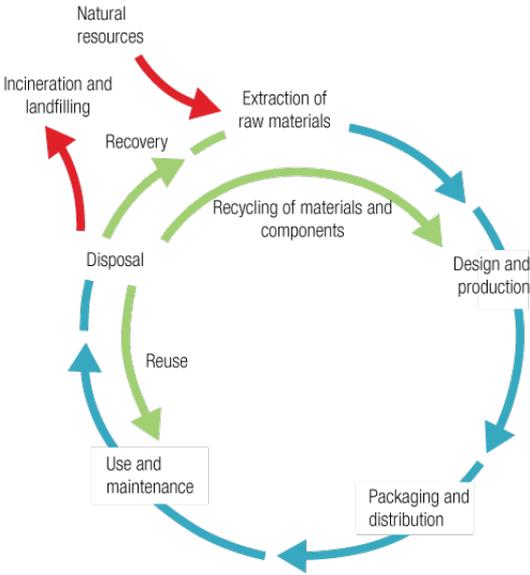


Figure 1: A typical product lifecycle diagramme (Life Cycle Initiative 2018)

product. Taking a life cycle perspective thus helps to understand trade-offs and unintended consequences and thereby enables companies to better understand their sustainability challenges.

As outlined by Andreas Wade, social and environmental life cycle assessment can help guide a societal transformation, through defining framework conditions which enable sustainable innovation. Life cycle thinking helps to apply a holistic perspective to the complex challenges. Environmental and social hotspots can be identified and as a result, sustainable innovations can focus on addressing the actual sustainability challenges in a product’s life

cycle. To maximize the chance to get sustainable innovation right, it thus needs to incorporate a life cycle perspective.

Sustainable Innovation from a Life Cycle Perspective?

As outlined above, sustainable innovation is urgently needed, yet as highlighted by Dr. Fernando Diaz Lopez, there are over 15 different terms and definitions of what constitutes sustainable innovation. Defining sustainable innovation is thus key to help advance and promote the concept on a broader level.

Sustainable innovation thus was defined by the participants as any new or significantly improved process/product/business model that adds value, not just from a monetary perspective, to an organization, product or service which results in an enhanced sustainability performance while adding value to the company.

As highlighted by Andreas Wade, sustainable innovation is specifically needed “for decoupling economic growth from resource consumption along with its environmental pressures.” The sustainability performance in this context needs to be assessed from a life cycle perspective to ensure that the innovation is actually “sustainable”, or to ensure that there are no unintended consequences. Taking a life cycle perspective when assessing sustainable innovation thus helps to design, manufacture, use and manage products, services or organisations at the end of their life in ways to decrease associated environmental impacts in comparison to their previous generation. This is in line with the FSLCI’s definition of Life Cycle Innovation, which states that innovation in operationalizing sustainability efforts should be achieved by taking a Life Cycle Perspective. As such Life Cycle Innovation is not meant to refer to a new approach or method of life cycle assessment or management (Forum for Sustainability through Life Cycle Innovation, 2018).

Jim Fava also outlined that leading companies have found that a truly comprehensive sustainability strategy must take a life cycle based approach to ensure that the full scope of a product’s impacts and benefits are considered

Sustainable Innovation is still Niche but has Potential to Grow

With this definition in mind, participants decided to discuss about how to upscale sustainable innovation. Prof. Dr. Klaus Fichter mentioned that the biggest barrier for sustainable innovation is the fact that they often remain a niche topic. He highlighted that most of the environmental product and service innovations do not exceed market shares of more than 15% (Fichter and Claussen 2016). He thus suggested that only a combination of several drivers like megatrends, science, culture, markets and user preferences, industry and policy could help to transform our global society towards a Green Economy. He also added that regulatory push, regulatory pull, societal push, vision pull, technology push and market pull are key external factors influencing the evolution of sustainable innovation. In general, he noted that technological advancements often drive innovation, but that a more demand-oriented and mission-driven innovation policy and practice (vision pull) are needed.

Participants agreed that to promote sustainable innovation, there is often a need for social change which needs to be embraced by society in order for new product or business models to be successfully implemented. The shift within society from consumer to prosumer or the popularity of customizations are recent examples of a societal shift that enabled the uptake of sustainable innovation in some areas.

