University support systems for sustainable entrepreneurship: insights from explorative case studies

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Abstract: In recent years public policy has increasingly recognised the importance of entrepreneurship for sustainable economic growth and solving fundamental challenges such as climate change. It is emphasised that universities should play an important role in supporting sustainable entrepreneurship by sensitising and educating future sustainable entrepreneurs. Up till now there has hardly been any research on university support systems for sustainable entrepreneurship. We address this research gap with a qualitative multi-case study of four universities in the USA and Germany, based on 41 good practice examples. Using an open innovation concept, we developed a conceptual framework that is based on an interactive paradigm and allows comprehensive support systems analysis. We identified top-down, bottom-up and combined implementation strategies as well as integrative and additive approaches. The framework is suitable for empirical investigations and supports future research. Our results demonstrate the importance of the
institutional framing of support activities and indicate that, in comparison with other elements of the university support system, research on sustainable entrepreneurship is lagging behind.

**Keywords:** sustainable entrepreneurship; university support systems; good practice cases; entrepreneurial universities; sustainable universities.


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1 **Introduction**

In recent years national as well as international public policy has increasingly recognised the importance of entrepreneurship for sustainable economic growth and solving fundamental challenges such as climate change, biodiversity loss and water scarcity. For
example, in 2014 the European Commission published the green action plan (GAP) to help start-ups and small and medium enterprises (SMEs) take advantage of the opportunities offered by the transition to a green economy (European Commission, 2014). The GAP states: “Green entrepreneurship should already be addressed in (higher) education, to prepare the mind-set of future green entrepreneurs”. Furthermore, the GAP recommends encouraging green entrepreneurship by helping potential entrepreneurs to identify sustainable business opportunities, and to develop new and creative forms of cooperation between businesses and academia. Accordingly, universities should sensitise and educate future sustainable entrepreneurs and use a systematic approach to specific opportunities and challenges of sustainable development by providing appropriate support systems. This argument and requirement from policy makers is supported by research on entrepreneurship and management education (Matten and Moon, 2004; Basu et al., 2008; Lans et al., 2014; Hesselbarth and Schaltegger, 2014). The need to include sustainability in educating responsible leaders has been emphasised in an extant body of literature (see Lozano García et al., 2006; Osiemo, 2012; Hesselbarth and Schaltegger, 2014). While the question of why sustainable entrepreneurship should be supported by higher education institutions has been clearly answered, there have been few insights into how an appropriate university system should be designed to effectively support sustainable entrepreneurship.

Universities are often seen as engines of growth in the knowledge-driven economy (Laursen and Salter, 2004). In addition to research and teaching, universities have a third role in promoting more specific tasks such as technology transfer, patenting and commercial outputs in an increasingly knowledge-based world. This phenomenon has also been described in the entrepreneurship literature as a paradigm shift toward an entrepreneurial university (Etzkowitz et al., 2000; Etzkowitz and Klofsten, 2005; Ranga and Etzkowitz, 2013).

Universities also play a pivotal role in promoting sustainability principles and thus contribute to the paradigm shift toward more sustainable development (Disterheft et al., 2013). Universities have been given key roles in promoting and implementing sustainable development (UNCED, 1992). An increasing number of universities have responded to the ethical obligation to systematically integrate sustainability into their institutions through teaching, research, operation, assessment and reporting (Disterheft et al., 2013). This has been described in the sustainable development research as the emergence of sustainable universities (Disterheft et al., 2015; Figueiró and Raufflet, 2015; Ramos et al., 2015).

Although the research fields of the entrepreneurial university and the sustainable university are both growing, until now there has been no connection between them. There is a clear gap in university entrepreneurship research regarding sustainability, and vice versa, and only very limited research has been carried out on support systems for sustainable entrepreneurship. The few exceptions are limited to single universities and to single elements in entrepreneurship education (Basu et al., 2008; Hesselbarth and Schaltegger, 2014; Lans et al., 2014). Against this background, Lans et al. (2014) highlight the lack of connections between the educational fields of entrepreneurship and sustainability at universities. Entrepreneurship education is usually located in the business schools, while sustainable development education is usually based in the environment faculty. There are some cases where the boundaries of these two disciplines are crossed (e.g., business courses offered to students from environmental or green
technologies fields) but only few cases in which an effort is made to integrate both perspectives (e.g., courses offering an original focus on sustainable entrepreneurship). Initial investigations have shown that, so far, only a few universities have developed special support activities for green and clean technologies or entrepreneurship programs with a focus on sustainability (Clausen and Fichter, 2011; Fichter et al., 2014).

In order to fill the research gap regarding university support systems for sustainable development, and to improve understanding of what universities can do to boost their development and implementation of sustainable entrepreneurship, we investigated the following research question:

- How do leading universities support sustainable entrepreneurship and how are their support systems designed?

To answer this question, we conducted a review and described the current state of the research in this field. We found that no appropriate conceptual framework for specific support systems at universities had been developed, and have therefore elaborated a new overarching conceptual framework. To empirically analyse the research question, we conducted in-depth case studies using our new conceptual framework. Methodologically, we took a qualitative approach to gain an in-depth understanding of a new and complex phenomenon within its specific contexts. Our analysis highlights the lack of research on university support systems for sustainable entrepreneurship. It also contributes a theoretical basis by providing a new conceptual framework and qualitative empirical results from case studies.

