Support Systems for Sustainable Entrepreneurship and Transformation (SHIFT)

Work Package 1: Theoretical Foundation

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Preface

The project SHIFT – Support Systems for Sustainable Entrepreneurship and Transformation – is being carried out in the timeframe 2012-2016 within the first call of the EU research network ECO-INNOVERA,[1] which enables international collaborative projects on eco-innovation that are funded by the respective national funding organisations of the participating research institutions. The goal of the project is to analyse how public, intermediary and private support systems for entrepreneurship have to be changed in order to systematically boost the development and implementation of eco-innovation, and make realistic recommendations for policy makers and important actors of the support system on how to initiate a paradigm change in their supporting schemes.

This report contains the results of Work Package 1 (WP 1) of the SHIFT project. It has been written as a "handbook" for the project team. WP 1 provides a theoretical foundation, an interdisciplinary framework and common, basic methodological approaches for the work to be carried out in the project and its individual work packages. It is based on a collectively developed understanding of the complex topic being researched. In order to ensure that the document reflects the positions and approaches of all participating partners, the act of writing it has been a multi-stage process, in which there were several meetings for discussing the drafted or completed parts and reflecting on the implications for the parts still to be written as well as future work packages. After an initial meeting in December 2012 in Berlin, Ch. 1, Ch. 2, and parts of Ch. 3, which elaborate on the relevant concepts and theories of the scientific disciplines in the project (entrepreneurship theory, innovation theory, design theory and sustainability research) were written. At a meeting in May 2013 in Linköping, the content was revised and a common understanding for the concept of support systems was developed, contributing to the conception of support systems in Ch. 3. Before the final meeting on WP 1 in September 2013 in Helsinki, the overarching framework for the project was elaborated in Ch. 4, based on the previous sections of the document and extensive discussion.

This process has helped the authors to identify gaps and redundancy in the proposed research design underway, which becomes most evident perhaps in the restructuring of some of the work packages. Work Package 5 on the "Role of Design for Sustainability (DfS) for Start-Ups & New Business Networks" will be replaced by one on "Design Service Providers". Work Package 6 on the "Role of Collaboration between Incumbents and Start-Ups in Designing Products and Systems" will be replaced by one on "Other Actors" to be identified along the way. Cluster initiatives have been identified and will feature prominently in Work Package 4 on the "Role of Business Development Organisations".

[1] www.eco-innovera.eu

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List of abbreviations

ADT	German National Incubator Association
AUTM	Association of University Technology Managers
BD	business development
BDO	business development organization
BIG	Business Incubation for Growth
BMBF	German Federal Ministry for Education & Research
BMU	German Federal Ministry for the Environment
BOP	bottom/base of the pyramid
C2C	cradle to cradle
CBA	cost-benefit analysis
CfSD	Centre for Sustainable Design
CI	cluster initiatives
DfE	design for the environment
DfS	design for sustainability
EC	European Commission
Eco-AP	Eco-Innovation Action Plan
EIA	environmental impact assessment
EIO	Eco-Innovation Observatory
EGSS	environmental goods and services sector
EMAS	Eco-Management and Audit Scheme
EMS	environmental management system
ENEC	European Network of Ecodesign Centres
ETAP	Environmental Technology Action Plan
EVCA	European Private Equity and Venture Capital Association
FIBS	Finnish Business & Society
GDI	gross domestic income
GDP	gross domestic product
HEI	higher education institution
IC	innovation communities

ICT	information & communication technology
IES	Institute for Environment & Sustainability
IS	industrial symbiosis
ISO	International Organization for Standardization
IT	information technology
IUCN	International Union for Conservation of Nature
KIC	Knowledge and Innovation Communities
LCA	life cycle assessment
LCC	life cycle cost analysis
LiD	lifecycle design strategy
LCT	life cycle thinking
MBA	master of business administration
MIT	Massachusetts Institute of Technology
MLP	multi-level perspective
MSME	micro, small and medium-sized enterprises
OECD	Organisation for Economic Co-operation and Development
NPD	new product development
PPP	public private partnership
PSS	product service systems
R&D	research and development
RDI	research, development and innovation
RoHS	Restriction of Hazardous Substances
SBE	sustainable businesses and entrepreneurship
SC	sustainable consumption
SCP	sustainable consumption and production
SEA	strategic environmental assessment
SETAC	Society of Environmental Toxicology & Chemistry
SIPS	sustainable infrastructures, products and services
SHIFT	Support Systems for Sustainable Entrepreneurship and Transformation
SHOK	Strategic Centre for Science, Technology and Innovation
SL	sustainable lifestyles

SME	small and medium-sized enterprises
SNM	strategic niche management
SUSCIN	Sustainable Supply Chains through Innovation
Swentec	Swedish environmental technology council
TBL / 3BL	triple bottom line approach
TM	transition management
UAS	university of applied sciences
UCD	user-centred design
UNCSD	United Nations Conference on Sustainable Development
UNEP	United Nations Environment Programme
VC	venture capital
VTT	VTT Technical Research Centre of Finland
WBCSD	World Business Council for Sustainable Development
WBGU	German Advisory Council of Global Change
WEEE	Waste Electrical and Electronic Equipment
WP	work package
WWF	World Wide Fund

1 Introduction to SHIFT

Klaus Fichter & Linda Bergset

1.1 Sustainability Challenges & the Contribution of Eco-Innovation and Sustainable Entrepreneurship

The need to bring together and make compatible the seemingly irreconcilable requirements of a well-functioning economy and a sustainable global development has increasingly been given due attention in the scientific community, the political sphere and among economic actors. Overwhelming challenges in both areas – such as climate change, biodiversity loss and water scarcity, on the one hand, and financial and economic crises, on the other hand – highlight the urgent need to think in new ways. Sustainability can therefore be considered to be the main challenge of the 21st century and requires a transformation and radical shifts in lifestyles and the way we design, produce and use goods and services. Sustainability is a key factor in the next global wave of innovations.

Eco-innovation is increasingly considered to be the key to Europe's future competitiveness within the framework of sustainable development.[2] An increase in development of sustainable products and services in a life-cycle perspective, which substitute unsustainable products, may lead to a structural change of the economy towards more sustainability that is better adapted to actual needs rather than a mere increase in production and economic growth as a goal in itself. In innovation that both creates business opportunities as well as benefitting the environment by preventing or reducing their impact, or by optimising the use of resources, sustainable entrepreneurship in green start-ups and innovative micro enterprises and SMEs is a driving force.

In order for eco-innovation to become mainstream, adapted support systems for entrepreneurship are needed. An emphasis on environmental and societal issues in entrepreneurship support will, on the one hand, enable and encourage such entrepreneurs who are in the process of developing more sustainable solutions and, on the other hand, incentivise entrepreneurs across the board to recognise product and service impact at an early stage and thus reduce negative impact wherever possible. Adapted support systems for sustainable entrepreneurship thus have the potential to provide effective leverage and acceleration in the transition towards a sustainable economy.

1.2 The Goals of the Project

The project SHIFT analyses the role of sustainable entrepreneurship in the emergence and implementation of eco-innovation. The aim of the project is to improve the understanding of how public, intermediary and private support systems for entrepreneurship have to be changed in order to boost the development and implementation of eco-innovation. The objectives can be divided in two:

[2] Cf. Environmental Technology Action Plan (ETAP) of 2004 and Eco-Innovation Action Plan (Eco-AP) of 2011 (cf. European Commission 2011).

(1) Evaluate how existing support systems for conventional entrepreneurship can be transformed to support sustainable entrepreneurship.

(2) Evaluate how existing support systems for sustainable entrepreneurship (good practice) can be transferred to and spread in other countries and contexts.

The target of the SHIFT consortium is to make realistic recommendations for policy makers and important actors of support systems like universities, incubators, business development organisations, financial institutions etc. how to change and improve their support schemes and activities in order to boost the development and implementation of eco-innovation. This might require a paradigm change in the support system.

1.3 The Units of Analysis

There are multiple units of analysis in SHIFT and these depend in part on the work packages. As the overall focus of the project is on changing the support systems for entrepreneurship, these public, intermediary and private support systems are necessarily crucial and primary units of analysis. Support systems comprise all actors, institutional settings and resources that help entrepreneurs in successfully generating and implementing innovation. These may differ substantially from one country context to the next and therefore need to refer to these in the specific cases. Figure 1 and Figure 2 as well as Table 1 show a graphical representation of the support systems for entrepreneurship and innovation in the countries participating in the project: Germany, Finland and Sweden.

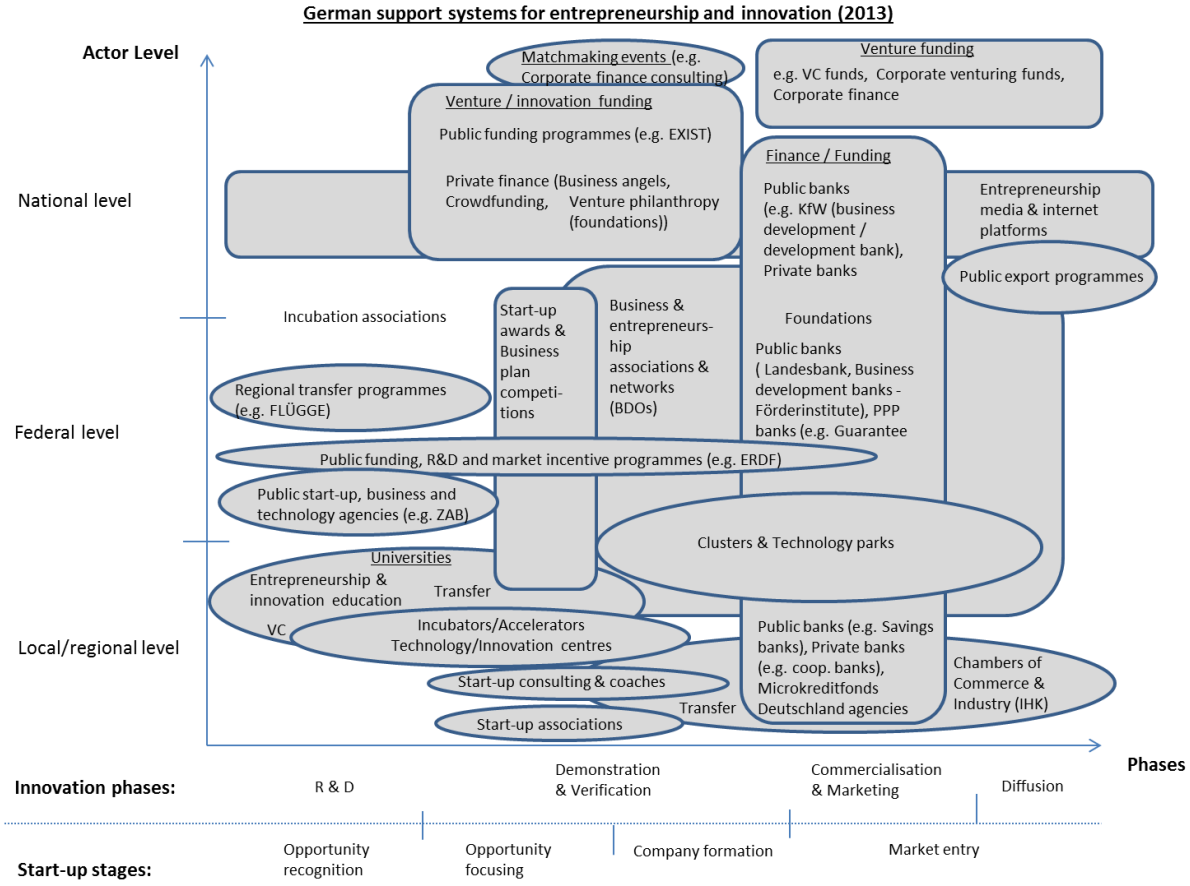

Figure 1: Overview of German support systems for entrepreneurship and innovation. Source: Authors (Bergset, Fichter and Geier).

Table 1: Overview of Finnish support systems for entrepreneurship an innovation (preliminary classification of actors). Source: Authors (Fuad-Luke, Kuisma and Viancha)

	SHIFT WORK PACKAGES					
	Universities (WP2)	Incubators & Business Platforms (WP3)	BDOs & cluster initiatives (WP4)	Design Service Providers (WP5)	Private and public funding (WP6)	Collaboration & other organisations (WP7)
Publicly funded national services	Basic & applied research in universities, UAS and sector research institutes; Innovation, incubation, business development services	EnterpriseFinland; Incubation and RDI services in universities and UAS, e.g. ACE, Aalto Start-up Centre, AppCampus;	Finpro (internationalisat.); EnterpriseFinland; BD services in universities & UAS, e.g. Aalto Protomo, Factories;	Joint projects with universities, UAS and sector research (LCA, DfS etc.); National Board of Patents and Registration (Design Rights, Trademarks, Patents etc)	Tekes (grants & programmes), Sitra	Tekes, Sitra (events&projects); Service nets (Team Finland, FinNode); Ministries;
Publicly funded regional services	University Consortiums (6);	Science Parks (29); Technology incubators in science and business parks (29); Novago Business Development etc.; Uusyrityskeskus (41)	Science Parks (29); Regional development communities; Culminatum Innovation Ltd; LADEC Oy etc; Uusyrityskeskus (41)	Forum Virium Helsinki (project collaboration)	ELY-centres (15); Regional Councils (18 / allocation of EU funding for various purposes etc.);	UrbanOffice; Helsinki Business Hub;
Investors & financiers		Tekes (grants & programmes); Finnvera; VC; Crowdfunding	Tekes (grants & programmes); Finnvera; VC; Crowdfunding		Tekes (grants & programmes); Banks; Finnvera; VC organisations; Private Investors (Business Angels); Crowdfunding	Crowdfunding

Profes-sional & trade organisa-tions	(Aalto Entre-preneurship Society Aaltoes)		The Foundation for Finnish Inventions; Cleantech Fin-land; Cleantech cluster; Green Net Finland;	The Foun-dation for Finnish Inventions; Design Forum Finland;	The Foun-dation for Finnish Inventions;	Aaltoes; Finatex; Design Forum; Orna-mo; Cleantech Finland; Green Net Finland; FIBS;
Entrepre-neur asso-ciations & chambers of com-merce						Suomen Yrittäjät; Su-omen Ekoyrittäjät; Confederation of Finnish Industries EK; FinnCham network and Chambers of Commerce (19)
Consult-ants / private develop-ment ser-vices	(Startup Sau-na)		Startup Sauna; Enterprise-Helsinki etci; Ecobio; CRnet; Excellence Finland;	(National Board of Patents and Reg.); Ecobio; VTT SULCA (LCA-software);		
Other services				Peloton (by Think Tank Demos);		Crowdsourc-ing; Think tanks; Do tanks; Media services; Events

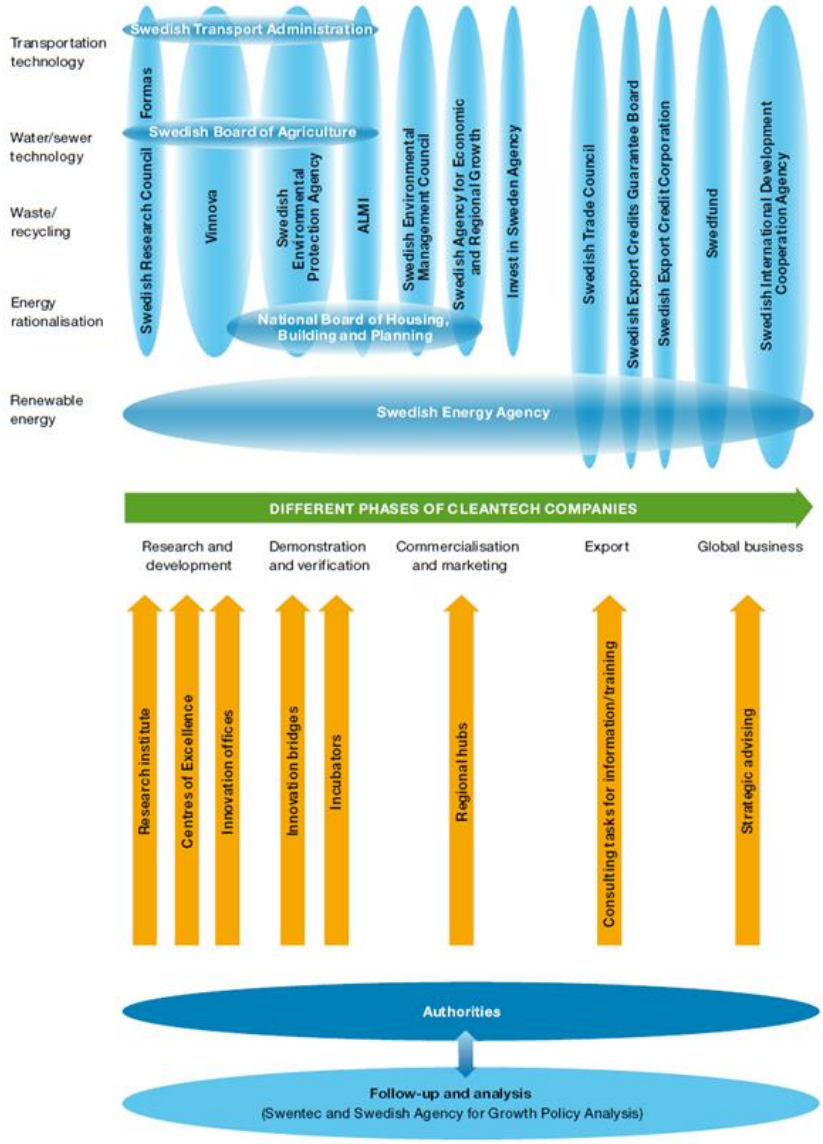

Figure 2: Overview of Swedish support systems for entrepreneurship and innovation. Source: adapted from Swentec (2008, 14.).

Figure 2 above depicts in a simplified manner key public actors providing direct and indirect support to the Swedish cleantech sector, which is one key area for eco-innovation. The upper part of the illustration shows actors supporting different segments within the cleantech sector and also their involvement in the different phases in the development of cleantech companies. The lower part of the illustration shows other actors financed by authorities from which cleantech companies can also receive support. Due to the mutable nature of support systems, the various actors, their programmes depicted might have been modified, terminated and or new programmes initiated. E.g. The Swedish environmental technology council (Swentec) has been decommissioned. Also, ‘‘Invest in Sweden’’ and the ‘‘Swedish Trade Council’’ have merged into a new organization called Business Sweden.

These three overviews indicate the complexity and the multitude of actor types and approaches of importance in support systems for entrepreneurship.

As the aim of the project is to help improve entrepreneurship support for sustainable, green start-ups as well as innovative micro, small and medium-sized enterprises (MSMEs) that develop eco-innovation, these organisational entities will also be units of analysis. These companies will be differentiated according to industry as well as the age of the industry (emerging, growing and mature). An amended OECD/Eurostat classification of the so-called Environmental Goods and Services Sector (EGSS) can help in distinguishing different types of eco-innovation under analysis (cf. Appendix 2). It should be checked whether EGSS also applies for minority and non-mainstream eco-innovation sectors like e.g. eco-fashion, eco-mobility services etc.

Both innovation and entrepreneurship processes are non-linear and complex processes. In order to incorporate a temporal perspective, the analysis of the companies will factor in the stage of the entrepreneurial life-cycle at which the organisational entity is in, as entrepreneurs experience different challenges and opportunities depending on what stage they are in.

In terms of the levels of analysis, the project thus aims at an exploration of the micro (entrepreneur, company, stakeholders, intermediaries, and individual support organisations), meso (e.g. region, cluster) and macro levels (e.g. aggregated support systems, country/EU contexts) as well as the interaction and interdependence between these.

Work Package 1 concisely presents key insights from the scientific disciplines that the project draws on – sustainability theory, transformation theory and systems theory – in order to create a common conceptual framework and point of origin for the three partners and to provide a theoretical foundation for the analysis of the individual parts of the support systems as explored in Work Packages 2-7.

2 The Theoretical Foundation of SHIFT

2.1 Introduction: Three Domains of relevant Research and Knowledge

Linda Bergset & Klaus Fichter

When studying the conditions for emergence of eco-innovation in the context of entrepreneurship, three large and well-established domains of relevant research can be drawn on: sustainability research, transformation theory and systems theory. First, sustainability research provides a context and manner of distinguishing in a project which deals not simply with innovation, but *eco*-innovation and not with entrepreneurship, but with *sustainable* entrepreneurship. The focus on sustainability in economic activity introduces different challenges and opportunities compared to that of "classical" entrepreneurship and innovation. Sustainability research is thus needed to give due attention to critical factors such as externalities, rebound effects, decoupling etc.. Second, transformation theory is needed as the project deals with transformation and change in two ways. The topics of the research project – innovation and entrepreneurship – are in themselves modes of transformation at the micro-level. Also, as it is an explicit notion of the project that there is a societal goal to move towards a sustainable economy and society, transformation theory provides a context for understanding such processes at a meso- and macro-level. Third, as the main focus of this project lies on understanding support systems in all their comprehensiveness and on transforming them, systems theory may help simplify the complexity of such systems without reducing the richness of understanding. Figure 3 provides an overview of the theoretical foundation underlying the research project SHIFT.

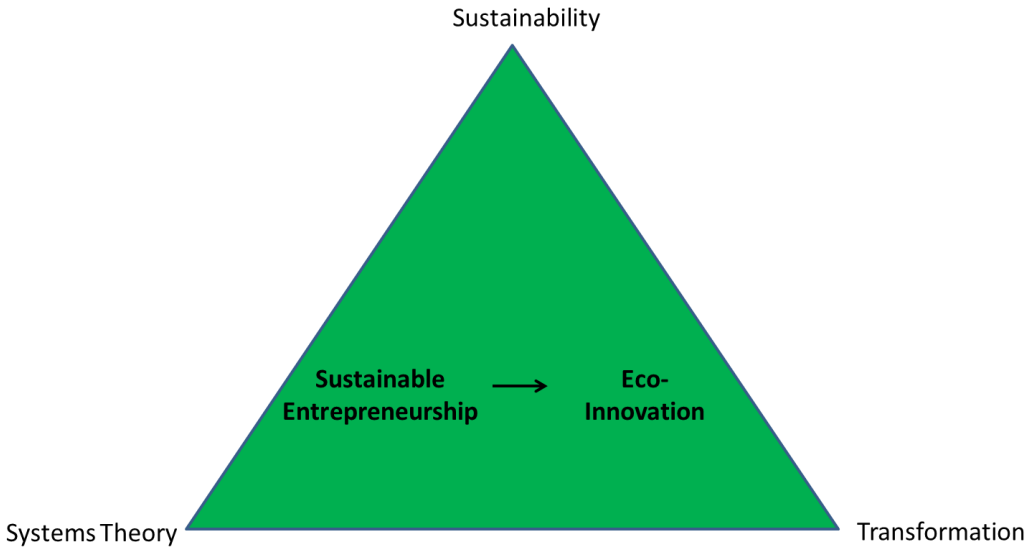

Figure 3: Representation of the theoretical foundation underlying SHIFT. Source: Authors.

2.2 Transforming the Economy

2.2.1 Transformation Theories

Mika Kuisma

2.2.1.1 Introduction

By the term "*Transformation*" we mean a change or alteration, especially a radical one. It is the creation and change of a whole new form, function or structure. In terms of quality, transformation is usually considered a change for the better, but instead of incremental improvements, transformational change means more radical shifts in mindset and actions. Transformation has several meanings in various fields of science and society that are not always related. Typically, science, society or organizations go through several stages in transforming themselves.

For example, the need for *organizational transformation* may be caused by various external changes in the market such as an organization's products or services being out of date, or new regulations coming into force. Business transformation is achieved by realigning work practices, how the organisation is structured and how technology is used. Companies may also transform their value chain into a more dynamic business network of customers, partners, and suppliers to stay ahead of competitors (*Business network transformation*). In a business network, companies collaborate closely to gain deeper insights on the needs of their customers in order to be able to respond quickly to changes. *Transformation design* in turn is a process that seeks to create desirable and sustainable changes in behavior and form of e.g. individuals and systems often for socially progressive ends (Burns, Cottham, Vanstone & Winhall, 2006). It is a multi-stage, iterative process applied to big, complex (social) issues applying design skills in non-traditional territories, and it often results in non-traditional outputs. It draws from a variety of design approaches as well as non-design disciplines.

Sustainability has become a buzzword of business and societies in the last two decades. Despite of this often rather loose use of the concept, sustainability has also been considered a springboard of profound and imperative social transformation. Perhaps nothing similar has been witnessed since the shift from an agricultural society to industrial society during the Industrial Revolution in the 18th century (e.g. Edwards, 2005). Sustainability has also been considered as a key factor in the next global wave of innovations during the next few decades, after the previous wave dominated by digital and IT technologies (Worldwatch Institute, 2008). The anatomy and characteristics of such major scientific or social “revolutions” has been analysed and described by various theoretical approaches. In this chapter, we briefly describe three such theoretical starting points for analyzing scientific and other societal transformation. The first, revolutionary science by Kuhn (1962) introduces the concept of Paradigm change or *Paradigm shift*. Secondly, *The Great Transformation* in turn refers to a book by Karl Polanyi where Polanyi analyzes the economic and social changes brought about by the "great transformation" of the Industrial Revolution. Thirdly, we review the predominantly Dutch school of thought, *Transition management,* which encompasses the change towards a more sustainable society and embodies questions of how this goal should be achieved.

Transformation is also an overarching concept for the SHIFT project. Transformation is taking place in different modes, one example of which is innovation, the development and implementation of a radically new or significantly improved product, process or practice that lead to major discontinuities in thinking and acting or in the use of technologies. Based on the assumptions and concepts from evolutionary economics, also other basic types of change can be distinguished (cf. section 2.2.2.2).

2.2.1.2 Key Theories and Approaches

Paradigm shift

The concept of *paradigm shift* (or revolutionary science) was first defined and popularized by Thomas Kuhn in his book The Structure of Scientific Revolutions (1962) as a change in the basic assumptions, or paradigms, within the ruling theory of science. A paradigm is typically defined as a set of assumptions, concepts, values, and practices that constitutes a way of viewing reality for the community that shares them, especially in an intellectual discipline. Paradigm shift in turn is often defined as a fundamental change in an individual's thinking or a society's view of how things work in the world. Classical examples of such changes from one way of thinking to another are for example the shift from earth to sun as the centre of the solar system, and heart to brain as the seat of thinking and feeling. Since the 1960s, the term has also been used in numerous non-scientific contexts to describe a profound change in a fundamental model or perception of events, even though Kuhn himself restricted the use of the term to the hard sciences. The concept entered the business world during the high-tech boom in the 1990s, and it has been abused in the marketing speak of business. Paradigm shift can often be considered a rather meaningless buzzword in this context.

Kuhn (1962) argued that science evolves in phases. In the first, pre-paradigm phase there is no consensus on any particular theory. Instead of consensus, there are several incomplete theories. In the second phase a single mental framework becomes the dominant paradigm, and "normal science" begins. Most scientists accept the prevailing paradigm, solving their puzzles within the assumptions of the dominant paradigm. However, as time goes on, anomalies accumulate and the dominant paradigm is stretched and adjusted in an effort to resolve them. In the third phase revolutionary science begins as some scientists start exploring alternative new ideas to the old self-evident assumptions, and they start developing a new conceptual framework that would present a better way of resolving the anomalies. As the new but still incomplete framework contains gaps and anomalies, it will normally face strong resistance from the scientific community, and even other actors in the society. The revolutionaries are attacked for being theoretically incomplete, and the revolutionaries attack the dominant paradigm for the anomalies. Such a period of conflict may last for decades. Finally, when most scientists agree that the old theory should be replaced by the rival theory, a paradigm shift has occurred. Naturally, some individuals may continue to defend the old paradigm. A fundamental theme of Kuhn's argument is that the typical development pattern of a mature science is the successive transition from one paradigm to another through revolutionary process. It is often the final result of the long process that is meant when the term *paradigm shift* – the (radical) change of worldview – is used, without reference to the specificities of Kuhn's argument.

The term “paradigm shift“ has found uses in other contexts, keeping up the fundamental idea of a major change in a certain thought pattern, e.g. a radical change in personal beliefs or system of organizations replacing the former way of thinking or organizing with a radically new way of thinking or organizing. The concept has also been developed for technology and economics in the identification of new techno-economic paradigms as changes in technological systems that influence the behaviour of the entire economy. This concept is linked to Joseph Schumpeter's idea of creative destruction. Examples include the move to mass production and the introduction of microelectronics, i.e. the introduction of the personal computer (PC) and the Internet have impacted the shifts in both personal and business environments from mechanistic industrial society to a service-based information society.

As mentioned above, the term paradigm shift has become an abused buzzword in business (marketing and management), now even with recommendations to avoid the use of it. However, the parallels of scientific paradigm shift in terms of anomalies are apparent in the basic mental model of contemporary management. Examples of such anomalies or challenges to modern management way of thinking have been many: the need for more attention to the needs of the customer, the importance of values such as trust and sustainability, and the need for more attention to the environmental and social impact of the operations etc. These anomalies may in practice mean game-changing transformations in industries that companies should not miss (e.g. Denning, 2012).

The great transformation

The Great Transformation refers to a book by Karl Polanyi (2001, original 1944) on the rise of the market economy in England.

In his classic work Polanyi analyzed the economic and social changes brought about by the "great transformation" of the Industrial Revolution. Modern market economy and the modern nation-state should be understood not as discrete elements, but as the single human invention he calls the "Market Society". Polanyi argued that the development of the modern state went hand in hand with the development of modern market economies and that these two changes were linked in history. For Polanyi, these changes implied *the destruction of the basic social order* that had existed throughout all earlier history, which is why he emphasized the greatness of the transformation.

Polanyi made a distinction between markets as a tool for ease of exchange of goods and Market Societies. Market Societies are those where markets are the paramount institution for the exchange of goods through price mechanisms. Polanyi argues that three general types of economic systems existed before the rise of a society based on a free market economy:

Redistributive: Trade and production is channelled to a central entity such as a tribal leader or feudal lord and then redistributed to members of their society.

Reciprocity: The exchange of goods is based on reciprocal exchanges between social entities. On a macro level this would include the production of goods to gift to other groups.

Householding: Economies where production is centred on individual household production. Family units produce food, textile goods, and tools for their own consumption.

These three forms of economic organization were based on the social aspects of the society they operated in and were explicitly tied to the social relationships. Polanyi argued that these economic forms depended on the social principles of Centricity, Symmetry and Self-Sufficiency. Markets existed as an auxiliary avenue for the exchange of goods that were otherwise not obtainable.

Polanyi argued that the construction of a "self-regulating" market necessitates the separation of society into economic and political realms. He did not deny that the self-regulating market has brought "unheard of material wealth", but he suggests that this is too narrow a focus. Polanyi saw *economic and social problems as inherently linked*.

The currently necessary remodelling of economy and society towards sustainability has been labelled for example by the German Advisory Council on Global Change as a „Great Transformation". In terms of the profoundness of impact, it is considered comparable to two other fundamental transformations in the world history, namely the invention and spreading of farming, and the transition from agricultural to industrialised society that Polanyi called the "Great Transformation" (German Advisory Council on Global Change, 2011).

Transition management

Before starting to deal with the concept of transition management, we will briefly consider the distinction between transformation and transition. Generally, a transition is a change from one thing to the next, either in action or state of being, whereas a transformation is a dramatic, radical change. Transformation can be considered one specific type of transition. For example, in their typology of sociotechnical transition pathways, Geels and Schot (2007) classify "transformation" as one of the four transition pathway types. The other three transition pathway types are "technological substitution", "reconfiguration" and "de-alignment and re-alignment".

The terms "transition" and "transition management" are often used to describe the change towards a more sustainable society and embody questions of how this goal should be achieved. By definition, transitions are important changes in functional systems, transformation processes in which existing structures, institutions, culture and practices are broken down and new ones are established. Societal transitions are defined as processes that structurally alter the culture, structure and practices of a societal system (e.g. Loorbach, 2007). The concept has been applied to a variety of systems to describe non-linear shifts between different states. The transformation processes take a very long time to materialize (1-2 generations), but partial processes such as changes in thinking or innovation can occur in a shorter period of time. Transition from sailing boats to steam ships, and the shift from coal to natural gas for residential heating are examples of past transitions.

The foundation for a new field of transition studies was laid in the Netherlands in the beginning of the millennium, as Rotmans, Kemp and others (2000, 2001, Chappin & Ligvoet 2012) introduced the transition concept in the area of sustainable development, governance and policy. Transition processes have been studied from a variety of system perspectives, such as socio-technical systems and innovation systems. Between the perspectives on transitions there are also basic commonalities: the systems are open and coevolve with outside environment, the changing environment influences the system, and the system exhibits non-linear behaviour to be able to adapt to the environment. Under certain circumstances, the environment and the system are so far out of tune that a gradual adapta-

tion is no longer sufficient. Crises undermining the dominant structure in the system occur and through a transformation period a new structure emerges.

Transitions can be described in terms of “degradation” or “breakdown”, versus “build up” and “innovation” (Gunderson & Holling, 2002) or in terms of “creative destruction” (Schumpeter, 1934). The central assumption is that social structures experience long periods of stability and optimization followed by relatively short periods of structural change. In this process, existing structures (values, institutions, regulations, etc.) fade away while new ones emerge (Loorbach, 2007). Hence, a transition is a process of structural social change from one relatively stable system state to another via a co-evolution of markets, networks, technologies, institutions, individuals etc. It can be accelerated by one-time events, such as large accidents like Chernobyl, or by a crisis, but it is not caused by such events only. The transition has been described to consist of four phases, represented by an S-shaped curve (e.g. Loorbach, 2007) – the predevelopment, the take-off, the acceleration (or breakthrough) and the stabilization phases. Behind this S-curve, multiple and interrelated innovations take place at a different speed and level. Transitions are the result of interacting system innovations, which in turn result from product and process innovations. So, qualitatively different phases in transitions are caused by multiple changes at different levels.

Transition management presents a model of such co-evolution, as sustainable development requires changes in socio-technical systems and wider societal change in beliefs, values and governance (Kemp et al., 2007). The central level in the model is the meso-level on which the so-called regime is located (see figure below). The term regime refers to the dominant culture, structure and practice embodied by physical and immaterial infrastructure, e.g. roads, power grids, as well as actor-networks, power relationships, and regulations. The institutionalized structures give stability to the system, and they guide actors’ decision making and behaviour. The regime has certain rigidity that usually prevents innovations from altering the structure fundamentally.

Hence, the dominant logic and practice, and the institutionalized structures will form a barrier that new ideas and technologies have to overcome in order to make transition possible. Path dependency can be referred to as a comparable concept to this prevention of innovations from altering the structure. Path dependencies occur because it is often easier or more cost-effective to simply continue along an already set path than to create an entirely new one, even if newer, more efficient products or practices are available. Path dependence is the dependence of economic outcomes on the path of previous outcomes, rather than simply on current conditions. In a path dependent process, "history matters". For example, the path dependence of dominant energy systems is often referred to as a barrier to the diffusion of sustainable electricity (e.g. Lafferty & Ruud, 2008).

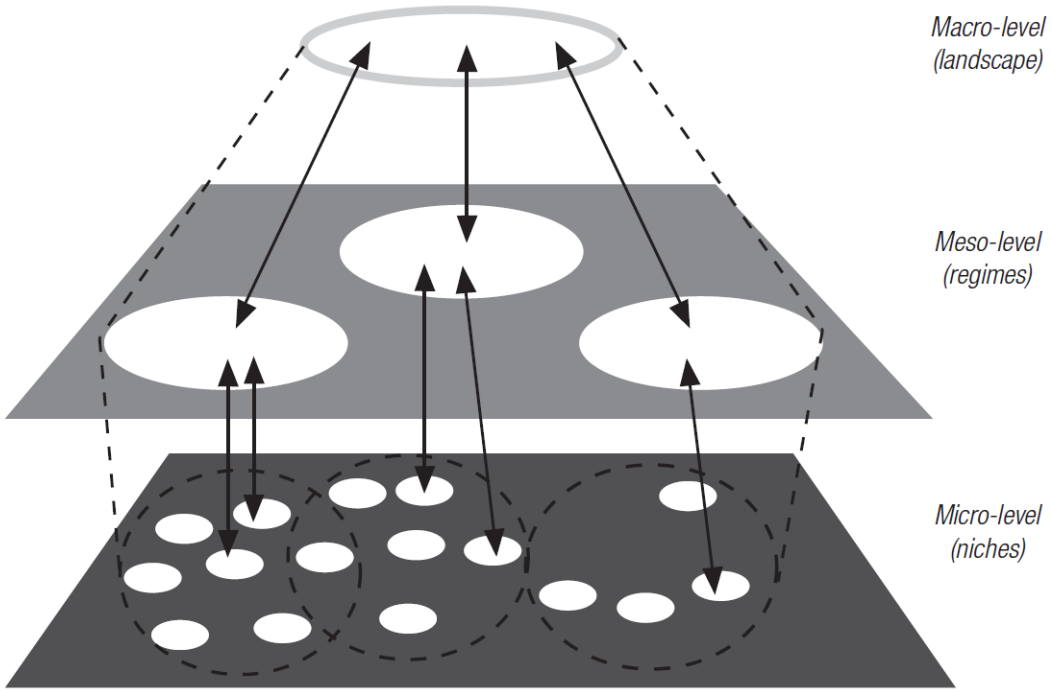

Figure 4: The multilevel model and the interaction between different scale-levels. Source: Loorbach (2007, 20).

