



SHiFT

*Support Systems for Sustainable
Entrepreneurship and Transformation*

Good practice collection University support for sustainable entrepreneurship

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Introduction

SHIFT ("Support Systems for Sustainable Entrepreneurship and Transformation") is a unique research project and is funded through the EU programme ECO-INNOVERA: www.eco-innova.eu. SHIFT's main goal is to enable universities, incubators, business development organizations, financial institutions and other relevant actors to support eco-innovation and sustainable entrepreneurship more effectively. On the basis of thorough empirical analysis of the status quo and the identification of good practices world-wide, concrete and realistic recommendations have been developed for policy makers and actors of the support systems: www.shift-project.eu

Universities are key players in the support system for entrepreneurship and innovation. They are important with regard to entrepreneurship education, venturing schemes and venture funds as well as with regard to technology transfer and university spin-offs. Universities also have been charged with key roles in promoting and implementing sustainable development and can play a pivotal role in promoting sustainable entrepreneurship and eco-innovation.

In our research on good practice of university support of sustainable entrepreneurship we investigated five countries (Finland, Germany, Sweden, UK and USA). We could identify 42 good practice examples in these countries and have analysed and documented these examples in detail (cf. Geier and Fichter 2015). This booklet introduces the conceptual background for investigating university support for entrepreneurship, summarizes key results of our empirical research and presents good practice examples of university support for sustainable entrepreneurship and eco-innovation.

Conceptual framework

While the state of the art in university entrepreneurship research offers a variety of classifications of relevant aspects and topics, none of these seem to fit exactly the purpose of a basic framework for investigating the role of universities in supporting sustainable entrepreneurship. Based on Xavier et al. (2012) and Rothaermel et al. (2007) we have developed a basic framework of university entrepreneurship, that subdivides the university as the unit of analysis into five key elements (cf. Figure 1 on the next page). In addition to research and education, which has developed historically, universities have embraced a third central function over the last few decades: to make solution- and action-orientated contributions to relevant societal challenges and problem areas. This "third role" comprises knowledge transfer, patent commercialization, joint research and implementation projects and cluster initiatives with companies and other societal actors as well as academic spin-offs and can be labelled as "cooperation". This three key functions of a university are influenced and governed by its institutional framing (strategy, structure, culture) and is supported by various cross-cutting practical university structures and activities like research funding offices, innovation and entrepreneurship centers, start-up coaching, transfer offices etc., which we label as "support". These five elements are mutually dependent on the environmental context (the national university policy, regional development strategy, innovation systems etc.) and are expected to generate benefits and positive effects for society, which can be assessed by various output indicators (like e.g. the number of academic spin-offs) and outcome indicators (like the number of jobs created in the region, reduction of greenhouse gas emissions etc.).

In regard to entrepreneurial support and the development of innovations there are numerous relations and forms of interaction between internal actors of a university and external actors. Building on the interactive school of innovation theory (Fichter et al., 2013, p. 27 ff.) we use an open innovation approach to describe and analyse interaction between the university and external key actors. We put, for the first time, universities in the center of an open innovation model and differentiate outside-in approaches, cooperation approaches and inside-out approaches in the interaction between universities and external entrepreneurs, start-ups and SMEs.

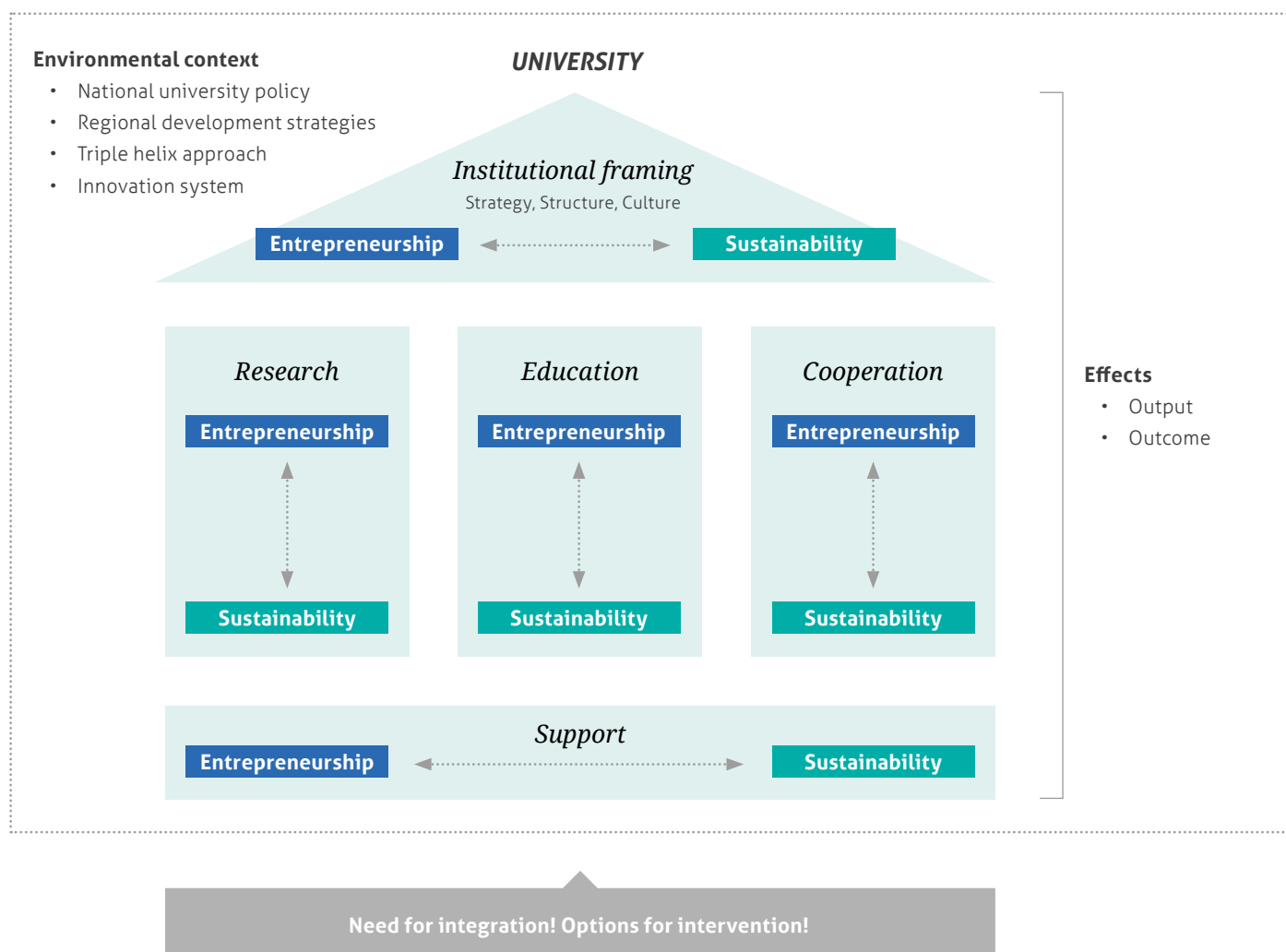
Key results of our empirical research

Our research results reveal that up till now the concept of the entrepreneurial university and the concept of the sustainable university are largely disconnected. This is true for university policy as well as for the practical implementation in higher education institutions. In our research we focused on three European countries (Finland, Germany, Sweden). Only a very limited number of universities in Finland, Germany and Sweden have yet implemented support activities that explicitly connect entrepreneurship and innovation support with sustainability issues and aims. Given the fact that these three countries are leading in regard to high performing innovation systems and especially in regard to supporting eco-innovation it can be

concluded that – on a European and international scale – university support systems for promoting sustainable entrepreneurship and eco-innovation are still in its infancy and can be considered to be a “niche phenomenon”.

Against this background it becomes clear that up till now there is no integrated support culture at universities that would systematically connect and integrate entrepreneurship and sustainability support. Supporting sustainable entrepreneurship and eco-innovation is not yet part of the existing support paradigm of universities. Thus, there is clear need for integration. Figure 1 displays options for intervention for developing university support systems for sustainable entrepreneurship.

Figure 1: Need for integration and options for interventions for developing university support systems for sustainable entrepreneurship



Overview of 42 good practice examples of support for sustainable entrepreneurship

Detailed profiles of support activities for sustainable entrepreneurship and eco-innovation of the following universities can be obtained from Geier and Fichter (2015) (cf. References).