2 Conceptual background

2.1 Literature review

2.1.1 Sustainable entrepreneurship

Sustainable entrepreneurship is a new research field that is still developing. Binder and Belz (2015) provide a systematic review of existing literature and show that sustainable entrepreneurship is an emerging stream within entrepreneurship literature. Traditionally, entrepreneurship was considered in terms of economic development, while environmental and social issues were widely ignored. The first article which linked sustainable development and entrepreneurship appeared at the end of the 1990s: Hart and Milstein (1999) applied the concept of creative destruction (Schumpeter, 1942) as the central force for the transition to a sustainable society. They were the first to put forward the concept of sustainable development as a source of entrepreneurial opportunities. Following this observation an increasing number of researchers began to turn their attention to the nexus of sustainable development and entrepreneurship (Cohen and Winn, 2007; Dean and McMullen, 2007; Pacheco et al., 2010; Patzelt and Shepherd, 2011). Since 2009, the number of articles published on sustainable entrepreneurship has increased significantly (Binder and Belz, 2015). While many of these articles emphasise opportunity seeking as key to sustainable entrepreneurship, another important thread of literature highlights a creative and effectuation-based approach (Hockerts and Wüstenhagen, 2010; Parrish, 2010; Schaltegger and Wagner, 2011) where a creation perspective is taken. These researchers emphasise the active role of ecopreneurs and sustainable entrepreneurs in
creating sustainability-oriented change. This perspective is particularly important for a
creative view of universities supportive of sustainable entrepreneurship.

With the upturn in research, different terminology and definitions of sustainable
entrepreneurship emerged. In this paper we view sustainable entrepreneurship, in
accordance with Pacheco et al. (2010), as the discovery, creation, evaluation, and
exploitation of opportunities to create innovative goods and services that are consistent
state that the recognition of sustainable development opportunities is more complex for
the entrepreneur than the recognition of non-sustainable opportunities motivated solely
by economic gain. Sustainable entrepreneurs need to balance often competing aims of
economic, social and ecological value creation (Parrish, 2010). This leads to increased
complexity for sustainable entrepreneurship in comparison to traditional forms of
entrepreneurship. In addition to high complexity, sustainable opportunities are
characterised by strong uncertainty (cause and effect of the problem), and the difficulties
of realising a complete solution. They have been classified as ‘wicked problems’ (Lans et
al., 2014).

Creating, recognising and taking advantage of sustainable opportunities are complex
challenges for sustainable entrepreneurs and demand specific support systems. An
effective support system incorporates all actors, institutional settings and resources that
help entrepreneurs in innovating successfully (Fichter et al., 2016). In this paper we
concentrate on the university as an important supporting actor. We assume that, on the
one hand, some personal attributes of entrepreneurs such as the individual’s prior
knowledge and motivation (Shepherd and Patzelt, 2011), sustainability orientation
(Kuckertz and Wagner, 2010; Wagner, 2012) and perpetual reasoning (Parrish, 2010) can
be influenced by the education and experience they receive at universities and should be
adequately addressed within the university context. One the other hand, universities are
also able to support external economic actors like SMEs or start-ups in developing and
establishing sustainable and often technology-driven products through their research and
development (R&D) resources. In the following chapter we discuss and analyse the
literature on university support systems.

2.1.2 University support system

First we describe the current research situation regarding the role of universities in
supporting entrepreneurship in general, and second the consideration of sustainability in
university entrepreneurship support in particular. We do this by reviewing international
literature, focusing on books and articles in peer-reviewed journals. Using the
comprehensive review of university entrepreneurship literature between 1981 and 2005
provided by Rothaermel et al. (2007) as a guide, relevant literature was identified based
on keyword searches in journals and journal databases. In this review, the following eight
journals were identified as the most important sources and formed the focus of our
analysis of the entrepreneurship literature: Research Policy, Journal of Technology
Transfer, Technovation, Journal of Business Venturing, Management Science, Small
Business Economics, International Journal of Industrial Organization, and R&D
Management.

In addition to the entrepreneurship literature, we looked at articles dealing with
regional sustainable development. With the increasing importance of sustainable
development on a global, national and regional level, the role of academia as part of the
regional ecosystem is also being investigated. The *Journal of Cleaner Production*’s issue on ‘The roles of academia in regional sustainability initiatives’ (2009, Vol. 17, No. 12) was a particularly important source.

The existing literature points to three key findings. First, university entrepreneurship research offers various classifications of relevant aspects of an entrepreneurial university, such as internal elements [internal incentive system (Freedman and Silberman, 2003), characteristics and roles of faculty (Chrisman et al., 1995), etc.] and external factors [federal laws and policies (Mowery and Sampat, 2001), relationships with industry (Harmon et al., 1997), etc.]. Many approaches focus only on specific factors, with just a few taking a more comprehensive view (European Commission and OECD, 2012; Rothaermel et al., 2007).

Second, there is a clear gap in university entrepreneurship research in regard to sustainability, and vice versa. Only three (Basu et al., 2008; Hesselbarth and Schaltegger, 2014; Lans et al., 2014) of the 56 articles and books we analysed consider sustainable entrepreneurship explicitly in a university context while the rest focus only on the field of entrepreneurial education.

Third, there is a need for more comprehensive systems analysis and an interactive paradigm. Rothaermel et al. (2007, p.740) suggest a more comprehensive analysis to understand the dynamics and effects of different measures on the whole system. This perspective is shared by other authors (e.g., Bradley et al., 2013) who stress that technology transfer and university entrepreneurship is a highly interactive process rather than a linear one.

These findings indicated that no comprehensive conceptual framework had yet been developed which adequately structured our unit of analysis (university support systems for sustainable entrepreneurship) and which was appropriate to answering our research question. Thus we needed a consistent conceptual framework to analyse the potential fields of activity and support and to determine starting points for transforming the general university support system for entrepreneurship to a support system for sustainable entrepreneurship. In the following chapter, we develop such a conceptual framework.