On the micro-level, inside the so-called niches, novelties are created, tested and diffused. Examples of such novelties are new technologies, rules and legislation, organizations or even new concepts and ideas. The landscape level is the overall societal setting consisting of social values, political cultures, built environment and economic development and trends. The processes of change occur on this level, which typically develops autonomously, but directly influences the regime level as well as the niches by defining the room and direction for change.

Key principles of transition management as a form of governance:

- it seeks to widen participation by taking a multi-actor approach in order to encompass societal values and beliefs (not all companies will contribute to a transition, but once a new development takes shape, others will follow, including companies that invested in the old system)
- it takes a long term perspective (between 1-3 generations) creating visions in which short term objectives can be identified
- it is focused on learning at the niche level, experiments are used to identify how successful a particular pathway could be (transition management is not so much concerned with specific out-comes, but rather with mechanisms for change)
- a systems thinking approach which identifies that problems will span multiple domains, levels and actors (systems innovation and system change are type of change that is sought)

- the government acts as a process manager, dealing with issues of orientation and adaptation of policy

Hence, transition management is a multilevel model of governance which shapes processes of co-evolution using visions, transition experiments and cycles of learning and adaptation. It helps societies to transform themselves in a gradual reflexive way through processes of variation and selection, the outcomes of which will promote further change (Kemp et al., 2007).

A different but complementary approach to transition management aiming at achieving sustainable development and innovation is Strategic Niche Management (SNM). It refers to the process of deliberately managing niche formation processes through real-life experiments. While SNM focuses on niche management (small to large / bottom up), transition management focuses on system management (large to small / top down). The core idea of SNM is that through experiments with new technologies and new socio-technical arrangements processes of co-evolution can be stimulated (Hoogma et al., 2002). Technologies – for example electric vehicles or smart cars - as well as the contexts (user preferences, networks, regulation, complementary technologies, expectations) in which they develop are worked upon simultaneously. In other terms, SNM aims at aligning the technical and the social. As a consequence new, more sustainable patterns might emerge, partly embodied in hardware (new technologies) and in new practices based on new experiences and ideas. Such experiments can be envisaged as (part of) a niche in which technologies are specified and consumers are defined and concretized. Experiments make it possible to establish an open-ended search and learning process, and also to work towards societal embedding and adoption of new technology (Hoogma et al., 2002). It is thus based on the assumption that user needs and wants are not fixed. Rather, consumer wants are based on their reflection of what they experienced in the past, new experiences may alter perceived needs.

2.2.1.3 Discussion

In this chapter we have reviewed theories and concepts that model and describe transformation, i.e. radical and profound changes in mindset and actions in the society. The first of the theories has its roots in Kuhn's work (1962) on the analysis of change in the basic assumptions (paradigms) of the ruling theory in science. Since the 1960s the term "paradigm shift" has found uses also in other contexts than science, keeping up the fundamental idea of a major change in e.g. personal beliefs or system of organizations that replace the former ways of thinking or organizing. A starting point for the second of the transformation theories was Polanyi's analysis on the economic and social changes due to the destruction of the ancient basic social order that took place during the industrial revolution. Central in Polanyi's thinking is the inherent linkage between economic (market) and social development. The third theoretical framework linked to transition and transition management. This theoretical framework has its roots in the late 20th early 21st century Netherlands, where the concept of transition was introduced in the area of sustainable development, governance and policy (Rotmans, Kemp et al.). Transition management presents a model of the co-evolution of interacting system innovations resulting from multiple product and process innovations. The multilevel model describes the interaction between changes on micro, meso and macro levels and explains change in socio-technical systems and ultimately also change in beliefs, values and governance. It seems that

transition management is an efficient tool for governance and change to promote sustainability. Design approaches' can encourage participation in these multi-actor support systems to harness a collective intelligence. Design approaches can also provide fresh ways of identifying systemic problems.

The transformation models or thinking frameworks seem to share some similar features. First, the time horizon for a transformation, be it a paradigm shift in science or a transition in technology, seems to be long. Even though changes in an individual's thinking may occur in a shorter period of time (days, months, years), transformation processes like paradigm shifts or technological transitions seem to take a rather long time to materialize (decades or even generations). Secondly, transformation needs agents of change. Without them, no change will take place or the transformation process would become even slower. Thirdly, in the development phase and start phase of a new paradigm or thinking framework, it will always face resistance by dominant paradigm, culture, structure and practice. This is also likely to e.g. decelerate the diffusion of new thoughts, technologies and practices promoting sustainability in the society.

2.2.1.4 Conclusion

Transformation is a central concept in the SHIFT project. Generally, a transformation is a dramatic, radical change. Transformation may take place in different modes, one example of which is innovation, the implementation of a radically new or significantly improved product, process or practice that lead to major discontinuities in thinking and acting or in the use of technologies. Based on the assumptions and concepts from evolutionary economics, also other basic types of change can be distinguished (cf. section 2.2.2.2).

The transformation models offer relevant perspectives for the SHIFT project in terms of the timeframe and mechanisms of change in the thinking framework (such as science) or a transition in technology. Although specific radical innovations or changes in an individual's thinking may occur in a rather short time, revolutionary transformation processes in the society (paradigm shifts or technological transitions) seem to take a rather long time to materialize as the diffusion of new thoughts, technologies and practices promoting sustainability in the society faces resistance by dominant paradigms, structures and practices. The time horizons for the different actors of the support system are also different. For example, the basic research in the universities usually has a long time horizon, whereas the actors in the funding system typically require positive results with quick steps.

The potential changes in support systems may face similar resistance in practice. What is more important, the diffusion of eco-innovations from start-ups and MSMEs are very likely to be hindered by the resistance from dominant business structures and practices in the society, e.g. procurement policies, resembling the first phases of emergent paradigms in science. Transformation needs agents of change. Without them, no change will take place or the transformation process is likely to become even slower.

The *transition management*'s model of governance seems very interesting in the context of the SHIFT project. TM frames and shapes the coevolution of system innovations resulting from product and process innovations (multiple changes at different levels). This is said to help societies to transform themselves gradually through processes of variation and selection, and promote further change.

Sustainable development requires such changes in socio-technical systems and also changes in beliefs, values and governance.

2.2.2 Innovation Theory

Klaus Fichter

The SHIFT-project focuses on "eco-innovation". This requires clarification of what "innovation" is and raises the question of how innovation theory can contribute to the understanding and explanation of eco-innovation and the role of entrepreneurship in the innovation process.

2.2.2.1 The Term "Innovation"

Since the introduction of the innovation concept in economic theory by Schumpeter (1911/1934) more than a century ago, the term "innovation" has experienced a wide array of conceptions and interpretations (Hauschildt 2004, 3 ff.). The definitions range from focussing on the feature of discontinuity (Schumpeter 1934), the degree of novelty[3] (Barnett 1953, 7), the perception of newness by individuals or a unit of adoption[4] (Rogers 2003, 12) to the focal aspect of successful implementation of novelty in the economic and social spheres[5] (EC 2003, 7). Some definitions limit the term "innovation" to the implementation of novelty, while others also include the process of developing a novel solution (Fichter and Clausen 2013, 34). The development process comprises activities like idea generation, idea assessment, R&D, prototyping and testing, business model development etc. The term "innovation" should not be limited to technical novelties, but should be conceptualized in a broader sense as the "development and implementation of a novel technical, organizational, business related, institutional or social solution that leads to significant change." (Translated from Fichter and Clausen 2013, 34). Since the development of novel technologies, products (goods and services), processes and practices play a key role in SHIFT, the following understanding of "innovation" will be applied in the project:

> *"Innovation is the development and implementation of a radically new or significantly improved product, process or practice which leads to major discontinuities in thinking and acting or in the use of technologies, objects and their performance." (Author)*

For empirical research on innovation, the aspect of delineation and measurability is of great importance. A particularly helpful definition is provided by OECD and EUROSTAT (2005). In their "Oslo Manual", which is concerned with the collection of innovation data at the level of the firm (OECD and

[3] "An innovation is … any thought, behavior or thing that is new because it is qualitatively different from existing forms." (Barnett 1953, 7).

[4] "An innovation is an idea, practice or object that is perceived as new by an individual or other unit of adoption." (Roger 2003, 12).

[5] The Commission of the European Communities defines innovation as "the successful production, assimilation and exploitation of novelty in the economic and social spheres." (EC 2003, 7). The Innovation Unit of the UK Department of Trade and Industry defines the term as follows: "Innovation is the successful exploitation of new ideas." (Tidd and Bessant, 2009, 16).

EUROSTAT 2005, 16), the term innovation is related to business organizations and is defined as follows:

> *"An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations." (OECD and EUROSTAT 2005, 16)*

Since this definition does not define "innovation" in general, but relates the term to business organizations as innovators, OECD and EUROSTAT actually define what can be called "business innovation".

The Manual deals with changes that involve a significant degree of novelty for the firm. It excludes changes that are minor or lack a sufficient degree of novelty. Four types of innovations are distinguished: product innovations, process innovations, marketing innovations and organisational innovations (OECD and EUROSTAT 2005, 47). From the viewpoint of SHIFT the definition is suitable, because the project is focussing on business organizations as innovators. Nevertheless, the interpretation of the term should not be limited to the perception of newness by companies, as it is the case in the Oslo Manual, but should include all kind of adopters including consumers, government and educational and scientific organizations. Furthermore, the term should not be limited to the "implementation" of novelty, but should also include the development phase (cf. above). With this extension of understanding the definition provided by OECD and EUROSTAT (2005) can be used in the SHIFT project and can be marked as "business innovation".

2.2.2.2 Innovation as a Specific Mode of Change

Innovation is a specific mode of change. It involves a significant degree of novelty and is combined with relevant discontinuities in thinking and acting or in the use of technologies, objects and their performance. For the understanding of the specifics of innovation as well as from the viewpoint of sustainability and the promotion of eco-innovation, it is important to realize that innovation is only one of several different forms of change. Based on concepts and assumptions from evolutionary economics, four basic types of change can be distinguished (Fichter & Clausen 2013, 85 f.):

- *Variation*: Existing technologies and practices are gradually changed. This can lead to minor improvements and is usually part of continual improvement processes in companies and other organizations, sometimes embedded in the framework of formal management systems like quality management (e.g. ISO 9000), environmental management (e.g. ISO 14000, EMAS) etc. The basic idea here is optimization of existing technological, organizational or business-related paths and can be considered as an "adaptive response" to competition and changing framework conditions.
- *Innovation*: the development and implementation of a radically new or significantly improved product (good or service), process or practice which leads to major discontinuities in thinking and acting or in the use of technologies, objects and their performance. Innovation can be considered as creating new paths. The potential for improvement is far larger than in the mode of variation, but the risk of failure is also significantly higher. In general it requires a greater amount of creativity, resources and power than variations, since the barriers for implementation are higher and "radical changes are likely to be rejected" (Goldenberg et al. 2001, 78). For that reason, this

mode of change can also be labelled as “creative response” (Schumpeter 1947, see 2.2.2.4) and often leads to “creative destruction”. In Schumpeter’s view, “radical” innovations create major, disruptive changes, whereas “incremental” innovations continuously advance the process of change (Schumpeter 1934).

- *Diffusion:* An innovation does not need to be developed by the firm itself but can be acquired from other firms or institutions through the process of diffusion. “Diffusion is the way in which innovations spread, through market or non-market channels, from their very first implementation to different consumers, countries, regions, sectors, markets and firms.” (OECD and EUROSTAT 2005, 17). Main elements of the diffusion of innovations are described by Rogers (2003). Based on Rogers and on insights from evolutionary economics, Fichter and Clausen (2013) provide an advanced theory of diffusion and apply the theory in the empirical study of eco-innovation.
- *Exnovation:* This final mode of change describes the termination of technologies, products or practices, which have been in use so far. Technological, organizational or market-related routines are stopped. This can happen non-intentionally, e.g. through market competition, but it can also be the result of an explicit exit-strategy of a company (e.g. exit from a market with low profits) or a government (e.g. the decision of the German government to abandon nuclear energy completely in Germany).

From the viewpoint of sustainability and for the success of eco-innovations all four modes of change are relevant.

2.2.2.3 Change in the Conditions of Innovation

In the last decades, the conditions of innovation have changed significantly. The development and implementation of process, product, service, and system innovations are taking place in a field of increased dynamics, complexity and division of labour. The acceleration and increased variability of technological change, market structures and innovation processes are determined by the idea of “dynamisation”. The increased dynamics of innovation is the result of two main causes: Firstly, the increasing power and efficiency of information and communication technologies, and their increasing use in the economic and innovation processes. Greater availability of information is accompanied by the intensified creation of knowledge and by a temporal and spatial segmentation of innovation processes and projects. Secondly, the dynamisation of innovation is due to the liberalization of global trading and increasing international competition for innovators. This increases the pressure to create powerful national and regional centres of innovation, to specialize within the global competitive innovation market, and to further accelerate development and market periods.

The increased dynamics and complexity of innovation notably impacts the interaction of corporate and non-corporate innovation activities as well as labour division within the innovation project itself. Based on studies conducted in research-based industries like IT, pharmaceuticals and biotechnology, Chesbrough (2003) notes a fundamental change in the way innovative ideas and inventions are dealt with and how they are successfully marketed. He characterizes this change as a fundamental paradigm shift in the way technological information is processed and utilized, from the formerly dominant paradigm of “closed innovation” to one of “open innovation” (see 2.2.2.6).

The increased dynamics and complexity of innovation processes also requires disparate information assets to be levelled and various interrelated knowledge bases inside and outside the organization to be integrated (Staber 2004). For this reason, self-organizing networks have become dominant innovators for complex technological and systems solutions (Kash and Rycoft 2000). An analysis of ten leading journals from the field of technology and innovation management clearly indicates that collective constructs of innovation like “teams”, “networks” or “communities” have received considerable attention since the early 1990s. From 1990 to 1995, some 175 articles focused on one or several of these three groups. This increased to 288 articles between 1996 and 2001 and to 425 articles between 2002 and 2007 (Fichter 2009a, 358).

2.2.2.4 Schools of Innovation Theory

More than half a century of innovation research offers a broad range of theories and conceptualizations of innovation (cf. Fichter 2005, 149 ff.). Conceptualizations and theories vary with regard to aspects like the type of innovation (technological, industrial, social innovation etc.), the innovation phase and process (process models etc.), the level of analysis of the innovation system (individual, organizational, industries, national etc.) or in regard to their basic assumptions and explanation models. With regard to basic assumptions and the fundamental question, why innovation happens, three schools of innovation theory can be distinguished (Fichter 2005, 157 ff.):

- The voluntaristic school
- The contextualistic school
- The interactive school.

In voluntaristic models innovation is explained as the result of the level of flexibility afforded by the innovating system (individual, organization, network of innovators) and of the free will of innovators. Thus it is the consequence of voluntary action of individuals, organizations or networks. In the voluntaristic school of innovation theory the origin of novelty is related to the ideas and creativity of people and their intention to implement new solutions.

The contextualistic school follows another explanation model. Here the explanation is not the latitude and will of innovation actors, but the context in which people act and the enabling conditions and barriers they are faced with. The contextualistic school explains innovation as the result of changing conditions, e.g. new governmental regulations, trends in society, inventions of new technologies, variations in market demands and other changes from outside the innovation system.

Voluntaristic and contextualistic models have dominated innovation theory until the 1990s. Since the conditions of innovation have changed significantly in the last decades (see 2.2.2.3), interactive models of innovation have gained in importance in the past 20 years. The interactive school of innovation explains innovation as the productive interplay between changing contextual conditions and creative actors and the recursive dynamics between them. The basic idea for interactive explanation models can be traced back to Schumpeter’s concept of “creative response” (Schumpeter 1947). Creative acts of innovators are not a simple reaction to the change of conditions. Environmental, societal or technological changes are often fuzzy and allow a broad range of possible interpretations and actions. Thus it is not automatically clear, to what extent innovations are needed and it depends on the crea-

tivity and entrepreneurship of innovators to find smart answers to new challenges. The interactive school of innovation comprises concepts like dynamic process models and the paradigm of "open innovation" (see 2.2.2.6) as well as co-creation, producer-user-interaction and network- and community-related concepts (Fichter 2005, 166 ff., see section 2.4.4).

2.2.2.5 Key Actors: A Concept from Interaction Economics

The recent theoretical field of interaction economics (Antes and Fichter 2011, 262) is a micro-economic approach that sees the social interaction between actors as a central "location" of self-organization as well as decision-making and change in economic processes, and therefore makes this aspect its main objective for conceptualization. Therefore, the focus of interaction economics is, like that of evolutionary economics, in the broadest sense the change in economic systems. Rather than describe an internal status, it concentrates on transitional processes and the emergence of new ideas both in terms of spreading and of the impact of novelty. Therein, the interaction between individuals within the system is conceptualized as the central "place of change" (Fichter 2009b).

The conceptualization of key actors presents an important explanatory model in interaction economics. The "key actor" concept builds on the assumption in interaction economics that, with respect to their heterogeneous characteristics, e.g., ethical dispositions, preferences, strategic behaviour, participants in economic processes can be differentiated as diverse types of actors, such as the consumer type, the corporate type, etc. Applying this assumed heterogeneity of players to the progress of innovation and diffusion over time, the question of which stakeholders particularly influence the course of events moves into focus. This is where the key actor approach takes hold.

> *"Key actors are those individuals, organizations or networks that are seen to have a significantly greater influence on the development and implementation of a new solution within a focal innovation or diffusion process." (Authors)*

Key actors can be encountered in all groups of stakeholders involved in an innovation and diffusion process, as well as in politics and administration, at the supply and demand ends of the market as well as intermediaries, or in civil society, e.g. in associations, interest groups or media.

The focus on key actors in fact has a long tradition within economic sciences, particularly in the area of innovation and diffusion research. Within innovation and diffusion research, a number of key player concepts can be found. This includes, among others, the "promoter" concept going back to Witte (1973) from the field of business innovation research (Hauschildt and Gemünden 1999), the "gatekeeper" and "champion" models (Hauschildt and Schewe 1999), the "lead user" concept (Hippel 1988; Hippel 2005), and the concept of "innovation communities" (Fichter 2009a). Diffusion research also draws on concepts of key actors, notably those "opinion leaders" and "change agents" found to be particularly relevant to the diffusion process by Rogers (2003). Another rich source is entrepreneurship research, which deals with the key player per se in innovation: with the entrepreneurs themselves or the entrepreneurial team (see section 2.2.3).

2.2.2.6 The Innovation Process: Models and Conceptions

With the change in innovation conditions (see 2.2.2.3), the aspect of time and process-related questions have become more important. Based on a historic analysis, Rothwell (1994) developed a classification of innovation process models. He differentiates five types, ranging from simple linear conceptions of technology push in the 1950s and market pull in the 1960s, to interlinked models in the 1970s, models of parallel innovation activities in the 1980s to models of system integration and networking in the 1990s. One of the most elaborate process models has been developed by Van de Ven et al. (1999). "The Innovation Journey" presents the results of a major longitudinal study of 14 diverse innovations and describes innovation processes as a highly dynamic, nonlinear system of divergent and convergent activities that may be repeated over time and at different organizational levels if resources can be obtained to renew the cycle. The authors conclude for innovation managers and entrepreneurs: "Learn to "go with the flow", because while they can learn to manoeuvre through the innovation journey, they cannot control its flow." (Van de Ven et al. 1999, I).

The growing importance of networking beyond organisational boundaries refers to the increasing necessity of letting ideas flow out of the corporation in order to find better sites for their monetisation, and flow into the corporation in the form of new offerings and new business models (Chesbrough 2003). In this context, the "Open Innovation paradigm" has been developed in the last ten years. It treats R&D as an open system (Chesbrough 2006, 1), and stresses the relevance of coupled processes, linking outside-in and inside-out flows of ideas by working within alliances of complementary companies (Gassmann and Enkel 2006). Presently research on innovation processes is dominated by the debate about the relation between "closed innovation" and "open innovation". "Closed" and "open" innovation are interesting areas of investigation for SHIFT and various design approaches fit to these two innovation approaches e.g. closed – user-centred design, participatory design for specific stakeholders, empathic design; open – open design, new product development (NPD), co-design, collaborative service design (cf. Section 2.4.4).

2.2.2.7 Conclusion

For the theoretical basis and conceptual framework of the project SHIFT, the following insights can be drawn from innovation theory:

- SHIFT should work with a clear definition of the term "innovation", which allows delineation and measurability in empirical research. The business related definition of OECD and EUROSTAT (2005) can serve as a foundation and is helpful, because SHIFT is focusing on business organizations as innovators.
- For SHIFT innovation is the focal mode of change. It should clearly be differentiated from other forms of change (variation, diffusion and exnovation) and conceptualized as element in a holistic picture of transformation. The success of eco-innovation depends on the spread through market and non-market channels (diffusion) and on exnovation of competing non-sustainable technologies, products and practices.
- Because of the existing innovation conditions (dynamics, complexity, division of labour) the interactive school of innovation theory is the most appropriate for SHIFT. It allows dynamic innova-

tion process models and suitable concepts of interaction between relevant actors of the innovation system.

- The key player concept from interaction economics can serve as a foundation for more detailed theories of entrepreneurship and innovators.
- In order to understand and explain the role of support systems for entrepreneurship in eco-innovation dynamic, nonlinear models of the innovation process are necessary. The concept of "Innovation journey" and the differentiation between closed and open innovation models can be helpful in this endeavour.

2.2.3 Entrepreneurship Theory

Magnus Klofsten

The discipline of entrepreneurship research has witnessed a large surge since the 1980s when the classical industrial economy, which has been dominating the landscape of societies for the last couple of centuries, started to fall apart and new opportunities and possibilities opened up (Hökmark, 2007; Dicken, 1998). This shows a revival of clear interest in entrepreneurship theory after a period of being out of the academic community's focus through the period after the Second World War. It was a period dominated by a focus on industrial and corporate management theories to cope with the more central role that large and multinational National Corporation played in the rebuilding of the economies of Europe and other parts of the world. There are many text books that discuss the broader lines of the entrepreneurship theory (Deakins, 1999; Kuratko & Hogetts, 2001). Many scholars stress the need to develop a comprehensive theoretical framework of entrepreneurship that includes theoretical variables and the relationship between those variables (cf. Wortman (1987). It is apparent that entrepreneurship research has focused mostly on the entrepreneurial processes and firm creation. Less research has been devoted to understand the business ideas themselves and especially at the early stage of firm development (Klofsten, 2005). Apparently there is no agreement between researchers on a clear definition of entrepreneurship (Bruyat & Julien, 2000). The theory of entrepreneurship can be explored using two methods. The first method looks at the historical progression of the entrepreneurship theory, while using the second method one tries to classify the theories into groups based on specific lines of thinking. In this report, we will be using mainly the second method of analysis. Shane and Venkataraman (2000) tried to create a conceptual framework for the entrepreneurship field.

2.2.3.1 Key Theories and Approaches

The word "entrepreneur" is derived from the French "entrepreneur", meaning "to undertake". The "entrepreneur" is one who undertakes to organize, manage, and assume the risks of a business (Kuratko & Hodgetts, 2001, p. 28). The core theories and theoretical works in the entrepreneurship field can be classified into seven major groups as follows:

The economic role approach - conceptual

The group of theories under this first category focuses on the economic role of the entrepreneur, using conceptual non-empirical analysis. This school of entrepreneurship research tries to understand the role of the entrepreneur in terms of the risk-taking and opportunity recognition.

Representative scholars of this first group of entrepreneurship theories include: Richard Cantillon, Adam Smith, Joseph Schumpeter, Carl Menger, Ludwig von Mises and Fredrich von Hayek. Hayek's main contribution to the theory of the entrepreneur is to point out that the absence of entrepreneurs in neoclassical economics is intimately associated with the assumption of market equilibrium (Casson, 2003). Hayek saw the disequilibrium in economy as the mechanism that creates the opportunities that entrepreneurs can capitalize on (ibid).

Economists such as Richard Cantillon (1725), Jean Baptiste Say (1803) and Joseph Schumpeter (1934) started to write about entrepreneurship and its impact on economic development early on. The recognition of entrepreneurs and their role in economies dates back to eighteenth-country France when economist Richard Cantillon associated the ”risk-bearing” activity in the economy with the “entrepreneur” (Kuratko & Hodgetts, 2001). Cantillon (1755/1999) was one of the earliest scholars who looked at the role of the individual in the market economy and the interdependency between the individual property rights and the economic healthiness of a society. Adam Smith in his milestone book “Nature and Causes of the Wealth of Nations” laid the foundation for the discussion about the way market economies function and in the process covered the role the individual or the entrepreneur has in the building of such market economy (Smith 1776). Joseph Schumpeter focused on the entrepreneur as an innovator and how that role creates economic opportunities through the destructive and distributive nature of the innovation activities. This approach to theory building in the entrepreneurship discipline was prominent in the period from the late 18th century to the early 20th century (roughly). This analysis appeared in his various works (Schumpeter 1912, 1934). The classical thinkers paved the way to what would be known later on as the Austrian school of entrepreneurship or the process school of entrepreneurship to highlight its focus on the processes coupled with the entrepreneurial activities.

The process approach

The discovery and development of opportunities lie at the heart of entrepreneurship (Venkataraman, 1997). One way to examine activities involved in entrepreneurship is through a process approach (Kuratko & Hodgetts 2001). The group of theories related to this approach focuses on the individual risk-taking perspective of entrepreneurship. Representative scholars of this approach include: Israel Kirzner and Frank Knight. Kirzner was a student of Mises. He regarded the entrepreneur as a person who recognizes business opportunities and takes the required risks to achieve the objective of capitalizing on these opportunities (cf. Kirzner, 1973). For Kirzner, the entrepreneur is someone who is alert to profitable opportunities for exchange. By recognizing the possibilities for exchange the entrepreneur is able to benefit by acting as a “middleman” between the capitalist and the consumer (Deakins, 1999). Another great scholar of this category of theories is Knight (1916/1921) who was the first to make a clear distinction between insurable risk and non-insurable risk or uncertainty arguing that the real entrepreneur is eager to take true non-insurable risks. For Knight the entrepreneur is an

individual who is prepared to undertake risk, and the reward, i.e. profit, is the return for bearing uncertainty (Deakins, 1999). The process approach to theory building in the entrepreneurship discipline was prominent in the 20th century and still has some impact on the produced works (Bhave, 1994). M. C. Casson is a scholar of the process approach in similarity with Knight. Casson recognizes that the entrepreneur will have different skills from others. These skills enable the entrepreneur to make judgments and to co-ordinate scarce resources. The entrepreneur makes critical decisions, which involve the reallocation or organization of resources (Casson, 2003).

The economic role approach - empirical

This group of theories focuses on the economic role of the entrepreneur using empirical analysis. Representative scholars of this approach include Arthur Cole, Alexander Gerschenkron and David Lande. The real effort related to this approach to entrepreneurship was organized by Arthur Cole through the Research Center in Entrepreneurial History at Harvard University. Based on these efforts, studies related to the modernization of economies were initiated. Two such studies stand as good examples for this school of thinking. The first is a study of the economy of the Soviet Union by Alexander Gerschenkrons (1947) and the second a study of the French economy by Lande (1949). This approach to theory building in the entrepreneurship discipline was prominent in the 1940s (Landström et al., 2012).

The entrepreneurial trait and personality approach

The entrepreneurial traits theories focus on the traits and personality of the entrepreneur. One representative scholar of this approach is David McClelland. McCelland (1961) stressed that a correspondence of the norms and values of society with the individuals' need for achievements is vital to the entrepreneurial environment and, in consequence, its economic development potential. This approach to theory building in the entrepreneurship discipline was prominent in the 1960s and 1970s (Landström et al., 2012).

The Functionality approach

The functionality entrepreneurship theories focus on job creation and the role of MSMEs. In this approach scholars study both the individual (the entrepreneur) and his/her creation (the firm) and the relationship between them. Known scholars who used this approach include Karl Vesper, Josef Mugler, John Hornaday, Allan Gibb, Terry Webb, Jan MacMillan, Gerlad Sweeney, Zoltan Acs and David Audretsch. Babson College was a leading figure in establishing the entrepreneurship field within the Academy of Management through the efforts of Karl Vesper, while in Europe Josef Mugler, from Vienna School of Economics and Business Administration played a vital role in the creation of the European Council of Small Business. Together with the conferences on MSMEs and the journals created for the discipline, the focus at this stage of entrepreneurship theory development lay on job creation and the role of the entrepreneur and MSMEs. These issues have received a lot of attention in the last four decades. Efforts were pursued also to involve the innovation aspect in entrepreneurship theory. Zultan Acs and David Audretsch looked at how innovation in SMEs is coupled to econom-

ic development (Acs and Audretsch, 1990). This approach to theory building in the entrepreneurship discipline has been prominent since the 1970s (Landström et al., 2012).

The multidisciplinary approach

This group of theories focuses on other aspects than job creation including conditions for individuals engaging in entrepreneurship activities for the first time (nascent entrepreneurship), financing of entrepreneurship activities (venture creation), entrepreneurship in the international context and the growth dilemma of MSMEs. For example, it is only recently that pre-entrepreneurial factors have been recognized as important influences on nascent (pre-start) entrepreneurs (Reynolds and White 1997). Scholars who contributed to this line of thinking include S. Venkataraman, Jerome Katz, Hans Landström, Hamid Etemad and Wright. This approach uses a multidisciplinary approach to entrepreneurship theory. Fields like economics, management, psychology and sociology impacted the kind of questions and the type of methods used to solve them. The multidisciplinary approach to theory building in the entrepreneurship discipline has been prominent since the 1990s. As expressed by Landström et al. (2012, p. 1156): “In the 1990s there was not only large scale migration into the field, but the mobility of scholars in and out of the field was also quite extensive.”

The new wave

This category of entrepreneurship theories covers the most recent scholarly efforts that tend to borrow from other classical disciplines such as economics, management, psychology and sociology in building the framework of analysis. Examples of this group of theories are works by Sara Sarasvathy (effectuation reasoning) (cf. Saravathy, 2001) and David Aldrich (evolutionary perspectives of entrepreneurship) (cf. Aldrich, 1999). This group also includes conceptual analysis which borrowed from classical firm performance modelling based on organization theory (Adli Abouzeedan, 2011), strategic management (Magnus Klofsten, 2010) as well as integrated system analysis (Henry Etzkowitz’s Triple Helix (Etzkowitz, 1998)). Often these theories of entrepreneurship tend to find new aspects in relation to the classical entrepreneurship theory and in the process try to find the common ground between the entrepreneur and his/her creation (the enterprise). The indications are that such an approach to entrepreneurship theory building is gaining more momentum. The definition of “entrepreneur” has to change to account for the multifaceted role that the entrepreneur takes upon in these days (Kuratko and Hodgetts, 2001). At the present, the word “entrepreneur” has become synonymous or at least closely linked with free enterprise and capitalism (ibid).

2.2.3.2 Discussion

In this discussion we will be covering two major questions: Why there is a need to develop entrepreneurship and how entrepreneurship is connected to the issue of sustainability and sustainable development. The answer to the first questions can be summarized in a short sentence as follows: “the collapse of the classical industrial economy and the necessity to have an entrepreneurial economy” and we will elaborate briefly on that. The classical industrial economies, which started during the Industrial Revolution, dominated the scene up to the end of the 1970s when the industrial production started being outsourced to countries with cheap labour. Globalization started to take place by

the end of the 1980s with major developments in information technologies (Abouzeedan et al., 2013). When the western world could not compete any more in producing higher-quality products than the Eastern and South Eastern countries of Asia, it had to fall down on the same mechanism that initiated the industrial revolution in the 17th and 18th centuries, namely entrepreneurial solutions and innovation-based new industries (ibid). In the new era, entrepreneurship theory might need to be revisited. It is also important to couple that to new innovation paradigms, which allow for a more effective creation of inventions. One such new approach to innovation is "open innovation" (Chesbrough et al., 2006) and applying that in particular industries such as in pharmaceutical industry (Hedner, 2012). Analysing business concepts through new perspectives is vital for creating a new wave of entrepreneurship thinking. Ardichvili et al. (2003) used Dubin's Theory Building framework to propose a theory for business opportunity identification. Klofsten (2005) studied the early stage of development of business ideas and the factors that affect the process of creating and developing such business concepts. Within this context, it is important to recall the analysis done by Penrose (1959) and how value creation is the driving force in establishing new firms. The value creation in this case would need to be sought in the scientific and knowledge-based competences of the western countries.

As in relation to the second question, it is in its place of the discussion to emphasize the need to account for the sustainability-related aspects of business development already in the early stage of the business concept. This gives a better probability that the firm activities should reflect these aspects. In traditional entrepreneurship research, the sustainability approach was absent for a long time, both in the business concept stage as well as in planning and executing firm operations. Value creation paradigm of the Penrosian view (Penrose, 1959) focused mainly on the direct economic gain by the firm. In general, there were no scholarly efforts to look at other value than the monetary value creation of firms. There is a need to reassess the way we look at firm value creation to encompass even intangible aspects such as resource-preservation, quality of the human life, the optimal socio-economic conditions for societies, relieving the pressures on the ecology, and the recycling of resources. In relation to this discussion, Ardichvill et al., (2003) see the antecedents for the entrepreneurial alertness to business opportunities as composed of three elements: personality traits, social networks and prior knowledge. One way to impact the entrepreneur awareness toward sustainability and sustainable development is to work with the pre-knowledge of the entrepreneur so that it reflects an understanding of the significance of sustainability to economic development. Another important way to influence entrepreneurial mindsets, motivations and visions in a sustainable way is through social networks and the actors and schemes of entrepreneurial support systems.

2.2.3.3 Conclusion

Within the project we will use a process approach when dealing with entrepreneurship and the following definition will be useful:

> *"Entrepreneurship is the identification, evaluation and exploitation of business opportunities." (Shane & Venkataraman, 2000, 218)*

Entrepreneurship theory has been born out of the effort to understand how economic development in societies occurs. The entrepreneurship field started on a foundation of the classical works of economic analysis and developed from there. Entrepreneurship studies help us to see the causation between the individual entrepreneurial drive and the outcome of such drive (i.e. the enterprise) and the agglomeration of economic activities resulting from the actions of the individual enterprises and the interplay between them.

The connection between sustainable development and a healthy entrepreneurial environment stems from entrepreneurship theory itself. The entrepreneurial environment in a society is determined by the values and modes of the individual and as thus the outcome of it dependent on them. If the individuals believe in a development which grants sustainability and long-lasting cohesiveness and a vision based on an optimal utilization of the earth's resources and the same time give high value to the preservation of the environment and good quality of life, then the striving of society would be toward a development which is focused on sustainability.

A healthy entrepreneurial environment is characterised by individual entrepreneurial drive that focuses on creating economic activities that aims to optimize the utilization of the resources, to minimize the negative aspects of human activities, to seek a balance between the need to develop land and people and the need to preserve a good quality of life and keep the environment intact. That is why alternative energy resources, clean technology, pollution control, land utilization, deforestation, and the greenhouse effect become issues for entrepreneurs to deal with out of a business opportunity recognition aspects rather than a moralist and existential type of reasoning. Therefore it is important to allow differentiation on a continuum of motivation from purely economic-oriented (opportunity driven) to purely sustainability-oriented (mission driven) when looking at "sustainable entrepreneurship" (cf. Section 2.3.2.3). There is a need to emphasize such logic in these modern times where value creation has to do more with the quality than the quantity of the output.