Stakeholders for Sustainable Innovation

Participants also agreed that in order to drive sustainable innovation, a good understanding of relevant stakeholders is needed. Stakeholders can equally drive or hamper the application of sustainable innovation processes and hence their roles need to be well understood. The role of top management and / or company founders was perceived as especially important when it comes to implementing sustainable innovation within a company.

In this context insights shared by Elise Naranjo from Einhorn highlighted that the company was founded with the specific objective to provide a better and more sustainable alternative to existing products. The objective of sustainability is thus part of the core DNA of the

company, which is thereby applying different priorities to their business than traditional businesses.

Relevant stakeholders include for example:

- Customers
- Suppliers
- Legislatives/ Policy makers
- Employees (especially the change agents)
- Civil society/ NGOs
- Researches
- Investors
- Financial institutions
- Competitors
- Media

Barriers for Sustainable Innovation

Participants identified a broad range of key barriers to foster and implement sustainable innovation on a larger scale and highlighted issues around:

- Cost
- Lack of awareness & information
- Regulations
- Transition risk
- Consumers
- Scarcity of time & resources
- Cultural differences on acceptance of taking risk (e.g. German mind set is based on trying not to fail and innovation always carries the risk of failing)
- Lack of skills
- Education system (whether or not entrepreneurial thinking is promoted)
- Lack of inspiration and motivation
- Risk of being the first mover (first movers=innovators are more likely to lose out)
- Uncertainty

- Lack of change agents/ supportive ecosystems within the companies

Drivers for Sustainable Innovation

Participants noted that drivers for sustainable innovation are often found to be similar to those who might represent also barriers. Most of the factors that are barriers are also factors that could push companies to innovate and hence lead to sustainable innovation. In general, potential drivers were identified as:

- Competitors and customers
- Cost reduction
- New Regulations
- Collaborative spirit within the company
- Cultural attitudes of the countries/ mindset
- Advantage of being the first mover (first mover is more likely to get a bigger market share than the latecomers)
- Presence of change agents and having a supportive ecosystem within the company
- New market/ community
- New infrastructure and technology opportunities in the market
- Scarcity of time and resources

How to Promote Sustainable Innovation and Life Cycle Understanding to the Companies

Participants underlined the fact that promoting sustainable innovation and life cycle understanding in the companies is important. Participants reiterated the importance of defining what sustainability means for the company as sustainability is a context sensitive term which may have different definitions. If a company can actually define internally why and how sustainability is relevant to them, it is more likely to care about it.

Participants also highlighted the importance of show-casing how sustainable innovation and life cycle thinking could create added value for companies. Companies need to understand that taking a life cycle perspective needs to be a key part of applying sustainable innovation processes to ensure that the innovation indeed is sustainable.

In order to successfully engage with companies on the subject, participants highlighted the need to tailor messages to the language of the various stakeholders within companies that need to be engaged. While the CFO for example needs to be convinced by long-term revenue benefits associated with sustainable innovation, brand management and marketing benefits should be communicated to the marketing team etc. Still, as outlined previously, convincing the management team is essential as organizations will only successfully implement sustainability if it becomes a core target that is promoted across the board and championed by the top management.

Key Take Away Messages from the Workshop:

In conclusion, workshop participants agreed to define sustainable innovation as any new or significantly improved process/product/business model which results in an enhanced sustainability performance while adding value to the company. Bearing this definition in mind, they further concluded that:

1. **Sustainable innovation is needed to solve global sustainability challenges caused by a focus purely on economic growth at the price of global environmental degradation and social inequality.** Business as usual is no option and thus sustainable innovation needs to be applied on a broad scale in order to create a more sustainable future.
2. **A life cycle perspective needs to be applied when assessing the innovation's sustainability performance.** Sustainable innovation can help decouple economic growth from resource and energy consumption when done right.
3. **A good understanding of relevant stakeholders, drivers, barriers and change management actions is needed so as to develop tailored messaging and engagement.** This understanding is key to establish processes that lead to sustainable innovation by engaging with key stakeholders in various contexts and developing critical processes and implementation actions.

4. **More collaboration and sharing is needed among researchers, practitioners and decision-makers in industry and government.** Sustainable innovation can only be achieved when addressed on a collective level. Tools such as platforms for knowledge sharing, exchange of resources and case studies are crucial as well as workshops to integrate new work processes and change mind-sets.
5. **Sustainable innovation needs to be driven by various external factors in order to be successful.** Technological advancement are often key drivers but need to be complemented by societal and regulatory changes and change management strategies within organizations in order to be successful and applied on a large scale.

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