2.2 Conceptual framework

The main purpose of the conceptual framework was to structure our unit of analysis, meaning to classify the potential fields of university activity and support for sustainable entrepreneurship. The conceptual framework is therefore descriptive and not explanatory, and is designed to cover all potentially relevant fields of activity and structure for supporting sustainable entrepreneurship in the university environment. It was designed to allow empirical investigation and analysis of the research question.

Sustainable entrepreneurship involves both new companies (start-ups), and intrapreneurship within established SMEs and larger companies. Both have different roles in this context: in a review of 100 diffusion processes, Fichter and Clausen (2016) found that start-ups are primarily involved in radical eco-innovation processes while established SMEs and larger companies are more strongly involved in incremental eco-innovation. Hockerts and Wüstenhagen (2010) further suggest that ‘sustainable Davids’ (start-ups) play a key role in emerging and early growth phases of market development while ‘greening Goliaths’ (larger companies) become more important in the growing and mature phases of an industry. University support for sustainable entrepreneurship is relevant to both, that is to help students, researchers, and university
teachers develop their entrepreneurial skills and start new ventures, and to help external economic actors develop and establish green products and sustainable business models.

2.2.1 Interactive paradigm

Developing a consistent conceptual framework for analysing the potential fields of activity and support and determining starting points for transforming the general university support system for entrepreneurship to a support system for sustainable entrepreneurship requires a clear and consistent theoretical basis. Since universities are complex social systems that are embedded in an even more complex environmental context, we agree with Rothaermel et al. (2007, p.740) and Bradley et al. (2013) that there is a need for more comprehensive systems analysis and an interactive paradigm. Interaction economics and interactive innovation theory are based on an interactive paradigm and offer a consistent theoretical basis for describing and analysing the evolution of university support systems for entrepreneurship. The theoretical field of interaction economics (Fichter, 2014) which has recently emerged is a micro-economic approach that sees the social interaction between actors as a central ‘location’ of self-organisation as well as decision-making and change in social and economic processes, and thus makes this aspect its main objective for conceptualisation. Consequently, the focus of interaction economics is, like that of evolutionary economics, in the broadest sense change in social and economic systems. Rather than describe an internal status it concentrates on transitional processes and the emergence of new ideas, both in terms of how these ideas are spread and the impact such novelty has. The interaction between individuals within the system is conceptualised as the central ‘place of change’ (Fichter, 2014). We therefore focus our analysis on university support activities and the interactions related to them. We differentiate between internal interaction (interaction between university actors) and external interaction between university and external actors.

Since university support for entrepreneurship is not limited to internal support for spin-off activities of students, researchers, and professors (academic entrepreneurship), but also comprises specific tasks such as technology transfer, patenting and commercial outputs as well as extensive cooperation with external actors, we felt it was most appropriate to base our conceptual framework on interactive and systemic concepts. The triple helix model deals specifically with the interaction among industry, university, and government at the local, regional, and national level (Etzkowitz and Leydesdorff, 2000). This model calls attention to the interdependencies between these three spheres of influence and to the dynamic processes through which actors mimic each other’s roles. In the triple helix model the role of universities becomes an entrepreneurial one, emphasising proactivity in commercialisation of knowledge and research results (Etzkowitz and Klofsten, 2005). The concept of entrepreneurial university (Etzkowitz et al., 2000; Etzkowitz and Klofsten, 2005; Ranga and Etzkowitz, 2013) is based on the triple helix model and provides a systemic perspective on universities and was suitable for our purpose. Etzkowitz (2001) describes the capitalisation of knowledge as a transformation of the role of the university in society comparable to the first academic revolution of the late 19th century and early 20th century when research became an accepted academic task in addition to teaching. Over the last few decades, universities have embraced a third central role: to make solution- and action-orientated contributions to societal challenges. Universities take on an entrepreneurial role as a transformation and
innovation actor and play a unique role in society, providing a community of experimentation and innovation (Wissema, 2009).

We perceive the entrepreneurial university as an integral part of the triple helix model and regional and transregional innovation systems (Astheim and Gertler, 2005; Geels, 2004). Examples of university involvement in transregional innovation systems are the Knowledge And Innovation Communities (KICs) of the European Institute of Innovation and Technology (EIT).

In regard to entrepreneurial support and the development of innovations, there are numerous relationships and forms of interaction between internal actors of a university and external actors. Building on the interactive school of innovation theory (Fichter, 2013) we use an open innovation concept (Chesbrough, 2006; Enkel et al., 2009) to describe and analyse these interactions between the university and external key actors. By putting the university at the centre of an open innovation model, support activities can be differentiated and related to inside-out activities (e.g., knowledge transfer to external actors, academic spin-offs, licensing, consulting of SMEs), networking and cooperation (e.g., joint research projects, master’s theses with industrial partners and regional clusters) and outside-in activities (e.g., industry partners as mentors in university business plan competitions, entrepreneurs and industrial partners participating in extracurricular courses or utilising office and laboratory space in universities’ incubators). These three types of interaction between university members and external actors can be perceived as part of the triple helix model, and can be related to interdependencies with government and industry.