2.3 Sustainability in the Context of the Economy

2.3.1 The Sustainability Concept

Mika Kuisma & Alastair Fuad-Luke

2.3.1.1 Introduction: Defining Sustainability

The roots of the contemporary view on sustainability can be located in the 1972 UN Conference on the Human Environment in Stockholm, Sweden. As a result of the conference, various national environmental protection agencies as well as UNEP (United Nations Environment Programme) were established. Even more important, this global forum began the attempt to find positive links between environmental concerns and economic issues such as growth and employment. By early 1980s, sustainability had begun to gain wider attention as a result of some influential publications such as Building a Sustainable Society by Lester Brown in 1981 (e.g. Edwards 2005). Sustainability became a popular word in environmental policy and research in the 1980s. The common themes that emerged included the continued support of human life on earth, long-term maintenance of the stock of bio-

logical resources, limited growth economies, continued quality of the environment and eco-systems as well an emphasis on small-scale and self-reliance (Brown et al., 1987).

Simply put, sustainability is about the ability to survive, preferably long term. Since the 1980s, sustainability has come to have a more specific meaning, linked to the human development and environmental agendas. Most popularly, sustainability is defined as a part of the concept *sustainable development*, put on the agenda by the World Commission on Environment and Development (Brundtland Commission) in 1987: "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

This definition implies an appropriate balance between the environmental, social equity and economic demands, the so called "three pillars" of sustainability (economic development, social development, and environmental protection) or the three E's – ecology, economy/employment and equity/equality (e.g. Visser et al., 2007). This view has been expressed as an illustration using three overlapping ellipses indicating that the three pillars of sustainability are not mutually exclusive and can be mutually reinforcing.

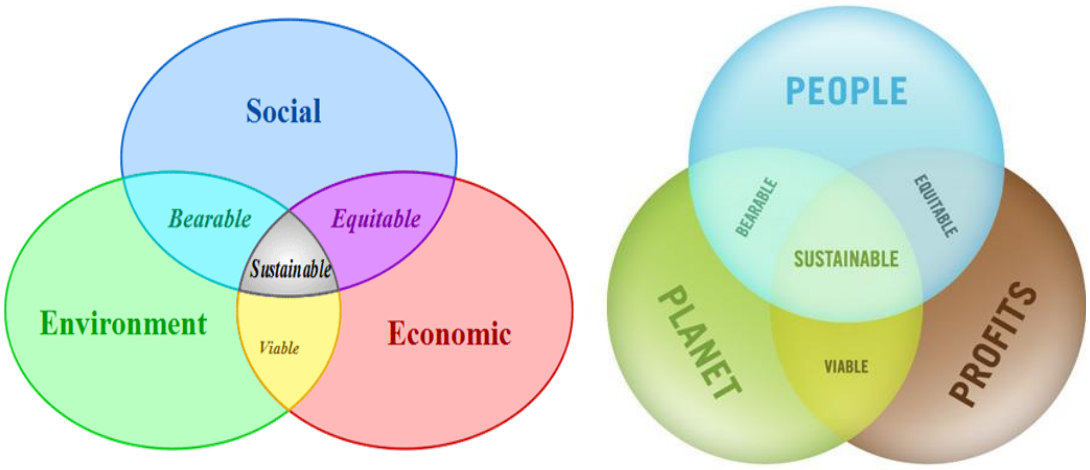

Figure 5: Diagrams of sustainable development and the confluence of three constituent parts. Source: Elkington (1997, 70-96).

The triple bottom line approach (abbreviated as TBL or 3BL, and also known as people, planet, profit) by Elkington (1997) builds on these "three pillars". According to Elkington, companies should prepare three different bottom lines, i.e. TBL accounting expands the traditional reporting framework to take into account social and environmental performance in addition to financial performance. "People" pertains to fair and beneficial business practices toward labour and the community and region in which a corporation conducts its business. "Planet" refers to sustainable environmental practices. "Profit" is the economic value created by the organization.

IUCN provided a slightly different definition of sustainable development in its publication with UNEP and WWF (Caring for the Earth, 1991). According to it, sustainable development "provides real improvements in the quality of human life and at the same time conserves the vitality and diversity of

the Earth". Both this and the "three pillars" definition are very broad and leave many elements undefined. What sustainability is, what its goals should be, and how these goals are to be achieved, all remain open to interpretation.

The word sustainability can be applied to many situations and contexts over many scales of space and time, from small local ones to the global balance of production and consumption. It implies responsible and proactive decision-making and innovation that minimizes negative impact and maintains balance between social, environmental, and economic growth to ensure a desirable planet for all species now and in the future. It can also just refer to a future intention. For these reasons sustainability may be perceived as nothing more than a buzzword with little meaning or substance at one extreme, but, at the other, as an important but unfocused concept like "liberty" or "justice".

The economy can also be considered a subsystem of human society, which is itself a subsystem of the biosphere (environment) and a gain in one sphere is a loss from another. This can be illustrated as three concentric circles inside each other (see Figure 6 below). The necessary change in the worldview of business management and investors with relation to sustainability has been illustrated with a similar model. Until recently, the executives' paradigm has been dominated by economy, and the society and the environment have played only minor roles (e.g. Willard 2005).

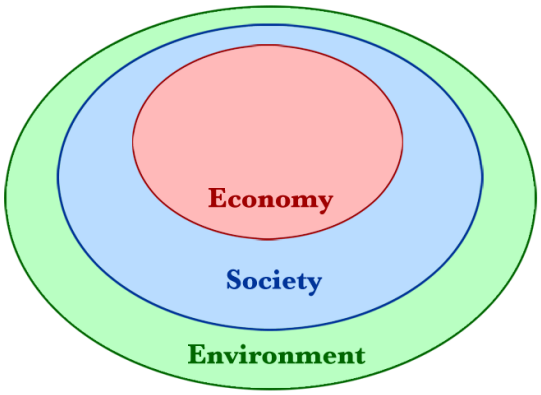

Figure 6: A diagram indicating the relationship between the three pillars of sustainability suggesting that both economy and society are constrained by environmental limits. Source: Willard (2005, 224-225).

Considering the different approaches to sustainability theory, the models of strong sustainability prioritize the outer circle (environment), whereas the weak sustainability approaches emphasize also other aspects of sustainability (see chapter 2.3.1.2).

Some researchers and institutions have pointed out that these three dimensions are not enough to reflect the complexity of contemporary society and suggest that culture could be included in this development model as well.

2.3.1.2 Key Theories and Approaches

Theories of sustainability aim to prioritize and integrate social responses to environmental and cultural problems (Jenkins 2012). Typically, economic models attempt to sustain natural and financial

capital, ecological models look to sustain biological diversity and ecological integrity, and political models focus on social systems. Sustainability directs attention to the complex mutuality of human and ecological systems. The challenge is to integrate economic health, ecological integrity, social justice, and responsibility to the future generations to address multiple global problems (e.g. climate change) with a coherent and durable vision.

Models of sustainability are sometimes divided into "strong" and "weak" approaches. *Strong sustainability* requires the preservation (or improvement) of the present stock of ecological capital, like the functioning of ecosystems or the existence of species and does not see it as substitutable for other types of capital. For example, strong view of sustainability might argue for protection of old-growth forests even if it would imply the decrease of other development opportunities. *Weak sustainability* in turn disregards obligations to sustain any specific capital type and sees different types of capital (economic, ecological and social) as substitutable and as such would support only a general principle to leave future generations no worse off than the present. As for protecting old-growth forests, the weak sustainability view would take into account all the benefits that old forests provide, and after that it would attempt to measure the future value of those benefits compared to the values created by (economic and social) development (Jenkins 2012). The two views can be considered to loosely but not perfectly correspond to ecologically oriented (*eco-centric*) and human-centred (*anthropocentric*) positions in environmental ethics. The strong sustainability view could, however, also be held from a human-centred perspective as human systems depend on rich biodiversity. Correspondingly, also the weak view would not necessarily approve the expiration of natural resources, even with the prospect of lucrative profit.

A pragmatist's third *middle view* exists between the strong and weak models of sustainability. According to this view, we may not have obligations to sustain any particular nonhuman form of life or ecological process (cf. the strong view). On the other hand, we should neither assume that that all future opportunities could be measured against one another (cf. the weak view).

Two contemporary schools of thought in social sciences, namely deep ecology and ecological modernization, basically correspond with the strong and weak extremes of sustainability models presented above. *Deep ecology'*s core principle is that the natural environment as a whole should be respected and should remain intact. The proponents of this ecological philosophy argue that the world does not exist as a resource to be freely exploited by humans. The ethics of deep ecology takes a holistic view of the world emphasizing that a whole system is superior to any of its parts. *Ecological modernization* on the other hand is more optimistic arguing that the economy benefits from moves towards environmentalism, i.e. economy and ecology can favourably be combined. Sources of future growth include increases in energy and resource efficiency, product and process innovations, and product design for sustainability. Ultimately ecological modernization should result in innovative structural change, although research is still more focused on eco-innovations and the societal factors fostering or hampering such innovations.

Instead of organizing theories of sustainability with dualistic terms, "strong" and "weak" or "eco-centric" and "anthropocentric", we can also classify them in terms of models for sustainability. The models prioritize their own components of what should be sustained, i.e. there are economic, eco-

logical, and political models available that often integrate complementary strengths of others. Hence, they are not necessarily mutually exclusive (e.g. Jenkins 2012).

Economic models of sustainability focus on sustaining opportunity in form of capital. The classical economic model would be to think of sustainability as an investment problem in which we must use returns from the utilization of natural resources to create new opportunities. Ecological economics argues that sustaining opportunity for the future requires strong conservation to keep economies operating in respect of natural limits. For example Daly maintained in his book "Beyond Growth: The Economics of Sustainable Development" (1996) that the economy is only a subset of the larger environment showing that continuous growth not only is not possible in the long run, but also undesirable. Similarly, increasing spending on the poor might be considered as an investment in the future. For example, Sen's "Development as Freedom" (1999) has been cited as a way towards a more humane society. By creating options for today's poor we create options that will drive greater development. This view is reflected in the Base of the Pyramid (BOP) approach in business that emphasizes building profitable businesses that are reducing poverty at the same time (Prahalad, 2010). Consequently, ecological and political models of sustainability are also complemented by the models mentioned above.

Rather than focusing on opportunity or capital as the key unit of sustainability, *ecological models* focus on the health of the nature. Anthropocentric views emphasize that natural resources and ecological systems on which human systems rely should be sustained. According to the eco-centric point of view, species and ecological systems should be sustained for their intrinsic value. In emphasizing the concern with local and global environmental problems that jeopardize human dignity, the *political models* of sustainability focus on sustaining the environmental conditions of human life.

2.3.1.3 Sustainability in the Current Economic Discourse

Sustainable consumption and production

Sustainable consumption and production can be defined as the process of behaviour change and technological innovation required from government, business and consumers (households) to decouple economic development from environmental degradation. The aim is to operate within the limits of the planet's ecosystems (Visser et al., 2007). It involves rethinking current business models to develop a wider approach of sustainability that reaches across the whole *life-cycle* of goods, services and materials. This means in practice that business should extend action along the value chain, from the issues arising in the extraction of raw materials to the phase when consumers discard the products or services after use. Sustainable production and consumption contributes to environmental quality through the efficient production and use of natural resources, the minimization of wastes, and the optimization of products and services (Falkman, n.d).

The idea of sustainable consumption and production has found expression in well-known concepts such as eco-efficiency (promoted by World Business Council for Sustainable Development, WBCSD), cleaner production (UNEP) and Factor-4 (introduced by von Weizsäcker and A. & L. Lovins). Governments have a key role to play in creating conditions for business adoption of sustainable consump-

tion and production practice by setting standards, economic incentives, regulation, voluntary agreements, business support programmes, and consumer policy (Visser et al., 2007).

Sustainable consumption (SC) denotes how (and whether) specific patterns of consumption can be sustained globally over time and in relation to their environmental impacts and resource intensity. The definitions of SC share a number of common features, and to an extent build in the characteristics of sustainable production, its sister concept: quality of life, wise use of resources, minimization of waste and pollution, use of renewable resources within their capacity of renewal, full(er) product life-cycles, and intergenerational equity. Sustainable consumption implies that the consumption of current generations as well as that of future generations improves in quality. Such a concept of consumption requires the optimalization of consumption subject to maintaining services and quality of resources and the environment over time (Salim, 1994).

Current patterns of consumption contribute to increasing CO_2 emissions and pollution, escalating processes of global warming, loss of biodiversity and the depletion of finite resources. There is particular interest in how to *engage consumers* to consume more sustainably, and the role of companies in promoting sustainable consumption (Southerton et al., 2004, Visser et al., 2007). Product eco-label practices have emerged as consumer-side measurements of product level sustainability.

Sustainable production emphasizes *longer term* consequences and benefits over short term profits. By investing in well-designed, safer products, resource efficient technologies and processes, and trained employees, organizations could thrive. Sustainable production is the creation of goods and services using processes and systems that are non-polluting, conserving energy and natural resources, economically viable, and safe and healthful for both workers and consumers. These conditions can lead, always in the long term, but often also in the short term ("low hanging fruits"), to more economically viable and productive enterprises. In practice, the long term benefits are still often ignored by short-sighted views of the management.

Green economy

Green economy is an economic development model based on sustainable development and ecological economics. UNEP (2011a, 16) defines the green economy as one that "results in improved *human well-being* and social equity, while significantly reducing environmental risks and ecological scarcities" (*environmental impact*). In its simplest expression, a green economy is low-carbon, resource efficient, and socially inclusive.

One central concept related to green economy is the *decoupling* of natural resource use and environmental impacts from economic growth (UNEP 2011b). Decoupling is about shifting from debt-financed consumption (which is unsustainable) as the primary economic driver of the economies to sustainability-oriented investments in innovation as the primary economic driver of the economies (see figure below). As shown in the figure, decoupling can be assessed in terms of resource decoupling (the relative decoupling of GDP development from resource use) or impact decoupling (the absolute decoupling of GDP from environmental impact).

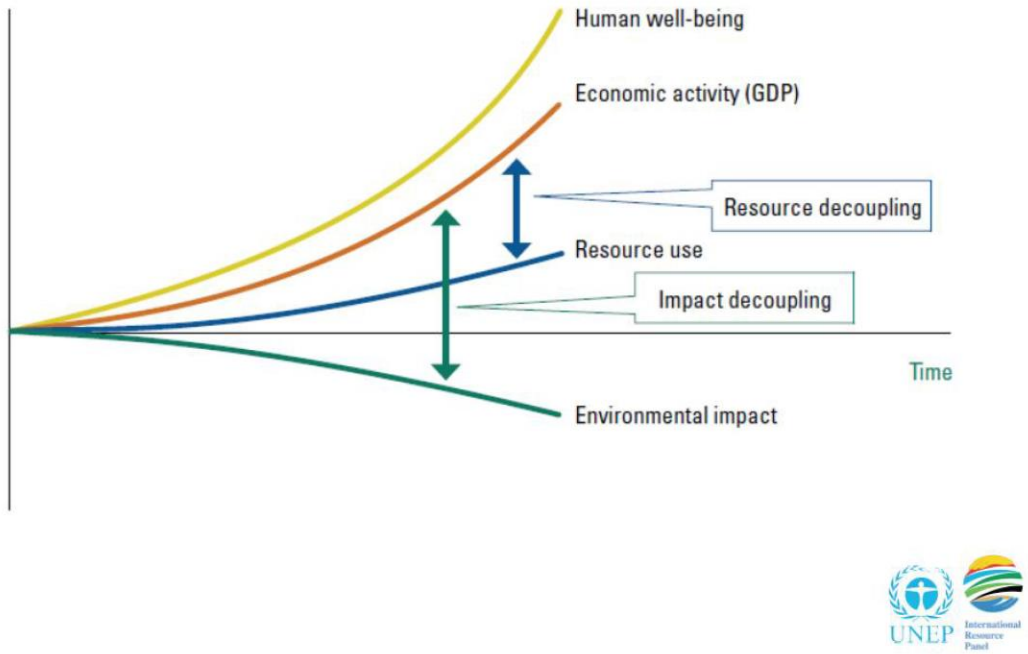

Figure 7: The two aspects of decoupling. Source: UNEP (2011b, p. xiii.).

A feature distinguishing green economy is the direct valuation of natural capital and ecological services as having economic value, and full cost accounting in which costs externalized onto society via ecosystems are reliably traced back to, and accounted for as liabilities of, the entity that does the harm or neglects an asset ("internalisation of externalities").

Green growth

Green Growth is a term used to describe a path of economic growth which uses natural resources in a sustainable manner. It is used globally to provide an alternative concept to standard economic growth. In 2008, UNEP led the Green Economy Initiative, and in 2011, OECD published a strategy "Towards Green Growth". OECD defines green growth as a means of fostering economic growth and development, while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies. The term green growth has been used to describe national or international strategies.

Green growth strategies can help economies and societies become more resilient when meeting demands for food production, transport, housing, energy and water. They can help mitigate the impacts of adverse shocks by reducing the intensity of resource consumption and environmental impacts, while alleviating pressure on commodity prices. Green growth also offers *competitive advantage* to those countries that commit to policy innovations. The global market for green goods and services is likely to grow fast, offering countries the dual benefit of prosperity and job creation.

Generic (business) strategy responses to sustainability

Across the last decades, the mindset of mainstream business management has frequently framed sustainability in terms of a trade-off involving lower profits and added cost. In short, if it is better for society and the environment, it must cost more for business (Laszlo & Zhexembayeva, 2011). However, sustainability does not have to come with a hefty price tag only. Many of the strategy schools address the value creation linked to sustainability ("win-win" proposal), at least under certain conditions.

First, managing sustainability-related business risks creates value (or avoids value destruction). Secondly, sustainability is an efficiency opportunity – improving efficiency is about cutting the quantity and intensity of resource use (and costs).Thirdly, sustainability might be a factor of differentiation for products and services. Fourthly, sustainability pressures such as growing ecological and social needs are creating new markets that may be huge. Fifth, sustainability may be a way to protect and enhance the brand, and companies can gain or lose significant market value based on stakeholder perceptions of the environmental and social impacts of the business. Sixth, pioneering companies in terms of sustainability may try to shape government regulations or private industry standards in ways that favour them over the competition, and e.g. environmental regulations can create barriers to entry as they may help keep out low-cost imports. Seventh, strategists have seen the potential for environmental and social performance as a driver of radical innovation, i.e. sustainability can be a source of creativity, helping to fundamentally rethink the nature of the business and the company. Recent strategy studies help mangers to understand better how ecological and social pressures may create (or destroy) value. It seems that business practitioners often continue to hold beliefs about sustainability that prevent them from fully benefiting from the inherent value-creating opportunities of sustainability (Laszlo & Zhexembayeva, 2011).

Degrowth

The conventional formula for achieving prosperity has relied on the pursuit of economic growth. According to this view, higher income will increase well-being and lead to prosperity for all. When global economy is constrained by finite ecological limits and huge disparities in income and well-being persist across the globe, it is questioned whether economic growth is still a legitimate goal for rich countries (Jackson 2005; Meadows et al. 1972).

Although the debate on growth goes back several decades, the term degrowth has only recently been used in economic and social debates, and before 2006 the expression does not appear in any dictionary of social sciences (Latouche, 2010). Degrowth is a political, economic, and social movement based on ecological economics and anti-consumerist and anti-capitalist ideas. Degrowth activists advocate for the downscaling of production and consumption—the contraction of economies. Central to the concept of degrowth is that reducing consumption does not require individual martyring and a decrease in well-being. The "degrowthists" aim to maximize happiness and well-being through non-consumptive means—sharing work, consuming less, while devoting more time to art, music, family, culture and community.

Degrowth thought is also partially in opposition to sustainable development. The concern for sustainability does not contradict degrowth, but sustainable development is rooted in mainstream development ideas aiming at increasing growth and consumption. Any development based on growth in a finite and environmentally stressed world is seen as inherently unsustainable. Since current levels of consumption exceed the Earth's ability to regenerate these resources, economic growth will lead to their exhaustion. Furthermore, growth-based development has been shown to be more effective in expanding social inequality, concentrating wealth in the hands of a few, than in actually generating more wealth and increasing well-being. The dominant economic paradigm rewards more instead of better consumption (Martinez-Alier et al. 2010).

The proposal of sustainable degrowth has been criticized, and as a response defended by considering it an inevitable direction and potent political vision that can be socially transformative (Kallis 2011). The critics argue that a slowing of economic growth would result in increased unemployment and increase poverty. The concept of degrowth is viewed as contradictory when applied to lesser-developed countries, which require the growth of their economies in order to attain prosperity. Many who understand the environmental consequences of growth still advocate for economic growth in the South, even if not in the North. But, a slowing of economic growth would fail to deliver the benefits of degrowth—self-sufficiency, material responsibility—and would indeed lead to decreased employment. On the other hand, degrowth proponents advocate for a complete abandonment of the current (growth) economic system, suggesting that relocalizating and abandoning the global economy in the Global South would allow people of the South to become more self-sufficient and would end the overconsumption and exploitation of Southern resources by the North.

Degrowth proponents are sceptic about technological advances to reduce resource use and improve efficiency due to the *rebound effect*. The concept is based on observations that when a less resource-exhaustive technology is introduced, behaviour surrounding the use of that technology will change and consumption of that technology will increase and offset any potential resource savings. Alternatively, an economic rebound effect may lead to increased consumption of other products or technologies due to the financial resources freed up by resource-efficiency. Considering the rebound effect, the only effective solutions seen involve a rejection of the growth paradigm and a move toward a degrowth paradigm.

The degrowth perspective is founded on the hypothesis that producing more always implies consumption of more energy and raw materials, while at the same time decreasing the size of the labour force, which is replaced by machines. This analysis is considered misleading from the point of view that technological progress allows us to produce more with less, as well as provide more services. This creative destruction, the process by which the "old" companies from a sector (as well as their costly and polluting technologies) disappear from the market as a result of the innovation in that sector that brings down costs while consuming less energy and raw materials in exchange for increased productivity. Supporters of scientific progress argue that technology will solve the problems of energy supply, waste and the reduction of raw materials.

2.3.1.4 “Capitals” frameworks and eco-innovation

The concept of “Capital” embraces ideas about wealth, stock(s), assets, resources and/or some sort of societal advantages accruing to individuals or social groups. Modern economic theory is still underpinned by the work of the Scottish social philosopher, Adam Smith, and his treatise “An Inquiry Into The Wealth And Causes of Nations” (Smith, 1776), with its emphasis on the creation of financial capital through human endeavour, which, in itself, improves individual human capital. Since the 1970s, the environmentalist, sustainability and, more recently, the Design for Sustainability (DfS) agendas have challenged this dominant view, requiring that considerations are given to the integrated positive and negative impacts of business and development on economic/financial, social and environmental capitals (see for example, Meadows et al., 1972; Birkland, 2008). The “sustainability octagon” places design at the centre of an enterprise as a means to balance human, social, financial and natural capital (James, 2001) and Jonathan Porritt names these and an additional capital, ‘manufactured capital’ to generate the Five Capitals Framework developed with Forum for the Future in the UK (Porritt, 2007). Design theory notes the importance of symbolic, cultural and social capitals and their potential interaction with the aforesaid capitals to present an expanded anthropocentric framework of ten capitals (Fuad-Luke, 2009).

Given the working definition of eco-innovation adopted for the SHIFT project (cf. sections 2.3.2.2, 4.1.1 and Appendix 1) which balances economic feasibility with environmental benefits, the emphasis is on decoupling accrual of economic/financial capital with adverse effects or impacts on natural capital. This is consistent with the eco-innovation perspectives from the mid-1990s and is framed within an eco-efficiency agenda originally coined by the World Business Council for Sustainable Development (Fussler and James, 1996, 139).

Viewing the wider eco-innovation support system, with its diverse actors, decision-makers and stakeholders, sustainable entrepreneurship is about delivering more diverse sustainable business value. As the diversity of stakeholders in an organisation increases, so do the forms of value they create or are focused on, widening out from economic capitals (e.g. assets, finances, brand and reputation, intellectual) to human, social and environmental capitals (PricewaterhouseCoopers, 2000).

2.3.1.5 Discussion

During the last few decades, the co-evolution of economic, ecological and social challenges and their governance has been described and modelled by several theoretical frameworks and other approaches. The underlying thought pattern in these theories and approaches is an aim to find a balance between economy, ecology and society due to the planetary constraints in the natural resources and many negative consequences of economic development on environment since industrial revolution and especially after the Second World War. The idea of sustainable development has its roots in the nature conservation movement and concern over limits to continuous economic growth based on increasing material wealth.

The attempt to find positive links between environmental concerns, economic growth and political justice started in the early 1970s, and since the 1980s the core idea of sustainability thinking has been the current definition of sustainability as an appropriate balance between the so called three

pillars of sustainability, i.e. economic development, environmental protection, and social development. The number of relevant pillars has been discussed as well as the hierarchy or ranking order of the specific pillars.

The majority of theories and approaches in the current economic discourse emphasize more anthropocentric or "weaker" views of sustainability. However, the importance of the health of the natural environment and efficient and balanced use of natural resources is never denied. A certain win-win situation seems to be considered an ideal, in which business would be profitable but a balanced use of natural resources and ecological systems as well as human wellbeing is preferred to overexploitation of material and human resources.

The majority of the sustainability approaches do not seem to question the mainstream economic ideal of continuous growth. However, qualitative changes in the economic growth pattern seem to be preferred. This is reflected for example in the green economy and also green growth, both of which emphasize decoupling of economic growth (in terms of GDP) from resource use (resource or relative decoupling) or environmental impact (impact or absolute decoupling).

Generally, the economic sustainability approaches seem to trust in scientific progress and the ability of developing technologies to solve problems. The relatively young school of economic thinking on degrowth however is more sceptical about the ability of technological advances to reduce resource use and improve efficiency, especially due to the rebound effect. According to degrowthists, the rebound effect is likely to offset much of the potential resource savings, and hence the only sustainable solution is a rejection of the mainstream growth paradigm. Advocating downscaling of production and consumption as well as increasing personal happiness, this economic approach is an important contribution to the economic discourse, but such a paradigm shift is likely to take time.

The dominant logic in business and economic activity in general has ignored the environmental and social values and constraints and concentrated mainly on the economic profitability of activities. In terms of the pillars of sustainability, there has been hardly any mutual dependence between economy, environment and society in the executives' mindset. The mindset of mainstream business management has typically framed sustainability in terms of a trade-off involving lower profits and added costs. However, business strategy scholars (e.g. Porter and Kramer) have already for a longer time addressed the value creation link to sustainability. There are also more and more examples available on businesses benefitting from the value-creating opportunities of sustainability. All these together are likely to help business professionals better understand how ecological and social pressures can create or destroy value and business. Strategic views on business and sustainability are likely to bring an emphasis on long term consequences and benefits over short term profits as well as life cycle impact considerations in the mindset of business executives - in the spirit of sustainable consumption and production.

The capitals frameworks offer potential for providing a lense through which to view sustainable consumption and production (SCP), the green economy, green growth and degrowth, and, potentially to create new concepts around value creation.

2.3.1.6 Conclusion

Sustainability theories and approaches have shown clearly that the decoupling of natural resource use and environmental impacts from economic growth is necessary. According to the key assumptions of sustainable consumption and production and green economy, more eco-efficient and environmental friendly technologies and sustainable business models are expected to lead to the necessary improvements in products and processes.

The sustainability theories and approaches linked to the economy suggest that businesses – as well as their support systems – should consider the principles of sustainable development, i.e. the balancing of economic, ecological and social impacts (challenges and opportunities) of their actions, when developing and supporting technologies and operations. Eco-MSMEs and eco-innovations can substantially contribute to a green economy, but they face similar growing pains than any other start-up or new technology trying to penetrate to market. The need and potential for product and business innovations promoting eco-efficiency (more efficient use of energy, water and other resources) and other sustainability concepts (cradle to cradle, biomimicry etc.) and wellbeing is huge due to the planetary constraints of material use and various social problems, and the obvious inability of mainstream business practices to create sustainable solutions to the sustainability challenges. In addition to incremental sustainability improvements in products, processes and practices, the development of real radical sustainability innovation has remained marginal in mainstream businesses.

Sustainability considerations are highly relevant when analysing the potential (opportunities) and needs of such businesses. As mentioned above, the dominant logic in business and economic activity in general has often ignored the long term environmental and social values and constraints, and concentrated mainly on the short term economic profitability of activities. At different times, certain innovative solutions may not at first seem feasible, but later they will prove sustainable both in terms of ecology and economy. This may be also reflected in the mindset of support services for start-ups and MSMEs so that they may not be able to foresee the potential and societal value of the new innovative solutions.

If the situation of innovative start-ups and MSMEs is analysed without proper understanding of sustainability challenges of the world and without knowledge of the potential growth opportunities of sustainability-oriented companies that provide innovative solutions to the needs of society in the spirit of sustainable consumption and production, the emerging green businesses might be doomed to fail and disappear from the market. Hence, it would be important that persons responsible for support decisions and services would be able to analyse the business cases with a wider toolset and expertise than just conventional business analysis. At the moment, the sustainability considerations are only starting to become a part of mainstream investment and financial analysis. Hence there is a need for more levels or dimensions of output measurement and analysis for eco-innovation. On the other hand, we may also need more knowledge on the specific features of eco-innovation in comparison to “mainstream” innovation. Is there ultimately so much difference?

The emergent degrowth paradigm, if successful, may also create momentum for sustainable innovations and MSMEs developing them. It is certain however that planetary boundaries will limit and ultimately end the current economic growth pattern based predominantly on increasing material use all over the world. This will create opportunities for innovative products and services that are able to

provide better solutions to the global sustainability challenges. The materialisation of the opportunities is partly dependent on the ability of support services to see the needs and challenges, and provide meaningful support during the process. In terms of consumption, we also need behavioural and structural changes in the society.

2.3.2 Eco-Innovation and Sustainable Entrepreneurship

Linda Bergset & Klaus Fichter

2.3.2.1 Introduction

Eco-innovation is defined by the EU-funded Eco-Innovation Observatory (EIO) as “any innovation that reduces the use of natural resources and decreases the release of harmful substances across the whole life-cycle” (EIO 2010, 10). This broad definition builds on an existing understanding of innovation and emphasises types of inputs, outputs as well as full life-cycle impact as key indicators of eco-innovation. Sustainable entrepreneurship has been defined as “[...] an innovative, market-oriented and personality driven form of creating economic and societal value by means of break-through environmentally or socially beneficial market or institutional innovations" (Schaltegger & Wagner 2011, 226). Sustainable entrepreneurs can thus be called the creators of eco-innovation. Building on these definitions, as well as an established understanding of what “innovation” (cf. section 2.2.2) and entrepreneurship” (cf. section 2.2.3) are, we will arrive at modified definitions suitable for the purposes of the project SHIFT.

2.3.2.2 Eco-Innovation

What is eco-innovation? While the above definition gives an indication, there is a widespread use of different terms to describe a similar phenomenon in academia, which has not necessarily converged over time (cf. Schiederig et al. 2012). Some of the terms used in recent years include “eco-innovation” (e.g. Kemp & Pearson 2007), “green innovation” (e.g. Schiederig et al. 2012), “sustainable innovation” (e.g. Wüstenhagen et al. 2008), “sustainability-oriented innovation” (e.g. Hansen & Große-Dunker 2013), “sustainable development innovation” (e.g. Hall & Wagner 2012), and “sustainability innovation” (e.g. Arnold & Hockerts 2011). While a distinction between social and environmental issues in innovation to some extent is made, a clear line is difficult to draw. Sustainability is widely agreed to consist of the three dimensions of environmental, social and economic value (Cf. Chapter 2.3). These dimensions to a great extent need to be considered jointly as they have overlaps as well as trade-offs between themselves (cf. Hansen & Große-Dunker 2013). The economic and environmental dimensions converge in eco-efficient innovation that reduces cost e.g. through the use of less material or energy (Horbach et al. 2012), the social and economic dimensions in e.g. fair-trade, and the social and environmental dimensions e.g. in innovation improving access to clean water. While trade-offs between profit concerns and social or environmental value are regularly observed, they may also arise between the social and environmental dimensions as observed in cases such as bio-fuel development (preferential use of resources or land for energy that could have been used for nutrition). According to ECO-INNOVERA, eco-innovation not only has environmental impact, it contributes “to sustainable growth in economic and social welfare” – and these dimensions should

be considered “on the same level” (cf. 1st call text). At the same time, there is a danger of watering out the significance of the environmental issues, when there is no clear prioritisation in their favour. Figure 6 above (cf. section 2.3.1) underlines the fundamental importance of an intact environment, without which no economic or social activity is possible.

Like in conventional innovation (see section 2.2.2.1), a wide range of types of eco-innovation (innovation objects) have been identified. New products (goods and services), business practice (organisation and marketing), production methods (process), combinations of goods and services (product service systems or PSS), system innovation and institutional innovation all fall under the umbrella term of eco-innovation (EIO 2010; Kemp & Pearson 2007). ECO-INNOVERA includes transfer, i.e. the use of a product or technology in a new context, in their understanding of eco-innovation (cf. 1st call text). The European Commission emphasises that eco-innovation does not imply a high technology level. EIO includes “material flow eco-innovation” in their classification, which involves “innovation across the material value chains of products and processes that lower the material intensity of use while increasing service intensity and well-being” (EIO 2010, 25). Examples here are as diverse as new materials, recycling and infrastructure transformation. EIO also redefines the ambiguous term of social innovation in the context of eco-innovation as “social eco-innovation”, focussing on the behavioural elements of resource consumption, e.g. in PSS or share economy). For the classification of eco-innovation activity in sectors, the Eurostat classification for Environmental Goods and Services (Eurostat 2009) provides a broad framework. Whereas there has been talk of an eco-innovation “sector” or “eco-industry”, these concepts may be considered somewhat imprecise or misleading, as eco-innovation takes place across the whole economy (Kemp & Pearson 2007). The concept of a green economy (cf. UNEP 2011a) illustrates this. All economic activity in all sectors and industries over time needs to become sustainable. Sustainability is thus a cross-sectoral theme.

How then can eco-innovation be distinguished from other types of innovation? There is a potentially doubly innovative aspect in eco-innovation: it can be seen, on the one hand, as in conventional innovation to imply a significantly altered product or service and, on the other hand, to signify a significantly altered impact on the environment. While the intention behind eco-innovation can originate from both economic and sustainability-related motives (Fichter & Arnold 2004), what matters most is the actual environmental impact that arises through the diffusion of such innovation (Kemp & Pearson 2007). The impact can be defined by the input going into the innovation and/or the output coming out of the end-result. In terms of input of materials and energy, impact can be measured by reduced use of non-renewable resources, increased material efficiency, reduction or stabilisation of land use, use of renewable energy or energy efficiency (BMU 2012). In terms of output, the following indicators are central: climate protection and reduction of emissions, waste prevention and recycling management, protection and preservation of biodiversity and eco-systems, soil protection or more indirect sustainability services (BMU 2012). Any impact can only be conclusively established ex-post and not before the innovation process is initiated. The “dilemma of innovation” (Ben-Haim et al. 2013) becomes even more clearly pronounced as a “double ambivalence” (Fichter & Clausen 2013) in the case of eco-innovation. Such innovation carries in it both “greater unknown dangers” as well as “greater potential advantages” than the current product or process that it is intended to replace (Ben-Heim et al. 2013, 130). In order to achieve the highest possible level of accuracy in ex-ante assessments of the societal impact of eco-innovation, including rebound effects that occur at the use

stage (cf. section 2.3.1.3), a full life-cycle assessment is considered to be most appropriate (cf. Schiederig et al. 2012; EIO 2010; Kemp & Pearson 2007).

An eco-innovation process is no straight-forward, linear process. Different internal and external factors (barriers and drivers) and actors influence it. Not only actors within the innovating organisation (see below), but also external actors help steer the direction of the process. On the one hand, it can be said that the eco-innovation process in practice differs from the conventional innovation process, in that environmental regulation is introduced with the intention of stimulating eco-innovation – i.e. in regulatory push and pull (cf. Hoffmann 2012) – as well as in innovator motivation (see also section 2.3.2.3). On the other hand, it could be argued that the eco-innovation process *should* normatively differ from the conventional innovation process in that other goals can be identified than classical profit-oriented ones as well as in the need for a broad integration of stakeholders who impact the success of and are in turn impacted by eco-innovation. The concept of open innovation introduced in section 2.2.2.3 can thus be observed to be a particularly interesting approach in eco-innovation processes, first due to the importance of integrating stakeholders in sustainability matters and second due to the possibility of lowering societal risks of the innovation. The methodological report of the Eco-Innovation Observatory (EIO 2010) and the EU-funded project Measuring Eco-Innovation (Kemp & Pearson 2007) provide overviews of barriers and drivers in eco-innovation. Fichter and Clausen (2013b) provide an overview of policy intervention options in the innovation and diffusion process of eco-innovation. The impact of individual factors is however challenging to disentangle, as there is a dynamic interaction of a multitude of factors in eco-innovation processes (Arnold & Hockerts 2011 and Fichter & Clausen 2013).