Finland

Aalto University (<http://www.aalto.fi/en/>)
Lappeenranta University of Technology (LUT) (<http://www.lut.fi/web/en>)
Turku University of Applied Sciences (<http://www.tuas.fi/en/>)
University of Jyväskylä (<https://www.jyu.fi/en/>)

Germany

Bergische University Wuppertal (<http://www.uni-wuppertal.de/en/home.html>)
Flensburg University of Applied Sciences (<http://www.fh-flensburg.de/fhfl/homepage.html>)
Hamburg University of Technology (TUHH) (<http://www.tuhh.de/alt/tuhh/startpage.html>)
Karlsruhe Institute of Technology (KIT) (<http://www.kit.edu/english/>)
Leuphana University of Lüneburg (<http://www.leuphana.de/en/home.html>)
Technical University of Berlin (TU Berlin) (<http://www.tu-berlin.de/menue/home/parameter/en/>)
Technische Universität München ("Technical University Munich") (TU Munich) (<http://www.tum.de/en/>)
University of Applied Sciences Munich (<http://www.hm.edu/en/index.en.html>)
University of Hamburg (<https://www.uni-hamburg.de/en.html>)
University of Kiel (<http://www.uni-kiel.de/index-e.shtml>)
University of Oldenburg (<http://www.uni-oldenburg.de/en/>)
University of Stuttgart (<http://www.uni-stuttgart.de/home/index.en.html>)

Sweden

Blekinge Institute of Technology (BTH) (<http://www.bth.se/eng>)
Chalmers University of Technology (<http://www.entrepreneur.chalmers.se>)
KTH Royal Institute of Technology (<https://www.kth.se/en>)
Linköping University (LiU) (<http://www.liu.se/?l=en>)
Luleå University of Technology (LTU) (<http://www.ltu.se/?l=en>)
Swedish University of Agricultural Sciences (SLU) (<http://www.slu.se/en/>)
Umeå School of Business and Economics (<http://www.usbe.umu.se/english/>)
University of Gothenburg (<http://www.gu.se/english>)
Uppsala University (<http://www.uu.se/en>)

United Kingdom

Brunel University, London, England (<http://www.brunel.ac.uk>)
Imperial College London, England (<http://www.imperial.ac.uk>)
University of Exeter Business School, England (<http://business-school.exeter.ac.uk/opmba/about/>)
University of Manchester, England (<http://www.manchester.ac.uk>)
University of Nottingham, England (<http://www.nottingham.ac.uk>)
University of Reading, England (<http://www.reading.ac.uk>)
University of Strathclyde, Glasgow, Scotland (<http://www.strath.ac.uk>)

USA

Babson College F.W. Olin Graduate School of Business, Wellesley, MA (<http://www.babson.edu>)
California Institute of Technology (Caltech), Pasadena, CA (<http://www.caltech.edu>)
Massachusetts Institute of Technology (MIT), Sloan School of Management, Cambridge, Massachusetts (<http://mitsloan.mit.edu>)
Pinchot University, (formerly BGI – Bainbridge Graduate Institute), Seattle, Washington (<http://bgi.pinchot.edu>)
Presidio Graduate School, San Francisco, California (<http://www.presidio.edu>)
Santa Clara University, Santa Clara, California (<http://www.scu.edu>)
Stanford University, Stanford, California (<http://www.stanford.edu>)
UC Berkeley, Berkeley, California (<http://www.berkeley.edu>)
UC Santa Barbara, Santa Barbara, California (<http://www.ucsb.edu>)

Examples of university support activities for sustainable entrepreneurship

Detailed profiles of support activities for sustainable entrepreneurship and eco-innovation of 42 universities can be obtained from Geier and Fichter (2015) (cf. References).

Phase	Institutional integration	Curricula/ teaching	Research	Support of concrete start-up undertakings	External co-operation
Finland					
Lappeenranta University of Technology (LUT) 	Key Performance Indicators (KPIs), a scorecard or other guiding principles refer to sustainability or entrepreneurship, e.g. certified ISO 14001 environmental management system; strategy 2020 is based on sustainability; entrepreneurship is strongly related; WWF Green Office label; Professorship "Environmental Economics and Management", Department of Environmental Technology	Master's programme in "Strategy, Innovation and Sustainability"; Doctoral Programme in "Environmental Technology"; Master's programme in "Energy Technology"; Courses in „Cleaner Technologies and Markets" and „Life-Cycle Costing of Investment Projects" (at LUT School of Business and Management)	Institute of Energy Technology ("LUT Energy"); Environmental Technology research areas include Lifecycle Modelling, Waste Management, Sustainable Community, Transition Management and Environment and Business	Green Campus Innovations Ltd.	Part of the International Sustainable Campus Network (ISCN) and Nordic Sustainable Campus Network (NSCN)
Germany					
Hamburg University of Technology (TUHH) 	Competency area "Green Technologies"; TUHH Sustainability Council; TUHH Startup Dock	Course modules: „Environmental Management and Corporate Responsibility"; "Business Model Generation & Green Technologies"; "Corporate Entrepreneurship & Green Innovation"	Research project "Academic Entrepreneurship in Synthetic Biology"	InnovationsCampus Green Technologies; Startup Consultant Green Technologies; Startup Prize Sustainability	StartersHub: Platform for Sustainable Entrepreneurship – collaboration between Hamburg-based universities and Babele.co (from April 2015)
Leuphana University of Lüneburg 	Sustainability is one of the basic principles that guides the activities of the university; sustainable guidelines noted in university's mission statement; Centre for Sustainability Management (CSM); Chair for Sustainability Management; Junior Professorship in "Social Entrepreneurship"	MBA in "Sustainability Management" General studies are mandatory for all first semester Bachelor students, module "Science bears Responsibility" accounts for 1/3 of a semester and covers sustainability issues and illustrates ethical behaviour; master studies: "Sustainability Sciences"; PhD: "Sustainability Sciences"	Research project: „Sustainability-oriented business model assessment" EU Tempus project ConSus – Connecting Science-Society Collaborations for Sustainability Innovations I4S (Innovation for Sustainability) EU project	Professional School's Start-up Service; Innovation Incubator of Lüneburg; Innovation Network "Sustainable SMEs"	As part of the I4S (Innovation for Sustainability) research project, under the leadership of The Academy of Business in Society (EABIS), Leuphana together with seven leading universities.
University of Oldenburg 	"Sustainable Entrepreneurship" is a core topic of the university; Adjunct Professorship in "Innovation Management & Sustainability"; Oldenburg Centre for Sustainability Economics and Management (CENTOS)	Master cluster with 9 master programmes in sustainability, energy and environmental sciences; Master's programme "Sustainability economics and management (SEM)"; "Eco-Venturing" module: part of the University of Oldenburg's Master's course in "SEM"	CENTOS: research in areas such as innovation management, the generation of sustainability innovations, the creation of 'green' future markets, and eco-entrepreneurship	Sustainability-specific start-up support (coaching, mentoring etc.) in the fields of climate change, cleantech and energy; ideas competition for SMEs in the field of climate protection and adaptation	Collaboration with local enterprises, especially in the area of sustainable entrepreneurship; regional SME network initiative for climate protection and adaptation; partner in "StartUp4Climate", the first national initiative for a Green Economy

Phase	Institutional integration	Curricula/ teaching	Research	Support of concrete start-up undertakings	External co-operation
Sweden					
Chalmers University of Technology	University vision „Chalmers for a sustainable future“; Chalmers Challenge Lab	All students take 7.5 credit hours' worth of classes in environment and sustainable development; M.Sc. in "Design for Sustainable Development"; M.Sc. in "Sustainable Energy Systems"; M.Sc. in "Innovative and Sustainable Energy Engineering"; M.Sc. in "Innovative and Sustainable Energy Engineering" (part of NST partnership)	Chalmers Initiative for Innovation and Sustainability Transitions (CIIST)	Chalmers Innovation offers to inventors and start-ups money and experience; Encubator AB (generic offering) in collaboration with the Chalmers School of Entrepreneurship	Core partner on Climate-KIC's master programme (first one in Sweden); as part of the Climate-KIC's Building Technologies Accelerator, Chalmers' 'living lab' brings together multidisciplinary teams across Europe to address the climate impact; Nordic Five Tech (NST) partnership
United Kingdom					
University of Manchester, England	Strategic plan for 2020 (puts an emphasis on social responsibility and environmental sustainability); Manchester Institute of Innovation Research; Sustainable Consumption Institute (SCI); two separate professorships on "Innovation and Sustainability" and "System Innovation and Sustainability"	B.Sc. in "Management (Innovation, Sustainability and Entrepreneurship)"; M.Sc. "Innovation Management and Entrepreneurship (IME)"; undergraduate courses on "Sustainable Development for Electrical and Electronic Engineering", "Cases in Sustainable Development", "Interdisciplinary Sustainable Development"	"Innovation and sustainability" (Manchester Institute of Innovation Research); "Sustainable consumption" (at the Sustainable Consumption Institute)	Manchester Enterprise Centre; "Venture Further" business start-up competition at the Manchester Enterprise Centre; The University of Manchester Innovation Centre (UMIC) (generic offering)	Part of the I4S (Innovation for Sustainability) project, under the leadership of The Academy of Business in Society (EABIS)
USA					
Presidio Graduate School, San Francisco, California	Presidio Graduate School focuses solely on sustainable management education; it embeds sustainability in every course	Master's degrees in the following formats: MBA, MPA, and Dual MBA/MPA programme in "Sustainable Management"; JD/MBA with University of California Hastings College of the Law; curriculum integrates real-world sustainability projects with clients as part of an Experiential Learning programme.	Research & Case Development Program supports applied research and case study development.		Field study partnerships in sustainable energy sector; student teams partner with external organizations based on the specific needs of their partner; projects at overseas partner locations; corporation-sponsored innovation projects
Santa Clara University, Santa Clara, California	Miller Center for Social Entrepreneurship: social entrepreneurship accelerator and mentorship; impact investing	Global Social Benefit Fellows programme: Frugal Innovation Lab at School of Engineering	The Willem P. Roelands and Maria Constantino-Roelands Grant Program	GSBI Accelerator (for social entrepreneurs preparing to scale) and GSBI Online (for social entrepreneurs validating their model) programmes	The Miller Center for Social Entrepreneurship draws on social entrepreneurs with a focus on disadvantaged communities and mentors that are part of the Silicon Valley ecosystem
UC Santa Barbara, Santa Barbara, California	"Eco-Entrepreneurship" is a core topic at the Bren School of Environmental Science and Management; Professorship in "Corporate Environmental Management"; specialization in Corporate Environmental Management (CEM)	Master of "Environmental Science and Management" (MESM); modules in "Eco-Entrepreneurship" and "Corporate Environmental Management"; the Bren School and the Technology Management Program at the College of Engineering allow for elective courses to be taken across programmes.	The Bren School Strategic Environmental Research Initiative (SERI)	UCSB Office of Technology & Industry Alliances (TIA) Startup Support Program; UCSB New Venture Competition (generic offering)	Faculty Impact: Collaborative faculty policy work - consulting and advisory roles; Capstone Project/ Module in "Corporate Environmental Management" or "Eco-Entrepreneurship"; Eco-Entrepreneurship Advisory Council