Based on an extensive literature review, Rothaermel et al. (2007) identified four research areas that emerged from a detailed analysis of 173 articles:

1. the entrepreneurial university
2. productivity of technology transfer offices (TTOs)
3. new firm creation

The research on the entrepreneurial university views entrepreneurial activity as a step in the natural evolution of a university system that emphasises economic development in addition to the more traditional mandates of education and research. “Consequently, most of the articles in this research stream attempt to reveal organisational designs of universities (‘structure’) that inhibit or enhance the commercialisation of university inventions. Studies have revolved around incentive systems, university status, location, culture, intermediary agents, focus, experience, and defined role and identity” [Rothaermel et al., (2007), p.708]. Discussion on the entrepreneurial university is thus related to institutional framing and issues of university strategy, structure and culture, so we took institutional framing as one element in our conceptual framework. According to Etzkowitz et al. (2000) the concept of the entrepreneurial university describes an academic structure and function that is revised through the alignment of economic development with research and teaching as academic missions. We extended this understanding to include the universities’ obligations to support sustainable development in local, regional and national environments and integrate sustainability issues within the concept of the entrepreneurial university. We also used other research areas identified by...
Rothaermel et al. (2007, p.707, ff.) in our conceptual framework. We included the work of TTOs and other transfer activities, and labelled this field of support activity ‘transfer activities’. We also included ‘new firm creation’ and the ‘environmental context’ as important elements in the framework. Two fields missing in the conceptual framework of Rothaermel et al. (2007, p.707) are teaching and research as the traditional fields of activity and key roles of universities. These are very important in supporting sustainable entrepreneurship. Against this background we developed a conceptual framework that differentiates between internal interaction and external interaction while also structuring the university into five internal fields of activity (see Figure 1).

**Figure 1** Potential fields of support activities of universities for sustainable entrepreneurship and innovation (see online version for colours)

The institutional framing (1) leads the top down processes for implementation of entrepreneurship and sustainability by defining the strategy and mission, organising the structures and functions of the institutions (e.g., professorships for entrepreneurship) and developing the culture of the university (Jacob et al., 2003). University presidents, chancellors, directors, deans and governing bodies play a key role here (European Commission and OECD, 2012). According to the extended role of the university, which we described above, we divided the basic activities into education activities (2) (e.g., teaching activities), research activities (3), and transfer activities (4). Based on the open innovation concept described above, we differentiate between the following types of transfer activities: inside-out activities (e.g., knowledge transfer to industry partners, TTOs, patenting, licensing etc.), cooperation (e.g., joint R&D projects with external partners) and outside-in activities (e.g., industry partners as mentors in university business plan competitions, participation of entrepreneurs and industrial partners in extracurricular courses). The university’s support activities for new firm creation
(European Commission and OECD, 2012, pp. 10–11; Grave et al., 2014) include consulting members of the university (students, researchers, professors etc.) in their entrepreneurial endeavours, coaching academic start-up teams, and supporting them by providing infrastructure within university entrepreneurship centres, incubators or programs (e.g., entrepreneurship summer schools). In our conceptual framework, these are grouped together into the activity field support activities for new firm creation (5).

The shift to more entrepreneurial activities arises from both the internal development of the university and external influences on academic structures (Etzkowitz et al., 2000; Rothaermel et al., 2007). Thus we expected that the five elements would be mutually dependent on the environmental context and the interaction with external actors such as government, industry or civil society. Here we applied the systemic and interactive perspective described above. The entrepreneurial university is influenced by national and regional universities, innovation and entrepreneurship policies and regional development strategies, and is embedded in regional and transregional innovation systems. In terms of our open innovation approach, support activities can be related to different forms of interaction between the university and external actors such as companies, start-ups and innovation networks. We categorise these open innovation activities in our conceptual framework as inside-out activities, cooperation and outside-in activities (Enkel et al., 2009).

We used this conceptual framework to systematically answer our research question. We analysed each framework element (institutional framing, education, research, transfer, and support for new firm creation) regarding the status quo of the specific support activities for sustainable entrepreneurship.

3 Method and data

3.1 Method and case selection

We took a qualitative case-based approach. Case-based research is appropriate when existing theories or the available data are insufficient to engage in quantitative hypothesis testing and when the researcher desires to gain an in-depth understanding of a complex phenomenon within its specific context (Eisenhardt and Graebner, 2007; Yin, 2009).

To identify appropriate cases, we comprehensively researched the literature and the Internet. The geographical scope of our research focused on five selected countries: Finland, Germany, Sweden, the UK and the USA. We used the eco-innovation scoreboard (Eco-IS) to select the first four of these five countries (EIO, 2016). The Eco-IS has 16 indicators that illustrate both eco-innovation performance and the level of development of the support system for eco-innovation across the EU member states. We assumed the leading countries on the Eco-IS would have the EU’s most highly developed good practice cases for university support systems for eco-innovation and sustainable entrepreneurship. In the top four we found

1 Finland and Sweden
2 Germany
3 Denmark
4 the UK.
Finland, Germany and Sweden were selected as they were the countries of the project partners and the governmental organisations that funded the research project. The UK was selected due to it being Europe’s most international education market (Hemsley et al., 2010) and for its cultural position “between the US and other European countries”. The USA was selected for a better global perspective as it is the world’s most global market in higher education (CWCU, 2014). Its business schools set milestones and its entrepreneurial centres for global technology entrepreneurship serve as templates for entrepreneurial ecosystem development, and we therefore assumed it would provide appropriate good practice cases outside the EU. Other countries were not considered due to the limited resources of the research project. To find the relevant universities within the countries we used country-specific university rankings (Grave et al., 2014; Net Impact, 2014; The Aspen Institute, 2012) as starting points. Findings from literature and Internet research for Finland, Germany and Sweden were supplemented by 12 expert interviews. As a result, 41 good practice examples were identified.