2.3.2.3 Sustainable Entrepreneurship

Entrepreneurship has to do with opportunity recognition, creation and exploitation (cf. section 2.2.3). What is *sustainable* entrepreneurship? Several characteristics can be directly derived from the definition given in the introduction. Sustainable entrepreneurship can be considered to be innovative (i.e. a source of eco-innovation), market-oriented, personality driven, radical ("break-through innovation") and creates economic as well as societal (social and environmental) value. Although certain aspects may be debated (e.g. the level of market orientation and whether not also incremental innovation should be considered), the definition indicates rather clearly how sustainable entrepreneurship can be distinguished from conventional entrepreneurship (more on this below). As in the case of eco-innovation, there are a range of concepts used – some interchangeably and others with great overlaps – for sustainable entrepreneurship (cf. Albino et al. 2009). These include "green entrepreneurship" (e.g. Berle 1991), "environmental entrepreneurship" (e.g. Dean & McMullen 2007), "ecopreneurship" (e.g. Petersen 2003; Schaltegger 2002; Schaper 2002), "social entrepreneurship" (e.g. Nicholls 2010), "sustainability entrepreneurship" (e.g. Parrish & Foxon 2009) and "sustainable entrepreneurship" (e.g. Schaltegger & Wagner 2011; Wüstenhagen et al. 2008; Dean & McMullen 2007). There have been efforts to disentangle and distinguish different types of sustainability-related entrepreneurship from each other (e.g. Thompson et al. 2011; Cohen et al. 2008), e.g. by linking social entrepreneurship exclusively to social impact, environmental entrepreneurship or ecopreneurship only to environmental impact and sustainable entrepreneurship to those types of entrepreneurs who integrate all sustainability-related issues in their activities (cf. Thompson et al. 2011). Such a distinc-

tion may appeal theoretically, but due to two considerations meet with difficulty in real entrepreneurial practice. First, as discussed above, the dimensions of sustainability are to some extent inextricably linked to each other. Second, there is a continuum of integration of sustainability considerations in entrepreneurial activity, which is influenced to different extents by amongst others entrepreneurial motivation, company strategy and type of product. Moreover, several authors discuss environmental issues in publications about social entrepreneurship (e.g. Lehner 2012; Nicholls 2010; Di Domenico et al. 2010). A distinction according to level of profitability has also been attempted: i.e. social entrepreneurship is non-profit whereas environmentally-related entrepreneurship is generally for-profit (Thompson et al. 2011) – however no consensus has developed here either (cf. Dorado & Ventresca 2012; Lehner 2012). As the definition above indicates, the term sustainable entrepreneurship is a broad concept, which allows for the inclusion of a range of entrepreneurial activities that are both market-oriented and directly sustainability-related.

A typology of sustainable entrepreneurship is nonetheless sensible as it can help operationalise and concretise the term for empirical research. Schaltegger (2002) and Walley & Taylor (2002) provide two typologies that allow differentiation on a continuum of motivation (from purely economic to purely sustainability-oriented) as well as regarding the level of market orientation. Even if motivation does not determine impact (cf. discussion on eco-innovation), it may have a significant influence on the level of profitability as well as the level of integration of sustainability. Schaltegger (2002) distinguishes between

- *alternative actors,* who have a low level of market orientation, are rather locally/regionally active and strongly sustainability-oriented,
- *bioneers* – inventor types who are technology/product driven, have found a niche segment of customers who are willing to pay a premium and have a mix of sustainability and economic motivation, and
- *ecopreneurs* who are strongly economically motivated and take advantage of eco-innovation opportunities that are potentially highly profitable and mass-market compatible.

  Walley and Taylor (2002) have two types that overlap with those of Schaltegger (their ethical maverick is similar to the alternative actor and their innovative opportunist to the ecopreneur). In addition they distinguish the following types:

- *visionary champions* are strongly sustainability motivated, but also strongly market-oriented and want to force less sustainable economic activity out of the market through creative destruction and mass-compatibility, and
- *ad hoc-environpreneurs* are “accidental” sustainable entrepreneurs in the sense that they offer eco-innovation without any intention or strategy to that effect.

Although some authors focus primarily on such entrepreneurial activity that is mass-market compatible (e.g. Schaltegger 2002), also smaller, more regionally active entrepreneurs may have a considerable contribution towards making the economy more sustainable.

Sustainable entrepreneurship can, moreover, take place in both new, small companies (start-ups) and as intrapreneurship in established MSMEs and larger companies. Different types of companies

have different roles in this context. Fichter and Clausen (2013) recently found in a review of 100 diffusion processes that start-ups are primarily involved in radical eco-innovation processes, while established MSMEs and larger companies are more strongly involved in incremental eco-innovation. Hockerts and Wüstenhagen (2010) furthermore suggest that "sustainable Davids" (start-ups) play a key role in emerging and early growth phases, while "greening Goliaths" (larger businesses) become more important in the growing and mature phases of an industry.

There are challenges in sustainable entrepreneurship that differ from that of conventional entrepreneurship. While conventional innovation processes are influenced by the existence of spillovers (Baumol 2010), eco-innovation may be challenged by the so-called double externality problem (Faber & Frenken 2009). Not only do spillover effects from the innovation benefit other firms in their innovation efforts; additionally, a reduced private return on investment results from eco-innovation when prices fail to sufficiently reflect positive externalities, i.e. social and environmental impact, created (and sometimes intended) by the entrepreneur and any negative externalities created by the products and services of competing entrepreneurs (cf. Pacheco et al. 2010; Faber & Frenken 2009; Isaak 1998). As conventional entrepreneurship generally unfolds within the existing market logic, while sustainable entrepreneurship directed at solving societal challenges to different extents "promotes system-change" (Dorado & Ventresca 2012, 70), the latter can be assumed to be faced with more challenges and barriers, also beyond those faced in the market.

As in the case of eco-innovation, the context in which sustainable entrepreneurship takes place matters. While one stream of entrepreneurship research focuses almost entirely on the entrepreneurial person with their skills, background and motivation and another stream focuses more on the institutional setting, newer conceptual and theoretical work builds on Schumpeter's view on innovation as entrepreneurs' "creative response" (Schumpeter 1947), emphasising the reciprocal interaction between entrepreneur and institution context (Fichter 2009b; Fichter & Antes 2007; Dimov 2007; Walley & Taylor 2002; Jack & Anderson 2002). While social structures both enable and hinder individuals (Sarason et al. 2006), they can choose either to reinforce currently prevailing structures or act entrepreneurially and thereby contribute to changing social structures (Walley & Taylor 2002).

2.3.2.4 Conclusion

While eco-innovation and sustainable entrepreneurship are distinct domains of research, they are closely related and linked. For the project SHIFT, which focuses on sustainable entrepreneurs as creators of eco-innovation as well as the support systems around such entrepreneurs, the following insights can be gained from the literature reviewed above:

- Building on and specifying the EIO definition given above, in the context of SHIFT eco-innovation is understood to be product/service innovation that causes a *significant* decrease in environmental impact, while remaining economically feasible (i.e. financially viable) and not being in conflict with social sustainability.
- While innovation can happen within as well as outside the market context, a suggestion would be to narrow down the focus of the project to such innovation that is market-oriented. Types of innovation (innovation object) considered in the project are marketable technologies, goods and services as well as a combination of these (PSS).

- While radical innovation is of considerable importance for a more sustainable economy, also incremental innovation contributes to a green economy and will also be analysed in the project, as long as it leads to a significant decrease in environmental impact.
- Sustainable entrepreneurship is thus seen as – in a somewhat condensed version of the definition given above – "a [...] market-oriented and personality driven form of creating economic and societal value by means of [...] environmentally or socially beneficial [...] innovations" (Schaltegger & Wagner 2011, 226).
- In the project, sustainable entrepreneurs will be distinguished according to the typologies explored above, with an extra consideration of the type of goals the entrepreneurs have (economic, environmental and/or social).
- In order to look at different industries that are in various stages (emerging, growing and mature), the project will analyse new companies (start-ups) as well as more established ones (innovative MSMEs) in a range of sectors (leaning on Eurostat's (2009) EGSS classification).
- A transformation to a more sustainable, green economy, in which economic activity is decoupled from resource use (see section 2.3.1), requires systemic change, which entrepreneurs are crucial contributors to. The considerable challenges explored in this process are different and go beyond that which conventional entrepreneurs experience, which indicates a need for a transformation in the relevant support systems.

2.3.3 Sustainability Assessment of Economic Activity

Olof Hjelm

2.3.3.1 Introduction

A multitude of systems analysis tools have been developed for environmental and sustainability assessment of economic activities. This includes environmental impact assessment (EIA), life cycle assessment (LCA), life cycle cost analysis (LCC), cost-benefit analysis (CBA), strategic environmental assessment (SEA), just to mention a few. For an overview please refer to Finnveden and Moberg (2005). The choice of assessment tool depends on what should be assessed (product, facility, project, plan etc.) and many tools can be used in parallel giving complementary data. Often a distinction is used based on process tools (SEA, environmental management systems) and data generating tools (LCA, LCC).

The main purpose of SHIFT implies some kind of development, improvement or reform of existing support systems including activities and organizations belonging to such schemes. It is therefore of interest to develop a framework for assessing changes induced by the reformed support systems (see Figure 8). Further, the evaluation of existing support systems is of interest of SHIFT. Challenges to assess support systems include the diversity in systems, activities and organizations and the multitude of impacts that can be seen as consequences of changes. Not least because the SHIFT project includes support systems in many countries and is interested in economic, environmental and social performance. The following sections will discuss these challenges departing from general evaluation

literature combined with experiences from the sustainability area. At the end an approach to be used within the project is proposed.

2.3.3.2 Challenges in Assessing Changes Induced by Support Systems

To start, a huge challenge in the SHIFT project is the sustainability focus. Sustainability with its inclusion of economy, environment and social dimensions faces the risk of becoming too complex to handle and also to unspecific in its definition. This calls for a clear focus and development of relevant indicators for assessment. As mentioned above, a multitude of environmental (or sustainability) assessment tools have been developed such as life cycle assessment (focusing products and services), ecological foot-printing, strategic environmental assessment (focusing policy, plans and programmes). Often a set of multiple indicators are used to capture the large number of factors to assess.

From the research area of environmental assessment, it is shown that follow-up of initiatives, plans, strategies and programmes in order to estimate whether the measures have fulfilled their intentions is often neglected in practice (e.g. Ivner, 2009; Hjelm et al., 2011). However, several studies discuss and analyze follow-up from a more theoretical perspective (Morrison-Saunders & Arts, 2004; Partidário & Arts, 2005; Cherp et al., 2006). Sometimes, follow-up is difficult since the goals set are diffuse or complex and therefore difficult to evaluate (Rydholm & Gustafsson, 2011).

Several units of analysis are of interest for the SHIFT project. It is not the individual company that is in focus but the overarching system of actors trying to boost the development of companies. Such actors often have the success at the company level as the prime unit of analysis for reporting success. Often new products released on the market, jobs created and increased sales are of interest.

This also opens up for a discussion regarding the difference between effectiveness and efficiency. Management research and especially environmental management and assessment studies often tries to distinguish between activities helping organizations to reach their set goals using as little resources as possible (efficiency) and activities leading to substantial environmental improvements i.e. doing things that solve the right problems (effectiveness) (Hjelm et al., 2011). Efficiency can be understood as doing things right; effectiveness as doing the right things. This has had important influence in research regarding corporate environmental management, where a distinction between the perceived impacts of organizations' environmental management and more objective performance indicators are important. Often the effects are judged as positive in the eyes of company representatives, but performance indicators are not always giving the same positive answer. This means that the form and scope of follow-up is crucial for evaluating and estimating the effect of visions and strategies.

Further, activities within a support system are not done in a vacuum. Not least the environmental arena is to a high extent influenced by changes in policy and especially legislation. A promising technology developed by an entrepreneur can because of policy changes become obsolete. Further efficiency measures (such as energy conservation or reduced material use) are strongly influenced by market prize. This adds to the classical problem in assessing if an observed change in e.g. company success of an incubator is because of the activities of the incubator or changes in the surroundings, i.e. there is often not a clear link between cause and effect.

Time scales are also important while evaluating the efficiency and effectiveness of support systems. If the activities within a support system are of strategic character, the effects are most likely not seen on a short time scale. It would therefore be of more interest to study the effects several years after a specific initiative. This is however very rare, leading to a situation in which the assessments risk of focusing on the short term and perhaps smaller effects compared to more long term and more substantial effects.

Finally, evaluation of policy and programmes (Vedung, 1998) often leads to the notion that the unforeseen effects are just as important as the expected effects. It can of course be argued that this is an afterthought to justify an unsuccessful program, but such spin-off effects should anyhow not be neglected.

2.3.3.3 Relevance for SHIFT

Given the aim of the SHIFT project the following suggestions can be made for designing a toolbox for sustainability assessment of support systems.

- Assessments in SHIFT should focus effectiveness before efficiency. This since the project aims for getting more benefits out of the support systems to the individual companies.
- A set of indicators could be developed mirroring the different dimensions of sustainable development (Figure 8).
- Economic assessments are probably most relevant using traditional indicators such as turnover, increased sales, new jobs etc. Such assessments are rather direct and concrete and most likely already done for several initiatives.
- It will not be possible or relevant for the SHIFT project to perform life cycle assessments and other detailed environmental assessments. Rather assessments aimed at indicating “right direction” of different initiatives would be sufficient. This could be seen as a “semi-direct assessment” evaluating the initiatives from the perspective how they contribute to societal goals (such as national environmental goals and EU-policy).
- Assessments in the social dimension are not of main interest in the project but rather indirect assessments, so that the initiatives are not conflicting with social responsibility, can be considered sufficient.

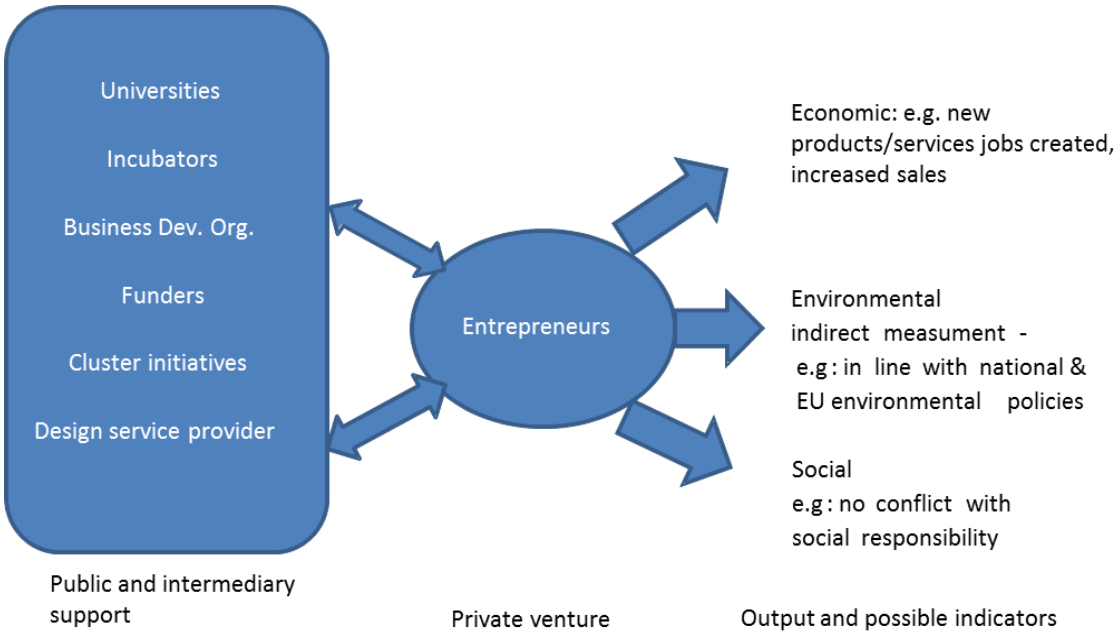

Figure 8: Focus of SHIFT project and possible output to be assessed using indicators. Source: Authors.

2.4 Systems Theory and Systematic Approaches

2.4.1 Systems Theory in Sustainability & Environmental Science

Wisdom Kanda

2.4.1.1 Introduction

System analysis is the science of the complex and has developed into complex theories and methods itself (Müller, 1997). The fundamental concept of system analysis is to serve as a mediating element between holism and reductionism. To this effect, systems theory aims to understand the interactions and dynamics of systems as entities effectively integrating the contributions and significance of system components into the whole dynamic complex. Examples of such system theories discussed in previous scientific literature include ecosystems theory, transition management framework and multi-level perspective (MLP). Their underlining theme is the importance of systemness – interconnections between things acting in a tangle of complexity. In the particular context of innovation, these theories contest linear models of technology emerging without external influences and having little influence on social changes (Mejía-Dugand, 2013).

Of particular interest for the SHIFT project is the multi-level perspective, which would be used in two ways.

(1) To position the SHIFT project in a broader context of sustainability transitions.

(2) To postulate how to analyse support systems for sustainable entrepreneurship.

2.4.1.2 Why are System Theories Needed in Sustainability Studies?

The use of system theories has become particularly important in the analysis of sustainability transitions (Geels et al., 2008). These theories depict sustainability challenges as formidable societal challenges which require changes in markets, lifestyles, cultural discourses, governmental institutions – in short societal challenges require system solutions (Grin et al., 2010; Rennings, 2000). To be specific, societal challenges such as climate change, biodiversity loss and resource depletion can only be solved by deep structural changes in transport, energy, agriculture and their reinforcing system components such as policy, industries, civil society, researchers etc. As a result, such socio-technical transitions are complex and long term processes comprising multiple actors (Geels, 2011). Although not sufficient, technological innovations are considered an integral part in the transition towards sustainability. These frameworks thus look beyond simple approaches by overcoming their narrow focus on changes in individual system components and focus rather on the dynamic interaction and the co-evolution within the entire system. The multi-dimensionality of sustainability transitions makes it imperative to understand such socio-technical transitions as complex processes which cannot be studied in fragments. Thus analytical frameworks for sustainability transitions need to accommodate co-evolution, multi-dimensionality, complexity and multi–actor processes (Geels et al., 2008).

2.4.1.3 Multi-Level Perspective

Innovation journeys are driven both by internal and external factors to an emerging entity. This principle is vividly captured in the multi-level perspective. The MLP offers a comprehensive conceptualisation by dividing social organisations into three different levels with the intention of tracking changes and analysing developments. These analytical levels are:

- *Niches level* – including individuals, companies where radical innovations emerge.
- *Socio-technical regime* –comprising networks, communities, organizations and their cognitive routines, belief systems, regulative rules and normative roles which stabilizes existing large scale systems.
- *Socio-technical landscape* – including nations, federations and their activities (e.g. macro-economics, macro-political developments) which form an external environment with influence on the niche and regime levels.

Figure 9 below depicts the multi-level perspective. Illustrated is a plot of structuration of activities against time. The figure also depicts the interactions within and between the three analytical levels. In summary, the core message that the MLP carries across when analysing or trying to influence socio-technological change is that transitions come about through interactions within and between processes at different levels: 1) niche innovations build up internal momentum 2) landscape changes induce pressure on the regime 3) disturbances in the regime create window of opportunity for niche innovations.

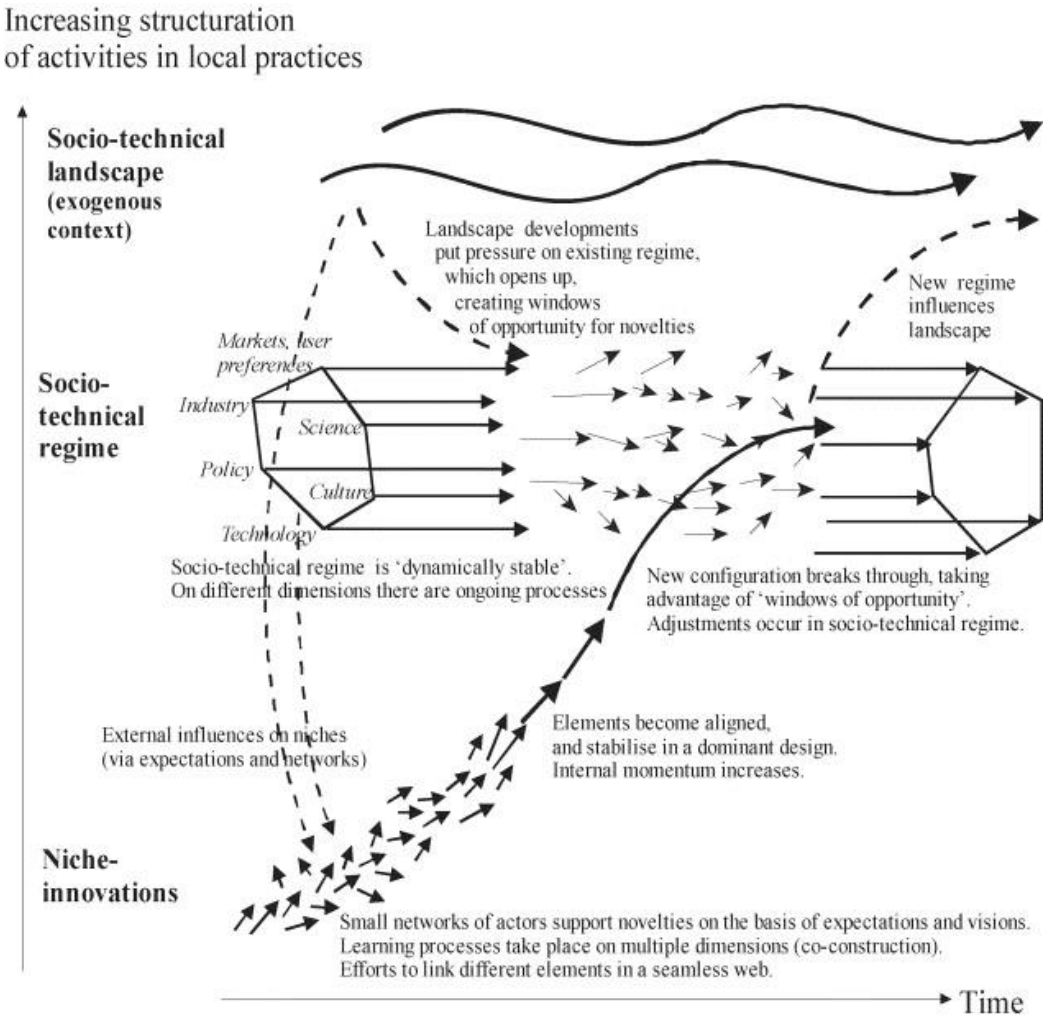

Figure 9: Multi-level perspective on transitions. Source: Geels (2011, 28)

2.4.1.4 Relevance for SHIFT

Analysing a particular technology emergence in isolation from the system within which it occurs is fruitless when aiming to understand and influence complex societal challenges such as sustainability transitions. The multitude of interactions between technologies and the systems with which they interact demands a systemic approach.

As has been mentioned in the background and overall aims of the SHIFT project, the focus is on support systems (e.g. financiers, universities, business development organisations, incubators) and how they could effectively boost the emergence of eco-innovations through sustainable entrepreneurship. These support organisations could fairly accurately be positioned in the socio-technical regime in the MLP framework see Figure 9 above. Eco-innovations often emerge at the micro-level (individuals, companies) in a dynamic environment interacting with actors and processes in the socio-technical regime and landscape. These niche level innovations face obstacles which have to be overcome in order to enter the regime and landscape levels. For such windows of opportunities to emerge, disturbances in the regime level often induced by pressure from the landscape is needed (Mejía-Dugand et al., 2012). Such macro level pressures include political support from higher gov-

ernmental levels for eco-innovations, awareness and negotiations about climate change, enabling macro-economic conditions etc. The window of opportunities appearing in the regime level opens up for niche level innovations which align or connect with existing regimes at minimal disturbance. With the drawbacks of suspicions and distrust, lack of proof of concept often associated with innovations, those who aim or tend to cause huge disturbances to the regimes and landscapes will face resistance, longer time to emerge or complete failure. The MLP has been applied to investigate many historical transitions such as land transports (from horses to cars), shipping, bus rapid transit systems, industrial production as well as sewer and sanitation. Though the MLP has emerged as a fruitful analytical framework, it has also been criticized for being biased towards bottom-up change models and being difficult to operationalize, amongst others. Thus the possibility of other relevant complementary (system) theories for exploring profound change in systems (e.g. see Senge et al., 2005) could be explored as the SHIFT project progresses.

In conclusion, the MLP enables the framing of the SHIFT project within a larger context of sustainability transition. It also emphasises the concept of systemness which means that units of analysis do not exist in isolation, but are in dynamic interaction with other components of the entire system. Thus an effective investigation of such public and intermediary support systems for sustainable entrepreneurship and eco-innovation would also require an understanding of the landscape and regime level dynamics of innovation and also diffusion which remains a natural extension to innovation.

2.4.2 Systemic Approaches in Innovation Research

Klaus Fichter

2.4.2.1 Introduction

As described in section 2.2.2.4, the necessity and relevance of interactive and systemic approaches in innovation research has been growing in the past decades. From the broad array of systemic conceptualizations in innovation theory, the concept of “innovation systems”, the trans-organisational model of “innovation communities” and interaction models like co-creation seem to be particularly relevant for the SHIFT project. The theory of innovation systems can be fruitful for SHIFT, because it helps to understand and explain the role of support systems for entrepreneurship. The innovation community-concept can be very helpful, because it relates to entrepreneurial roles in the innovation process and the collaboration of innovators across organizational boundaries and across different levels of the innovation system. These concepts shall be introduced and discussed in the following section. The concept of co-creation is being discussed in section 2.4.4.

2.4.2.2 Innovation Systems

While most research on innovation networks has focused on inter-organizational cooperation, there have been a growing number of research activities conceptualizing these networks as part of an “innovation system” since the 1980s (Freeman 1987). Most of them focus on national innovation systems, which can be defined as “market and non-market institutions in a country that influence the direction and speed of innovation and technology diffusion […] But innovation systems also exist at other levels, e.g. as world-wide, regional or local networks of firms and clusters of industries” (OECD

1999, 23). While many scholars focus exclusively on the aspect of “institutions” in the definition of “innovation systems” other authors also stress the importance of “actors” and resources” to be included in the concept of innovation systems (cf. Burr 2004, 16; Fichter & Antes 2007, 22). Against this background Fichter (2012) defines “innovation systems” as follows:

> *“An innovation system comprises all actors and stakeholders of an innovation process as well as the rules and resources that influence their action and interaction.” (Fichter 2012, 43, translated from German by the Author)*

Drawing on the interactive paradigm of innovation (Lundvall 1988, see also section 2.2.2.4) and the idea of “inter-organizational collectivities” (Van de Ven, Delbecq & Koenig 1976), more recently, scholars (Lynn, Reddy & Aram 1996) have developed an “innovation community framework” for studying relevant organizations and relationships as structural systems. They propose the term “innovation community” to refer to the organizations significantly involved in the commercialization of a new technology or innovative product. Thus they conceptualize “innovation communities” as inter-organizational networks, “embedded in a dense web of social and economic relationships” (Lynn et al. 1996, 98). Technology is perceived to be at the centre of the innovation community, which is suggested to consist of a “substructure” and a “superstructure”:

“Organizations in the substructure produce either the innovation or its technological complementaries […] Superstructure organizations provide collective goods to their members, often specializing in coordinating flows of information or coordinating the activities of substructure organizations” (Lynn et al. 1996, 98). Many superstructure organizations are thus “linking organizations”, such as professional societies, occupational or industry associations, government organizations, as well as non-corporate R&D institutions. Superstructure organizations promote innovation and technology integration in different ways, linking diverse bodies of knowledge, competence and skills.

The framework of Lynn et al. (1996) has helped the understanding of the way in which inter-organisational innovation communities function (Lynn 1998), allowing for different levels of innovation systems to be differentiated. Above the individual and single company level, there is an organisational and network level directly involved in “producing” innovations (substructure) and a third level (superstructure) that links to further innovation organizations and intermediates. Thus, the relevant point here is that innovation systems consist of different interconnected levels of innovation protagonists (Vanhaverbeke and Cloodt 2006, 276). This supports the notion that interaction takes place not only across organisational boundaries, but also across different levels of the innovation system.

Nevertheless, one main shortfall of the innovation community framework of Lynn et al. (1996) is that it exclusively examines inter-organizational aspects, omitting the role of interpersonal networks within the innovation system. Thus, there is a conceptual gap in what might be called the “micro-structure” of an innovation system. Under these circumstances, it is helpful to turn to “promoter” and “champion research” theory in order to conceptualize the interpersonal microstructure within innovation systems.

2.4.2.3 Promoter Theory

Promoter theory is based on the notion that the success of innovation processes depends on overcoming certain barriers; it requires promoters who commit enthusiastically to specific innovation projects and help overcome those barriers. Witte (1973, 15) defined promoters as "individuals who actively and intensively support the innovation process". With regard to barriers, Witte (1977) differentiates between two kinds of specialisation, the "power promoter" and the "expert promoter", and assumes that there is a correspondence between specific barriers and specialised roles. The "power promoter" contributes through hierarchical power and the "expert promoter" contributes through expert knowledge (Witte, 1973, 17). Another assumption of promoter theory is that the innovation process will be more successful if both types of specialised promoters work closely together (Hauschildt and Kirchmann, 1997, 68).

Witte's original two-centre theory of power and knowledge has been extended since its introduction in the 1970s. In the 1980s, Hauschildt and Chakrabarti (1988, 385f) described a third barrier that can hinder economic progress: administrative barriers. For this reason, they introduced the role of a "process promoter", who actively arbitrates between the technical and the economic world by means of organisational knowledge (Hauschildt, 1999, 174). Gemünden and Walter (1995) developed a fourth type of specialised promoter: "relationship promoters" actively encourage an innovation pro-cess by means of innovation-related business relationships inside and between the organisation and its external partners. The defining characteristic of relationship promoters is their extensive network competence, i.e. powerful relationships with other parties.

Table 2: Barriers, power bases and promoter roles in innovation processes. Source: Fichter (2012, 10).

Barrier type	Power base	Promoter role
Knowledge	Specialized knowledge	Expert promoter
Ignorance, opposition, resources	Hierarchical potential, control of resources	Power promoter
Administrative	Organizational know-how, communication skills	Process promoter
Cooperation, dependency	Networking skills, potential for interaction	Relationship promoter

Promoter theory stresses that the different specialised promoter roles do not have to be played by different individuals, but can also be combined in one person, the "universal promoter".

Promoter theory offers a consistent and elaborate base for describing and explaining the role of transformational leaders in innovation processes; its conceptual focus on a single organisation is, however, too limited in scope (Fichter, 2005). For this reason, the original theory has to be extended, by adding two new assumptions:

(1) Cross-boundary cooperation of promoters: In cases of open innovation and complex technologies, the innovation process will be successful only if universal or specialized promoters from cooperating organizations work closely together.

(2) Promoter roles on all levels of innovation systems: Promoter roles are not limited to those organisations involved in "producing" innovations, but can also be played by innovation intermediates (Howells 2006) or individuals from organizations of the superstructure of the innovation system (Lynn et al. 1996; Lynn 1998).

The new construct of "innovation communities" (see the following section) can draw on the concept of multi-level innovation systems, because it helps to clarify and configure cross-boundary relationships and allows systematic connections to the research on "superstructures" of regional, national and international innovation systems (Lynn et al. 1996; Lynn 1998).

2.4.2.4 Innovation Communities as Promoter Networks

On the basis of extended promoter theory and the concept of three-level innovation system, the term "innovation communities" shall be defined as follows:

"An innovation community is an informal network of likeminded individuals, acting as universal or specialised promoters, often from more than one company and different organisations that team up in a project related fashion, and commonly promote a specific innovation, either on one or across different levels of an innovation system." (Fichter 2012, 13)

Innovation communities therefore are characterised as promoter networks or as informal personal networks of innovators. They can be differentiated from scientific communities, which follow specific research topics (R&D communities), or communities that follow specific professional interests, by their declared and primary aim to support the breakthrough of a specific innovation. Innovation communities should, for this reason, not be confused with "Communities of Practice" (Lave and Wenger 1991; Wenger et al. 2002; Amin and Roberts 2008), but are a specific form of communities that are related to concrete innovation projects.

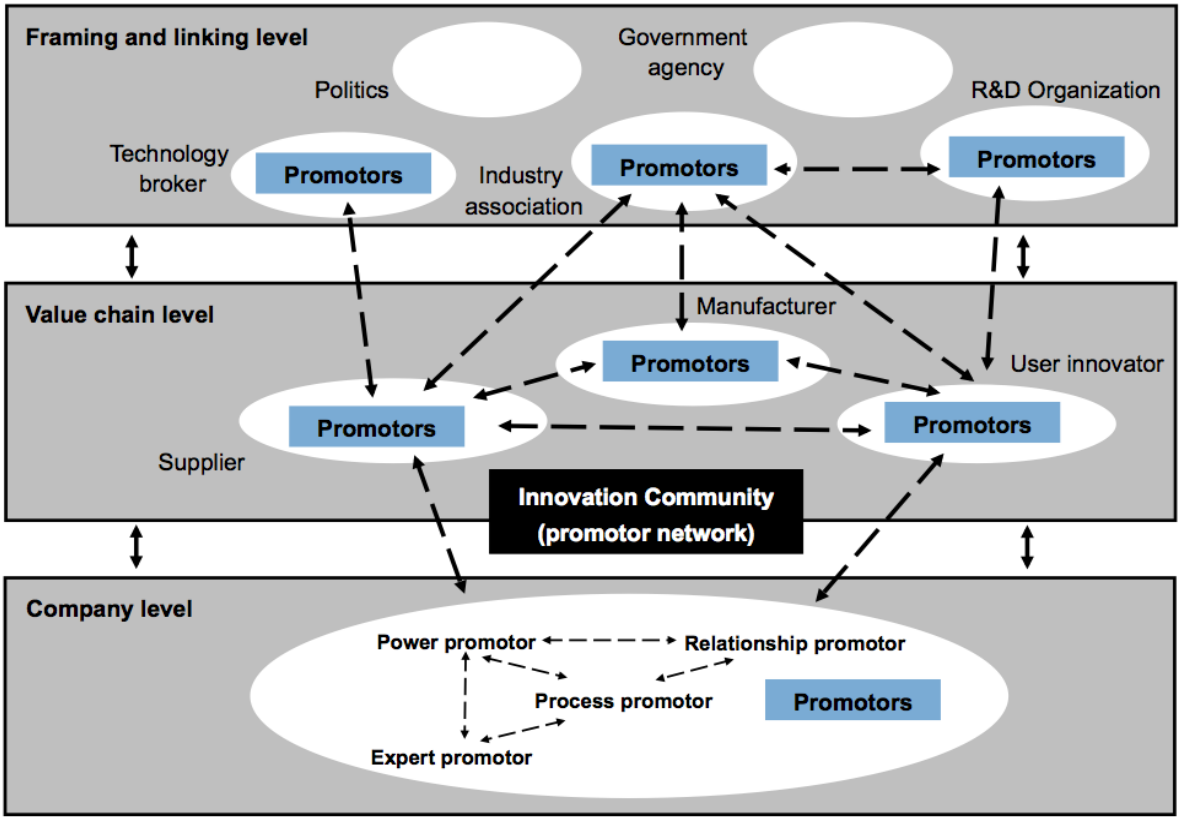

Figure 10: The innovation community as promoter network. Source: Fichter (2009a, 361).

It can be concluded that "innovation communities", as defined here, can be differentiated from other forms of social networks in innovation processes by three key criteria:

(1) The community is always related to a specific innovation idea or project.

(2) All community members play a promoter role in this process.

(3) The community members collaborate closely and informally, and they perceive themselves as a "team", a "group" or a similar entity, with a feeling of group identity.

2.4.2.5 Conclusion

The theory of innovation systems can be fruitful for SHIFT, because it helps to differentiate different levels of actors, activities and institutions in the eco-innovation process. It can be used to conceptualize the support system for entrepreneurship.

Promoter theory serves as a basis for the concept of innovation communities, but it can also be used to differentiate between different roles of entrepreneurs and other key actors in the innovation process.

The innovation community concept can be very fruitful for SHIFT, because it helps to understand and explain how entrepreneurs with their different promoter roles can cooperate with promoters and supporters from other level of the innovation system to implement eco-innovations successfully.