Bren School of Environmental Science & Management, UCSB California, USA



Bren School of Environmental Science & Management – University of California, Santa Barbara

Characterization: Environmental science and management school that focuses on business and entrepreneurship



Good practice highlights

Master of “Environmental Science and Management (MESM)”: MESM is a 2-year professional degree programme designed for individuals who plan to enter or re-enter the workforce upon graduation. The programme focuses on application and problem-solving and has three parts: the first-year core curriculum, the second-year work in one of seven Specializations, and the Group Project or Eco-Entrepreneurship Project.

Module in “Corporate Environmental Management (CEM)”: CEM provides for a specialization as part of the MESM and conveys how private-sector firms may address environmental and natural resource issues in a manner that also promotes shareholder value, thus creating a link between the quality of environmental and natural resources and a firm’s overall market objectives.

Module in “Eco-Entrepreneurship (Eco-E)”: Eco-E is part of the MESM and enhances other electives (specializations) by providing a special focus on eco-entrepreneurship. The module is a joint initiative between the Bren School and the Technology Management Program of the College of Engineering. Eco-E students pursue additional coursework and activities that provide them with skills and support to launch new ventures, products, and technologies that address society’s environmental and resource problems.

UCSB Office of Technology & Industry Alliances (TIA) Startup Support Program: The Startup Support Program is a programme established to help UCSB startup companies. The programme provides one-on-one customized support covering a broad range of topics, services, and resources. Anyone in the UCSB community who is consider-

ring starting up a company or who has already launched a new venture-based on UCSB research is eligible for this programme;

Eco-Entrepreneurship Advisory Council (EEAC): EEAC guides, supports, and promotes eco-entrepreneurship education at the Bren School, and serves as the primary conduit between the school and the entrepreneurial and investor communities.



Key data

Location: Santa Barbara, California, USA

Founded: 1991 (Bren School), UCSB was founded in 1891

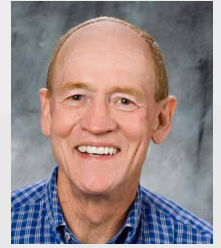
Number of students (2015): 220 (Bren School), UCSB as a whole has 23,000 students

Profile: The Bren School is among a few schools in the United States – and the only one on the West Coast – that integrate science, management, law, economics, and policy as part of an interdisciplinary approach to environmental problem-solving. The Bren School collaborates closely with other schools and groups at UCSB. Its interdisciplinary teaching and research programmes underline its mission of the connection between human and natural systems.

Bren School of Environmental Science & Management, UCSB: www.bren.ucsb.edu

Interview with Gary Libecap, Ph.D.

*Professor, Corporate Environmental Management
Bren School of Environmental Science & Management
University of California, Santa Barbara*



Why did your university/business school start to support sustainable entrepreneurship and/or eco-innovation endeavours?

It started when I came here in 2006 because we had a traditional entrepreneurship programme at Arizona, where I was working prior to the Bren School. It didn't specifically focus on the environment although there were some students who were interested, but it was the most successful undergraduate and MBA program in Arizona. I directed the centre that ran it. When I came to the Bren School, it seemed to me that there was a perfect opportunity to apply it to environmental issues. I think a major reason is that our professional master's programme in "Environmental Science and Management" is like an MBA programme, in the sense that, it's a terminal degree and students want tools to be effective environmental managers. If you have this sort of an independent risk-taking group which student includes, then Eco-Entrepreneurship seems like a perfect opportunity for them.

Who initiated your programmes, what were the milestones of their evolution?

I initiated the Eco-Entrepreneurship programme in close collaboration with the Technology Management Programme of the UCSB College of Engineering. On that basis the Bren School launched the nation's first programme of study in eco-entrepreneurship (Eco-E) in 2007. We did a „Let's do it" mini version to see if we can develop this kind of a programme. And then, there was this explosive student interest, which caught a lot of the faculty off-guard. It was advertising this and really going after students who were looking for this kind of a programme. So it became clear that this couldn't be something just a little side project of one

of the faculty and that we really have to develop a comprehensive programme. And so, we did a search and identified Emily Cotter and hired her as Eco-Entrepreneurship Lecturer, Project Coordinator and Programme Manager. She has started several businesses herself. Emily was a huge part of the success. She's an amazing teacher. Literally, the first year we started this programme, I think we had 30 students out of our 80 that decided they wanted to do this even though it was not a reason they came to Bren at all. It's just a matter of being exposed to her in the initial orientation and two weeks kind of boot camp things about opportunities and a lot of them gave it a try. And now, we've flushed out the programme in a very big way. Another important milestone was the establishment of our Eco-Entrepreneurship Advisory Council. The Advisory Council guides, supports, and promotes eco-entrepreneurship education at the Bren School, and serves as the primary conduit between the school and the entrepreneurial and investor communities. It has been very helpful in terms of creating incubator funds and fellowships.

What can other universities learn from it?

The universities always have to justify themselves. They compete for government funds or they compete with private funds. They compete for the best faculty. They compete for the best students. If eco-entrepreneurship is an area that has social benefits, if this is an area that students are interested in, if this is an area the faculty are interested in, then a successful university has to be there.

What are your next steps/future plans?

We are working on developing more fellowships, trying to find a way to incubate the student teams, or really talk with some alumni and community members that will be putting together an Angel fund. We don't know the mechanics of it yet because different Angel and Master's funds operate differently. I don't know if it'll be one where we have the students present and each member decide if they want to invest or if they will collectively create a pool of funds and then have a Board that determines the investment amount and award our investment.

What has been the impact of your sustainable entrepreneurship support?

I think success is shown by student interest and the fact that we now have a full-time Eco-Entrepreneurship Lecturer and Programme Manager, Emily Cotter. Every year since 2012 we had one student team launch a new eco-venture. Last year we had two. This year, we'll have two as well. It's happening and there is momentum. Students are coming in and realizing this is a path that they can do after graduation. There's definitely been an impact as far as media coverage for our programme because our students have been consistently going to national competitions and winning awards and getting placing in the top semi-finals to finals. Our Eco-Entrepreneurship Team, Charborn, just recently won \$75,000 in a National Business Competition. Charborn seeks to unlock the potential of biochar as a soil amendment for the agricultural industries. A high-carbon soil amendment similar to shredded bits of charcoal, biochar allows farmers to boost yields while using less water and fertilizer. So, that happened and every year, we keep seeing more and more.

Chalmers University of Technology – Gothenburg, Sweden

Characterization: *Technical university with a strong focus on entrepreneurship and sustainability*



Good practice highlights

Chalmers Challenge Lab: an initiative where Master's students across engineering disciplines take on big societal challenges with industry clusters, government and academia as part of their master's thesis work. The aim of the Challenge Lab is to provide students with perspectives, methods and tools that are useful in taking on and leading challenge-driven sustainability transitions. As a preparation for the Challenge Lab students are offered an opportunity to partake in the course "Leadership for Sustainability Transitions".

Chalmers has an integrated sustainability approach: **all students take 7.5 credit hours' worth of classes in environment and sustainable development.**

M.Sc. in "Innovative and Sustainable Energy Engineering": Purpose of the Nordic Master Program is to provide state-of-the-art education in the fields of conventional and renewable energy sources. As part of the joint Nordic Master's programme Chalmers offers two of the tracks: "Geothermal Energy" and "Heat & Power Engineering". The term "sustainable energy engineering" comprises a wide array of practices, policies and technologies (conventional and renewable/alternative) aimed at

providing energy at the least financial, environmental and social cost. A strong emphasis is placed on dealing with energy engineering tasks with due consideration of technical, environmental and socio-economic issues. Another strong emphasis is put on the innovative and entrepreneurial aspects of the energy society, especially related to how existing and new efficiency improvement innovations can be brought to the market in different countries.