Table 1  Study design and case selection criteria

<table>
<thead>
<tr>
<th>Multi case study design</th>
<th>University as whole organisation</th>
<th>University with natural sciences and engineering as core areas</th>
<th>University with social sciences as core areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit of analysis</td>
<td>University with entrepreneurial focus</td>
<td>University with sustainable focus</td>
<td>University with entrepreneurship support (activity or program)</td>
</tr>
<tr>
<td>Technical or non-technical profile</td>
<td>USA</td>
<td>Germany</td>
<td>USA/GER</td>
</tr>
<tr>
<td>University focus</td>
<td>Level of advancement: breadth and scope of explicit sustainable entrepreneurship support (activity or program)</td>
<td>Heterogeneity: university types (entrepreneurial, sustainability); countries (USA/GER)</td>
<td>Field access: access to relevant actors of the case for interviewing</td>
</tr>
<tr>
<td>Selected countries</td>
<td>Different perspectives of involved actors</td>
<td>University management (president, president’s office, dean)</td>
<td>Entrepreneurship experts (professors of entrepreneurship/ director of an entrepreneurship centre)</td>
</tr>
</tbody>
</table>

We used detailed descriptions of these good practice examples (Geier and Fichter, 2015) to identify cases for our in-depth analyses. Because of limited resources, we balanced the two aims of gaining multi-faceted results from different cases (a multi-case study design) and analysing the cases in more detail, by choosing four universities from the most advanced ‘good practice’ cases. To select the four cases we used following criteria (Gorden, 1975):

1  The level of advancement in sustainable entrepreneurship support: the breadth and scope of explicit sustainable entrepreneurship support activities and programs. Cases had to have activities in all elements of our conceptual framework (institutional framing, education, research, transfer, and support for new firm creation).
Heterogeneity: cases with different foci (entrepreneurial, sustainable), profiles (technical, social sciences) and from different countries, in order to represent different contextual settings.

Field access: access to the relevant actors of the case for interviewing. Based on these selection criteria we chose four universities with two different foci (two with more entrepreneurial focus and two with a more sustainable focus), with two different profiles (two technical universities and two non-technical universities) and from two different countries (two from the USA and two from Germany). Within each case, we included the different perspectives of interview partners from university management, research and teaching in the fields of entrepreneurship and sustainability, as well as an external perspective.

Data collection and analysis

To collect our data, we used the triangulation method which combines online and offline document analysis, revision of the results by members of the universities, and guideline-based in-depth interviews with different relevant actors involved in the case. In each of the four cases we interviewed six different persons representing different perspectives such as university management, research, teaching and an external perspective. In total, 24 in-depth interviews were conducted. Recordings of over 956 minutes were made (the average duration of an interview being 40 minutes) and transcribed in the original languages (English and German).

The data from the document analyses and the interviews was evaluated through coding and analyses with MaxQDA. The coding category system was developed using a combined deductive and inductive approach. Initially, a code category system based on the conceptual framework and the guiding questions was developed deductively. In the pre-coding process (five interviews) various adjustments were inductively made, with the main code categories being divided into more specific sub-code categories. New codes were added to represent the inductively derived categories. To ensure the analysis was objective and reliable, three of the project researchers independently coded the same interview to pre-test the coding system. The results were compared, variations were discussed and adaptations of the code system were made until an appropriate level of intercoder reliability was achieved. The coding using the final code system was performed by one person. Having only one coder has the advantage of reducing variations due to personal coding behaviour and increases coding consistency. At the same time, intercoder reliability of final coding is not controlled for the subjective interpretation. Thus both approaches (having one or several coders) involve advantages and disadvantages. Since we had controlled intercoder reliability in the pre-test, we decided to choose the approach of one coder.

Case analyses

To answer our research question, we analysed the relevant support activities and classified these activities according to our conceptual framework elements (see Figure 1): institutional framing, education, research, transfer, and support for new firm creation. We
analysed each case separately, looking at the relevant supporting activities and the design of the support system for each case in detail, then we conducted a cross-case analysis investigating the data in aggregated form to compare the cases.

4.1 Individual case analyses

4.1.1 Case: German university GER U1

Our first case is a medium-sized university in Germany. It was founded in the 1980s and characterises itself as a humanistic, proactive and sustainable university with entrepreneurship as a cross-cutting theme. Several interesting sustainability-related supporting activities for entrepreneurship and innovation were identified (see Table 2).

This case notably features explicit elements within the institutional framework of the university that cover both the topics of sustainability and entrepreneurship. Interestingly, the university mission statement treats entrepreneurship and sustainability as two co-existing strategic aims, but does not explicitly connect them. It defines an entrepreneurial university as a proactive university which fosters the development of proactive individuals who demonstrate creativity and thoughtfulness as well as the willingness and ability to creatively shape society. The concrete support activities for sustainable entrepreneurship integrate the two perspectives and focus primarily on education and research. These activities are located within the sustainability faculty of the university. They offer modules and programs which sensitise students to environmental protection and sustainability in conjunction with business and entrepreneurship education. The sustainability faculty conducts several large research projects on specific topics, such as sustainable business model assessment or sustainability transformation of businesses and markets, and organises research conferences with a specific focus on sustainable entrepreneurship. These integrative activities are designed and promoted mostly from the bottom up by individual professors and staff members.

4.1.2 Case: German university GER U2

Our second case is a young medium-sized German university. It was founded at the end of the 1970s and can be characterised as a technical university with a focus on entrepreneurship and green technologies. The following support activities for entrepreneurship and innovation were identified as sustainability related (see Table 3).