2.4.3 Systemic Approaches in Entrepreneurship Research

Dzamila Bienkowska

2.4.3.1 Introduction

The systematic approaches present in current literature on innovation and entrepreneurship acknowledge the role that the surroundings of an entrepreneur may have in the entrepreneurial process. Since new and small firms often depend on collaborations and external support in order to develop, we need systematic approaches when analysing them. Actors at different levels, e.g. individuals, institutions and organisations, can be present in the various models found in the literature, along with factors such as infrastructure. Flourishing surroundings can elevate an entrepreneur and contribute to the success of a new venture. Conversely, meagre surroundings can prove a disadvantage throughout the development of a new firm. The values inherent in an entrepreneur's surroundings can be considered when decisions about starting a new venture are made, as well as when a relocation of a developing firm is considered.

2.4.3.2 Key Theories and Approaches

Networks and Entrepreneurial Teams

Network approaches in entrepreneurship research suggest that all entrepreneurs are embedded in social networks, which can both facilitate and constrain their activities (Aldrich & Zimmer, 1986). These social networks encompass family, friends, partnerships, as well as professional & business contacts. Strong ties in networks are characterised by intense and long-term relations and tend to promote trust and knowledge transfer, but can also lead to insularity and lock-in effects (Johannisson, 2000). Weak ties are on the other hand characterised by infrequent and non-affective contacts which can contribute with diversity and new inputs, but simultaneously imply less trustful relations. Three important entrepreneurial processes can in particular benefit from network embeddedness: securing resources, gaining legitimacy and discovering opportunities (Elfring & Hulsink, 2003)

Research focusing on entrepreneurial teams acknowledges the fact that many new businesses are started by teams of people with a financial interest in the firm rather than by individual entrepreneurs. It focuses on issues such as team formation (Aldrich & Kim, 2007), interpersonal processes (Watson et al., 1995) and decision making in teams (West, 2007), which in turn have an effect on the performance of new businesses. Entrepreneurial teams can contribute with more resources than individual entrepreneurs while also bringing in more points of view and a broader set of skills as well as checking and balancing each other's decisions (Watson et al., 1995). New firms founded by teams reach greater financial success and growth potential, develop products faster and have better survival rates than firms founded by single individuals. However, many entrepreneurial teams also split up after some years of business (Watson et al., 1995).

Clusters and Entrepreneurial Ecosystems

While networks and entrepreneurial teams signify collaboration between individuals, the concept of clusters is applicable at the level of firms and organisations. Clusters can be defined as geographical concentrations of firms in similar and complementary industries that can be related by for example shared infrastructure or technology (Porter, 1990, 2000). Firms in clusters can benefit from their location in several ways; they can for example attain higher productivity or be more innovative than competitors in other locations. This is explained with advantages such as transaction efficiency, knowledge spillovers and a pool of skilled labour (Malmberg & Maskell, 2002; Bienkowska et al., 2011). Clusters have been identified in industries such as publishing & printing, furniture and agricultural products (Delgado et al., 2010). Recently, it has been shown empirically that strong regional clusters have a positive impact on the diversity and range of entrepreneurial opportunities, and simultaneously reduce the costs of starting up new firms (Delgado et al., 2010).

An extension of the cluster concept to a larger group of diverse firms and other actors which are located within one region and are inter-dependent leads us to the concept of entrepreneurial ecosystems (Cohen, 2006). The ecosystem encompasses a multitude of actors and within the region such as local government, business incubators, providers of financial capital and public organisations; as well as environmental factors such as roads, housing and office space; and social factors, e.g. culture, and formal and informal networks. A well-functioning entrepreneurial ecosystem can in turn enable the rise of a more specified cluster, as in the case of Boulder, Colorado in the US where an ICT cluster has developed (Neck et al., 2004). Other places that have been studies from the entrepreneurial ecosystem perspective include the Sustainable Valley in Victoria, Canada (Cohen 2006) and, on a smaller scale, the ecosystem of the Massachusetts Institute of Technology (Roberts & Eesley, 2011).

Triple Helix

The triple helix model deals specifically with the interaction between industry, university, and government on local, regional, and national levels (Etzkowitz & Leydesdorff, 1995). This model calls attention to the interdependencies between those three spheres of influence and to the dynamic processes through which actors mimic each other's roles. In triple helix model the role of universities becomes an entrepreneurial one, emphasising proactivity in commercialisation of knowledge and research results (Etzkowitz & Klofsten, 2005). Meanwhile, firms move towards a more academic way of functioning, characterised by for example openness and increased knowledge sharing. Governmental bodies and agencies are no longer only viewed as having a regulatory and supervisory function, but can also for example assume the role of a venture capitalist (Etzkowitz 2003). A recent study of triple helix effects in the US shows that US regions with high entrepreneurial activity such as Texas, California and Maryland have increased firm birth rates when there are interactions between university and government R&D, and university and industrial R&D respectively (Kim et al 2012). Therefore, the authors conclude that universities act as "entrepreneurial mediators" in these regions while no such effect could be found in low entrepreneurial activity regions such as Iowa and Connecticut.

2.4.3.3 Discussion

Systematic approaches in entrepreneurship research were to begin with created as part of a reaction against a one-sided focus on individual entrepreneurs in earlier research. Now they are considered mainstream and permeate throughout entrepreneurship research. The theoretical models presented above direct our attention to the social contacts of the entrepreneur (networks and teams), the characteristics of the social environment surrounding the entrepreneur (networks, ecosystems, and, to a lesser extent, clusters) and how they influence growth and development of new firms. Furthermore, the models emphasize the role of collaboration and competition between similar and related firms (clusters) and the role of indirect effects stemming from the wider surroundings of entrepreneurs (ecosystems). Finally, the importance of interactions of firms with universities, as well as with governments and public organisations, and the dynamic process of development that these interactions shape, is highlighted (triple helix).

2.4.3.4 Conclusion and Relevance for SHIFT

The models presented here are highly relevant for SHIFT since the project focuses heavily on the surroundings of entrepreneurs. The role of universities (WP 2) can for example be analysed using the Triple Helix and Ecosystems approaches, while the role of incubators and business development organisations (WP 3 & WP 4) can be viewed with the help of frameworks such as Clusters and Ecosystems. The role of financing (WP 6) is an important part of Ecosystems approach. When studying the roles of these organisations, the theoretical frameworks can for example be used to evaluate which factors are supported, in what way, and also what is insufficiently supported by current systems.

The literature on systematic approaches opens up many new interesting questions, both in research and policymaking terms. For example, do different regions/environments have varying needs for support and if so, which indicators should one consider when designing the support systems? It also seems necessary for SHIFT to differentiate between factors affecting the micro, meso and macro levels with regard to the systems the actors of the WPs (e.g. universities, incubators and business development organisations etc.) are embedded in. In line with this, is it most valuable to support meagre or rich entrepreneurial environments, i.e. should the support systems aim for low hanging fruits? The SHIFT project has great potential to analyse such questions and provide examples and scenarios that can help to answer them.

2.4.4 Systemic Approaches in Design Research

Alastair Fuad-Luke

2.4.4.1 Introduction

Designing new artefacts, products, services, experiences and possibilities – scenarios, concepts, prototypes, visualisations – involves a diverse array of design disciplines and approaches (Erlhoff & Marshall, 2008) acting on “things and systems” across a wide range of disciplinary fields (Boradkar, 2007), (Figure 12). In this sense, design is applied and blended with many other disciplines to achieve its outputs and deliver outcomes (the results and effects of designing). Design, thus framed, works with-

in a poly-disciplinary environment which embraces trans-, inter-, cross-, multi-, bi- and solo-disciplinary modes (Dykes, Rodgers, & Smyth, 2009). This way of working often sees a dynamic tension between design practice, design studies and design explorations (Fallman, 2008). Guy Julier argues that design is always making a response to current and emerging societal and cultural issues (2008). As the contemporary challenges to our societies get ever more complex, posing more intractable "wicked problems" (Rittel & Webber, 1973) design (-ing) is being seen as an important discipline to help create fresh and innovative ways of solving these challenges. "Design thinking" (Macdonald, 2001; Brown, 2009; Lockwood, 2009), "open design" (van Abel, Evers, Klaassen, & Troxler, 2010), "service design" (Meroni & Sangiorgi, 2012; Stickdorn & Schneider, 2012), "design for social innovation" and "social design" (Margolin & Margolin, 2002; Chick, 2012; Thorpe & Gamman, 2011) and "design activism" (Fuad-Luke, 2009; Jané, 2011; Thorpe, 2012) all indicate a "turn" in design(-ing) from a solely business/government orientated activity towards a wider societal remit. This "turn" implicitly and/or tacitly, acknowledges the inter-connected sustainability agenda to balance economic, social and environmental well-being with institutional well-being, a framework first proposed as the "prism of sustainability" by Joachim Spangenberg (2001) from the four dimensions originally proposed by the UNCSD (United Nations Conference on Sustainable Development, 1996). This is represented in Figure 11, with the inclusion of Design for Sustainability (DfS) and participatory design approaches showing where they are applied to the framework.

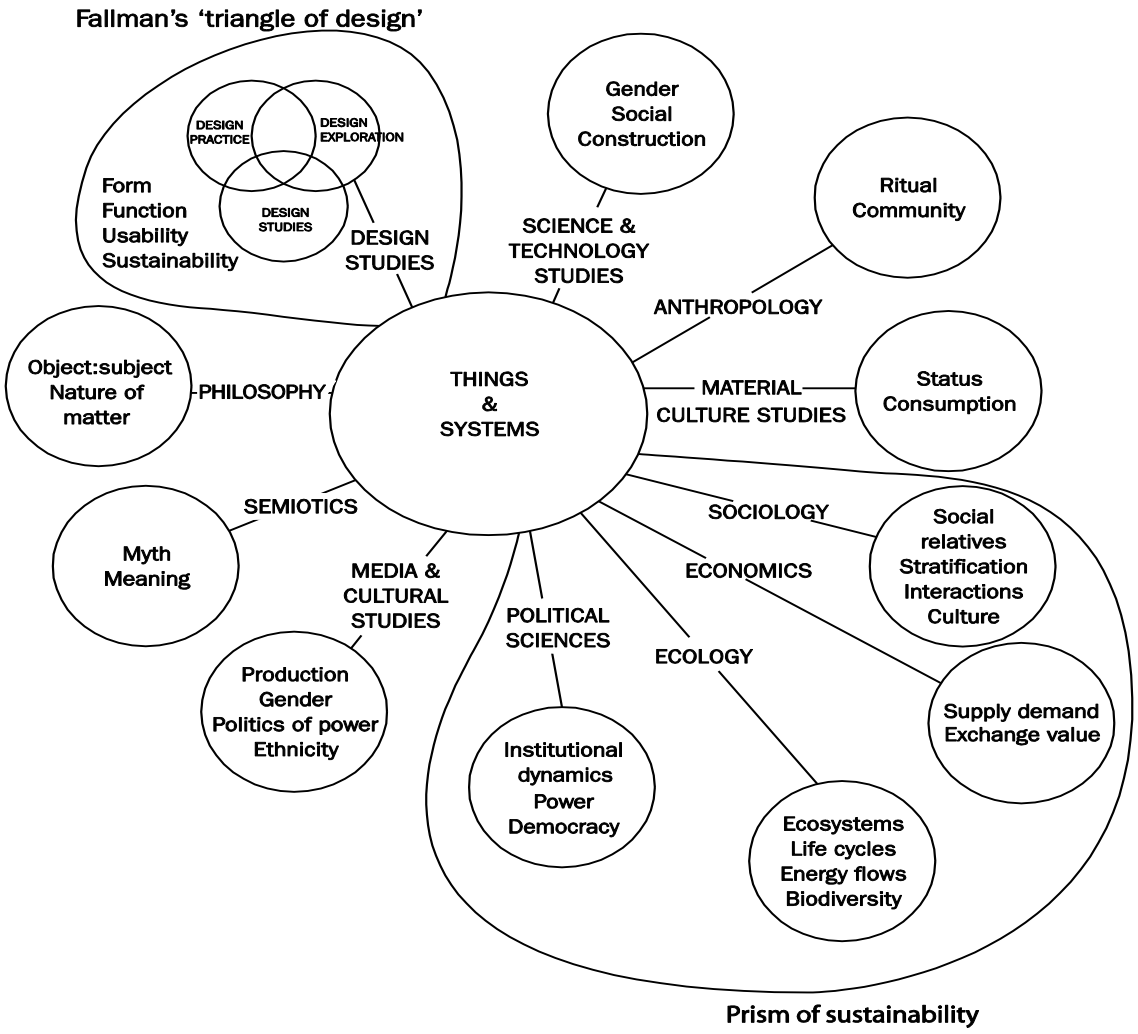

Figure 11: The diverse disciplinary environment which is engaged with design(-ing). Source: Fuad-Luke (2009) inspired by Boradkar (2007).

Over the last two decades design has increasingly played a role in the innovation of new products and services to respond to the sustainability agenda. Typically, this is via the application of eco-design of new products or eco-re-design of existing products (Fuad-Luke, 2002, 2005, 2009; Lewis & Gertsakis, 2001) and life cycle thinking (LCT) (McDonough & Braungart, 2002; Lewis & Gertsakis, 2001), design management (Best, 2006, 2010; Lockwood, 2009) or by embedding design(-ing) in new innovation processes for more sustainable solutions (Charter & Tischner, 2001).

The expansion of the application of design in recent years is also reflected in, and inter-related to, the divergence of the design research agenda to embrace art and design approaches (Gray & Malins, 2004), to import methodologies from other disciplines to evolve earlier approaches of empathic de-sign, user-centred design (UCD) and participatory design (Martin & Hanington, 2012) and ways of working in the "lab, field and showroom" (Koskinen, Zimmerman, Binder, Reström, & Wensveen., 2011) to explore new systematic approaches for applied design research.

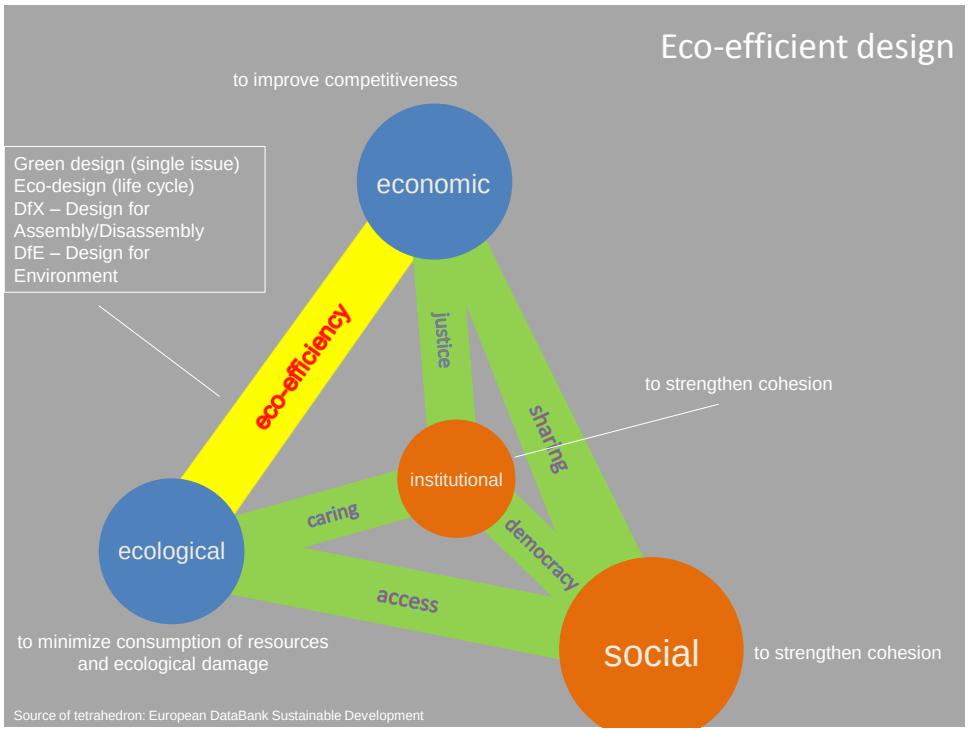

Figure 12: The Sustainability Prism showing where DfS are applied. Source: Spangenberg (2001).

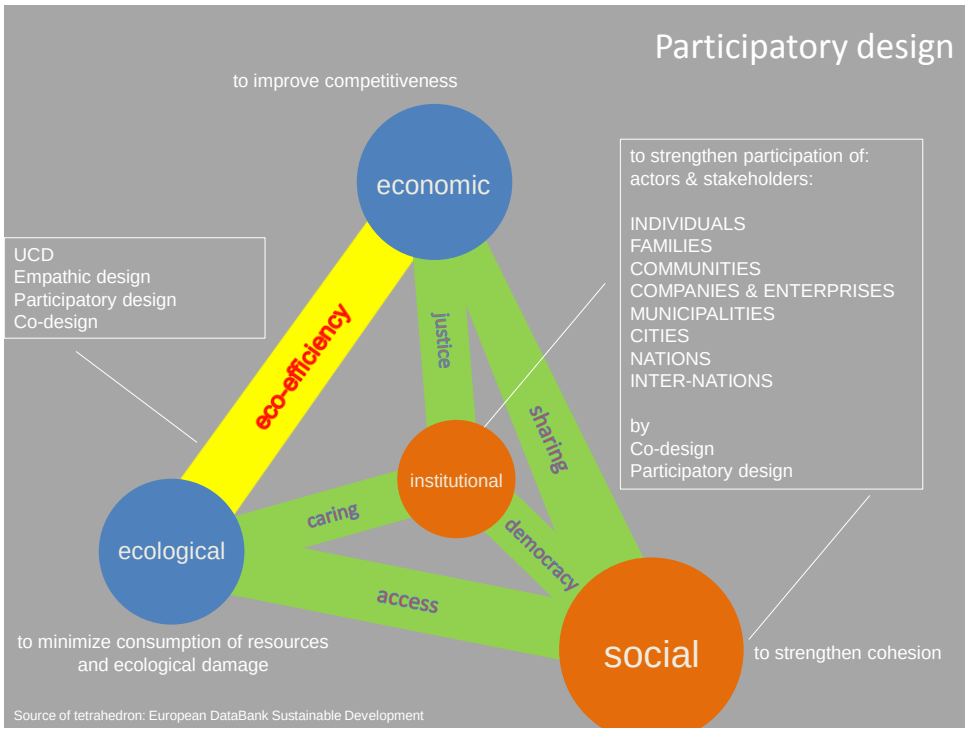

Figure 13: The Sustainability Prism showing where participatory design approaches are applied. Source: Spangenberg (2001).

2.4.4.2 Key Theories and Approaches

Here the focus is on how design has and is responding to the sustainability agenda and how progression from "sustainable development" (World Commission on Environment and Development, 1987) to "positive development" (Birkland, 2008), and from eco-innovation (Fussler & James, 1996) to social innovation (Murray, Caulier-Grice & Mulgan, 2010; Caulier-Grice, Davies, Patrick & Norman, 2012), is influencing key theories and approaches with specific reference to products and services. The design responses of architecture from green to eco- to sustainable architecture are not included here, although it is acknowledged that they have a considerable influence on the design of renewable energy technologies, new eco-materials and eco-construction techniques and standards. This decision is made when considering the range of Finnish Micro- and Small & Medium Enterprises (MSMEs) which are part of the Finnish consortium for the SHIFT project. To date there are not any enterprises specifically engaged with the construction and architectural technology sectors signed up to the project.

Design for Sustainability (DfS)

Design has a long history of making an active response to environmental and social circumstances (Fuad-Luke, 2009; Jané, 2011). However, the first significant collective response by designers to the environment and the environmental crisis in the 1970s marks a steep change. The response was twofold. Firstly, from design engineers responding to government demands to find ways of reducing energy consumption after the global oil price crisis of 1973-74 – they developed Life Cycle Thinking (LCT) and Life Cycle Analysis (LCA). This gradually evolved into a sophisticated consultancy sub-sector by the early 1990s leading to the development of standard and bespoke LCA software management which could be applied using basic database information (e.g. EcoIT from Pré Consultants, the Netherlands) or more professional versions that could be deployed with standard or bespoke databases for specific industrial sectors (e.g. SimaPRO, also from Pré Consultants. Another, more societal response in the 1970s came from a diverse array of "alternative" technology and lifestyle movements influenced by communal ideologies. Their designs tended to be open, shared and low-tech solutions, many of which found their way into the Last Whole Earth Catalog (Brand, 1971).

Early industry initiatives in the late 1980s / early 1990s focused on "green design" often involving government agencies, such as the United Kingdom (UK) Design Council (John Elkington Associates, 1986; Burrall, 1991), or leading companies, public bodies or design agencies (Mackenzie, 1990) at which point the term "Design for the Environment" (DfE) emerged. DfE rapidly morphed into DfX where "X" could be "Environment", "Assembly", "Disassembly", giving rise to "Cradle to Cradle" (C2C) thinking (MacDonough & Braungart, 2002) and eco-design (Lewis & Gertsakis, 2001). By now the concept of the "product life cycle" was well established and differentiation between green design (single issue focus), eco-design (life-cycle focus) and sustainable design (systems focus) was better understood (DEMI, 2002-2006). Whatever the specific methodology or toolset, the focus was for companies to develop "eco-efficient" products, i.e. those which maintained economic profits without doing harm or doing less harm to the environment. In the 1990s, it was recognised that MSMEs generally preferred eco-design strategies which reduced costs, increased profits or did both. The low hanging fruit on the Lifecycle Design Strategies (LiDs - also known as ecodesign strategy wheel) was

often to apply reduction in weight, waste or energy consumption through the product life cycle (van Hemel, 1994, 1998). Product improvement and product redesign were perceived as achievable in shorter time spans and requiring less investment and organisational complexity than function innovation and system innovation where the real eco-efficiency gains were to be achieved (Rathenau Institute, 1996) (Figure 15).

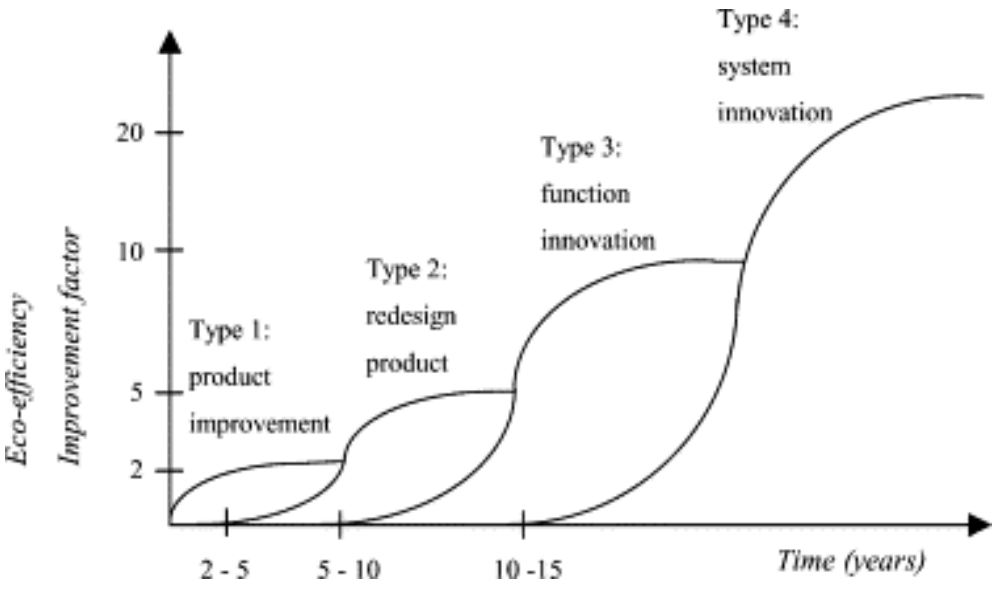

Figure 14: Four types of Ecodesign. Source: Rathenau Institute (1996).

From product to Product-Service Systems (PSS)

By the late 1990s and early 2000s the debate on "sustainable consumption and production" began to merge with the "sustainable design" agenda and influence companies and enterprises looking for other value-added ways of delivering eco-efficiency (Balcioglu, 1998; Charter & Tischner, 2001). This was coupled with the rise in interest in "experience design" and "service design" and the ability of new Information and Communication Technologies (ICT) to deliver different kinds of services (Ryan, 2004), a more integrated systemic view of DfS (Vezzoli, 2007) and the possibilities of integrated sustainable product and services systems involving collaborative actors and agents (Manzini & Jégou, 2003). Product Service Systems (PSS) are defined as a "system of products, services, supporting networks, and infrastructure that is designed to be competitive, satisfy customers' needs, and have a lower environmental impact than traditional business models" (Mont, 2002). Nonetheless, the emphasis on PSS remains firmly on delivering eco-efficient outcomes which decouple economic growth from increasing the environmental load despite trying to encourage consumer and producer behaviour change (Cooper, 2010). Recent work around collaborative services brings in a social sustainability element (Meroni & Sangiorgi, 2012; Fuad-Luke, 2012) but, at present, a more holistic sustainability case remains to be demonstrated by PSS.

Participatory design approaches

Design approaches encouraging participation have their root in Scandinavia and the USA in the 1950s, where they were integrated into practices to encourage worker participation in decision making, although as a design research topic it emerged in the 1970s (Björgvinsson, Ehn. & Hillgren, 2012; Ehn, 2008). Participatory design involves domains of human activity, multi-stakeholder roles, shared design representations, participatory interactions and it changes the participants' knowledge and skills. Furthermore, participatory design "refers to a large collection of attitudes and techniques predicated on the concept that the people who ultimately will use a designed artefact are entitled to have a voice in determining how the artefact is designed" (Carroll, 2006, 4). Recent papers on participatory design indicate that it is constantly evolving to respond to socio-technological changes (Hagen & Robertson, 2012; Manzini & Rizzo, 2011).

Co-design

Co-design, designing together, is a form of participatory design that has gathered significant interest over the last decade from the design community (CoDesign, 2005-2013; Sanders, 2000) and, more latterly from the public and commercial (private) sectors (Fuad-Luke, 2007, 2012; Mattelmäki & Sleeswijk Visser, 2011). It is seen as an evolution and hybrid between participatory design and user-centred design (UCD) and has also been named as "co-creation" (Sanders & Stappers, 2008), although co-creation has similar and different meanings from a business perspective (Ramaswamy & Gouillart, 2010). Co-design has a deep commitment to including every stakeholders "voice" in processes upstream and downstream of the design brief (Fuad-Luke, 2012). It is sometimes referred to as "transformation design" because of its inclusive approach and the resultant transformation of the participants (Burns, Cottam, Vanstone, & Winhall, 2006).

User-centred design

User-centred design, UCD, embodies a broad range of design approaches, methods and tools whereby the designers can gain an intimate understanding of the users' needs or wants and gain insights into their everyday lives in order to better meet needs and/or improve the performance of the product or service (Martin & Hanington, 2012). UCD often combines traditional market research about the users with more specific investigations at specific phases in the NPD or new service development life cycle. These involve learning more about the daily lives of the users through ethnographic research, through getting users to interact with "cultural probes" (Mattelmäki, 2006), and/or by adopting empathic design tools (Koskinen et al., 2003) prior to or during the development of early design concepts. Later in the design cycle, users can be brought in to "focus groups" to help with iteration of design concepts, prototypes, models or mock-ups. Post-launch of a new product or service, consumer-users might be invited to comment on further iterations that would improve the performance of the actual design operating in the real marketplace.

Prosumers and presumers – designing with the users/consumers

The boundaries between producer and consumer are being challenged by prosumers (Toffler, 1980) and presumers (Trendwatching, 2012) - users who wish to get involved earlier in the design cycle process to influence what is actually brought to market. To this end, companies have been exploring how to take advantage of mass collaboration and "crowdsourcing" (Leadbeater, 2007), lead-users (von Hippel, 2006), open design (van Abel et al., 2010) and other open innovation techniques to ensure their products and services get more early adopters and are well received by the marketplace on launching.

2.4.4.3 Discussion

In a recent report about the kind of support SMEs in the United Kingdom (UK) needed in eco-innovation, 49% of the enterprises said they needed more support in "How to design for sustainability" (Charter & Woolman, 2012, 57). This, sadly, reveals that little progress has been made in the UK since earlier reports were made by the Design Council about the adoption of DfS by enterprises and design agencies/consultants (Otto, 2002; Richardson, Irwin & Sherwin, 2005). However, there is evidence that some sectors in Europe, such as automotive and textiles are embedding eco-design into their everyday practices (Montalvo, Díaz López, & Brandes, 2011), indicating a level of expertise being applied during the design cycle, although this appears to be predominantly still driven by eco-efficiency considerations rather than a more holistic sustainability ideology.

Austria, Germany and the Netherlands probably have the most advanced cultures of eco-design and DfS in Europe, developed from the mid-1990s onwards. However, it is clear that the picture across the European Union (EU) is rather more patchy. If the culture of designing in more sustainable ways is limited (across design agencies, innovation support systems and within enterprises) then it might self-limit the enterprises *and* the effectiveness of the innovation support system. Similarly, if eco-innovation receives little support in the larger innovation systems, it self-limits the potential to grow those enterprises that are trying to be eco-innovative. How can the aforementioned design approaches help change this situation?

Applied design research can help by:

- Including all relevant actors and stakeholders in articulating, visualising and communicating the EXISTING eco-innovation support systems then CO-DESIGNING how and why the systems could or should be changed. [Research group Nodus already has new primary research data to support this claim.]
- Applying ethnographic and empathic design approaches to better understand the needs, wants and perspectives of the MSMEs.
- Considering existing products, PSS or services of existing MSMEs and exploring through DfS, co-design and UCD how these offerings can be improved. This might involve LCA/LCT, stakeholder mapping, envisioning the supply chain, developing scenarios by fore- or back-casting, developing concepts or prototype testing, improving branding and communications or other means.

- Showing how changes in the eco-innovation support systems deliver better outputs and better outcomes in a more resource efficient and socially beneficial way, *and* increase the capability and capacity of the system to eco-innovate. This might involve new ideas of producer-consumer relationships and product, PSS or service "enterprise model", e.g. "collaborative production and consumption" or "collaborative services" models.
- Working within and between the "lab, field and showroom" (Koskinen et al., 2011) to link up different actors and stakeholders in the eco-innovation support system.

2.4.4.4 Conclusion

There are several inter-related elements that might be of significance to the SHIFT project in terms of "DfS" and participatory design approaches:

(1) What is the level of integration of DfS in start-ups, MSMEs, and can raising the DfS understanding and expertise within an enterprise help deliver more viable eco-innovation outcomes? How is DfS expertise matched with other forms of expertise in terms of developing their enterprise, expanding their markets and securing the right funding/investment/business model?

(2) How can participatory design approaches be applied to the SHIFT project to involve key actors, stakeholders and agents in perceiving the current eco-innovation support system and then co-designing the system to provide better support?

(3) Where can DfS and participatory design approaches be applied within the eco-innovation support systems and within the innovation cycle to maximise the outcomes (for all stakeholders)?

Given the "social turn" in designing and recent interest in "design for social innovation" and encouraging more participation in design(-ing) it might be relevant to consider expanding the theoretical remit of the SHIFT project to embrace actor-network theory (Latour, 2005) and the emerging theories around social innovation (Caulier-Grice et al., 2012). The former might be important because early primary research by Nodus, Aalto ARTS, the Finnish partner in the SHIFT consortium, with the MSMEs and the key funding partners in the eco-innovation support system, indicates that key actors in parts of the system can have a significant influence on the effectiveness of the system. Furthermore, the European Commission is undertaking active research around "social innovation" in the TEPSIE project (Caulier-Grice et al., 2012) to determine how it is different from other forms of innovation (technical, scientific). As it is increasingly clear that the delivery of more sustainable ways of producing, consuming, living and working requires significant behavioural change at a societal level (Jackson, 2005), and a re-evaluation of how we deploy and care for natural and anthropocentric capitals (Porritt, 2007; Fuad-Luke, 2009, 2012), it appears sensible to look at how the social sector (non-profit and informal sectors) in Europe has been developing its own innovation toolbox (Murray et al., 2010) and whether some of these tools can be merged with DfS and participatory design approaches to amplify eco-innovation outcomes.

3 Support Systems and Its Key Actors and Approaches

3.1 Concept of Support Systems

Klaus Fichter, Linda Bergset & Dzamila Bienkowska

3.1.1 Introduction

In section 1.3 we define support systems as comprising "all actors, institutional settings and resources that help entrepreneurs in successfully generating and implementing innovation". While the proposal text for SHIFT does not explicitly define the concept of support system, rather identifies central actor types that are part of such systems, the concept is applied in more than one way in the proposal. It is used in the singular as *support system* implying a holistic, systematic approach to providing support for entrepreneurship, which includes a range of actors. It is also used in the plural as *support systems*, indicating on the one hand that one actor type (e.g. business development organisations or universities) can be considered a separate system in itself providing a particular type of support and, on the other hand, that geographically support systems can be quite different in different countries or regions.

While the term "support system" is used rather generically in academic literature on entrepreneurship, we have not found any evidence that a specific conceptual construct has been developed for it. However, there is a large body of literature on a range of concepts that explore different types of support and relationships that have an impact on entrepreneurship. These we will draw on in developing our understanding of the concept of support systems. Based on these different concepts as explored in section 2.4 (Systems Theory and Systematic Approaches) and a search for new concepts through a literature review of recent articles in pertinent journals,[6] we here provide a systematic overview of such concepts. The concepts already reviewed in Chapter 2 and included here are: *Clusters, Entrepreneurial Eco-Systems, Entrepreneurial Teams, Innovation Communities, Innovation Systems, Networks, Triple Helix and Design Services*.

One result of the literature review is the discovery of an novel elaboration of the concept of *Industrial Symbiosis* (IS): While earlier research on this type of support system has emphasised the outcome (i.e. reduction in material input and increased recycling of output), newer conceptual work focuses more on the process and relational aspects including the involved organisations (not only business, but also research and public institutions), culture, mutual learning, information sharing and network effects – and redefines the concept in the following manner:

> *"IS engages diverse organizations in a network to foster eco-innovation and long-term culture change. Creating and sharing knowledge through the network yields mutually profita-*

[6] Journals reviewed for the period 2008-2013: *Journal of Business Venturing, R&D Management, Journal of Product Innovation Management, Journal of Industrial Ecology, Business Strategy and the Environment* and *Ecological Economics*.

ble transactions for novel sourcing of required inputs, value-added destinations for non-product outputs, and improved business and technical processes." (Lombardi & Laybourn 2012, 31f.)

These authors emphasise that increased efficiency is a result, but not the driving force of networks in industrial symbiosis: "we replace the physical exchange of resources as the *core* of IS with eco-innovation as the *result*" (Lombardi & Laybourn 2012, 32 (italics in original)). This concept could therefore also be considered as a relevant concept of support systems, even if IS-research up to date mainly focuses on manufacturing and heavy industry (cf. Lombardi & Laybourn 2012) and thus on more established incumbents, rather than start-ups and innovative MSMEs.

A systematic description of the key characteristics of the different types of support systems will provide a basis for comparison and evaluation of their salient features and their resulting relevance and adaptability for the research to be carried out in the project SHIFT. The Table 3 thus explores for each concept:

- The definition of the concept
- Its key unit of analysis
- The basic assumptions underlying related research
- The level(s) at which the analysis is carried out
- The actor concepts that are developed, if any
- The resources that are considered within the approach

Beyond this, the relevance to SHIFT is explored in Table 3 through:

- An evaluation of the measurability of the concept
- Key empirical findings
- Potential relevance to specific work packages

The content of this comparison will provide a basis for the discussion at the next project meeting that aims at laying out the design of the conceptual framework to be subsequently described in Section 4.1 of Work Package 1.