Research is linked to the newly (2015) started **Chalmers Initiative for Innovation and Sustainability Transitions (CIIST).**

Chalmers Innovation offers money and experience to inventors and start-ups. There are seven experienced business coaches all with focus on fast growing technology-based start-up companies.

Chalmers University of Technology is **Climate-KIC's first network partner in Sweden.**



Key data

Location: Gothenburg, Sweden

Founded: 1829

Number of students (2012): 10,000

Profile: The University's vision "Chalmers for a sustainable future" permeates all activities, from undergraduate education and doctoral programmes, research, innovation and collaboration, to campus development and internal environment. For thirty years, all students have taken a class in "Environment and Sustainable Development" and had the opportunity to complete their studies with a sustainability profile. The vision is linked to sustainable development as a driving force intended to have an effect Chalmers-wide in terms of education, research, and environmental management systems.

Chalmers University of Technology:
<http://www.chalmers.se/en/>

Interview with Mats Lundqvist, Ph.D.

Professor in Entrepreneurship

*Director of the Chalmers School of Entrepreneurship
Chalmers University of Technology*



Why did your university/business school start to support sustainable entrepreneurship and/or eco-innovation endeavours?

Obviously, climate issues are urgent, and need to be dealt with. We strongly believe that people with an entrepreneurial capacity are necessary to realize a sustainable future. To bring about changes we need individuals and teams willing to search for new opportunities, try new ways and find creative solutions to difficult challenges. To us entrepreneurship is a means to combine different competencies, including sustainability- and climate-related skills. In order to implement practical solutions, a problem cannot be tackled from only one angle. So, in our world our entrepreneurial environment is a natural habitat for climate innovation.

Who initiated your programmes, what were the milestones of their evolution?

The Chalmers School of Entrepreneurship was initiated in 1997 by me and Professor Sören Sjölander here at Chalmers. I'd like to point out two milestones that have been important in our development: the creation of our own incubation company in 2001 which enabled us to actually transform our ventures into viable companies; and the change of the programme into a 2-year international Master's programme fully taught in English. This allowed us to admit students with more perspectives than just the Swedish one. Sustainability is a global concern and thus must be dealt with from an international perspective.

What can other universities learn from it?

First of all, trust the students! Many questioned us, when we got started, if it was sane to have the students in the "driver's seat" so to say. But from our experience this has worked very well. Combining education with actual value creation is a great way for students to learn and at the same time see the effects of their actions become a reality.

What are your next steps/future plans?

At Chalmers we are now increasing our efforts in the area of venture creation. The University and the foundation we are owned by have made a 10-year commitment to invest in early stage start-ups stemming from Chalmers. This will hopefully lead to a better access to funding for new green innovations. In terms of our education, we are initiating collaborations with other master's programmes within Chalmers, focusing on sustainability, energy and ecology to see where we can cross-fertilize efforts across disciplines.

What has been the impact of your sustainable entrepreneurship support?

We are continuing to increase venture creations in green/clean technology as part of our portfolio. Out of more than 50 ventures, 11 have a green- or cleantech focus. Our portfolio venture Wave Tube was the final winner of the Climate Launch Pad in 2014, Europe's largest cleantech business idea competition.

Hamburg University of Technology (TUHH) – Germany

Characterization: *Technical entrepreneurial university with a focus on green technologies*



Good practice highlights

TUHH bundles their research activities in the three competency areas (Green Technologies, Life Science Technologies and Aviation & Maritime Systems). **The competency area of "Green Technologies"** encompasses three fields of research, namely Renewable Energies, Systems-Storage-Networks and Water and Environmental Engineering.

TUHH Startup Dock: collaboration between the Institute of Entrepreneurship and the Centre for Innovation & Entrepreneurship. It supports TUHH students and alumni interested in setting up their own enterprise. Entrepreneurs with a focus on "*Green Technologies*" are advised by a start-up consultant "*Green Technologies*".

TUHH and Northern Institute of Technology Management (NIT) offer a unique double-degree programme (M.Sc. from TUHH and **Master or MBA in Technology Management from NIT**). The programme is inspired by a vision for globally responsible leadership rooted in a wide qualification, comprising intercultural skills, ethics and languages.

Startup Prize "Sustainability": national award for exceptional founders with a scientific background. It is awarded for exemplary achievements in the development of innovative and technology-orientated business ideas whose implementation results in a more efficient use of resources or reduction of carbon emissions.



Key data

Location: Hamburg-Harburg, Hamburg, Germany

Founded: 1978

Number of students: 7,000

Profile: TUHH is a competitive entrepreneurial university focussed on high-level performance and high quality standards. TUHH is dedicated to the principles of Humboldt (unity of research and education). TUHH has a strong international orientation and also focusses on its local environment. It does so by contributing to the development of the technological and scientific competence of society. Aiming at excellence at the national and international level in its strategic research fields. Educating young engineers and academics within demanding programmes using advanced teaching methods. The TUHH has been honoured by the German Federal Ministry of Economics and Energy (BMWi) as one of the best entrepreneurial universities in Germany (one of the 22 winner for the EXIST program line „*Culture of Entrepreneurship*“ in 2013).

Hamburg University of Technology:
<http://www.tuhh.de/alt/tuhh/startpage.html>

Interview with Dr. Ralf Grote

Head of the President's Office
Hamburg University of Technology (TUHH)



Why did your university/business school start to support sustainable entrepreneurship and/or eco-innovation endeavours?

Research topics such as "Cleaner production", "Substitution of chemical constituents by biological systems", "Renewable resources" and "Recycling of waste and residues", etc. have a long tradition at TUHH. The current president of TUHH, Professor Garabed Antranikian, has his background in this particular area of research. His focus as a researcher is on interdisciplinary collaboration with engineers to establish processes for the eco-friendly production of fine chemicals, pharmaceutical agents and fuels refined from biomass. In 2004 he received the German Environmental Prize from the President of the Federal Republic of Germany donated by the German Federal Environmental Foundation ("DBU – Deutsche Bundesstiftung Umwelt"). Consequently, "Green Technologies" have long been part of our DNA.

Who initiated your programmes, what were the milestones of their evolution?

With his commencement as the university's president in April 2011, Professor Garabed Antranikian, based on the needs of our society, defined a clear vision and concrete guidelines for the duration of his 6-year presidency. These include the focus of research activities on global socio-technical challenges, positioning the TUHH as an entrepreneurial university and the gradual expansion of the TUHH to a sustainable university. This

focus triggered a process of integrating research activities in three competency areas: "Green Technologies", "Life Science Technologies and Aviation & Maritime Systems". At the same time the issues of sustainability and entrepreneurship were kept in mind as strategic goals. The long tradition of knowledge transfer with the help of TuTech GmbH should be supplemented by the support of knowledge-based start-ups in the defined competency areas. The university's distinction as an entrepreneurial university and its qualification for the EXIST Programme "Entrepreneurial Culture" in 2013 supported the development of necessary structures. For this purpose, the Startup Dock was established in 2013 and organized in accordance with the three competency areas (including a specialized advisor for „Green Technologies“). The start-up award "Sustainability" can be highlighted as one of the first sustainability-specific start-up support activities. In 2014 a professorship in entrepreneurship was created and filled by Professor Christoph Ihl, offering a unique selection of entrepreneurship courses for students of all fields.

What can other universities learn from it?

TUHH can only serve as a role model if we verbalize our activities and make these transparent so that other universities are able to identify relevant components for themselves. Hereby, an individualized approach is very important! Unique selling points ought to be recognized. TUHH does not look at specific areas in isolation but at their interconnections. This creates

synergies and also credibility. In order to recruit the best minds we need to explore new paths. An openness to applicants outside of traditional academic career paths is helpful.

What are your next steps/future plans?

Next is the evaluation of the second stage of the EXIST Programme „Entrepreneurial culture“. We will further develop the Entrepreneurship chair. An "Innovation Campus Green Technologies" is planned to combine basic research with real-life applications in the competency area of "Green Technologies". The campus will strive to be a hub for R&D, technology transfer and collaborations with industry. Moreover, we would like to generate good practice examples and success stories in order to strengthen the entire sustainability domain.

What has been the impact of your sustainable entrepreneurship support?

More than 40% of all projects which are supported by the three start-up consultants have a background in "Green Technologies". This is one reason why the TUHH Startup Dock offers a specialized support for business ideas focusing on "Green Technologies". Now that TUHH's Startup Dock is expanding its support to all universities in Hamburg, even more green start-ups are expected to be formed, not least due to Hamburg's supportive environment for "Green Technologies".

Lappeenranta University of Technology – Finland

Characterization: Technical university with a strong focus on entrepreneurship and sustainability



Good practice highlights

Certified ISO 14001 environmental management system (EMS); strategy 2020 is based on sustainability; entrepreneurship is strongly related.