In this case the university strategy promotes the institutional integration of green technologies and green entrepreneurship in a top-down approach. The university management has set clear strategic objectives and builds a comprehensive structure to support entrepreneurship activities within the field of green technologies (innovation centre for green technologies, start-up consultant for green technology, etc.). Sustainability and entrepreneurship issues are connected in a way that is more integrative than additive. Specific challenges and opportunities of sustainable business ideas are addressed by specific support offerings (e.g., start-up consultant/expert for green technologies; start-up prize for sustainability etc.). The university has also strong bonds to industrial partners due to its technical competencies. The focus on entrepreneurial activities within the field of green technologies is supported through interactive cooperation between the university and its industrial partners.
<table>
<thead>
<tr>
<th>Institutional Framing</th>
<th>Education</th>
<th>Research</th>
<th>Support</th>
<th>Transfer</th>
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<tr>
<td><strong>Strategy:</strong> In the mission statement the university sees itself as a humanistic, sustainable and proactive university</td>
<td>Bachelor’s module and MBA program which sensitize the students to environmental protection and sustainability in conjunction with business and entrepreneurship education</td>
<td>Several research projects in the field of sustainable entrepreneurship: e.g., sustainability-oriented business model assessment; sustainability transformation of business models and markets, science-society collaborations for sustainability innovations, sustainable innovation</td>
<td>General career, start-up and technology transfer service</td>
<td>Collaboration with several leading universities and their corporate partners to study sustainability-driven innovation</td>
</tr>
<tr>
<td><strong>Structure:</strong> Sustainability faculty, centre focused on sustainability management topics with a professorship of sustainable management and professorship of social entrepreneurship</td>
<td>Course offerings in the field of sustainable and social entrepreneurship</td>
<td></td>
<td>Innovation incubator with some focus on sustainable services and business ideas that are best suited to create new companies and jobs in the region</td>
<td>Association for sustainable research, a network to strengthen the sustainability sciences</td>
</tr>
<tr>
<td><strong>Culture:</strong> Sustainability and entrepreneurship are both cross-cutting university-wide issues</td>
<td>Interdisciplinary first-semester modules with focus on sustainability and entrepreneurship for all students from different studies, complementary studies with focus on sustainability and entrepreneurship</td>
<td>Conference on entrepreneurship with focus on sustainable entrepreneurship</td>
<td>Interactive platform for social entrepreneurs to promote student engagement and activity in social entrepreneurship</td>
<td>Innovation network with sustainable SMEs supports to innovate for sustainability</td>
</tr>
<tr>
<td></td>
<td>Extra-curricular projects and student initiatives in the field of social entrepreneurship</td>
<td></td>
<td></td>
<td>University-SME network with a focus on resource and material efficiency</td>
</tr>
<tr>
<td>Institutional framing</td>
<td>Education</td>
<td>Research</td>
<td>Support</td>
<td>Transfer</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-----------</td>
<td>----------</td>
<td>---------</td>
<td>----------</td>
</tr>
<tr>
<td><strong>Strategy</strong>: The university vision and guidelines for six-year presidency are focused on research on global socio-technical challenges, positioning itself as an entrepreneurial university, and gradual expansion into a sustainable university. Defined university mission with themes of sustainability and entrepreneurship.</td>
<td>Curricular courses in the fields of environmental management and corporate responsibility, business model generation with focus on green technologies, corporate entrepreneurship and green innovation, etc.</td>
<td>Various application-oriented research projects in the field of green technologies.</td>
<td>Various integrative sustainability support activities: innovation centre for green technologies, start-up consultant for green technologies and start-up prize for sustainability.</td>
<td>Online platform for sustainable entrepreneurship collaboration between local universities.</td>
</tr>
</tbody>
</table>
4.1.3 Case: US university US U1

Our third case is a medium-sized US university founded in the 19th century. It can be characterised as a value-driven university underpinned by a strong ethical tradition and a focus on social entrepreneurship, with a strategic priority to support social entrepreneurs in addressing climate change. The following sustainability-related support activities for entrepreneurship and innovation were identified (see Table 4).

The elements of the institutional framing support sustainable entrepreneurship in this case. One key strategic aim is engagement with industry to become immersed in entrepreneurship and sustainability. An important structural element is a centre for social entrepreneurship whose mission is to accelerate global, innovation-based entrepreneurship in service to humanity. As opposed to many other university entrepreneurship programs, this university concentrates primarily on existing entrepreneurs who are not part of the university. Instead, the program recruits for excellence in the social enterprise field in order to maximise positive environmental impacts. University students can then benefit from the external network of the program and participate in practical learning as an elective forming part of their undergraduate education. Thus the focus of support activities is primarily on institutional framing, transfer, and education.

4.1.4 Case: US university US U2

Our fourth case is a large US university founded in the late 19th century. Its focus on environmental science and management is located in a specific school founded in the 1990s. It has had a key focus on sustainable business and eco-entrepreneurship for the last ten years. Its specialisation in corporate environmental management teaches students how private sector firms may address environmental and natural resource issues in a manner that also promotes shareholder value, thus creating the important link between a quality of environmental and natural resources and a firm’s overall market objectives. The following sustainability-related support activities for entrepreneurship and innovation were identified (see Table 5).