3.1.2 Overview of Existing Concepts

Table 3: Description of the key characteristics of existing concepts of support systems for entrepreneurship

Concept Support systems	Definition	Key unit of analysis	Basic assumptions	Level of analysis	Actor concept	Resource concept	Measurability	Key empirical findings	Relevance for WP + overall	Key literature
Cluster	Geographical concentrations of firms and other organizations in similar and complementary industries related by shared technology or infrastructure	Cluster, involved firms	``A cluster of independent and informally linked companies and institutions represents a robust organizational form that offers advantages in efficiency, effectiveness, and flexibility'' (Porter, 1998, p. 80).	Micro; meso	Firms co-locate & spin out, cluster initiatives may help dev. clusters	Shared infrastructure, concentrated labour market	Geographical scope, number of firms, productivity of firms	Higher productivity and more innovation through transaction efficiency, knowledge spillovers, pool of skilled labour; cost reduction for start-ups	Universities, Incubators, BDOs, Collaboration, Sustainable design, Finance institutions	Porter (1990, 2000); Delgado et al. (2010) Malmberg & Maskell 2002
Entrepreneurial Eco-System	Encompasses a multitude of public and business actors within a region, as well as env. (e.g. infrastru.) & social factors (e.g. culture)	Eco-system, involved firms		Individual actor (hybrid?)					Universities, Incubators, BDOs, Financing, Overall relevance	Cohen (2006)
Entrepreneurial Teams	Entrepreneurial teams can contribute more resources, points of views and a broader set of skills	Team members		Individual, micro		Pooling of resources		Greater financial success & growth potential, develop products faster & greater survival	Collaboration, Sustainable design	Watson et al. (1995)

								rates than individual entrepreneurs		
Industrial symbiosis	"IS engages diverse organizations [incl. non-industry partners] in a network to foster eco-innovation and long-term culture change" (Lombardi & Laybourn 2012, 28)	Varies: process, company, facility, industry	"Creating and sharing knowledge through the network yields mutually profitable transactions for novel sourcing of required inputs and value-added destinations for non-product outputs" (Lombardi, Laybourn 2012, 28)	Org., macro		Shared EMS, "close mental distance" (as opposed to physical proximity: access to partners and trust)	Synergy effects difficult to measure	Explicit sustainability focus, however financial benefits through synergies are central; cross-sectoral knowledge transfer	Traditional focus: heavy industry & manufacturing-however, possibly relevant for WPs Universities, Incubators, Collaboration (knowledge exchange)	Lombardi & Laybourn (2012); Chertow (2000)
Innovation Communities	"informal network of like-minded individuals […] that team up in a project related fashion and […] promote a specific innovation" (Fichter 2012, 13)	Teamworking of individual promoters, community	Success of innovation depends on overcoming barriers; in order to overcome these barriers it needs various power bases	Individuals interacting on different levels of an innovation system	Promoter, Innovation Communities as networks of promoters	Power, tech. expertise, org. know-how, networking skills of promoters	Good, cf. Fichter & Beucker (2012), measures for teamwork quality and innovation success	Innovation communities (IC) have a strong impact on the success of innovation projects; an IC mostly comprises 3 to 7 individual promoters	Identifying key actors for eco-innovation success, collaboration of key persons across organisational boundaries and various levels of an innovation system	Fichter (2009); Fichter & Beucker (2012)
Innovation System	"market and non-market institutions in a country [or other context] that influence the direction and speed of innovation and tech. diffusion" (OECD 1999, 23); the actor system and inst. setting (rules) that influence a specific field of innovation	System (substructure: org. level + superstructure: intermediaries, "link"org., public inst.)	A holistic and systemic concept is required to understand and influence innovation processes	Micro, meso, macro level The levels can be designed as needed	The actor system is a key element of the innovation system	Actors and the resources they control	No specific measurement approaches known		Overall relevance	Freeman (1987)
Networks	Entrepreneurs are	Network,	Networks can facili-	Individ-	Actors	Social	Indicators such	Advantages: secur-	Collaboration,	Aldrich &

	embedded in social (informal & formal) networks	Member types	tate or constrain (lock-in) entrepre-neurial activities	ual, micro, meso	seek others in simi-lar sit. for e.g.exch-ange of experi-ence	capital (trust, long-term relation-ships, knowledg e transfer)	as co-patenting, co-authorship of papers, shared devel-opment pro-jects; business relations, in-formal relations	ing resources, gain-ing legitimacy, discovering oppor-tunities Disadvantages: insularity and lock-in	Sustainable design	Zimmer (1986); Johannisson (2000); Granovetter 1973
Triple Helix	Interaction between industry, university and government on local, regional and national levels	System, Actor types	Interdependencies between three actor types; Role expansion due to interaction	Org., micro+ macro	Collabo-ration with actors, imita-tion of actors	Relation-ships, common interests	Indicators of relationships such as ber-ship/participati on in organisa-tions and net-works	Helps increase start-up rates	Universities, Collaboration Overall rele-vance	Etzkowitz (1998); Etzkowitz& Leydesdorff, (2000). Leydesdorff, Etzkowitz (1996)
Design Ser-vices	Services provided by public or private sectors or hybrid public/private partnerships to create or add value by design(-ing)	System actor types	Design (thinking, management & strategy) creates and adds value through the innova-tion cycle and can specifically contrib-ute to eco-efficiency & eco-innovation (espe-cially DfS)	Micro, Meso	Design actors provide advice & prod./se rvice dev. &/or apply partici-patory design ap-proach-es with multi-stake-holders & users	Best use of re-sources given contextual con-straints	Number of organisations or individuals supported; number of new products or services devel-oped; Costs saved in rela-tion to reduced environmental resource use or material inten-sity	n/a data needs collating and is across disparate sources	Potentially relevant overall but especially DfS/Design Service Provid-ers WP	

3.1.3 Discussion - Application in SHIFT

There is a richness of theoretical approaches related to support systems available that can be applied in SHIFT. It is the authors' opinion that there is no need to limit oneself to one approach for all actor types and work packages. On the contrary, explicitly evaluating and selecting the most appropriate approach for each individual work package increases the chance of applying one which has a good fit with the practice to be described. Even if a multi-concept research design is chosen, it is worthwhile to identify common or cross-cutting themes, which would allow an exploration of where the different actor types currently interact and where new opportunities might exist as well as raise our holistic understanding of how the overall effectiveness of support systems can be enhanced. Even the identification of key actors (key players) within the organisations in our support organisation typology might offer a critical way of viewing the support system(s).

With regard to the multi-concept research design, one exception might be reserved for the concept of industrial symbiosis. It may have evolved in the last few years into becoming a more actor and network related approach. Caution should nonetheless be applied in using such an approach as a concept for support systems in the context of SHIFT. Due to its long history of being applied as a concept primarily related to physical input and output, its shift in usage might cause more confusion than understanding in the target audiences and perhaps severe criticism from the mainstream IS community.

In order to decide on an approach in the individual case, it is helpful to clarify what is meant by "support": support may be both of the "hard" and the "soft" kind (cf. Norrman 2008). "Hard" support refers to material aid like money, in-kind contributions, office space and tax services. "Soft" support more often relates to intangible aid such as coaching, training, contacts and moral support (cf. Autio and Klofsten 1998). Furthermore, it is sensible to distinguish between informal and formal types of support providers within the support system. While formal support providers such as incubators and banks are institutionalised organisations or programmes with a clear mission and agenda to provide support to entrepreneurs, informal support providers, such as family, friends or even business angels, may provide support that has a less structured or planned character, albeit being no less valuable to the entrepreneur. What exactly is provided, for whom is it provided, who provides the support, and what need is assumed to be fulfilled? It is sensible to evaluate the perception of these characteristics on both the supply-side and demand-side in order to see if they match. A gap in perception may indicate a gap in support provision.

3.2 Actors of the Support System and Their Role in Entrepreneurship

3.2.1 Universities

Joerg Geier

3.2.1.1 Key Features

A critical role of universities is to provide a platform for the young and the old to meet, to unite imagination with experience, in addition to the fundamental purpose of research and teaching. Imaginative consideration has a transformative potential on knowledge (Whitehead 1928, 448). Universities' interaction with stakeholders and their place in society has been changing. While in the past higher education was a part of social policy, today, it is increasingly seen as part of a country's economic policy. The United States' Bayh-Dole Act in 1980 marked the beginning when regulating intellectual property transfer (Altbach et al., 2009). Nowadays, technology transfer or corporate engagement offices are widespread. An OECD report recommends for universities to participate actively in regional development from multiple angles: innovation, human capital formation as well as social cultural and environmental development (OECD 2007). An economy's level of university education has a measurable macroeconomic impact. "Over the past decade, more than half of the GDP growth in OECD countries is related to labour income growth among tertiary-educated individuals" (OECD 2012, 182).[7]

Tertiary education and graduation rates across OECD countries vary substantially. While an average of 39% will complete tertiary type-A[8] (largely theory-based) education during their lifetimes, there is a significant variance between completion rates: from 50% or over in countries such as Iceland, Poland, United Kingdom and Denmark to less than 25% in Turkey, Mexico and Saudi Arabia. While Finland at 49% is above average, Germany at 30% and Sweden at 37% score below average. Reasons for the disparity can be found in different pathways between countries' secondary and tertiary programmes and the relative flexibility of their education systems. Some countries like Germany (14%) have a stronger focus on tertiary type-B (largely vocational) programmes that convey practical or technical skills for direct entry into the labour market. In Finland, where tertiary type B programmes

[7] There are three methods to measure the level of activity in the economy: the expenditures (Gross Domestic Product or GDP), the income (Gross Domestic Income or GDI), and the value added approach. Gross Domestic Income (GDI) is analytically equivalent to Gross Domestic Product (GDP). Due to measurement errors, slight differences can sometimes occur among the measures (cf. OECD 2012).

[8] Tertiary-type A and B education: "Tertiary-type A education is largely theory-based programmes designed to provide sufficient qualifications for entry to advanced research programmes and professions with high skill requirements, such as medicine, dentistry or architecture. Duration at least three years full-time, though usually four or more years. Tertiary-type A programmes include second-degree programmes, such as the American master's degree." Tertiary-type B education are programmes whose duration is "typically shorter than those of tertiary-type A and focus on practical, technical or occupational skills for direct entry into the labour market, although some theoretical foundations may be covered in the respective programmes. They have a minimum duration of two years full-time equivalent at the tertiary level." (OECD 2012).

are being phased out, graduation rates from these programmes have fallen sharply (from 34% in 1995 to naught in 2010) in favour of more academically oriented tertiary education. Sweden has remained at a stable rate of between 4 and 6% between 2000 and 2010. Because of increasing harmonisation among the systems of higher education in European countries and a general shift away from longer programmes in favour of three-year programmes, some countries have seen rapid rises in their graduation rates. Graduation rates rose sharply in Finland between 2007 and 2008 within the framework of the Bologna process reforms. Between 1995 and 2010, tertiary type A graduation rates have nearly doubled from 20 to 39% on average among OECD countries, while rates for tertiary-type B programmes have been stable. Tertiary-type A graduation rates in Finland (from 21 to 49%), Germany (from 14 to 30%) and Sweden (from 24 to 37%) have followed this trend, though with different intensities (OECD 2012).

In Germany there are 427 higher education institutions (HEIs) of which 108 are universities and 215 are universities of applied sciences/polytechnics (in German, "Fachhochschulen"). As of 2012/13, there are 2.5 million enrolled students (an average of 5850 per HEI) of which 1.6 million students are enrolled at universities (an average of 14,885 per university) and 800,000 at universities of applied sciences (an average of 3,703 per university of applied sciences) (Statistisches Bundesamt, 2013). In 2011 in Sweden there were 16 universities, 15 university colleges (högskolor), 7 art colleges (konstnärliga högskolor), and 9 private colleges providing specialised tertiary education (övriga enskilda utbildningsanordnare, e.g. in nursing) (Högskoleverket (Swedish Higher Education Authority) 2012, 4). In the autumn of 2011 there were 362,628 undergraduate students registered at Swedish higher education institutions (Ibid, 116). Of these, 269,955 were registered at universities (cf. Högskoleverket 2012, own calculation based on numbers on p. 116).

In Finland there are 14 universities of which four universities are specialized universities (with a focus on certain academic fields). There are 27 universities of applied sciences/polytechnics (in Finnish "ammattikorkeakoulu") (Finnish Ministry of Education and Culture 2013). In 2008, there were 280,000 students (an average of 6,828 per HEI [post-merger in 2007, 2008 and 2010]), 148,000 of which were at universities (an average of 10,567 per university) and 132,000 of which were at university colleges/polytechnics (an average of 4,889 per university) (Finnish Ministry of Education 2010, 42 and 67).

3.2.1.2 The Role of Universities for Entrepreneurship

As indicated in section 2.4.3.2, the triple helix model emphasises the important role played by universities as part of the entrepreneurial ecosystem. Research and technology-intensive universities have a significant impact on the development of economies and their innovation and growth capabilities (Roberts and Eesley, 2009). Universities' entrepreneurial support mechanism is active on two levels: (a) it provides an ecosystem for start-up and spin-off activities and (b) it offers entrepreneurship education. Among the enabling conditions required for the facilitation of innovation and entrepreneurship, the Global Entrepreneurship Monitor lists a country's quality of entrepreneurial education and R&D transfer activity (Xavier et al., 2012). In six case studies Fetters et al. (2010) outline key success factors for the development of a comprehensive university-based entrepreneurship ecosys-

tem and emphasize that universities are a potent catalyst. There is no single development pathway, however, for the creation of an ecosystem, but instead a multi-stage process where the stages are not clearly defined. Typically, entrepreneurship ecosystems include multidimensional enterprises that support entrepreneurship development through a range of activities including teaching, research and outreach; it is part of the overall university framework and its wider community (Fetters et al. 2010). The Massachusetts Institute of Technology highlights the importance of social network institutions and phenomena as ingredients for MIT's successful entrepreneurial output. Activities at MIT fostering an entrepreneurial mind-set include student-run business plan competitions, a proactive technology licensing office, mentoring services, the provision of research grants to support the commercialization of ideas and a special innovation & entrepreneurship track within its MBA programme (Roberts and Eesley 2009). Clark emphasizes structural aspects in transforming universities to become more entrepreneurial. He believes that key players across departments need to come together to collectively influence the institution's structure and orientation (Clark 1998).

According to the Association of University Technology Managers (AUTM), 671 start-up companies were formed out of universities in the United States in 2011, up from 553 in 2006 (Association of University Technology Managers 2011). In Europe the number of university start-ups increased by 10 percent annually between 2004 and 2007 (Arundel et al. 2008). According to AUTM, start-up companies are defined as new companies dependent on their licensing institution's technology for their formation. They are either student or faculty-run incorporated companies which "received assistance from the university in the form of entrepreneurial training or education, legal advice, marketing help or services, help in securing financing, accounting assistance, subsidized office space in business incubator, R&D assistance, or other support (e.g., business plan competition awards)" (Association of University Technology Managers 2010). Numerous governments have developed policies in order to provide incentives for the participation of universities in technology transfer. Academic spin-offs play an important role as part of a wide range of activities to engage with industry. They are an important element of the overall high technology start-up ecosystem (Shane 2004).

The OECD argues that Europe has much to learn from US entrepreneurship education approaches. The discussion stresses the importance of segmenting programmes, evaluating programme impacts, integrating entrepreneurship in the wider curriculum, setting high quality standards, building a strong pipeline of entrepreneurship teachers, using interactive teaching methods, ensuring appropriate funding, encouraging cross-border collaborations, facilitating spin-offs and profiling role models (Potter 2008). In contrast to the US, in Europe entrepreneurship courses are not necessarily a channel for wealth-generation. For example in Germany, where the first chair for entrepreneurship at a university was founded in 1998, entrepreneurship education is frequently a basis for small business management. Both in the UK and in German-speaking countries there has been a long-lasting tradition of MSME chairs. Another major difference between the US and Europe is that the European approach tends to be more academic with traditional academics teaching courses, while in the US there is substantially more input from former entrepreneurs. In European OECD countries there is a greater emphasis on the study of family firms.

3.2.2 Incubators

Dzamila Bienkowska

Business incubators are a form of entrepreneurship support that caters to new ventures and MSMEs in particular locations and can focus on particular industries or provide generic support for all types of businesses. They make use of whatever resources are available locally, such as universities, research institutes and existing firms, and align them in order to benefit their members (Autio & Klofsten 1998). The main areas of business incubator activities can be characterised as selection of members; provision of infrastructure; business support; mediation, i.e. development of relationships and contact networks; and graduation, i.e. strategies for exiting the incubator (Bergek & Norrman 2008). Four main types of incubators have been identified in previous research: Business Innovation Centres, University Business Incubators, Independent Private Incubators, and Corporate Private Incubators (Grimaldi & Grandi 2005).

Business Innovation Centres offer basic services to MSMEs such as office space, infrastructure and information about external financing. They were first started following an initiative from the European Commission. University Business Incubators focus on knowledge-based MSMEs and offer support for the transfer of knowledge from research to commercial use along with basic services such as office space. They are started by universities themselves and can often be located in their close proximity. Following recent developments such as globalisation, digitalisation and the rise of internet-related firms, private and profit-oriented incubators have become more prevalent. These can assist in provision of financial capital and contact networks, concept validation, business guidance, as well as administrative tasks. In return they collect fees or percentages of revenue from their clients. Corporate Private Incubators are set up by existing large firms in order to support development of innovations into self-sustaining spin-off firms. Independent Private Incubators are owned by smaller firms or groups of individuals and run as businesses in themselves. They may choose to focus on support for later stages of new venture development and act as “accelerators” instead of incubators (Grimaldi & Grandi 2005).

A recent study of incubators in the US showed that there were 993 business incubators in the whole country in 2009 (Amezcua 2010). The European Business & Innovation Centre Network is an umbrella organisation for Business Innovation Centres and other incubators. In 2008 it had 240 members and was structured into thematic networks, one of them being Cleantech Network with 41 members (EBN 2013). Climate-KIC is a triple-helix type network addressing challenges associated with climate change that works with business acceleration programmes and knowledge transfer vouchers for MSMEs along with other activities such as education and placements. It was created in 2010 and operates through national and regional centres in ten European countries including Germany (Climate-KIC 2013). KIC InnoEnergy is a similar network in the sustainable energy field which offers business acceleration along four dimensions: technology, market, team and finance. It is present in six countries, including Germany and Sweden (KIC InnoEnergy 2013). In Sweden the association Swedish Incubators & Science Parks has 42 incubators as members (SISP 2013) and BIG Sweden has 46 members (ALMI 2013). Many of the Swedish incubators are strongly linked to the local universities and higher education institutions. In Finland there are 29 science parks and technology centres (members

of Finnish Science Association), while in Germany approx. 400 technology centres and incubators are in operation, 158 of these are members of the German National Incubator Association ADT.

3.2.3 Business Development Organisations

Wisdom Kanda

Strong reasons are needed to motivate public support for private venturing. The rationale for such support can be grouped into two categories, i.e. those based on societal goals and those based on identified or assumed barriers (Norrman, 2008). The societal goals relate to innovation and entrepreneurship as engines for growth and wealth, means to increase productivity, and sources of jobs. For eco-innovation and sustainable entrepreneurship, these goals also include environmental welfare. The barriers posed by market failures, the complexity of sustainability transition, risks and uncertainties are among the reasons justifying public support for private venturing.

In addition, eco-innovations exhibit peculiarities which hinder their rapid emergence. They tend to be more expensive with lower performance in mainstream dimensions compared to existing innovations and face uncertainties about future markets and regulations (Geels, Hekkert, & Jacobsson, 2008). Firms might not by themselves have all the resources they need to overcome these barriers. Thus, they need to be able to get hold of and utilise crucial resources in an efficient way to be able to reach a stage of stability. Barney (1991) divides these crucial resources into three main types: physical capital, human capital and organizational capital. Davidsson and Klofsten (2003) set out eight cornerstones that form a platform from which a firm can act more independently (see section 3.3.1 for a description of the business platform concept). Hjelm (2011) presents the SIMPLE model which has three cornerstones, the company, the project team and external resources representing different types of networks for supporting innovations. Cluster initiatives are discussed by Laur, Klofsten, and Bienkowska (2012) as mediums to connect, capture and tackle the real needs of regional actors on a voluntary basis. This involves three kinds of actors: i.e. (a) key players who represent crucial resource providers, (b) target groups which are prerequisites for uncovering businesses' real needs and also (c) support groups which enrich the medium with their networks, political and social influence (see section 3.3.3 for further description of the role of these actors in supporting entrepreneurship). The driving force for such interactions is often attributed to a perceived need or systemic gap (similar to the gap SHIFT explores between supply and demand in support systems for sustainable entrepreneurship). Firms and organisations within such networks thus (aim to) benefit from linkages and networks that provide resources such as knowledge, business information and shared infrastructure (Laur et al., 2012).Though differences exist in these categorizations and typologies presented above, a common notion is that some of these resources are found within the firm or its staff, while others must be obtained from the surrounding environment.

Business development organisations belong to the supportive organisations external to the firm in an innovation system. Their activities are intended only to serve as a complement to the market, i.e. to cover situations where the market fails. In order to bring some structure to the various support offered by such public organizations, their activities can be divided into two categories ''hard'' and ''soft'' type of support (Norrman, 2008). The hard type of support also referred to as configuration

oriented support includes support such as provision of infrastructure, proximity to universities, research institutes, competently managed science parks/incubators, the supply of venture capital and other types of funding. The soft types of support also more process-oriented relates to support directed towards the actual venture and its daily needs, e.g. different kinds of business advice, coaching, education and networking activities (Autio and Klofsten, 1998). This division between various types of support is by no means absolute and most business development organizations might combine both kinds of support in one way or another.

As SHIFT focuses on three different countries, i.e. Germany, Finland and Sweden, differences in the configurations and operations of such BDOs should be anticipated and investigated. Specifically, distinctions could be made between BDOs in the various countries on several levels: e.g. private vs. public owned BDOs, BDOs supporting MSMEs in general vs. BDOs which support cleantech MSMEs, e.g. Cleantech Östergötland in Sweden and BDOs which focus their support at various stages of the value chain from R&D to export. The focus of SHIFT should be clearly defined to allow for operationalization of the research aims.

3.2.4 Financial Institutions

Linda Bergset

3.2.4.1 Key Features

The crucial role of financial institutions in a market economy is to improve economic actors' access to capital and contribute to increasing the efficiency of capital allocation through the banking system or the stock market.[9] Most financial institutions are intermediaries that direct funds from money lender to debtor or investor to investee (e.g. commercial banks or venture capital (VC) firms). Some financial actors are private individuals, like so-called business angels, who invest their own money directly in the investee (often high risk start-ups). A distinction in the source of finance can be made in institutional ownership, i.e. whether the institution is privately (e.g. commercial banks) or publicly owned (e.g. savings banks in Germany) or a public private partnership (PPP, e.g. guarantee banks). Publicly owned or PPP financial institutions have a societal function that goes beyond that of strictly private financial actors (Börner 2005). Beyond conventional financial institutions (both banks and non-bank financial institutions) there are a range of newer institutions, such as e.g. microfinance institutions or crowdfunding platforms, which alter the manner in which investment decisions are made and the criteria (beyond the conventional criteria of risk and return) that inform such decision making processes (cf. Rubinton 2011). These also contribute to increasing financial access to further groups of economic actors directly and indirectly, as they increase competitive pressures on existing financial institutions (cf. Carmichael & Pomerleano 2002).

[9] Cf. http://data.worldbank.org/about/world-development-indicators-data/financial-sector (23.4.2013).

3.2.4.2 The Role of Financial Institutions for Entrepreneurship

Not all financial institutions are involved in entrepreneurial finance, e.g. those primarily involved in the trading of existing shares on the stock exchange (i.e. other than initial public offerings). In order to develop their business and survive the first crucial years in which income is low or non-existent, entrepreneurs are dependent on internal and/or external financial infusions (cf. Carter & Van Auken 1990). Despite this crucial role of finance for entrepreneurs, financial access for entrepreneurs in new companies is generally considered to be more challenging than for more established business actors due to a high level of uncertainty arising from both the product/service (often new technologies with no market history) as well as the entrepreneur or the company itself (e.g. inexistent credit history, lack of collateral or assets) (cf. Staroßom 2013; Cosh et al. 2009; Kerr & Nanda 2009; Megginson & Smart 2006). The result of financial assessment is thus often a high level of risk, potentially accompanied by a high level of expected return. These challenges can be assumed to diminish somewhat for more established, innovative MSMEs with a proven track record and growing business network.

Financial institutions provide financial support to entrepreneurs in the form of debt or equity (or mezzanine capital forms)[10]. Debt capital is a more purely monetary infusion that has to be repaid at a set rate. Equity investment is performance based, which induces the investor to supplying additional services, such as strategic advice and network contacts, beyond the capital contribution, in order to increase the likelihood of success. Also, this type of investment confers ownership rights, which enables the investor to take part in the decision-making about strategy and direction of the firm (Hartmann-Wendels 2005). Entrepreneurial finance can be divided into three main stages: seed stage, early stage and later stage (OECD 2011).[11] While venture capital firms normally get involved at a later stage, business angels invest in early and seed stage businesses (Kollmann 2005). Seed stage companies are often dependent on their informal network and own funds as well as public funding programmes (see section 3.3.4) (cf. KfW 2012; Kollmann 2005; Schulte 2005; Bhide 1992).

Academic literature on entrepreneurial finance often focuses on a specific source of capital: venture capital (e.g. Megginson & Smart, 2006). Venture capitalists contribute substantial equity capital to young companies worldwide ($32.3 billion – approx. €25 billion) and in Europe (€4.1 billion) (numbers for 2009, respectively from Ernst & Young (2010) and EVCA (2012, 20)).[12] Notwithstanding these large sums, however, VC only contributes a part of all entrepreneurial finance (cf. Bhide 1992). As another main actor in entrepreneurial finance, business angels also contribute substantial equity capital to young, entrepreneurial firms, often at a very early stage: In 2009, they jointly invested an

[10] Mezzanine capital is a hybrid financial instrument, structured either as subordinated debt (i.e. more risky and potentially profitable than normal debt) or preferred equity (i.e. less risky than common shares).

[11] Seed stage is the stage before the legal foundation of the new company. In this period, the entrepreneur is working on the business idea and business plan and strategy (cf. Kollmann 2005).

[12] In 2009, €203.2 million were invested in VC in Sweden, €84.5 million in Finland and €668.7 million in Germany (BVK 2010, 27ff). Venture capital investments as a proportion of GDP were in 2011 for Sweden 0.064%, Finland 0.044% and Germany 0.027% (EVCA 2012, 32).

estimated $3.56 billion (approx. €2.7 billion) in Europe (OECD 2011). While concrete estimates on the amount of debt capital entrepreneurs receive, primarily from banks (e.g. savings banks, cooperative banks, commercial banks, investment banks and business development banks), are hard to come by, there is evidence that entrepreneurs, especially in some country contexts (like Germany) predominately choose debt capital funding (Block et al. 2008; Schulte 2005). Other actors that provide "unconventional" or more informal sources of capital for entrepreneurs include microfinance institutions and crowdfunding platforms. On these two latter types of institutions, which only recently have emerged in Europe, little empirical data exists to date regarding the aggregated sums of investments to entrepreneurs.

While a range of financial actors with sustainability focus have emerged within the set of more conventional institutional types (e.g. "sustainable" business angels, "green" or cleantech VC firms and "ethical" banks), a range of unconventional financial institutions that are new in the European context (e.g. crowdfunding platforms, microfinance institutions and venture philanthropy)[13] have as institutional types a more democratic and sustainability-oriented raison d'être (cf. Lehner 2012). There is still little data on aggregated investment going into sustainable entrepreneurship. In 2009 over €1 billion was invested in venture and growth capital in cleantech companies (ECVA 2010), which can be considered to be one of many parts of the green economy and eco-innovation.

3.2.5 Design Service Providers

Alastair Fuad-Luke

3.2.5.1 Design and Eco-Innovation in a European Policy Context

European policy in the early 2000s invoked the application of (eco-)design through the development of European Union Directives to target specific sectorial activities and improve eco-efficiency. Initially the focus was on reducing the adverse impacts of chemicals and hazardous substances (RoHS Directive), wastes from the electronics and electrical industry (WEEE Directive) followed by targeting the energy use of products (Eco-design Directive) and then trying to bring them all together through the Integrated Product Policy (see for example, Charter & Clark, 2007; Charter & Tischner, 2001). Later it was recognised that this policy tended to align companies towards compliance rather than driving sustainable innovation and that there were many policy obstacles to overcome (Charter & Clark, 2007). Policy recommendations to the European Parliament for eco-innovation, encouraging a more resource and energy efficient economy, did not specifically mention eco-design or Design for Sustainability (DfS) or perceive these approaches as necessary recommendations for transforming the innovation systems (Bleischwitz et al., 2009). Policy development under the EU ECO-INNOVERA programme from 2006, the FP7 Framework and more recently the 2011 Eco Innovation Action Plan EcoAP (European Commission, 2011), all seem to have failed to contextualise and/or prioritise the exploration of how eco-design and sustainable design can help integrate and encourage eco-innovation, as indicated by the following text of the EcoAP:

[13] Venture philantrophy is a hybrid of equity finance and grant-funding.

[T]he [European] Commission will foster key drivers for the market uptake of eco-innovation by:

- using environmental policy and legislation as a driver to promote eco innovation (Action 1);
- supporting demonstration projects and partnering to bring promising, smart and ambitious operational technologies to the market that have been suffering from low uptake (Action 2);
- developing new standards boosting eco-innovation (Action 3);
- mobilising financial instruments and support services for SMEs (Action 4);
- promoting international cooperation (Action 5);
- supporting the development of emerging skills and jobs and related training programmes to match the labour market needs (Action 6);
- promoting eco-innovation through the European Innovation Partnerships foreseen under the Innovation Union (Action 7). (pp. 6-7)

Moreover, in the recent report of the European Design Leadership Board (established by Commission Vice President Antonio Tajani in early 2011), recommendations for Strategic Design Action 2 - Positioning design within the European innovation system - failed to recommend the implementation of eco-design or sustainable design for eco-innovation, preferring to focus on design as a driver of user-centred innovation (Thomson & Koskinen, 2012). Although, a recent guide for Small & Medium Enterprises (SMEs) and business coaches does highlight an eco-design checklist and promote the business benefits of design (Eco-Innovation Observatory [EIO] & Centre for Sustainable Design [CfSD], 2013). Despite this lack of policy support, the key actors and organisations below, the "design service providers" that support eco-innovation in Europe and further afield show great strength in their diversity and potential reach. Just how effective these actors and organisations are in levering eco-innovation requires more detailed study in the forthcoming SHIFT work packages.

3.2.5.2 Design Service Providers Supporting Eco-Innovation

In the context of the SHIFT project the specific focus is on services that support eco-innovation and sustainable entrepreneurship through the application of design knowledge, applied by designers, design researchers and other professionals. There is a distinction between supporting the development of eco-products, services, materials and experiences, and supporting an enterprise to develop its eco-branding, eco-business and developing its eco-profile within the marketplace. A recent report by Charter and Woolman (2012) for the Centre for Sustainable Design (CfSD) in the United Kingdom (UK), a design service provider since 1995, noted that eco-SMEs tend to want more support around business development (including market penetration, finance, business planning and IP protection) than design for sustainability in order to satisfy their diverse and specific needs.

3.2.5.3 A Draft Typology of Design Service Providers and Their Activities

It appears that information on European and/or worldwide design service providers for eco-innovation support is lacking, although there are exceptions, such as a study exploring eco-design in

innovation driven companies in Spain (Santolaria, Oliver-Solà, Gasol, Morales Pinzón, & Rieradevall, 2011) and various reports by CfSD in the UK. A sound overview needs to be established in future work packages for SHIFT. At this juncture a draft typology of design service providers and a list of the typical activities by these providers create a starting point for further research:

Table 4: Design service providers supporting eco-innovation across different sectors and actors

Sector	Sub-sector	Type of organisation	Examples of "typical" organisations and actors
Public	International	Independent Standards	International Standards Organisation developing ISO for eco-design and LCA
		Research Centres	Collaborating Centre on Sustainable Consumption & Production – a collaboration between United Nations Environment Programme (UNEP) & the Wuppertal Institute – focus on Sustainable Lifestyles (SL), Sustainable Infrastructures, Products & Services (SIPS) and Sustainable Businesses & Entrepreneurship (SBE)
	Government International	European initiatives	European Life Cycle Assessment Platform at the Institute for Environment & Sustainability (IES) EU Ecodesign Directive
	Government national	Funding agencies supporting eco-innovation National Design Councils	For example: Finland - SITRA, TEKES Germany – Rat für Formgebung, German Design Council UK – Design Council
	Universities	Research & Innovation Centres	There are many centres at European universities. Some leading examples include: ▪ UK University of Creative Arts, Centre for Sustainable Design CfSD University of Sheffield, Product Life Network University of Loughborough, Sustainable Design Network University of Lancaster, Imagination Lancaster and Centre for Global Eco-innovation University of West Wales, Ecodesign Centre ▪ Netherlands Technology University Delft ▪ Austria Technology University Vienna
		Materials Centres	Rematerialise, University of Kingston, UK – focus on recycled materials
		Specialized design schools	Ecosign, Cologne, Germany
Private	Consultancies or agencies	Eco-design	Research based – e.g. ec[o]cept, Germany Design based – e.g. Seos, Finland

		Life Cycle (LCA, LCT)	Pré Consultants, Netherlands – since early 1990s a consultancy specialising in entry level and professional LCA software & tools
		Materials specialists & databases	MATREC Centres, Milan & Florence, Italy Materials Information Society, Ohio, USA
Hybrid – Public/Private collaborations	Networks	Eco-design Networks	European Network of Ecodesign Centres (ENEC) – collaborative projects, networks with industry, especially MSMEs
Not-for-profit	Professional associations	Network & research centre	SETAC, Society of Environmental Toxicology & Chemistry – LCA standards & guidelines
	Institutes	Standards Institute	Cradle to Cradle Products Innovation Institute, California, USA

The above design service providers offer a variety of activities for their customers, users, collaborators and/or clients, including: best practice (case studies, instruments, policy & policy tools, product development, services, tools), cleaner production, consultancy, eco-design (checklists, standards, tools), innovation, knowledge exchange and/or transfer, life cycle assessment (LCA) (standards, advise and tools), life cycle thinking (LCT) advise and tools, materials innovation, materials sourcing & management, networking – facilitation, events, projects (collaborative, from eco-efficiency to climate change, multi-sectorial, research-led), research, resource efficiency management, supply chain management, sustainable management of wastes, sustainable product innovation, training & coaching and waste management.

The SHIFT project needs to establish exactly what type of activities eco-MSMEs do need support on from design service providers. The sheer diversity of design service providers and typical activities seems to indicate a lack of integration into strategic, operational, management and content delivery within the overall eco-innovation frameworks in Europe, with many actors responding to local, national or international factors but not linking up effectively. Data from the Sustainable Supply Chains through Innovation (SUSCIN) project led by the CfSD also indicated that eco-MSMEs tended to be technology and product-focused rather than market- and customer-focused (Charter & Woolman, 2012). Design service providers can certainly help create more eco-efficient products, but how do they best compliment the services of other support agencies focusing on business and market development? And how does eco-efficiency help deliver eco-effectiveness and a decoupling of resource use with economic gains? What are the behavioural changes required by suppliers, producers and consumers for more sustainable production and consumption, and how are design service providers best positioned to help? These are significant questions the SHIFT project can help to answer.

3.2.6 Overview of Actor Types

Table 5: Overview of actor types analysed in the project SHIFT

Actor type	Definition	Key data Finland	Key data Germany	Key data Sweden
Universities	Universities' fundamental purpose is research and teaching. In the context of entrepreneurship, universities provide education and support for transfer of technologies.	14 universities (4 specialized universities); 27 universities of applied sciences; 280,000 students (148,000 at universities, 132,000 at university colleges)	427 higher education institutions (108 universities, 215 universities of applied sciences); 2.5 million enrolled students (1.6 million at universities, 800,000 at universities of applied sciences)	16 universities, 15 university colleges (högskolor), 7 art colleges (konstnärliga högskolor), and 9 private colleges providing specialised tertiary education (övriga enskilda utbildningsanordnare, e.g. in nursing); 362 628 students (269 955 at universities)
Incubators	Provide entrepreneurship support to new ventures and MSMEs in particular locations and can focus on particular industries or provide generic support for all types of businesses.	29 science parks and technology centres (members of Finnish Science Park Association) Other regional incubation services and programmes also available	400 technology centres and incubators, 158 of these are members of the association ADT	The association Swedish Incubators & Science Parks has 42 incubators as members; BIG Sweden has 46 members
Business development organisations	Private or public organisations that support MSMEs in general, or in specific sectors, and at various stages of the value chain.	41 service centres for new enterprises (uusyrityskeskus in Finnish) with a total of 83 service points; Several regional development clusters; 15 Centres for Economic Development, Transport and Environment (ELY Centres)	Public BDOs (including smaller agencies) at municipality, city and state levels: approx. 12000	Approximately 500 active BDOs. Number could vary due to some the ad-hoc nature of some BDOs.
Financial institutions	Improve economic actors' access to capital and contribute to increasing the efficiency of capital allocation through the banking system or the	Entrepreneurial VC invested (2009): €84.5 million; VC as a proportion of GDP (2011): 0.044%	Entrepreneurial VC invested (2009): €668.7 million; VC as a proportion of GDP (2011): 0.027%	Entrepreneurial VC invested (2009): €203.2 million; VC as a proportion of GDP (2011): 0.064%

	stock market.			
Design service providers	Support eco-innovation and sustainable entrepreneurship through the application of design knowledge, applied by designers, design researchers and other professionals	n/a	n/a	n/a
"Other" actors	Comprise relevant stakeholders in the development and implementation of eco-innovation, e.g. Business networks; Networks of universities, public services (and companies); Professional and trade organisations; Entrepreneur associations; Chambers of commerce; Consultants; Media services; Internet platforms; Customers	n/a	n/a	n/a

3.3 Approaches

In addition to the actor types described above, the SHIFT project evaluates the significance of several activities and instruments to support (sustainable) entrepreneurship, which we summarize with the term "approaches". These are described briefly in the following sections. Additionally, the concept of Design for Sustainability is seen as a central approach in the project. It will, however, not be discussed further here, as it is described thoroughly in sections 2.4.4 and 3.2.5.