Professorship in "Environmental Economics and Management" and Department of Environmental Technology (at the LUT School of Energy Systems): enable the integration of sustainability and entrepreneurship/innovation in teaching and research.

Master's programme in "Strategy, Innovation and Sustainability": develops advanced competencies in the intersection of strategic management and innovation; looks at sustainability issues both as challenges and an opportunities for value creation.

Doctoral Programme in "Environmental Technology": Goal of the programme is to identify and develop environmentally friendly and cost-effective solutions that are sustainable from both the societal and individual perspective and that equally meet the needs of business, communities and society.

Concentration in "Sustainable Technology and Business" (as part of the Master's programme in "Energy Technology"): Students learn both technological solutions and business methods to put their own innovations into practice. The studies consist of a group-orientated real-life project, incl. project planning, budgeting, communications and stakeholder management.

Institute of Energy Technology ("LUT Energy"): largest energy research and education organization in **Finland**; includes research on Energy Technology, Electrical Engineering and Environmental Technology; Environmen-

tal Technology research areas include Lifecycle Modelling, Waste Management, Sustainable Community, Transition Management, and Environment and Business.

Green Campus Innovations: The market-driven business model of Green Campus Innovations includes incubation, acceleration and seed investment activities and helps commercialize university research.



Key data

Location: Lappeenranta, Finland

Founded: 1969

Number of students (2015): 6,500

Profile: Lappeenranta University of Technology (LUT) has developed Key Performance Indicators (KPIs), a scorecard and other guiding principles which refer to sustainability or entrepreneurship. It describes itself as a pioneering science university, bringing together the fields of science and business. LUT works across scientific and departmental boundaries. Its focus is on demanding topical issues, such as the mitigation of climate change and the continuous availability of clean water and energy. Its expertise in energy is reflected in the Green Campus, a unique research and study environment.

Lappeenranta University of Technology:
<http://www.lut.fi/web/en/>

Interview with Dr. Lassi Linnanen

*Professor of Environmental Economics and Management
Lappeenranta University of Technology (LUT)*



Why did your university/business school start to support sustainable entrepreneurship and/or eco-innovation endeavours?

There is strong history at LUT in the domain of environmental protection. It started in the early 70s with the measurement of industrial emissions in Finland which was part of the energy technology department. Other environmental technologies – such as water quality in addition to emission control – were added later. In the 90s a minor in environmental technologies was introduced. Around 2000 it became an independent programme in environmental technologies. When I joined LUT there was a trend in systems analysis and lifecycle assessment. I was selected for the new professorship in “Environmental Economics and Management” because of my dual background in environmental management and as an entrepreneur. Prior to that there were no internal capabilities combining environmental technology with entrepreneurship. I helped to integrate both domains as one aspect of the environmental technology programme. So the overall trend started quite a while ago. Aside from the new chair it has been an evolution rather than a particular event that led to the combination of sustainability and entrepreneurship over time.

Who initiated your programmes, what were the milestones of their evolution?

The evolution started in the 70s with the establishment of the previously mentioned professorship in “Environmental Economics and Management” in 2005 as an important milestone. I have been adding some relevant courses, so have my colleagues. These courses strongly focus on “learning-by-doing” which is the basis for innovation. Students also learn something about entrepreneurship when they have to solve real life problems based on fairly large projects! That’s one new element which I established. It has been an incremental process with new elements having been added to the programme over time.

What can other universities learn from it?

Our approach has focused on cross-disciplinary learning. You can’t deal with this domain from one perspective only but instead from multiple perspectives. It’s about solving mankind’s grand challenges. In order to create something valuable, you have to tolerate different perspectives. You have to be able to link different types of people and competencies. That way you can apply thinking rooted in sustainable innovation.

What are your next steps/future plans?

We have a history of spin-offs from energy technologies. We are looking for climate neutral solutions. There is a nexus of energy security, climate change, water and food security. We would like to improve our understanding of food and water systems including infrastructure needs. This increases the overall complexity of teaching and research. We would like to ask the right questions and expand our knowledge in different contexts accordingly. To solve these interconnected challenges we have to create more appropriate frameworks.

What has been the impact of your sustainable entrepreneurship support?

Since 2002 there have been 10 university spin-offs. All of them focus on business ideas in the environmental or sustainability domain. Hundreds of students have benefited from entrepreneurial sustainability programmes overall. The order of magnitude has been particularly high with our course in “Sustainable Innovation and System Transition” which involved a real-life project. We run the course with a cap of 20 students once a year. We are in our fourth year now. There have been 4 to 5 journal articles in the area of sustainable entrepreneurship so far.

Leuphana University of Lüneburg – Germany

Characterization: *Humanistic, action-oriented and sustainable university with entrepreneurship as crosscutting theme*



Good practice highlights

The Leuphana University of Lüneburg's development is **rooted in an all-encompassing perspective on education** and its **subject matter and value-orientated implementation of activities**. The university aims to become a humanistic, sustainable and entrepreneurial university.

Leuphana University's semester starts with a kick-off week for all first semester students. Working together as a team, they get involved in broadly conceived **projects developing solutions that make our society a place worth living in**.

Leuphana Conference on Entrepreneurship (LCE2016):

Explores approaches of sustainable entrepreneurship and its interaction with sustainability innovations, sustainability-orientated business models and business cases.

Centre for Sustainability Management (CSM): A centre of excellence in research, teaching and academic training as well as knowledge transfer in the fields of entrepreneurial sustainability management, corporate social responsibility (CSR) and social entrepreneurship.

Entrepreneurship Hub: Pools all entrepreneurial activities at Leuphana University. In co-operation with other relevant stakeholders it raises awareness of these activities.



Key data

Location: Lüneburg, Lower Saxony, Germany

Founded: 1946: as a pedagogical university
2005: Leuphana was created based on a merger of the University of Lüneburg and the University of Applied Sciences at Nordostniedersachsen (FH NON))

Number of students: 7,350

Profile: Culture, sustainability, business and education are the four thematic focus areas in research and teaching with which the Leuphana University of Lüneburg addresses the future of social responsibility vis-à-vis civil society in the 21st century. In recognition of its development as a humanistic, proactive, and sustainable university, in 2007 Leuphana received an award from the German Science Foundation ("Stifterverband für die Deutsche Wissenschaft") within the scope of the competition on "Strategies for Excellence at Small and Medium-sized Universities". In 2013 Leuphana was honoured by the German Federal Ministry for Economic Affairs and Energy (BMWi) as one of the best entrepreneurial universities in Germany.

Leuphana University of Lüneburg:
<http://www.leuphana.de/en/>

Interview with Prof. Dr. Stefan Schaltegger

Professor for Sustainability Management
Head of the Centre for Sustainability Management (CSM)
Leuphana University of Lüneburg



Why did your university/business school start to support sustainable entrepreneurship and/or eco-innovation endeavours?

It is difficult to consider all actors and processes of the whole university in a short reply but as most sustainable entrepreneurship activities are located at CSM, as a head of the institute, I can say something about my own motivation. Sustainability and entrepreneurship had already been one of my key areas of interest during my own university studies. In 1998 I wrote a newspaper column titled "From Bioneers to Ecopreneurs" ("Von Bionieren zu Ecopreneuren") in the Basler Zeitung. Back then I used made-up terms to describe interesting phenomena more tangibly but the concepts were still very basic. I received numerous responses which motivated me to develop a research project. In 1999 the R.I.O. Management Forum took place in Lucerne, Switzerland, a conference dedicated to the notion of "Ecopreneurship". I transferred the project from Basel to Lüneburg. Together with Holger Petersen we conducted several studies on that topic and created content on its basis which was subsequently integrated into the teaching curriculum piece by piece: at first as part of the general sustainability management lecture and in 2000 as a specific lecture on sustainable entrepreneurship. When filling Ph.D. positions we also tried to identify people interested in this topic. Over time, other faculty and staff who joined CSM got slowly interested in sustainable entrepreneurship. Consequently, this resulted in a range of additional activities in our research, teaching and knowledge transfer areas. On the university level, environmental and sustainability sciences

were established in 1990s but not with a specific link to entrepreneurship.

Who initiated your programmes, what were the milestones of their evolution?

With regard to environmental and sustainability education and research it was Gerd Michelsen, Senior Professor for Sustainability Science, who initiated the integration of sustainability into the university's vision, research and teaching programme. He had already launched a project in 2000 which dealt with Leuphana University's Agenda 21 focusing on the university's sustainable development (editor's note: Agenda 21 is a non-binding, voluntarily implemented action plan of the United Nations with regard to sustainable development). Gerd Michelsen also involved CSM in that process. The project had no direct link to entrepreneurship. The goal was to create a more sustainable campus and organization. Perhaps, one could say that we took a first step at establishing sustainable entrepreneurship for the university as an institution.

What can other universities learn from it?

We have been in contact with researchers worldwide interested in sustainable entrepreneurship and try to keep up with the exchange. Most of our exchange on sustainable entrepreneurship with other university colleagues is research-oriented.

What are your next steps/future plans?