In this case, specific supporting activities for sustainable entrepreneurship focus primarily on a single school of a large university, thus institutional framing is limited to a single unit of the whole organisation. The entrepreneurship program is designed bottom-up, is out of the school, and has its roots in environmental science rather than in business. It follows the integrative approach by developing entrepreneurial solutions with a specific focus on ecological issues (eco-entrepreneurship). The program has strong external business connections, with a strong entrepreneurial focus rooted in a capstone project that allows students to interact with “the real world”. The program is comprehensive in its interdepartmental approach through collaboration with a technology management program of the engineering department, but the supporting activities primarily reach students of the particular school rather than of the whole university.
<table>
<thead>
<tr>
<th>Institutional framing</th>
<th>Education</th>
<th>Research</th>
<th>Support</th>
<th>Transfer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strategy:</strong> The vision of the university focuses on the education of citizens and leaders of competence, conscience, and compassion and on cultivating knowledge and faith to build a more sustainable world; strategic priorities include engagement with industry to become immersed in entrepreneurship, innovation and sustainability and to advance the knowledge and understanding of the ways in which social justice and sustainability intersect.</td>
<td>A centre that teaches social entrepreneurship in partnership with other campus units. A fellowship program that leverages the learning asset of an alumni network of 300+ social enterprises for faculty and students. The fellowships provide a comprehensive program of mentored, field-based study and action research for undergraduate juniors within the alumni network of social entrepreneurs.</td>
<td>Private grant program, administered by the centre for social entrepreneurship, supporting faculty and student research in science and technology for social benefit across campus.</td>
<td>The accelerator program prepares advanced social enterprises for growing impact and securing capital investments; social entrepreneurs work alongside mentors to complete online modules, which refine their business models and identify growth opportunities.</td>
<td>Except for the fellows program, the centre's focus is on the environment outside of the university: mentors are entrepreneurs, investors and technology leaders, and the beneficiaries of the program are social entrepreneurs, in most cases with a focus on developing countries.</td>
</tr>
<tr>
<td><strong>Structure:</strong> Centre for social entrepreneurship with the mission of accelerating global, innovation-based entrepreneurship in service to humanity; institute and accelerator program with a focus on global social benefits; engineering school with an innovation lab whose purpose is to support students in developing adaptable, affordable, and accessible technologies and products for emerging markets.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Culture:</strong> A mission-driven university which attracts people interested in social entrepreneurship.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Institutional framing</td>
<td>Education</td>
<td>Research</td>
<td>Support</td>
<td>Transfer</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-----------</td>
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<td>----------</td>
</tr>
<tr>
<td><strong>Strategy:</strong> The mission of the school focuses on taking a leading role in researching environmental issues, identifying and solving environmental problems, and training research scientists and environmental management professionals; eco-entrepreneurship is a core topic at the school&lt;br&gt;&lt;br&gt;<strong>Structure:</strong> A school with a focus on environmental science and management; professorship in the field of corporate environmental management; informal cooperation between the environmental sciences school and the school of engineering sciences</td>
<td>Master’s studies with focus on environmental sciences and management issues, with modules in corporate environmental management and in eco-entrepreneurship</td>
<td>Strategic environmental research initiative based on strategic plan of the school, which takes an interdisciplinary approach to addressing environmental challenges</td>
<td>General start-up support service is provided by the office of technology transfer&lt;br&gt;Offerings such as new venture competitions provide opportunities for any student from different subjects to learn how to start a business&lt;br&gt;Project-based internship programs designed to improve the support given to eco-entrepreneurship teams interested in pursuing their ventures after graduation; formalised process of providing financial support, resources and guidance for recent graduates</td>
<td>Faculty members of the school play leading roles in advising government agencies, corporations, and non-profit organisations about science, management, and policy questions&lt;br&gt;Group projects or eco-entrepreneurship projects within the master’s program, which involve small groups of students partnering with outside clients to solve a real-world environmental problem&lt;br&gt;Eco-entrepreneurship advisory council (external members) which guides, supports, and promotes eco-entrepreneurship education and serves as the primary conduit between the school and the entrepreneurial and investor communities</td>
</tr>
</tbody>
</table>
4.2 Cross-case analysis

When we compared the cases, we made several observations: First, approaches for implementing support activities and the objectives of sustainable entrepreneurship in the university support system range from clearly defined approaches focusing on social or eco-entrepreneurship (e.g., specific eco-entrepreneurship projects within the master’s program) to fuzzily defined approaches aimed at sensitising and motivating large numbers of students on the basis of more general concepts (e.g., ‘responsible and proactive solutions for societal problems’). Second, we were also able to distinguish between integrative approaches and additive approaches. Integrative approaches are supporting activities which consider sustainability and entrepreneurship as a combined issue rather than as separate issues. Examples include university business plan competitions which integrate sustainability criteria into the larger set of assessment criteria or which offer an award category for sustainability, and research conferences on entrepreneurship or innovation management which offer sessions on sustainable entrepreneurship alongside other topics. In contrast, additive approaches address sustainability and entrepreneurship issues in separate activities and programs. This could mean treating entrepreneurial orientation and sustainability as two separate strategic objectives in the university strategy, or offering general start-up support and general entrepreneurship courses to all students and researchers, including those from green technology or sustainability disciplines.

Table 6  Cross-case comparison of coding frequency within the conceptual framework elements

<table>
<thead>
<tr>
<th>Framework Element</th>
<th>GER U1</th>
<th>GER U2</th>
<th>US U1</th>
<th>US U2</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Institutional framework</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In general</td>
<td>19</td>
<td>21</td>
<td>9</td>
<td>3</td>
<td>52</td>
</tr>
<tr>
<td>Strategy</td>
<td>2</td>
<td>7</td>
<td>2</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>Structure</td>
<td>10</td>
<td>9</td>
<td>5</td>
<td>2</td>
<td>26</td>
</tr>
<tr>
<td>Culture</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In general</td>
<td>16</td>
<td>13</td>
<td>3</td>
<td>4</td>
<td>36</td>
</tr>
<tr>
<td>Curricular</td>
<td>9</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>16</td>
</tr>
<tr>
<td>Extracurricular</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td><strong>Research</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In general</td>
<td>7</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td><strong>Support for new firm creation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In general</td>
<td>6</td>
<td>7</td>
<td>2</td>
<td>3</td>
<td>18</td>
</tr>
<tr>
<td><strong>Transfer</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In general</td>
<td>17</td>
<td>20</td>
<td>5</td>
<td>9</td>
<td>51</td>
</tr>
<tr>
<td>Cooperation with industry</td>
<td>8</td>
<td>7</td>
<td>0</td>
<td>2</td>
<td>17</td>
</tr>
<tr>
<td>Cooperation within networks and initiatives</td>
<td>7</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>Outside-in activities</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>
After analysing each individual case in a qualitative manner, we analysed all the cases in a more aggregated form, comparing the coding frequency across the cases. In particular, we analysed the coding frequency of the code categories for the conceptual framework elements (institutional framework, education, research, transfer, and support for new firm creation). The aggregated results of this analysis are shown in Table 6.