3.3.1 The Business Platform and the Idea Platform

Magnus Klofsten

A characteristic of many new ventures is their instability, which often leads to a greater risk of failure and disappearance from the market. Ventures that manage to get through the critical early development process become more viable, and therefore will have to establish a "Business Platform" (Klofsten, 1992; Davidsson & Klofsten, 2003). More precisely such a platform is defined as: "A state of affairs whereby an enterprise has an input of business resources and is able to use these to promote firm survival and growth in reasonably normal business circumstances" (Klofsten, 1992, p. 9).

Eight cornerstones are defined, all of which must be in place to build up a business platform. Each cornerstone must furthermore be sufficiently strong to hold the platform so that it does not buckle. By analysing each cornerstone and assessing its strength, it is possible to determine whether or not a business platform has been attained. The eight cornerstones are:

- Idea – to be able to develop, the firm must have a concept from which its activities can be launched and developed
- Product or service – an essential part of the process is to develop products or services that are accepted by customers on the market
- Market – the venture is not able to address all markets for reasons of effectiveness, and one definition could be in terms of a niche, which is large enough to be profitable
- Organisation – to be able to cope with and solve problems, the venture must have an internally functioning organisation
- Expertise – to found and run a venture requires different forms of expertise within e.g. marketing, sales and technology
- Driving force and commitment – in the early development phases, strong driving force and a high level of commitment by those involved in the firm is necessary
- Customer relations – the venture needs someone who will buy the product or service
- Other firm relations – the venture needs other forms of relationships that complement the customer relations

The business model describes the dynamics of each cornerstone and how they can be measured over time. Each of the cornerstones has been rated according to one of three levels, depending on how developed it is. The high and low levels are the endpoints on a scale, where low depicts a cornerstone that is hardly or not at all developed while high depicts one that is strongly developed. The intermediate level is a position in the cornerstone's development where an essential step has been taken on the path to a high level. Due to the definition of these levels, it is possible to measure whether or not a venture has attained a business platform and, if not, what the firm needs to reach the platform.

In recent years, another platform has been developed which complement the business platform, namely the idea platform and it is defined as "… a foundation for starting a new venture, and there is an actor, which is prepared to invest resources, in the future development of the idea " (Klofsten, 2005, p. 117). This is the first platform a new venture needs attain to be able to take the next step to a business platform.

3.3.2 Business Plan Competitions

Jens Clausen

3.3.2.1 Key Features

In a business plan competition each participating start-up will be asked to write a business plan giving information on the various aspects needed to evaluate the quality of a product idea, a start-up team and a financial plan to develop the new firm. The most convincing applicants will receive awards. The most important winner might, however, be the regional or nationals business promotion agency, which must contribute to economic strength and employment in its area of activity.

The Association for Start-Up Research (Förderkreis Gründungsforschung FGF e.V.) in Germany lists 105 business plan competitions on its website[14] of which three are international, three based in Switzerland and five in Austria. 94 competitions are focussed on Germany and its regions. For Finland and Sweden, the Nordic Venture Cup, which also takes place in Denmark and Norway and is one of the world's largest, is *the* central business plan competition.

A business plan competition usually combines at least four targets, intentionally or implicitly:

- The award and the deadline for application provide an incentive for early stage entrepreneurs to write and finalize a business plan.
- The applications of early stage entrepreneurs bring them in contact with the regional business promotion and may lead to important start-up support action beyond that of the competition itself.
- The ceremony, which is usually organized to award the winners, as well as some press and media work associated with it, gives a stage to the winners and quite often leads to important business contacts, which in turn support winners on their way to a successful start-up.
- Over the years, the number and quality of award winning start-ups contribute to regional economic strength and employment.

3.3.2.2 The Role of Business Plan Competitions for Entrepreneurship

Each start-up has its beginnings in the idea stage. To get an idea to be spelled out in the discussion with friends might be a first step to sort out good and bad ideas. But to actually form a business requires much more. Not only a product or service idea has to be described, but the potential market has to be studied and the market niche for the new product has to be found. Furthermore, competitors have to be paid attention to, risks have to be evaluated, a competent team has to be found and

[14] FGF e.V. has a list of German-language competitions in its information system - retrieved from www.fgf-ev.de/structure_default/main.asp?G=111327&A=1&S=NSgB1E5w1k190T9815N2YfM21D8E18839G63TOYiv2Xe2V84626514&N=137702&ID=-1&P=&O=&L=1031 (08.06.2013).

formed, marketing and distribution have to be planned and last but not least, a preliminary financial plan has to be drawn up.

A regional or national business plan competition is quite likely to attract people with start-up ideas and provide them with an incentive, not only to begin to write a business plan, but also to finish it before the end of the deadline for applications. During the preparation of the business plan, a lot of questions arise for the early stage entrepreneur, which he or she can answer him- or herself, together with friends or in contact with the regional business development organisation, which usually is behind the competition and offers such services to the applicants. The regional competitions might provide easier access to support in the process, because they usually are linked to business promotion agencies with start-up support organisations that have coaches and training facilities and can easily be visited. National competitions sometimes lack the background of a start-up support organisation. Kerlen and Prescher (2010, 16) find about 50% of the competitions to provide training and coaching. Zoche (2002, 5) links training and networking activities to regional contexts.

Awards are usually not too high or comprehensive. Most prices are within the range of up to €10.000, only some go up to €25.000 and are as such an important part of the overall start-up capital base (Kerlen & Prescher, 2010, 16).

The applicants as well as the business development organisation are highly interested in high quality applications, because only a high quality application may win, may succeed in the market and, at the end of the day, create jobs. The process of writing the business plan is only the first step of a competition. The award ceremony and the follow-up are as important for the best start-ups to gain new contacts, partners or possible pilot customers.

The business plan competition thus is an important tool to foster and develop early stage entrepreneurship. Up to date, sustainability hardly plays a role in any of the competitions. The national "start-social competition" aimed at non-profit start-ups is the only prominent one in Germany.

3.3.3 Cluster Initiatives

Magnus Klofsten

Studies show that clusters add value for the actors involved as well as for the wider economy - such as learning and knowledge-development, increased community synergies, and improved economies of scale via extended social relationships and networks, information flows and infrastructure (Dti, 2004). Cluster development is therefore prioritized within policy programmes as a means to facilitate firm development and job creation. So-called cluster initiatives (hereafter called CIs) are often established with the aim of developing activities and services for its members, which can be both cluster firms and support organizations (Laur et al., 2012). More precisely CIs are defined as follows:

> *"…collaborative actions by groups of companies, research and educational institutions, government agencies and others, to improve the competitiveness of a specific cluster [... for example] by raising the awareness of companies within a cluster and creating more effective platforms for interaction [... or providing] a platform for a better dialogue between the pri-*

vate and the public sector when making decisions about how to improve the cluster-specific business environment." (Ketels & Memedovic, 2008, 384)

An important force behind cluster initiatives are often ambitious and entrepreneur - individuals from all type of private and public contexts (Lundequist & Power, 2002). These individuals start CIs to satisfy certain needs and to fill gaps that exist on the market (Aziz & Norhashim, 2008). In many cases they continue to lead the CIs throughout their lifecycles (Klofsten, 2010).

Laur et al. (2012) propose that CIs can be seen as a form of intermediary organizations, which is in place to articulate and serve the needs of those CI actors who decide to become allied with it (cf. Intarakumnerd, 2005; Fromhold-Eisebith & Eisebith, 2008). Using existing knowledge on intermediaries and their character opens up interesting perspectives in the study of CIs and casts new light on their activities and relations between involved actors. Figure 15 illustrates three categories of CI members (Laur et al, 2012, p. 1917).

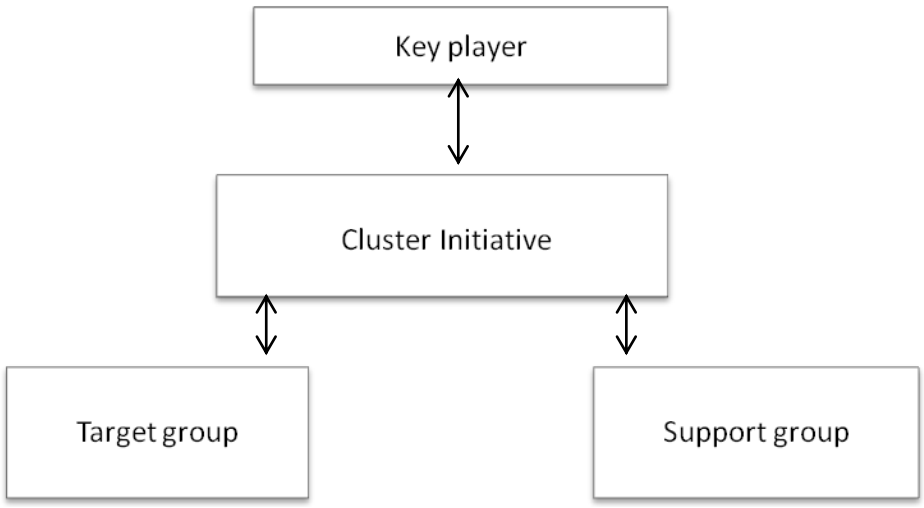

Figure 15: Actors involved in cluster initiatives. Source: Laur et al. (2012, 1917).

Those members are characterised as follows:

- Key players are actors with a dominant position and roles within the CIs e.g. organizing, financing, or both.
- Target groups are members whose needs serve as the basis for the CIs activities.
- Support groups are organizations related to target group, but is not the primarily focus of the CIs operation. They could serve as complementary resource providers to the key player.

When studying CIs it is important to understand e.g. whom these actors are, what relationships are built, what resources are provided in the relationships and how changes in the constellation take place and develop.

3.3.4 Public Funding Programmes

Linda Bergset

3.3.4.1 Key Features

Public funding programmes provide financial support for businesses. The aim of such public programmes is to bridge gaps in funding for companies that are unable to access private financial institutions. Public funding programmes often attempt to mobilise private funds by using public funds as leverage. Many such programmes are thus directly or indirectly public private partnerships (PPP). Depending on the governmental structure of the state, some public funding programmes may be organised at the state level by public institutions, while other are offered on federal state or regional/local levels.

3.3.4.2 The Role of Public Funding Programmes for Entrepreneurship

Entrepreneurship contributes substantially to economic activity, growth and employment opportunities in an economy and is therefore generally considered desirable by economic policy makers (cf. KfW 2011). However, as new firms' and entrepreneurs' own capital often does not suffice as collateral for credit finance (Staroßom 2013) and the size of their economic activity does not (yet) have a size that benefits from scales of economy (Weber 2012), entrepreneurs are often disadvantaged in competition with more established companies. Public funding programmes are thus developed to help spur on entrepreneurial activity that might otherwise be discouraged due to market failure that arises from a suboptimal allocation of capital (cf. Weber 2012; Börner 2005).

While public funding programmes for entrepreneurship focus primarily on support for the process of starting up new companies or the development of young firms, comparable programmes for innovation focus on the good or service to be developed and the R&D process (generally, however, distinguishing between support for MSMEs and larger corporations). The main types of financial instruments used in public funding programmes are non-repayable grants, repayable loans and guarantees. Some programmes use public funds as leverage to increase private investment, e.g. deficit guarantees or security collateral to lower private risk, or incentives like investment grants offered to a private investor as a percentage of their equity investment. In this case the money does not go directly to the entrepreneur, but to the investor providing funds to the entrepreneur. Others provide an independent sum directly to the entrepreneur. Some programmes specify explicitly what the entrepreneur can use the money for (i.e. the money is earmarked for e.g. start-up or business consulting, coaching or stipends for the entrepreneurs), while others leave this to the entrepreneur to decide (as long as they fulfil certain criteria).

The emphasis on public funding for entrepreneurship in economic policy varies considerably from country to country. In Germany, there are currently 209 different programmes at state and federal

state levels that provide funding for entrepreneurs in start-ups and young companies.[15] In the German public budget for 2013, € 83 million have been earmarked for "innovative start-ups", but there are other posts in which innovative entrepreneurship is also partially funded, such as "innovation funding for SMEs" (total budget: € 510 million) or "technology and innovation transfer" (total budget: € 29.7 million).[16] Also, the Federal Ministry of Labour and Social Affairs provides a total of € 40 million for microlending to entrepreneurs and small business owners in the programme Mikrokreditfonds Deutschland.[17] In Sweden in 2011, Tillväxtverket (Swedish Agency for Economic and Regional Growth) provided SEK 1.55 billion (approx. €176.6 million) in regional support to companies in the form of investment support, contribution to business development, seed finance and project based funding (Tillväxtverket 2012, 7). In Finland, public funding for entrepreneurship comes primarily from Tekes and the Ministry of Employment and the Economy via the Centres for Economic Development, Transport and the Environment (ELY Centres). In 2011, 58% (i.e. €208 million) of total Tekes funds were targeted at MSMEs and 31% (i.e. €112 million) were targeted at small and young companies (less than six years old) (Tekes 2012, 7).

In Germany, there are certain public funding programmes that also, although not exclusively, provide funds to sustainable entrepreneurs. Entrepreneurs can thus find support within programmes that focus on eco-innovation (e.g. the Umweltinnovationsprogramm (environmental innovation programme) of the Federal Ministry for the Environment)[18] or start-ups (Cleantech being one focus of the aforementioned High-Tech Start-Up Fund).

[15] Cf. http://www.foerderdatenbank.de/Foerder-DB/Navigation/Foerderrecherche/suche.html?get=08a0272a381c6de0148d0aef64a39de2%3Bsearch%3Bindex&typ=qk&act=exe&gbrb=1&gbrl=2&gbt=&brt=1&brh=&art=&qry=&execsrh=Finden&cgparam.formCharset=ISO-8859-1 - This number includes funding for innovative start-ups as well as less specialised ones (29.4.2013).

[16] Cf. http://www.bundeshaushalt-info.de/startseite/#/2013/soll/ausgaben/einzelplan/09.html. The funds earmarked for "innovative start-ups" are mainly given to science-based start-ups in the programme EXIST, to the so-called High-Tech Gründerfonds ("High-Tech Start-Up Fund") via the European Recovery Programme as well as to investment grants for venture capital (29.4.2013).

[17] An additional 60 million is provided by the European Social Fund - http://www.foerderdatenbank.de/Foerder-DB/Navigation/Foerderrecherche/suche.html?get=549ca6c176ec3659316c05a745c4e00a;views;document&doc=10917 (30.4.2013).

[18] Cf. http://www.umweltinnovationsprogramm.de/ (16.05.2013).

3.3.5 Overview of Approaches

Table 6: Overview of approaches analysed in the project SHIFT

Approach	Definition	Key data Finland	Key data Germany	Key data Sweden
Business platform & Idea platform	Defines the cornerstones of a successful firm: Idea, product/service, market, organisation, expertise, driving force/commitment, customer relations, other firm relations	n/a	n/a	n/a
Business plan competition	Competitions for start-ups in which the best business plans are granted with awards (financial and other support)	1 large: Venture Cup	94 competitions (regional & national)	1 large: Venture Cup
Cluster initiatives	"Collaborative actions by groups of companies, research and educational institutions, government agencies […] to improve the competitiveness of a specific cluster" (Ketels & Memedovic, 2008, 384)	6 Strategic Centres for Science, Technology and Innovation (SHOKs); Various other (regional) clustering development initiatives; Transnational BSR Innovation Express for supporting the internationalisation of SMEs	Approx. 400-500 cluster initiatives in total	58 cluster initiatives in Sweden active in year 2012 (Laur, 2013)
Design for Sustainability & other design approaches encouraging participation of diverse stakeholders & users	Important discipline to help create fresh and innovative ways of solving sustainability challenges	n/a	n/a	n/a
Public funding programmes	Public sector financial support for businesses in the form of non-repayable grants, repayable loans and guarantees	Tekes funds for MSMEs: €208 million; Tekes funds for small and young companies	209 programmes (state and federal state levels); 2013 budget: €83 million for "innovative	Tillväxtverket provided SEK 1.55 billion (approx. €176.6 million) in regional support

		(less than six years old): €112 million (2011)	start-ups", € 510 million for "innovation funding for SMEs", € 29.7 million for "technology and innovation transfer"; €40 million for Mikrokreditfonds Deutschland	to companies (2011)

3.4 Types of Collaboration

3.4.1 New Business Networks

Mika Kuisma

A network consists of a set of actors and nodes with a set of ties of a specified type that link them (e.g. Borgatti & Halgin, 2011, Geiger & Finch 2010, Håkansson & Ford 2002). Much of the theories of network analysis consist of characterizing network structures and node positions and relating these to group and node outcomes. Research on social networks has grown considerably, but despite this popularity, there seems to be confusion about network theorizing (Borgatti & Halgin, 2011). There are typically multiple opportunities available to businesses in a network, as the relationships encourage interdependence between different systems and reinforce their complementarity. The macro perspective on networks compares the network to an instrument coordinating the companies, whereas the micro perspective investigates networks in terms of strategy and operations as a function of the changing dynamics of the company (Trequattrini et al., 2012). The setting of boundaries for a network of companies and organisations is challenging, as network setting extends without limits through connected relationships, making any network boundary arbitrary (Halinen & Törnroos, 2005).

There are no constraints in the formation of business networks in terms of company size. Company networks are formed both by small businesses and large companies (e.g. Trequattrini et al., 2012). A company network is a free business association, which creates structures that are capable of integrating the efforts of members, for example, to exchange information and other resources, design and produce goods and services, develop new processes, reduce time needed for innovation or entry to the market (e.g. Håkansson & Ford, 2002). Networks have been claimed, for example, to be the defining feature of innovative regions (such as the Silicon Valley), the locus of innovation in high-tech industries, and shape the diffusion of technologies and practices (Owen-Smith, n.d.).

The social or personal networks of entrepreneurs can be a cost-effective means of obtaining information that is valuable to the business, and moving from the personal to extended networks allows entrepreneurs to expand their access to information and resources (Dubini & Aldrich, 1991). In practice, *Business networking* has been defined as a socioeconomic activity by which groups of like-minded businesspeople recognize, create, or act upon business opportunities. It is a low-cost activity that involves more personal commitment than company money. Business networking is regarded as

an effective low-cost method for developing contacts and also sales opportunities (cf. marketing). In addition to specific networking events and tools, such as local networking events, speed networking events and business networking websites, networking opportunities include e.g. exhibitions, workshops, professional clubs and websites, and societies and associations for specialist subjects (businessballs.com, 2013).

Active networking and participation in network partnerships is often seen as a beneficial opportunity for creating value and growth (Trequattrini et al., 2012). Strategic partnerships are often mentioned among the most important gains of networking. Other potential benefits include access to expertise, products and services. The exchange of ideas, mutual support of a peer group, and benchmarking opportunities and best practice have also been among the potential benefits of networking for a start-up or small business. Stimulation, a positive influence of networking, has also been emphasized in several practitioner oriented listings of the benefits of business networking (e.g. amazingbusiness.com, enterprisenation.com, is4profit.com 2013).

There are several specific business networking organizations that create models of networking activity that allow the business person to build new business relationships and generate business opportunities at the same time. Business networking can be conducted in a local business community, or on a larger scale via the Internet. There are specific networking checklists and tips available for effective networking, and recently also teaching techniques for integrating traditional business networking skills with the newest social media (Delaney, 2013).

Providing estimations on the number of business networks for example in Finland, Germany and Sweden is challenging. In addition to formal networks there are also informal network structures between professionals, MSMEs and other organisations etc. The existence of tangible relationships and connections between companies has been observed in studies for tens of years (e.g. Håkansson & Ford, 2002), but there are no statistics available that would provide exact and comparable data on the (new) business networks approach. However, it seems that there is a growing trend in terms of networking approach. We will continue to look for potential sources of data in the forthcoming work packages of the SHIFT project.

3.4.2 Collaboration between Incumbents and Start-Ups

Mika Kuisma

The term “incumbent” refers here to a company that is powerful and has a large amount of market share, as for example in “the dominant incumbent software company”. The incumbent is typically (amongst) the largest player(s) in an industry (e.g. Investopedia, 2013). These already established organizations gain certain incumbent’s advantages in the market, as compared to new entrants.

Start-ups, e.g. new technology firms often lack certain complementary assets to commercialize their innovations. Complementary assets include infrastructure or capabilities necessary to support successful commercialization and marketing of an innovation. Consequently, incumbent start-up collaboration is often linked to commercialization strategies for start-ups (e.g. Belleflamme, 2012, Gans & Stern, 2003). On the other hand, incumbents may face severe difficulties in adapting to radical (tech-

nological) change. Radical innovations may even initiate a process of creative destruction leading to the replacement of incumbents by new entrants. Inter-firm cooperation between incumbents and new entrants has been suggested as one way that the incumbents can adapt to radical (technological) change (Rothaermel, 2002). In addition, the cooperation between incumbents and new entrants may contribute to an improvement in incumbent industry performance (Rothaermel, 2001a,b).

Instead of attacking or competing with established incumbents in the markets, start-ups often choose collaborative partnerships with large incumbent firms who possess the necessary complementary assets such as manufacturing capabilities, marketing channels, brand name etc. (Rothaermel, 2001a). Start-up product entry to the market is often costly, and due to the high entrance cost, start-ups will favour the option of partnership with an incumbent firm. This will enable the incumbent firm to make use of the external start-up innovation that will be positive for its development. When start-ups do not present much competition for the incumbent, their ideas and inventions may sometimes be stolen and imitated by incumbent firms (Belleflamme, 2012). Innovators face a strategic trade-off between the protection of their ideas and an effective commercialization strategy. Protection against expropriation often requires some level of secrecy (Gans et al., 2008). A start-up innovator with weak intellectual property protection is likely a weak competitor, dampening the innovation incentives of entrepreneurs (Gans & Stern, 2003).

In niche markets however incumbent companies do not control complementary assets. This business environment is characterized by tight competition between start-up firms and incumbents, and start-up firms may have the opportunity to acquire stronger position using the existing "blind spots": the Swiss watch industry and the mobile telecommunications industry have been frequently used as examples where start-ups take advantage of blind spots in the industry (Glassmeier, 1991, Belleflamme, 2012). Start-ups can choose whether to compete or to cooperate with an incumbent firm. They are able to protect their own innovations from imitations, and thus they do not need the complementary assets of incumbents.

Similarly, large (incumbent) and small (start-up) firms may have differential roles in transforming industries towards *sustainable development*. In their analysis, Hockerts and Wüstenhagen (2010) present a view of industry transformation, where the initial phase is characterized by sustainability initiatives of small firms, idealistic "Davids". In a second phase, some pioneering "Goliaths", e.g. retailers, mimic some of the David initiatives and try to bring them into their mainstream distribution channels. In isolation, none of these two developments would necessarily lead to sustainable transformation of mainstream markets, because Davids tend to get stuck in their high-quality, low-market penetration niche, while Goliaths have an inherent tendency to react to cost pressures by lowering the sustainability quality of their offerings.

The success of emerging Davids, which can also be seen as a potential competitive threat for incumbents, has been instrumental for some of the greening Goliaths to embark on the level of sustainable entrepreneurship that they did. It has been argued that the sustainable transformation of industries is not going to be brought about by either Davids or Goliaths alone. Instead, the interaction of incumbents and new entrants is essential in sustainable entrepreneurship. Achieving the sustainable transformation of an industry requires a fine-tuned mix of disruptive and incremental innovation,

which can be promoted if the interplay of Emerging Davids and Greening Goliaths is understood, rather than focusing only on one of these paths while neglecting the other. Smart innovation policies should try to leverage cooperation and competition between Davids and Goliaths (Hockerts & Wüstenhagen, 2010).

Providing estimations on the volume and quality of collaboration between incumbents and start-ups for example in Finland, Germany and Sweden is challenging as well. As mentioned above, the existence of tangible relationships and connections between companies has been observed in studies for tens of years (e.g. Håkansson & Ford, 2002), and there is also research and theorising on the relationships between incumbents and start-ups in sustainable entrepreneurship (e.g. Hockerts & Wüstenhagen, 2010). It seems however that there are no statistics available that would provide exact and comparable data on the collaboration approach. We will continue to look for potential sources of data in the forthcoming work packages of the SHIFT project.

4 Conclusion

4.1 Conceptual Framework for SHIFT

Klaus Fichter & Linda Bergset

The goal of Work Package 1 is to reach a common understanding of the research objective across the different scientific disciplines and backgrounds represented in the project. In order to reach such an understanding, not only the theoretical foundation of the project, rather also the key concepts themselves are subject to different conceptions, debate and, finally, agreement. Building on theories and concepts presented and discussed in Chapter 2 and Chapter 3, we will develop a common conceptual framework for SHIFT in the following sections.

4.1.1 Understanding of "Eco-Innovation" & "Sustainable Entrepreneurship"

In SHIFT the concepts of "eco-innovation" and "sustainable entrepreneurship" are key focal elements of the research design. Therefore, the research team needs a common understanding of them.

With regard to "eco-innovation", we first clarified the term "innovation" (cf. Section 2.2.2.1) and defined it as follows: "Innovation is the development and implementation of a novel technical, organizational, business related, institutional or social solution that leads to significant change" (Fichter & Clausen 2013, 34, own translation). Since the focus is on business organizations as innovators in SHIFT, we will be dealing primarily with innovations developed and implemented by start-ups and MSMEs. They can therefore be specified as "business innovations". We will draw on a definition provided by OECD and EUROSTAT (2005, 16), which is concerned with the collection of innovation data at the level of the firm and is suitable for empirical research, because it allows for delineation and measurability. By extending the interpretation of OECD and EUROSTAT (2005, 16) slightly, we define "business innovation" as follows:

"A business innovation is the development and implementation of a radically new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations. Entrepreneurs, start-ups and companies are key innovators of business innovations." (Authors, based on OECD and EUROSTAT 2005, 16)

While innovation can happen within as well as outside a market context, we will narrow down the focus of SHIFT to such innovation that is market-oriented. Types of innovation (innovation object) considered in the project are marketable technologies, goods and services as well as a combination of these (product-service systems).

Building on the definition of "eco-innovation" provided by the Eco-innovation Observatory (EIO), we define it somewhat more narrowly as innovation that *significantly* "reduces the use of natural resources and decreases the release of harmful substances across the whole life-cycle" (EIO 2010, 10). In our understanding, only those innovations that are

(1) environmentally beneficial,

(2) economically feasible and

(3) not in conflict with social sustainability

can be labelled as “eco-innovation”.

How does “sustainable entrepreneurship” relate to eco-innovation? First of all, we have identified entrepreneurs, start-ups and other companies as key innovators. Second, we build on the rich stream of entrepreneurship theory and research (cf. Section 2.2.3), which helps us see the causation between the individual entrepreneurial drive, the creation through such drive (i.e. the enterprise) and the emergence of innovation. Within SHIFT we will use a process approach when dealing with entrepreneurship and will use the following definition:

> *“Entrepreneurship is the identification, evaluation and exploitation of business opportunities.” (Shane & Venkataraman 2000, 218)*

Entrepreneurship is seen broadly as opportunity creation, recognition and exploitation within a market context. By building on a process approach, we will study the opportunities and challenges over the course of the entrepreneurial life cycle from the initial opportunity identification to the end stage of liquidity. The “entrepreneurial life cycle” (cf. Price 2004), which outlines the key stages of an innovation process, includes not only the entrepreneurs and their company, rather also all factors and actors in the institutional setting that have an impact on the innovation process (see Figure 16).

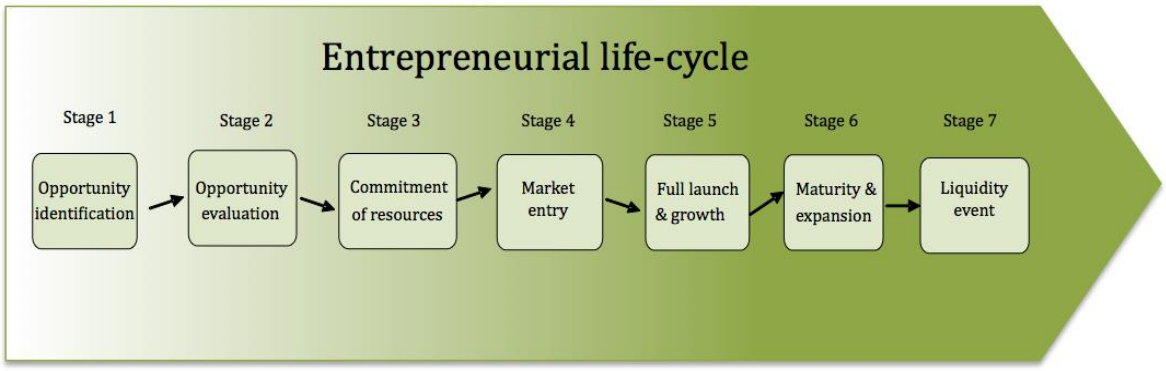

Figure 16: Stages in the entrepreneurial life-cycle (based on Price 2004, adapted by the Authors)

What is “sustainable entrepreneurship”? Sustainable entrepreneurship can be considered to be innovative (i.e. a source of eco-innovation), market-oriented, personality driven, and creates economic as well as societal (social and environmental) value (cf. Section 2.3.2.3). Building on the definition provided by Schaltegger and Wagner (2011, 226), we define the concept of “sustainable entrepreneurship” in a somewhat condensed version as:

"a market-oriented and personality-driven form of creating economic and societal value by means of environmentally or socially beneficial innovations."

When the two concepts of eco-innovation and sustainable entrepreneurship are seen together, sustainable entrepreneurs can be called the creators of eco-innovation. In the project, sustainable entrepreneurs will be distinguished according to the typologies explored in Section 2.3.2.3 with an extra consideration of the type of goals the entrepreneurs have (economic, environmental and/or social).

In order to look at different industries that are in various stages (emerging, growing and mature), the project will analyse new companies (start-ups) as well as more established ones. Within the group of established companies attention is given to innovative micro, small and medium-sized enterprises (MSME).[19]

4.1.2 Embedding Eco-Innovation in a Multi-Level Framework of Transformation

The underlying idea of the project is that eco-innovation and sustainable entrepreneurship will contribute substantially to bringing about a transformation. Transformation is taken to signify a radical change or creation of a whole new form, function or structure. It is assumed that a "great transformation" is needed in society and the economy in order for these to become (substantially more or radically) sustainable. In order to better understand and explain the role of eco-innovation in this great transformation, we will apply systems theory and multi-level frameworks (MLP) (cf. Section 2.4.1) within SHIFT. MLP enables the framing of the SHIFT project within a larger context of sustainability transformation. It also emphasises the concept of systemness, which implies that units of analysis do not exist in isolation; rather they are in dynamic interaction with other components of the entire system. The multi-level perspective will be used in two ways:

(1) To position the SHIFT project in a broader context of sustainability transitions.

(2) To postulate how to analyse support systems for sustainable entrepreneurship.

One basic concept we build on is the differentiation between micro-, meso- and macro-levels of a societal system (cf. Section 2.2.1.2 and Figure 4). In our understanding, eco-innovation and sustainable entrepreneurship are mainly micro-level phenomena, while support systems for the developing and implementing novel or significantly improved products and services can be located on a meso-level. We think that the contribution of eco-innovation can only be understood if the micro-level phenomena of eco-innovation and sustainable entrepreneurship are conceptualized as part of a larger transformation process of society and socio-technical systems towards sustainability. This long-term transformation process can be framed to take place on a macro-level.

[19] We lean on EU definitions for sizes of companies, cf. http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/sme-definition/ (retrieved on 17.10.2013)

Table 7: Multi-level framework and focal areas of interests in SHIFT. Source: Authors.

Level	Focal area of interest
Macro-level	Long-term transformation of society and socio-technical systems
Meso-level	Support systems for innovation and entrepreneurship
Micro-level	Eco-innovation and sustainable entrepreneurship

While the above differentiation is suited to locate key concepts of SHIFT on different levels of a societal system, we will additionally use a second multi-level framework to analyse and explain the role of eco-innovation and sustainable entrepreneurship in the transformation process towards sustainability. Figure 9 describes the transition from one paradigm to another in a multi-level framework. It describes the influences of change from the macro-level and the micro-level that impact on the dominant design of a societal system. It thus becomes clear that there is fluidity in this dominance. Nonetheless, there are some recurring concepts that have arisen in the different parts of this work package that deal with the existing economy's and support systems' dominant logic and resistance (as one form of barrier to change). In a transformation to a new, sustainable economy and society, there are not only support systems willingly providing support for the agents of change. A thorough understanding of the barriers inherent in the dominant logic has to play a fundamental part in the analysis of existing systems, if realistic suggestions for change are to be made. The analysis should not be limited to barriers and obstacles, but should also include the enabling conditions for eco-innovation and its diffusion. Therefore, the analysis should look at e.g. breakthrough approaches or initiatives as well as at change agents and promoters.

In order to analyse the above mentioned aspects we will draw on transformation theory (cf. 2.4.1.3) and use the framework provided by the German Advisory Council of Global Change (WBGU), which builds on transition research (cf. Geels et al., 2008).

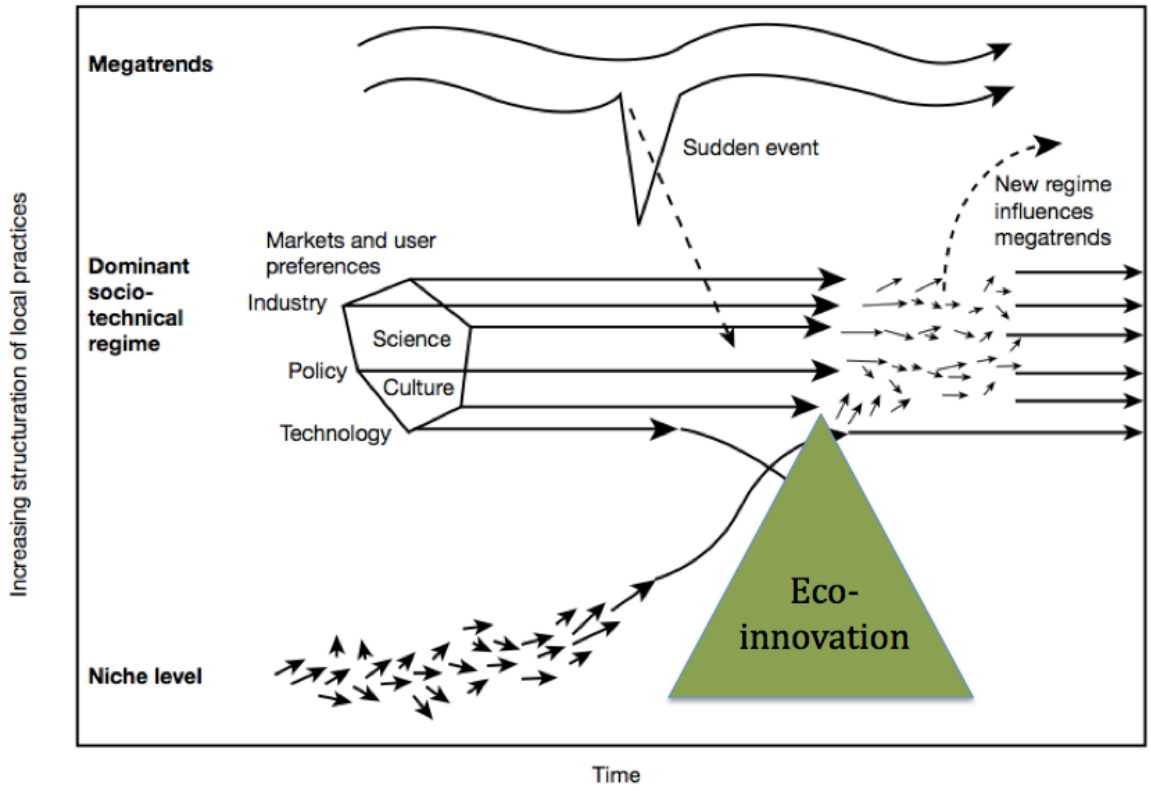

Figure 17: Eco-innovation embedded in a multi-level framework perspective on transformation. Source: WBGU (2011, 93), with additions by the Authors.