At the moment we are not planning to change our activities. In our lectures we try to create awareness for the topic,

motivate students to engage in sustainable entrepreneurship and develop ideas. In our MBA programme we focus on continuous learning and the support of our alumni. Our more specific lectures take place in our undergraduate programme. Transfer activities go on as part of the Innovation Network Sustainable SMEs, Sustainable Leadership Forum, etc. With our research, teaching and transfer activities we continue striving to support entrepreneurial activities for sustainable development. Leuphana University's Entrepreneurship Hub has more of a conventional entrepreneurship focus, a comparatively large number of staff and a lot of resources. Fortunately, it has begun to also embrace start-up activities with a sustainability motivation. In this sense, both areas are in the process of creating implicit links although only little and no formal exchange has been realized so far. I think it is very encouraging that for the first time, initiated by the organizer of the Leuphana Entrepreneurship Conference, we are going to organize a joint event: the 6th Leuphana Entrepreneurship Conference: "Creating solutions through sustainable entrepreneurship".

What has been the impact of your sustainable entrepreneurship support?

The module "Sustainable Entrepreneurship" in our Bachelor's programme helps create awareness among students for the topic at an early stage. Different start-ups have been spun off from our MBA in Sustainable Management alumni network during or after the programme. For example, one MBA student founded a trading company on photovoltaics employing around 100 staff today.

Presidio Graduate School San Francisco, California, USA



Presidio Graduate School San Francisco – California, USA

Characterization: Graduate school with sustainable management focus (in business, public policy and law)



Good practice highlights

MBA, MPA, and a Dual MBA/MPA programme in "Sustainable Management": JD/MBA in partnership with the University of California Hastings College of the Law: Sustainable management is a comprehensive management framework that bridges the gap between commerce and the common good. It is a strategic approach to management and policy that requires a blending of social, natural and financial capital to create an integrated bottom line. This means sustainable management considers not just the financial benefits of a decision, but also its economic, environmental and social impact. As a part of the integrated and entrepreneurship-focused MPA and MBA Capstone programme, students design and launch new social ventures, conceive and propose transformative public administration and public policy innovations, and collaborate on product design prototypes.

In each **Experiential Learning course**, student teams partner with external organizations to create a custom-made project based on the specific needs of their partner. Additionally, there are **field study partnerships in the sustainable energy sector**.

PGS offers **several specialized certificate options for professionals:** Certificate in Sustainable Management, Certificate in Sustainable Energy Management.



Key data

Location: San Francisco, California, USA

Founded: 2003

Number of students (2015): 150

Profile: Among the world's first and leading sustainability graduate schools, Presidio Graduate School (PGS) looks at private enterprise and the public sector, commerce and the common good, as companions, not competitors. PGS looks at sustainable management as an integrated, applied approach to learning that sees problems as a whole and designs solutions that account for human, economic and environmental concerns. A whole-systems orientation rests on coursework in systems thinking, sustainability literacy, ethics and social justice. The integrated curriculum is designed around three fundamental concepts that define competence in sustainable management: sustainable systems, sustainable leadership and business excellence.

Presidio Graduate School: <http://www.presidio.edu>

Interview with Dwight Collins, Ph.D.

*Founding Faculty Member and Professor Emeritus
Presidio Graduate School*



Why did your university/business school start to support sustainable entrepreneurship and/or eco-innovation endeavours?

Sustainable entrepreneurship and eco-innovation were the main themes underlying the founding of Presidio Graduate School (PGS) in 2003.

Who initiated your programmes, what were the milestones of their evolution?

PGS was founded by a noted educator, Richard Gray, PhD, and a leading San Francisco business man, Steven Swig, to change the way business is done on the planet. It opened in 2003 with a class of 22 students, and incorporated sustainability in every MBA course. It is offered in a hybrid format in which students meet with faculty in a face-to-face residency each month, and complete assignments and interact with faculty in an online environment in the weeks in between. For its first 11 years, PGS was accredited by the Western Association of Schools and Colleges (WASC) through its affiliation with Alliant International University. Its fourth semester integrated Capstone course provided a springboard for launching its students as highly skilled social entrepreneurs and practitioners of sustainable management solutions. In 2006, the school introduced its highly acclaimed Experiential Learning Program in which students work closely with three to four companies, non-profits, or government agencies as part of their MBA experience. In 2009, the PGS core faculty re-designed its MBA curriculum around a set of 10 programme learning outcomes (PLOs). Each course is largely defined in terms of which PLOs it teaches and assesses student performance against. In 2009, the school also introduced its acclaimed Master of Public Administration (MPA) and Dual MBA/MPA Degree offerings. In 2013, the school introduced a number of Certificate programme offerings in addition to its degree programmes. Also, a new core course, Market Failures and the Regulatory Environment, was introduced. This course teaches tools for establishing strategic co-operation between business and government as an often necessary vehicle to ensure success of its social entrepreneurs. The year 2014 was historic in that PGS became WASC accredited independent of its Alliant parent.

What can other universities learn from it?

PGS demonstrates how to design MBA and MPA programmes in which sustainability and social entrepreneurship values and tools are taught in every course. Its leaders believe that every MBA and MPA programme needs to share these attributes in order to solve our society's most pressing sustainability problems.

What are your next steps/future plans?

PGS enrolments are growing. Its leaders are examining a number of vehicles to bring its brand to scale. These include partnerships with other programmes that can facilitate this growth, and fully online offerings.

What has been the impact of your sustainable entrepreneurship support?

PGS has close to 800 graduates. Many have started up new social enterprises. Others are "social intrapreneurs", serving in sustainable leadership positions in many of the world's best companies and organizations, e.g., Apple, Cisco Systems, Facebook, Google, PG&E, SolarCity and Environmental Defense. Some are leading sustainability initiatives for innovative, forward-thinking cities like Austin, TX, Baltimore, MD and Berkeley, CA. A number occupy Director of Sustainability positions at major universities including University of California at Riverside, Wake Forest University, and the University of Texas at Arlington. A number of Presidians have launched category-creating companies. One, EOS Climate, for example, has built a market in destruction of CFC-based refrigerants, in effect, reducing the earth's ozone hole at a profit. Another, Mission Motors, develops cutting edge electric powertrain systems for high-performance vehicles. A third, Ecohome Improvement, is a 10-year old highly successful Berkeley, CA-based showroom and design studio offering ecologically friendly and healthy home improvement products.

*University of Manchester
England, UK*

MANCHESTER
1824

The University of Manchester

University of Manchester – England, UK

Characterization: *Comprehensive research university with a strong societal focus*



Good practice highlights

Sustainable Consumption Institute (SCI): an interdisciplinary research centre that explicitly explores the role of eco-innovation in more sustainable consumption and production.

B.Sc. in "Management (Innovation, Sustainability and Entrepreneurship)": offers a specialization in Innovation, Sustainability and Entrepreneurship (ISE). The specialization explores the area of strategic innovation management and sustainable development through real company case study analysis; it includes modules on entrepreneurship and small business development.

M.Sc. "Innovation Management and Entrepreneurship (IME)": allows students to study modules such as "Eco-Innovation Management" and "Water and Sanitation Planning and Policy in Developing Countries" and complete a dissertation on a topic of eco-innovation.

Manchester Enterprise Centre: offers a range of taught core and elective units for undergraduate students, some of which include sustainability content: Sustainable Development for Electrical and Electronic Engineering, Cases in Sustainable Development, Interdisciplinary Sustainable Development. The centre supports social enterprises.

Manchester has **two separate professorships on "Innovation and Sustainability" and "System Innovation and Sustainability"**. "Innovation and Sustainability" is defined as a research theme.



Key data

Location: Manchester, England, United Kingdom

Founded: 1824

Number of students (2014): 38,400

Profile: The University of Manchester's strategic plan for 2020 puts a strong focus on social responsibility (as a goal and key performance indicator) and environmental sustainability as an enabling strategy. The Manchester Institute of Innovation Research, one of the largest groupings of innovation researchers in the world, has defined "Innovation and Sustainability" as a research theme. Its research strategy talks about impact and notes that "our work must have an impact beyond academia and yield economic, social and cultural benefits whenever the opportunity arises".

University of Manchester: <http://www.manchester.ac.uk>

Interview with Andrew McMeekin, Ph.D.

*Professor of Innovation, Management and Policy
Research Director, Sustainable Consumption Institute
Manchester Business School
The University of Manchester*



Why did your university/business school start to support sustainable entrepreneurship and/or eco-innovation endeavours?

I joined the university as a research assistant in the early 1990s. Back then I was involved in a Research Council-funded research project led by Professor Ken Green who was the initiator of research on innovation and sustainability in the business school. At that time, I believe, there wasn't any teaching at the business school on that topic. There may have been a few lectures in other courses but it wasn't very prominent in the teaching programme. So I think this was the business school's full research endeavour into the specific area of innovation and sustainability. In terms of the "why", this was a research-led, bottom-up initiative by Prof Green at the time, not necessarily a strategic move in the '90s to develop a set of broader activities in that area.

Who initiated your programmes, what were the milestones of their evolution?