Transformation needs agents of change. Without them, no change will take place or the transformation process is likely to become even slower. While sustainable entrepreneurs, start-ups and innovative MSMEs can be located at the niche innovation level (micro-level), we consider eco-innovation projects to be the attempt to develop and implement an environmental beneficial technology, good or service by pushing it from a niche-level into the dominant socio-technical regime (cf. Figure 17.

4.1.3 Eco-Innovation as Key Element in Sustainable Development

The sustainability theories and approaches that relate to the economy suggest that businesses – as well as their support systems – should consider the principles of sustainable development, i.e. the balancing of economic, ecological and social impacts (challenges and opportunities) of their actions, when developing and supporting technologies and operations (cf. Section 2.3.1). Sustainability theories as well as empirical research have shown that both economy and society are constrained by environmental limits (cf. Willard 2005, 224-225; as well as Figure 6). They also indicate clearly that there is a need for growth in human well-being and for decreasing the use of natural resources on a global scale. In SHIFT we therefore build on the concept of decoupling natural resource use and environmental impacts from human well-being and economic activity (cf. Figure 7). We think that decou-

pling is possible, if three elements are integrated in a co-evolution approach: (1) establishing sustainable production and consumption patterns and the values and cultures supporting them, (2) institutional arrangements and regulation securing sustainable development on the local, regional and global levels, and (3) eco-innovation. The model of a "green economy" is helpful to conceptualize these three elements. Green economy is an economic development model based on sustainable development and ecological economics. UNEP (2011a, 16) defines the green economy as one that "results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities". In its simplest expression, a green economy is low-carbon, resource efficient, and socially inclusive.

For SHIFT, innovation is the focal mode of change. It should clearly be differentiated from other forms of change (variation, diffusion and exnovation) and conceptualized as element in a holistic picture of transformation (cf. 2.2.2.2). The success of eco-innovation depends on the spread through market and non-market channels (diffusion) and on the discontinuation of competing non-sustainable technologies, products and practices (exnovation).

4.1.4 Support Systems for Sustainable Entrepreneurship and Eco-Innovation

The guiding research question in SHIFT is:

> *In which regard and how do support systems for entrepreneurship have to be changed in order to effectively support the generation and implementation of eco-innovation?*

There is no widespread, common understanding of the concept of support systems in the context of entrepreneurship and innovation. Based on the model of "innovation systems" (cf. Section 2.4.2.2) and a range of related concepts in both innovation theory and entrepreneurship theory (cf. Section 3.1.2) we thus broadly define "support systems" as follows:

> *A support system comprises all actors, institutional settings and resources that help entrepreneurs in innovating successfully. (Authors' own definition)*

In SHIFT we will focus on key actors of the support system for entrepreneurship. We will distinguish the following groups of actors in the support system:

(1) Universities

(2) Incubators

(3) Business development organizations

(4) Design service providers

(5) Financial institutions

(6) Other actors

During the work period of WP 1, workshops with MSMEs have already been carried out.[20] In these, the practical importance of both institutionalised and informal support systems became clear. For this reason, a new category of "Other actors" has been developed for one work package and will replace the explicit focus on collaboration between incumbents and start-ups and MSMEs initially intended for work package 6 (cf. Section 3.4.2).

Furthermore, we will give special attention to specific practical approaches (instruments and activities) that can support entrepreneurship and eco-innovation:

(1) The business platform and the idea platform

(2) Business plan competitions

(3) Cluster initiatives

(4) Design for Sustainability

(5) Public funding programmes

How do we relate these actors and approaches of the support systems to those persons or organizations that generate and implement eco-innovations? SHIFT will focus on specific innovators, comprising entrepreneurs (single persons or teams), start-ups as well as MSMEs. While the proposal had a more comprehensive scope of innovators in mind, in the work process running parallel to this WP 1, the partners have agreed to focus on support to sustainable entrepreneurship in start-ups und innovative MSMEs developing eco-innovation. Thus large companies and incumbents are not a specific research object in SHIFT. Nevertheless we will include and consider the role of incumbents as potential cooperation partners or incubators of entrepreneurs and start-ups.

Taking these focal actors and practical approaches into account, the relationship between the support system, the key actors (entrepreneurs, start-ups, MSMEs) in the entrepreneurial life-cycle and eco-innovation can be conceptualized in SHIFT as follows:

[20] On 06-03-2013 an "open evening" took place at The Hub in Helsinki. On 25-04-2013 a workshop was carried out at Aalto Media Factory in Helsinki.

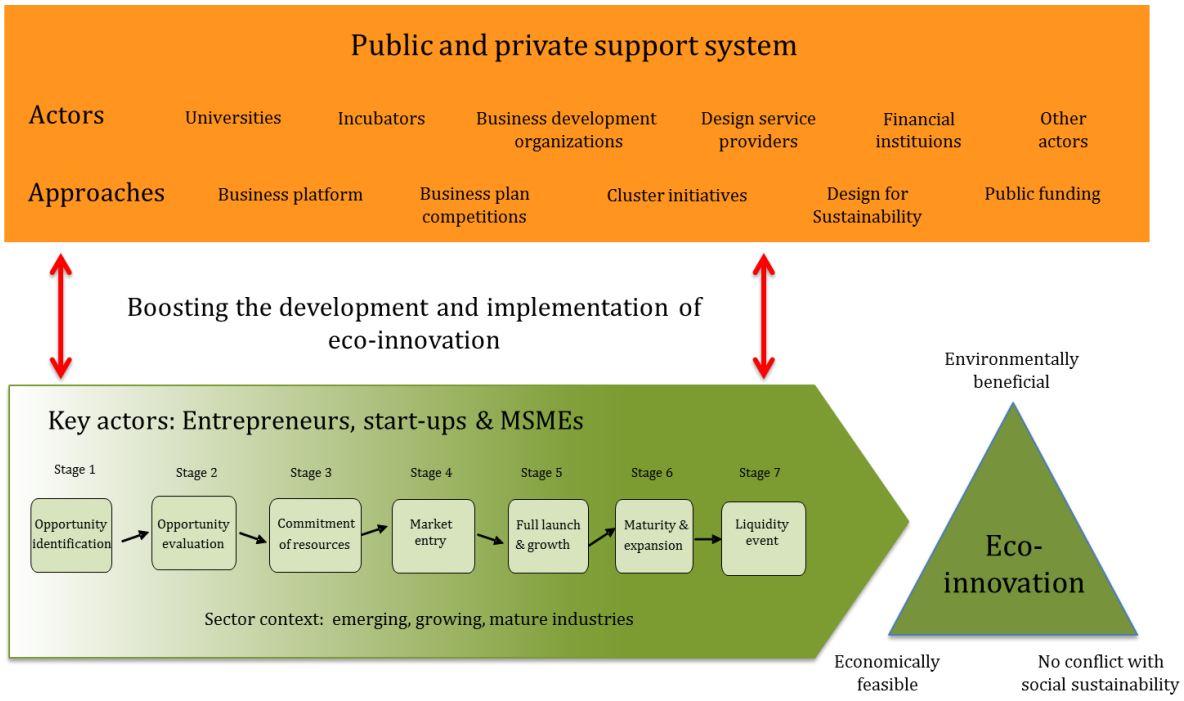

Figure 18: Framework for analysing the role of support systems for entrepreneurship and eco-innovation. Source: Authors.

There is a richness of theoretical approaches related to support systems available that can be applied in SHIFT (cf. section 3.1). There is no need to limit oneself to one approach for all actor types and work packages. On the contrary, explicitly evaluating and selecting the most appropriate approach for each individual work package increases the chance of applying one which has a good fit with the practice to be described. In order to decide on an approach in the individual case, it is helpful to clarify what is meant by "support": support may be both of the "hard" and the "soft" kind (cf. Norrman 2008). "Hard" support refers to material aid like money, in-kind contributions, office space and tax services. "Soft" support more often relates to intangible aid such as coaching, training, contacts and moral support (cf. Autio & Klofsten 1998). Furthermore, it is sensible to distinguish between informal and formal types of support providers within the support system. While formal support providers such as incubators and banks are institutionalised organisations or programmes with a clear mission and agenda to provide support to entrepreneurs, informal support providers, such as family, friends or even business angels, may provide support that has a less structured or planned character, albeit being no less valuable to the entrepreneur.

When analysing the interaction between the support system and the innovators (entrepreneurs, start-ups, MSMEs), it has to been taken into account that time horizons for the different actors might be different; something which can cause problems in their interaction (cf. 2.2.1.4). For example, the basic research in the universities usually has a long time horizon, whereas the actors in the financial system typically require positive results within a relatively short time-frame.

In focusing on eco-innovation we focus specifically on innovative products and services (and product-service-systems), which have a beneficial impact on the environment, while remaining economic feasible (i.e. not dependent on direct subsidies in the long run) and being in harmony with social sustainability (i.e. no conflict to be expected).

4.1.5 Conclusion: A Basic Conceptual Framework for SHIFT

Finally, we can pull the different conceptual elements together, which have been presented in the previous sections, and integrate in one basic framework for SHIFT. We can do so by drawing on Figure 17, which embeds eco-innovation in a multi-level perspective on transformation. Building on the above developed framework for analysing the role of support systems in boosting sustainable entrepreneurship and eco-innovation and the notion that a transformation process should lead to a "green economy", we can generate the following basic framework for research activities in SHIFT:

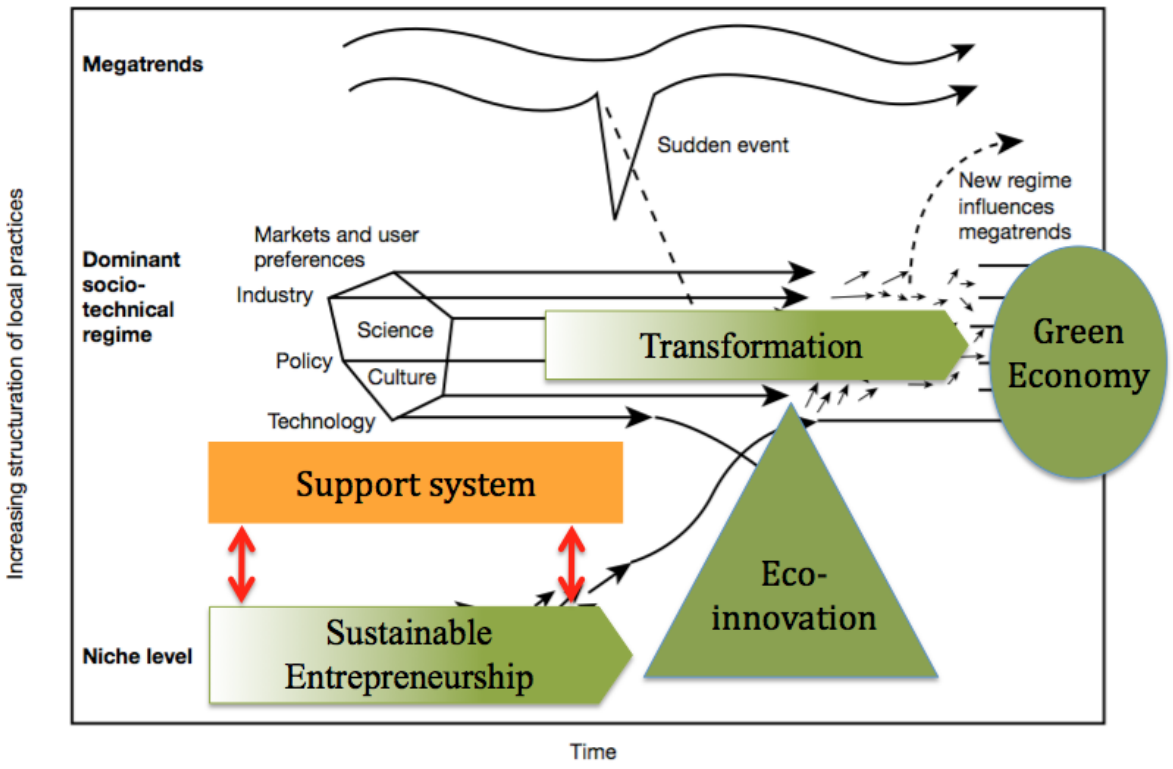

Figure 19: Basic research framework for SHIFT. Source: Authors.

4.2 General Approach of the Project

Olof Hjelm, Dzamila Bienkowska, Wisdom Kanda, Magnus Klofsten, Alastair Fuad-Luke, Klaus Fichter and Linda Bergset

4.2.1 General Approach

4.2.1.1 Demand, Supply and the Gap

The first phase of the project consisted of an overview and analysis of the state of the art in several relevant academic fields. The analysis has been developed by individual contributors with previous experience from these fields and through mutual discussions during project meetings. This work package constitutes a condensed version of the project's overview of state of the art and is useful as a handbook for project members. More specific analyses will be developed in other publications and serve as theoretical frameworks for particular research questions. The following figure (Figure 20) sums up the general approach of the project as discussed by the project members.

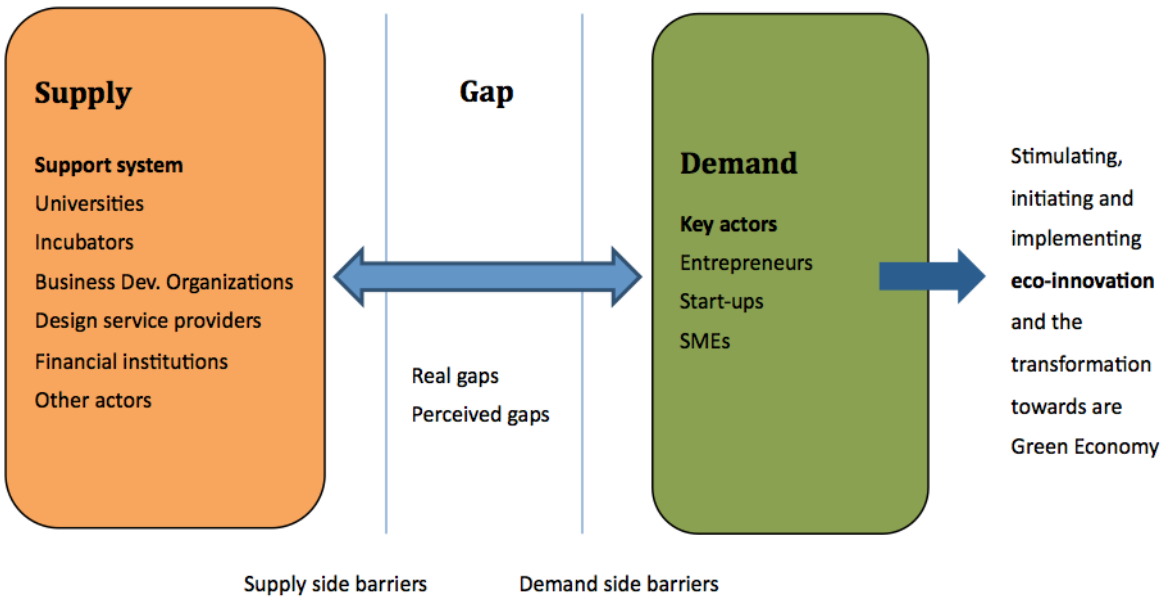

Figure 20: Representation of the gap-approach of the project. Source: Authors.

Figure 20 above depicts three major aspects of a business support system, the demand side (firms and entrepreneurs), the supply side (organisations that support businesses) and a gap that might exist between these two. Whether this gap exists, depends on a possible mismatch between the supply and demand sides in business support activities (Gibb, 1992, Klofsten and Mikaelsson, 1996). The support that is given does often not correspond to the real needs within businesses in general, or small firms in particular. Gibb (1992) argues that there are several barriers associated with business

support, for example a scepticism from the small business manager regarding the value of support, inability to pay to take part in support, lack of time and the preference to be engaged in activities that seem to give a more direct return on investments rather than indirect activities such as business support activities. Kanda et al. (2012) in their study of public support for cleantech MSMEs highlight some challenges on the demand side, such as unawareness of such support programmes among some MSMEs, and also the difficulty in accessing such programmes stemming from amongst others the confusingly large number of initiatives and organisations.

Examples of barriers on the supply side may be that support organizations employ experts who have no experience in starting and running a business and entailed with that using a theoretical approach when the entrepreneur is more interested in practical issues. Other barriers may be that the demand side prefer learning by doing rather than being in a situation where the expert dominates in a class-room setting (ibid). Further support of sustainable entrepreneurship is a rather new area indicating a tentative lack of experience on the supply side.

Gibbs' propositions have over the years been tested in a number of studies using various constructs. For example in a study by Klofsten and Mikaelsson (1996), technology-based firms were studied with a particular interest in the owner manager's (the demand side) attitudes towards support. Similar studies have also been made regarding the supply side concerning how different types of support organizations view the demand side and their own efforts about business support (Klofsten, 1999).

The gap in itself as depicted in Figure 20 above is characterised by the "real" and perceived needs of the demand side. The gap should thus be explored for a better correlation between the supply and demand sides. This could be done through reactive approaches where solutions are sought to perceived or "real" needs of the demand side and/or through proactive approaches such as scenarios of changes in the landscape and regimes within which the demand side operates (cf. discussions from project meeting in Linköping in May 2013). In any such approach, the generic needs for boosting innovation should be differentiated from needs specific to eco-innovation to make targeted recommendations for filling the gap.

4.2.1.2 Transdisciplinarity

The integration of sustainability, systems, entrepreneurship and design theories offers potentiality, a means to enact a more radical transformation of the eco-innovation support system, which in itself can be regarded as a "wicked problem" (Rittel & Webber, 1973). However, such integration calls upon transdisciplinary imagination (Brown, Harris & Russell, 2010). Roderick Lawrence suggests that transdisciplinarity tackles complexity in science, challenges knowledge fragmentation and deals with research problems from heterogeneous domains (Lawrence, 2010). Furthermore, transdisciplinary research accepts local contexts and uncertainty, implies intercommunicative action and is action-orientated. "Designerly" ways of knowing are ideally adapted to a more transdiciplinary approach (Turnball Hocking, 2010) and being aware of different disciplinary modes enables fresh perspectives to problem solving (Dykes, Rodgers & Smyth, 2009). As SHIFT is dealing with a multi-actor, multi-stakeholder, multi-level and multi-domain systems, the research strategies in individual work packages will embrace appropriate disciplinary modes to deal with the complexity in the specific contexts.

4.2.2 Methodological Approaches

The key research question for SHIFT is:

> *In which regard and how do support systems for entrepreneurship have to be changed in order to effectively support the generation and implementation of eco-innovation?*

This question contains several distinct components, which reveal the complexity of the object of research in the project. It emphasises the *need for change*, in a *systemic manner*, in a range of actors related to *entrepreneurship* and *eco-innovation*, as well as the exploration of the *kinds of changes* that are needed for an effective transformation of the support systems. The question needs to be operationalized in order for the empirical work in the individual work packages to bear fruit. The following concepts and their description help make explicit what elements the empirical work will look at in the following work packages:

- **Support system** – embraces notions of hard, soft, formal and informal types of support from the key actors within various overlapping and independent support systems.
- **Key actors** – identified through the specifics of each work package e.g. Universities, Design Service Providers, Financial Institutions etc., but will also be identified through contextual research of the existing eco-innovation support systems in Germany, Finland and Sweden and through more extensive 'state of the art' literature and contextual reviews. Especially the newly defined work package "Other Actors" allows for the exploration of actor types that are not as visible as others in the support systems, even if they might have a considerable impact.
- **Enterprise types** – depending upon the scope of the work package, focus will be given to start-ups, young MSMEs and/or established SMEs.
- **Indicators** – both specific indicators are needed for the specific actor types in the individual work packages as well as high level key indicators that apply across all work in the project.
- **Work package specific indicators:** The key actors will be expected to define their own measures of success and cause and effect, thereby revealing their purpose, intentions and means by which they measure and indicate their impacts. This will involve identifying quantitative and qualitative indicators. These indicators will be compared with existing eco-innovation indicators and enable a differentiation between genuinely green, sustainable enterprises and weak or 'greenwash' enterprises. First, indicators are expected that measure the types of entrepreneurial activities that are supported (e.g. preference of specific technologies/innovations; focus on the greening of any entrepreneur etc.). The idea behind these indicators is to see if the support is targeted on the "right" type of entrepreneurs, products and services. Second, promising technology or services that are not used or diffused to a broader society (i.e. it remains in a small niche market) will only make a small incremental impact. Therefore it might also be necessary to use more traditional indicators such as increased sales etc.

- **High level key indicators:** These general indicators, on the other hand, apply across all work in the project. These high level key indictors still have to be developed and agreed on. Two possible key indicators have been discussed so far:

  (1) the number and percentage of support actors that explicitly include sustainability considerations in their evaluation (or decision making) processes (support system perspective)

  (2) the number and percentage of start-ups and MSMEs that are providing sustainable products and services (entrepreneurial perspective)

- **Radical change** – combining the overview and multi-perspectives of different actors offering differential support and observing their impacts on different enterprise types offers potentiality for insights leading to (more) radical change than incremental change.

Relevant issues regarding the operationalization of the constructs with relation to the WPs might have to be continuously discussed and clarified. Using common constructs adaptable for the various WPs will ideally make it possible to synchronize and compare results between WPs and countries. Similar arguments apply for building databases and surveys for data collection. Throughout the project, case studies as well as survey studies will be used. It will initially be possible to use the constructs presented in the studies by Klofsten and Mikaelsson (1996) and Klofsten (1999). These will then be developed and adapted to the various sub-studies within the project. Regarding good and/or "unusual" practices and their transferability, practices from countries with reputation for effective support systems could be investigated using e.g. desktop research and their adaptability to contextual deficits in the three countries analysed through theories and findings from surveys and case studies. SHIFT is focused on identification and transfer of best practice as well as development of new approaches (unsual, but promising, practices). When designing surveys, questionnaires, interview guidelines etc., the developed indicators can serve as support for which questions to ask.

The individual work packages will thus explore the different elements of the research question and use the methodological approaches as elaborated upon above, but will adopt their own methodologies to suit their context and key actors. However, they will have due cognisance of the need to be able to integrate micro, meso and macro level system(ic) views. It is expected that conclusions will be developed continuously and transferred to the scientific as well as practitioner and policymaker communities during the project. Suggestions and experiences from these communities will be used as important inputs during the project similarly as in the interactive research model proposed by Ellström (2007), see Figure 21 below.

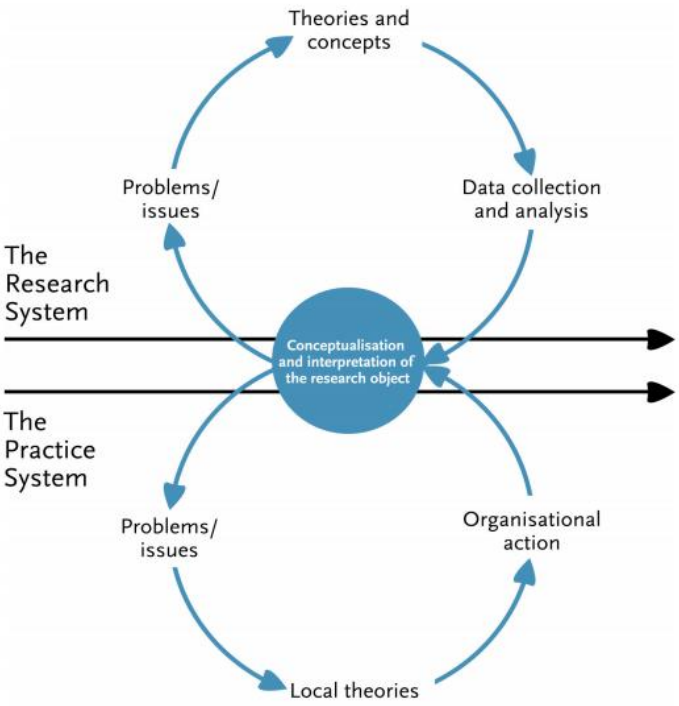

Figure 21: Interactive research model (source: Ellström 2007).

Finally, work packages will follow a standardised structural framework to support the interactive research model to include:

- State of the art
- Analyse existing deficits and potential
- Good practices
- Transfer strategies

It is anticipated that this will enable better cross-cutting analysis and synthesis of the results with improved insights into what needs changing in the support systems and why, leading to better informed policy recommendations.

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Appendix 1 - Glossary: Definition of Central Terms and Concepts

- **Business Development Organisation (BDO):** These are public or private organisations that support firms in general or in specific sectors by providing business resources complementary to the firm's internal competence, and at various stages of the value chain.
- **Business innovation**: Business innovation is the development and implementation of a radically new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations." (based on OECD and EUROSTAT 2005, 16)
- **Business Platform:** "A state of affairs whereby an enterprise has an input of business resources and is able to use these to promote firm survival and growth in reasonably normal business circumstances" (Klofsten, 1992, p. 9).
- **Change management**: Change management is an approach to shifting or transitioning persons or organisations from a current state to a desired future state. It is a process aimed at helping them to accept and adapt changes in the business environment (for organisations) or in the personal lives (of individuals).
- **Clean technology / Cleantech / Environmental technology:** The term environmental technology is used in a variety of ways with no unified and widely accepted definition among scholars. A useful definition is provided by the Swedish Ministry of Environment(2005) as '' goods, systems, processes and services that offer clear environmental advantages in relation to existing or alternative solutions, seen from an ecocycle perspective."
- **Cluster:** Clusters can be defined as geographical concentrations of firms in similar and complementary industries that can be related by for example shared infrastructure or technology (Porter 1990, 2000).
- **Cluster initiatives (CI):** ''groups of companies, research and educational institutions, government agencies […] to improve the competitiveness of a specific cluster" (Ketels & Memedovic, 2008, 384).
- **Co-design**: Co-design is a development process of products or services where design professionals facilitate, encourage and guide users and stakeholders to develop solutions together, i.e. the role between user, stakeholder and designer is blurred. In designing together, the final result is believed to become more appropriate and acceptable to the user and stakeholders. The co-design approach is can also be applied within a multi-stakeholder environment to understand contexts, problem spaces and the development of design briefs as well as the delivery of designed solutions.
- **Cradle-to-Cradle design**: Cradle to Cradle (C2C, cradle 2 cradle) design is a holistic economic, industrial and social framework that aims to create production techniques and systems that are efficient and also waste free. In cradle to cradle production all material inputs and outputs are

seen either as technical or biological nutrients. Technical nutrients can be recycled or reused with no loss of quality and biological nutrients composted or consumed. In 2002, Braungart and McDonough published a book called Cradle to Cradle: Remaking the Way We Make Things that gives specific details of how to achieve the model.

- **Design for Sustainability**: Design for Sustainability (DfS, D4S) is an improved product (or service) design approach. It implies that organisations incorporate environmental and social factors into product development throughout the life-cycle of the product, throughout the supply network, and with respect to their socio-economic surroundings. Hence, it also includes the more limited concept of Ecodesign (or Design for the Environment, DfE). It is closely linked to life-cycle based concepts such as sustainable product-service systems, and systems innovations.
- **Diffusion** "… is the way in which innovations spread, through market or non-market channels, from their very first implementation to different consumers, countries, regions, sectors, markets and firms." (OECD and EUROSTAT 2005, 17)
- **Dominant logic**: Dominant logic describes the cultural norms and beliefs that an organisation (e.g. a company) espouses. It is a common way of thinking about for example strategy across different businesses. Seen negatively, it can lock an organisation into thinking in only one way. This narrowed approach can prevent it from innovating, and it can stifle creativity. Consequently, the dominant logic may slow down the diffusion of alternative ideas and new technologies in the society.
- **Ecodesign:** Ecodesign is environmentally conscious product development which explores how reductions of negative environmental impacts can be achieved by considering design options throughout the life cycle of the product or service, from design concept to manufacturing, distribution, the use phase and end-of-life phase.
- **Eco-effectiveness:** Eco-effectiveness is where the usage of eco-efficient products and services ensures stable environmental and ecosystem conditions in the present and the future. This contrast with the phenomenon of the rebound effect where consumers tend to use eco-efficient products or services more and/or spend money saved on other products or services leading to no net gain of environmental improvement or to a reduction in environmental and ecoystem conditions.
- **Eco-efficiency**: Eco-efficiency refers to the efficient use of environmental resources (raw materials, energy) over the lifespan of the product or service, to deliver maximum performance with minimum negative impacts. Sometimes it also refers to economically viable and environmentally efficient products or services.
- **Eco-innovation:** An eco-innovation is a product or process innovation that causes a *significant* decrease in environmental impact, while remaining economically feasible (i.e. financially viable) and being in harmony with social sustainability.
- **Entrepreneurship:** "… is the identification, evaluation and exploitation of business opportunities." (Shane & Venkataraman, 2000, 218)

- **Entrepreneurship education:** Entrepreneurship education at universities provides students with specific programmes or an integration of entrepreneurship courses in other programmes that provide the student with tools to start their own company. Activities may include courses, business plan competitions, technology licensing office, mentoring services, office space and the provision of research grants to support the commercialization of ideas.
- **Exnovation**: The termination of technologies, products or practices, which have been in use so far. Technological, organizational or market-related routines are stopped. (Fichter 2013)
- **Green Economy:** Green economy is a model of economic development that is based on the principles of sustainable development and ecological economics. The valuation of natural capital and ecological services as having value distinguish it from earlier (conventional) economic regimes. Green economy has been briefly defined as resulting in improved human well-being and social equity, while significantly reducing environmental risks and negative impact.
- **Green Growth**: Green Growth is a term that has been used as an alternative concept to standard economic growth. In addition to fostering growth and development, green growth describes a path of using natural resources in a sustainable manner, helping societies to become more resilient. By reducing the intensity of resource consumption and environmental impacts, green growth is said to offer competitive advantage to the countries that commit policy changes in favour of more sustainable products and lifestyles.
- **Incubator:** An incubator refers to an organisation which provides entrprenueral support to new ventures and SMEs in particular locations and can focus on particular industries or provide generic support for all types of businesses.
- **Innovation**: Innovation is the development and implementation of a radically new or significantly improved product (good or service), process or practice which leads to major discontinuities in thinking and acting or in the use of technologies, objects and their performance.
- **Innovation community (IC)**: "An innovation community is an informal network of likeminded individuals, acting as universal or specialised promoters, often from more than one company and different organisations that team up in a project related fashion, and commonly promote a specific innovation, either on one or across different levels of an innovation system." (Fichter 2012, 13)
- **Innovation system:** "Market and non-market institutions in a country [or other con-text] that influence the direction and speed of innovation and tech. diffusion" (OECD 1999, 23). An innovation system comprises the actor system and institutional setting (rules) that influence a specific field of innovation.
- **Key actors** "… are those individuals, organizations or networks that are seen to have a significantly greater influence on the development and implementation of a new solution within a focal innovation or diffusion process." (Fichter 2013).
- **Life-cycle assessment (LCA):** Life cycle assessment is a tool to assess the potential environmental impacts and resources used throughout a product's life cycle i.e. from raw material acquisition,

via production and use phases to waste management. The term ‘product’ refers to both goods and services.

- **Multi-level perspective (MLP):** The multi-level perspective presents a structuration spanning the niche, regime and landscape levels and provides an analytical framework for understanding the dynamics of innovations and the context within which they occur.
- **New Business Networks:** Business networking is an activity in which groups of businesspeople recognize, create, or act upon business opportunities. It can be conducted in a local business community or on a larger scale in the Internet where networking websites have grown over recent years. A business network may agree to meet regularly and to complement this, the individual members often meet outside this circle, on their own time, and build their own one-to-one relationship.
- **Open innovation:** The “Open Innovation paradigm” developed in the last ten years treats R&D as an open system (Chesbrough 2006, 1), and stresses the relevance of coupled processes, linking outside-in and inside-out flows of ideas by working within alliances of complementary companies (Gassmann and Enkel 2006).
- **Paradigm change / paradigm shift:** A paradigm shift was first defined as a dramatic change in the paradigm of a scientific community (Kuhn, 1962). In addition to that, it can be defined as a fundamental change in an individual’s thinking or a significant change in a group’s or the society’s views and beliefs of how things work in the world. The concept has also been abused in the marketing speak of business.
- **Path dependency:** Path dependencies occur because it is often easier or more cost-effective to simply continue along an already set path than to create an entirely new one, even if newer, more efficient products or practices are available. Path dependence is the dependence of economic outcomes on the path of previous outcomes, rather than simply on current conditions. In a path dependent process, "history matters". For example, the path dependence of dominant energy systems is often referred to as a barrier to the diffusion of sustainable electricity (e.g. Lafferty & Ruud 2008).
- **Product-service systems:** A product-service system (PSS) is a pre-designed integrated combination of products, services and necessary infrastructure, e.g. a business model where a firm offers a mix of both products and services. A PSS can be thought of as a market proposition that extends the traditional functionality of a product by incorporating additional services and networks in the offering. The emphasis is on the sale of use or result rather than the sale of product. It is aimed at providing improved conditions for sustainability of both consumption and production.
- **Rebound effects:** Rebound effect also known as take-back effect refers to behavioural or other systemic responses that are likely to offset resource savings from increased efficiency of resource use.
- **Socio-technical system:** The term socio-technical system (STS) refers to the interaction between society's complex infrastructures and human behaviour. The idea of STS is an intellectual tool to

help recognize patterns in the way technology is used and produced. Any single technology can be used in multiple, and sometimes unexpected, ways and in each different use, the technology is embedded in a complex set of other technologies, physical surroundings, people, procedures, etc. that together make up the socio-technical system.

- **Support systems**: Comprise all actors, institutional settings and resources that help entrepreneurs in successfully generating and implementing innovation.
- **Sustainable consumption and production (SCP):** Sustainable consumption and production can be defined as the process of behaviour change and technological innovation required from government, business and consumers (households) to decouple economic development from environmental degradation. The aim is to operate within the limits of the planet's ecosystems.
- **Sustainable entrepreneurship:** "A [...] market-oriented and personality driven form of creating economic and societal value by means of [...] environmentally or socially beneficial [...] innovations" (Schaltegger & Wagner 2011: 226).
- **Transdisciplinarity:** Transdisciplinarity is highly inclusive and participatory approach that tackles complexity and knowledge fragmentation. It does so by integrating knowledge and research from diverse disciplinary fields to become a context specific negotiation of knowledge involving intercommunicative action and is, often, action orientated (Lawrence, 2010). The expected outcome of the approach is a holistic view with new knowledge which transcends the individual disciplines.
- **Transformation:** Generally, a transformation is a dramatic, radical change. Transformation may take place in different modes, one example of which is innovation, the implementation of a radically new or significantly improved product, process or practice that lead to major discontinuities in thinking and acting or in the use of technologies.
- **Transition management:** Transition Management is a systematic multi-actor approach to planning, implementing and monitoring change in an organisation or in the society. The model is often discussed in reference to Sustainable Development and the possible use of the model as a method for change. Transition management offers an alternative model of (environmental) governance that aims to guide the continuous process of transformation of beliefs, values, practices and structures of the society.
- **Triple Helix approach:** The triple helix approach depicts the interctions between industry, university and government with particular focus on the dynamic interdependence between these three actors in entrepreneurship activities.
- **User-centred design:** User-centred design (UCD) is a design approach, in which the needs and wants of the end-user are given extensive attention at each stage of the design process in order to optimise the functions, appeal and practicalities of the product or service for the end-users.

Appendix 2 - OECD/Eurostat classification: Environmental Goods & Services Sector (EGSS)

CEPA	Classification of Environmental Protection Activities
1	Protection of ambient air and climate
2	Wastewater management
3	Waste management
4	Protection and remediation of soil, groundwater and surface water
5	Noise and vibration abatement
6	Protection of biodiversity and landscape
7	Protection against radiation
8	Research and development
9	Other environmental protection activities

CReMA	Classification of Resource Management Activities
10	Management of waters
11	Management of forest resources
A	Management of forest areas
B	Minimisation of the intake of forest resources
12	Management of wild flora and fauna
13	Management of energy resources
A	Production of energy from renewable sources
B	Heat/energy saving and management
C	Minimisation of the intake of fossil resources as raw material for uses other than energy production
14	Management of minerals
15	Research and development
16	Other natural resource management activities

Source: Eurostat (2009, 44f) as portrayed in Weiß & Fichter (2013, 24).