It was a gradual evolution over a 20- to 25-year period starting with the Research Council-funded research project. Since then we have passed through different phases where on the research side there have been a long sequence of externally funded projects mainly from UK-based research council and also some projects funded by the UK Government's Department of the Environment, Food and Rural Affairs which was the main policy funder. There were two research clusters at the time. They originated from two independent universities (UMIST – University of Manchester Institute of Science and Technology and the Victoria University of Manchester) that subsequently merged to become The University of Manchester. In the Manchester Institute of Innovation Research, we set up a specific theme on "Innovation and Sustainability" which I ran from around 2008. Together with colleagues from another school within the university, I developed a proposal

which was eventually funded by the Economic and Social Research Council, DEFRA and the Scottish government for a 3-year term, between 2010 and 2013. The research group, which we called Sustainable Practices Research Group, cut across several different universities and conducted research on the ways that new technologies get absorbed in everyday life and how that brings about changes in the environmental impacts of everyday social activities. In 2007, with the same combination of people – and this is when it becomes more strategic – the university entered a strategic partnership with TESCO to establish the Sustainable Consumption Institute. In summary, there has been a gradual creation of critical mass and more programmatic funding. Over time, more experts with domain expertise have been recruited to support corresponding activities.

What can other universities learn from it?

It is a story of evolution and growing momentum. You start off with fairly small and modest activities often centred around a very small number of people. I am talking of one or two initially. You start creating momentum by building networks within the university and beyond. That involves building partnerships with other universities and with a whole range of other non-academic stakeholders. That's essentially what we have done over the last 20 to 25 years. The main story is to develop an intellectual identity that has relevance to stakeholders embedded in international networks and a network within the university itself.

What are your next steps/future plans?

In terms of the Sustainable Consumption Institute, we plan to further develop our research programme and to find support for that through a more diverse range of funding streams. We are trying to push the development of our international academic networks. We are in

discussions with the Chinese Academy of Social Science in Beijing. Together with seven or eight European partners, we are involved in a research consortium funded by the European Commission's Horizon 2020 scheme. And on the agendas we are working on we have connections to networks in North America as well. This is important for us to feel we are embedded in the global academic interest in issues of not just innovation and sustainability, but also questions of dynamics of consumer behaviour of consumption practices. We are trying to develop more of an intellectual synergy in terms of our international networks and also developing our stakeholder networks with UK government organizations such as the Committee for Climate Change, the Waste and Resources Action Plan and a number of other stakeholders like that.

What has been the impact of your sustainable entrepreneurship support?

As an anecdote, someone I supervised for his dissertation on the M.Sc. "Innovation Management and Entrepreneurship (IME)" programme had focused on "Carbon Reduction in Supply Chain Management" based on research at TESCO. As a result of his training at Manchester he was able to get a job as a sustainability analyst at PricewaterhouseCoopers. The Manchester Enterprise Centre has worked with firms developing green technologies and business ideas. At a Master's level, students work with companies in a kind of incubator environment. This experience has helped them develop business plans and some of those companies have gone on to prosper. Examples include students who have won a category of "Venture Further". A winner of the business category in 2013 officially launched her ethical fashion business Fair-T which produces Fairtrade cotton t-shirts. A winner of the social category 2015, Powercycle, produces energy from kinetic movement and stores it inside the attached power adaptor.

Carl von Ossietzky University of Oldenburg – Germany

Characterization: *Entrepreneurial university with sustainable entrepreneurship as a focal point*



Good practice highlights

"Sustainable Entrepreneurship" is a focal point in the university's strategy as an entrepreneurial university.

The university offers a **sustainability master cluster** with 9 master programmes in sustainability, energy and environmental sciences.

Professorship for Innovation Management & Sustainability: responsible for the "Eco-Entrepreneurship" major study programme for master students and research in the field of sustainable entrepreneurship and innovation.

Master's programme in "Sustainability Economics and Management": includes the award-winning module "Eco-Venturing". Eco-Venturing was the first course worldwide with students developing sustainability-orientated business concepts in co-operation with business partners aiming at the promotion of tangible green business start-ups.

Sustainable development is a major research field of the university and is being coordinated through the interdisciplinary **Centre for Environmental and Sustainability Research (COAST)**, which comprises five specialized sub-centres. One of them is the **Oldenburg Centre for Sustainability Economics and Management (CENTOS)** with more than 50 professors and researchers from social sciences.

Sustainable Entrepreneurship is a major research field of CENTOS. It includes areas such as the generation and diffusion of sustainable innovation, the creation of green future markets, green start-ups and eco-venturing strategies.



Key data

Location: Oldenburg, Lower Saxony, Germany

Founded: 1973

Number of students: 13,700

Profile: The University of Oldenburg's goal is to find answers to the major challenges society faces in the 21st century – through interdisciplinary, cutting edge research. Its research in sustainable development, encompassing several academic disciplines, is especially renowned. The University of Oldenburg has been honoured by the German Federal Ministry of Economics and Energy (BMWi) as one of the best entrepreneurial universities in Germany.

University of Oldenburg: <http://www.uni-oldenburg.de/en>

Interview with Prof. Dr. Klaus Fichter

*Adjunct Professor for Innovation Management & Sustainability
Head of Eco-Entrepreneurship major study programme
University of Oldenburg*



Why did your university/business school start to support sustainable entrepreneurship and/or eco-innovation endeavours?

The University of Oldenburg has a long tradition in sustainability-related teaching and research. E.g. our three-term non-consecutive master's programme in "Renewable Energy" started already in 1987. More than ten years ago the university decided to further strengthen its applied focus. In addition to the traditional roles of research and teaching, the provision of practical solutions to societal challenges has grown in importance and the university as a whole decided to become more entrepreneurial. This endeavour has been successful. Only recently we have been honoured as one of the best entrepreneurial universities in Germany by the German Federal Ministry of Economics and Energy. The University of Oldenburg and the regional innovation system, with its appreciation for sustainability as a guiding principle for regional development, provide a very good eco-system for sustainable innovation and entrepreneurship.

Who initiated your programmes, what were the milestones of their evolution?

Based on its tradition and specific competencies in sustainability-related teaching and research, the Department of Economics, Business and Law decided to expand the sustainability master cluster and introduce a new master's programme in "Sustainability Economics and Management (SEM)" which started in 2005. During a 2-month research visit to the Bren School of Environmental Science and Management at the University of California, Santa Barbara, in 2008, I had the opportunity to learn more about their focal study programme in "Eco-Entrepreneurship", which was introduced only a year prior to my arrival. It was the nation's first programme on this topic. I liked the approach and suggested to our Department to introduce an "Eco-Entrepreneurship" major study course as a specialization in the SEM master's programme. Core of the specialization in Eco-Entrepreneurship is the award-winning master project module in "Eco-Venturing" which we have been offering every winter semester since 2008.

What can other universities learn from it?

There is an explicit demand for sustainable entrepreneurship! Students love the idea of turning challenges into opportunities and combining entrepreneurial spirit with practical solutions for sustainability. Building an effective university support system for sustainable entrepreneurship and eco-innovation requires a systemic approach and takes time but it is definitely rewarding.

What are your next steps/future plans?

In order to support sustainability-orientated business model development, we are going to introduce the concept of a "Sustainable Business Canvas". Soon we will provide an online tool to assist students, academic entrepreneurs and green start-ups outside of the university to take sustainability success factors into account when developing their business model or business plan.

What has been the impact of your sustainable entrepreneurship support?

More than 50% of all students in the master's programme "Sustainability Economics and Management" participate in the "Eco-Entrepreneurship" major study course and develop competencies in eco-venturing and in starting green businesses. The entrepreneurial support system of the University of Oldenburg and the sustainability-specific support activities facilitate and accelerate academic entrepreneurship in the fields of cleantech, renewable energies and sustainability. This leads to 10 to 20 green start-up projects and spin-offs by students and researchers from the university every year.

Santa Clara University California, USA



Santa Clara University – California, USA

Characterization: Value-driven university with a strong ethical underpinning



Good practice highlights

Miller Center for Social Entrepreneurship: The Center prides itself for a unique integrated approach. Its programmes consist of three core offerings:

Global Social Benefit Institute (GSBI®): pairs social entrepreneurs (outside of Santa Clara University) with Silicon Valley mentors, to help them reach their profound potential and scale. GSBI has three distinct programmes tailored for social entrepreneurs at different stages in their lifecycle:

GSBI Accelerator: prepares advanced social enterprises from around the world for growing impact and securing capital investments. Over the course of 10 months, social entrepreneurs work alongside Silicon Valley mentors to complete online modules, which refine their business models and identify the growth opportunities.

GSBI Online: helps early-stage social enterprises formalize their business models through a 6 month mentored capacity development programme conducted online. The programme helps early stage social entrepreneurs blueprint and validate their businesses through lessons focused on business strategy, operational planning, metrics, and financials.

GSBI Boost: packs core business lessons into a powerful 3-day workshop. GSBI Boost helps early stage social entrepreneurs learn business fundamentals, improve their strategic thinking, and articulate a business plan that demonstrates impact, growth, and long-term financial sustainability. GSBI Boost programmes have been conducted for over 100 clean cookstove entrepreneurs in Kenya, Ghana, Uganda, Bangladesh, and China.

Impact Capital: initiative develops new investment vehicles and provides thought leadership to the impact investment community.

Global Social Benefit Fellows programme: provides life-changing educational opportunities for undergraduate students to participate in action research with social enterprises.

The Center has a strategic initiative to support social entrepreneurs addressing climate change, and all of its programmes are focused on sustainability within the organizations it supports (including, for example, decentralized, renewable energy generation and attempt to minimize resource input and maximize output). There is a strong and inherent overlap between the domains of social and sustainable (green) entrepreneurship addressing urgent environmental concerns.

The Willem P. Roelandts and Maria Constantino-Roelandts Grant Program in Science and Technology for Social Benefit: supports faculty and student research across campus, especially for frugal innovation projects. Through this grants programme, the Miller Center for Social Entrepreneurship fosters shared research and learning among the social entrepreneurship movement and the campus community.

Frugal Innovation Lab at the School of Engineering: The Frugal Innovation Lab's purpose is to combine instruction, innovation and immersion experiences for SCU students to develop appropriate, adaptable, affordable, and accessible technologies, products and solutions for emerging markets. The Frugal Innovation Lab fosters collaboration between students, social entrepreneurs, corporate partners and faculty to incubate and scale development projects in areas such as clean energy, global health, mobile technologies, and sustainable livelihood development.



Key data

Location: Santa Clara, California, USA

Founded: 1851

Number of students (2013): 8,800

Profile: Santa Clara University (SCU) is a comprehensive Jesuit, Catholic university located in California's Silicon Valley. As a Jesuit institution, SCU is committed to faith-inspired values and educating leaders of competence, conscience, and compassion who will help fashion a more just, humane, and sustainable world. Putting this mission into practice, the University's Miller Center for Social Entrepreneurship accelerates global, innovation-based entrepreneurship in service to humanity.

Santa Clara University: <http://www.scu.edu>

Interview with Thane Kreiner, Ph.D.

*Executive Director, Miller Center for Social Entrepreneurship
Howard and Alida Charney University Professor of Science and Technology
for Social Benefit
Santa Clara University*



Why did your university/business school start to support sustainable entrepreneurship and/or eco-innovation endeavours?

Accelerating enterprises that foster social and environmental justice aligns with our mission as a Jesuit university. Indeed, it is a mission shared among all Jesuit institutions. We realized we had a unique opportunity to link the Silicon Valley entrepreneurial acumen with new ventures that help eradicate poverty and foster resilience to climate change.

Who initiated your programmes, what were the milestones of their evolution?

Our signature GSBI was launched in 2003 following the observation by several business school faculty that many innovations meant to serve the poor and create a more sustainable planet were not reaching meaningful scale relative to the magnitude of these pressing problems. In 2010, we added impact capital to facilitate appropriate flows of financial investment. In 2012, we began tailoring our programs to meet the needs of enterprises at different lifecycle stages. We have now worked with more than 340 social enterprises focused on poverty eradication; over half of these deliver clean energy solutions to poor communities.

What can other universities learn from it?

We believe the GSBI Methodology can be leveraged by other universities and mission-aligned organizations to help social and sustainable entrepreneurs succeed. The critical factors are:

commitment of senior leadership, ideally including the President; a pool of talented mentors, usually found among successful alumni; and a pipeline of entrepreneurs who can benefit from the methodology. Our GSBI Network welcomes others to join and share best practices with more than 24 member organizations. See: <http://www.scu-social-entrepreneurship.org/gsbi-network>

What are your next steps/future plans?

We are exploring avenues to replicate validated impact and business models in other geographies, which would enable massively parallel scaling. The idea is that most of the solutions needed for environmental sustainable and poverty eradication already exist; they just haven't reached enough people. This replication experiment would help test alternate approaches to scaling. We are also training other organizations in the GSBI Methodology through "Train-the-Trainers" programmes.

What has been the impact of your sustainable entrepreneurship support?

More than 340 social enterprises participating in our GSBI programmes have positively impacted the lives of over 107 million people in 55 countries and raised more than \$96M. Through our Energy Sector Focus we have worked with more than 80 enterprises delivering sustainable clean energy solutions to poor communities.

Recommendations for redesigning the university support system

The following recommendations are targeted at decision makers at universities as well as at policy makers in charge of university policy, entrepreneurship policy, innovation policy and environmental policy. The recommendations are based on our empirical

research (expert interviews, good practice research, in-depth case studies) and are linked with basic strategies for redesigning support systems for eco-innovation and sustainable entrepreneurship (cf. Fichter et al. 2016).

Table 1: Recommendations and good practice examples for universities

Basic strategy	Selected recommendations for actions	Selected good practice example
1 Put eco-innovators at the centre of support efforts	Check whether a specific university has the potential to focus on sustainability and eco-innovation as a core area of its research and transfer activities. If so, this allows for addressing eco-innovators specifically and establish centers that focus on eco-innovation/greentech and for introducing chairs / tenure positions for eco-innovation / sustainable entrepreneurship. Develop a specific community of eco-innovators at and around the university.	Hamburg University of Technology (TUHH): Competency area "Green Technologies"; InnovationsCampus Green Technologies; Startup Consultant Green Technologies; Startup Prize Sustainability
2 Easy entry and sign posting for eco-innovators	Make students, post-docs, professors potentially interested in eco-innovation and green start-ups aware of existing online-platforms specifically designed for eco-innovators like www.start-green.net .	The German Internet Portal for green start-ups and eco-innovators: http://www.start-green.net
3 Encourage experimentation	The SHIFT good practice collection shows that there are already proactive approaches and that there is quite a bit of experimentation going on with sustainable entrepreneurship support at universities. Let yourself get inspired by the different approaches and select approaches that seem to fit your university.	Cf. SHIFT good practice collection of university support for sustainable entrepreneurship with nine good practice cases from Europe and U.S.A: (cf. SHIFT good practice collection)
4 Dynamic tailoring of support activities	(1) Provide sustainability specific know-how and support at entrepreneurship centers and transfer offices of universities and connect and integrate it systematically with general start-up support activities; (2) Develop specific support activities for eco-innovators and green start-ups (3) Provide access to sustainability experts and networking support for green entrepreneurs.	(1) Technical University of Hamburg, Germany: Start-up Consultant Green Technologies and (2) Santa Clara University: GSBI Accelerator for social entrepreneurs from developing countries preparing to scale and GSBI (cf. SHIFT good practice collection).
5 Mainstreaming sustainability in the support system	(1) University policy: Recognize the need for connecting the concept of the entrepreneurial university and the concept of the sustainable university. (2) Develop an award for the "Sustainable entrepreneurial university". (3) Entrepreneurship policy: Change government funding programs for start-up support at universities. Make "Sustainability" an obligatory requirement in start-up funding programs (e.g. for funding proposals, for business plans etc.), (4) Make sustainability a key criterion in evaluation schemes of entrepreneurial universities (e.g. in Germany the "Gründungsradar" (Start-up radar of universities).	(1) Lappeenranta University of Technology (LUT), Finland: Strategy 2020 is based on sustainability; entrepreneurship is strongly related; (2) Leuphana University Lüneburg, Germany: Leuphana University's semester starts with a kick-off week for all first semester students. Working together as a team, they get involved in broadly conceived projects developing solutions that make our society a place worth living in. SHIFT good practice collection .
6 Specialisation	(1) Establish sustainability and entrepreneurship as a core values and as basic principles of the university strategy; (2) integrate them in the Key Performance Indicators (KPIs) and the scorecard of the university (3) Establish centers that focus on eco-innovation/greentech; (4) Introduce chairs / tenure positions for eco-innovation / sustainable entrepreneurship. (5) Offer specialized teaching and support programs for eco-innovators and green start-ups.	(1) Chalmers University of Technology, Sweden, is Climate-KIC's first network partner in Sweden. (2) Bren School, UC Santa Barbara: Module in "Eco-Entrepreneurship (Eco-E)". (3) University of Oldenburg, Germany: Award-winning module "Eco-Venturing" (cf. SHIFT good practice collection).
7 Assessment and monitoring of effectiveness	Make sustainability a key criterion in evaluation schemes of entrepreneurial universities (e.g. in Germany the "Gründungsradar" (Start-up radar of universities). Include universities and university spin-offs in the Green Economy Start-up Monitor provided by the Borderstep Insitute.	No university-related good practice example of assessment and monitoring of effectiveness is known.

Overview good practice collection

[Free download here](#) ↗

Good Practice: Bren School of Environmental Science & Management, UCSB California, USA

Good Practice: Chalmers University of Technology Gothenburg, Sweden

Good Practice: Hamburg University of Technology (TUHH), Germany

Good Practice: Lappeenranta University of Technology (LUT), Finland

Good Practice: Leuphana University of Lüneburg, Germany

Good Practice: Presidio Graduate School San Francisco, California, USA;

Good Practice: University of Manchester England, UK

Good Practice: Carl von Ossietzky University of Oldenburg, Germany

Good Practice: Santa Clara University California, USA

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