Almost all coding could be assigned to the deductively generated categories of the conceptual framework. Only a few additional comments could not be assigned and were grouped together as ‘other’. The sub-category ‘cooperation’ was inductively divided into two sub-categories: ‘cooperation with industry’ and ‘cooperation within networks and initiatives’. The most coding were found in the categories ‘institutional framework’ and ‘transfer’, followed by the category ‘education’. Within the ‘institutional framework’ category, the sub-category ‘structure’ was the category used most by the interview partners. Within the ‘transfer’ category, inside-out activities and cooperation with industry were mentioned most by the interview partners. Within the ‘education’ category, the curricular seminars and programs were the categories cited most. Least mentioned was the ‘research’ category. With exception of GER U1, few specific research activities regarding sustainable entrepreneurship could be identified.

Analysing the institutional framework in more detail, we identified different design strategies for university support of sustainable entrepreneurship (see Figure 2).

**Figure 2** Design strategies of support systems for sustainable entrepreneurship (see online version for colours)

(a)   (b)   (c)

Notes: (a) Top down; (b) Bottom up; (c) Combined.

- **Top-down**: e.g., university management defines a university strategy related to entrepreneurship and sustainability and develops structures and supportive culture accordingly.
- **Bottom-up**: e.g., the supporting activities are based on initiatives of individual staff members (professors, lecturers and TTOs) according to their own interests and competencies.
- **Combined**: simultaneous occurrence of both top-down and bottom-up strategies.

In some cases we observed unplanned emergent developments, for example from external cooperation or a research project.

The most coding were assigned to the top-down category. In the German cases especially, university management defines a specific university strategy, develops structures accordingly and establishes a supportive culture. The bottom-up strategy was the most dominate pathway only in the case of US U2.
Table 7  Cross-case comparison of the coding frequency of design strategies for sustainable entrepreneurship

<table>
<thead>
<tr>
<th></th>
<th>GER U1</th>
<th>GER U2</th>
<th>US U1</th>
<th>US U2</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top-down</td>
<td>6</td>
<td>9</td>
<td>3</td>
<td>1</td>
<td>19</td>
</tr>
<tr>
<td>Bottom-up</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>Combined</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Emergent</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>5</td>
</tr>
</tbody>
</table>

5 Discussions

To answer our research question, we first developed a conceptual framework to structure the support system for entrepreneurship at universities in five key fields of activity. We analysed the relevant activities for each case and classified these activities according to the criteria of our conceptual framework.

In the case studies we began by analysing each case separately, looking at the relevant support activities in detail. We found diverse and heterogeneous approaches within different contexts. The specific and integrative support activities for GER U1 focus primarily on education and research and are located within the sustainability faculty of the university. By contrast, the dominant approach in the GER U2 case is the specific integration of green technologies and entrepreneurship issues on a whole-of-institution basis (strategy, structure, and culture). The US U1 case, too, had developed strong institutional framing, with a focus on external networking. Its entrepreneurship programs concentrate primarily on external social entrepreneurs who are not members of the university. The supporting activities of the final case, US U2, focus primarily on a single school of the university. The program has strong business connections and a strong entrepreneurial focus rooted in a capstone project that allows students to interact with industrial partners. These different approaches demonstrate an emerging field of action which is characterised by experimentation. No dominant design of support system for sustainable entrepreneurship can yet be observed.

We found very different understandings of what ‘sustainable entrepreneurship support’ is supposed to mean, ranging from clearly defined interpretations focusing on social or eco-entrepreneurship to rather fuzzy interpretations with a less defined focus. This demonstrates that, even in the small group of leading universities, support for sustainable entrepreneurship is not a clearly defined term and is as yet far from being a well understood construct.

The results show that two basic forms of implementation approaches can be distinguished:

1. an additive approach where entrepreneurial orientation and sustainability are two separate strategic objectives
2. an integrative approach where, for example, specific teaching activities partially or fully combine both topics in one integrated perspective on sustainable entrepreneurship.
The integrative approach is more widespread within the cases we analysed. This could mean it is an important factor for the explicit support of sustainable entrepreneurship.

After analysing each case in a qualitative manner we conducted a cross-case analysis of the data in an aggregated form, comparing the cases. By analysing each framework element (see Figure 1) of the university support system for sustainable entrepreneurship, we identified examples of support activities for all elements. Almost all activities could be assigned to one of the framework elements. Under the ‘other’ category, only a few additional comments could be identified which were not directly related to the elements of the conceptual framework. We therefore determined that our conceptual framework was appropriate for describing and analysing university support systems for sustainable entrepreneurship.

We found it valuable to follow an interactive paradigm and apply a systemic perspective as a basis and to use an open innovation concept. Differentiating inside-out transfer activities, cooperation and outside-in transfer activities also proved useful. The analysis revealed that different forms of cooperation can be distinguished and that these can be assigned to the sub-categories ‘industry cooperation’ (cooperation activities with industry partners exclusively) and ‘cooperation within networks and initiatives’ (cooperation activities with different types of external actors such as external scientific partners or regional governing bodies).

The ‘institutional framework’ has been emphasised by the interviewees as an important influential factor, and especially its sub-element of ‘structure’. The establishment of sustainability departments, entrepreneurship centres, professorships and Bachelor’s/Master’s courses with a specific focus on sustainable entrepreneurship seem to be an important factor for the long-term implementation of specific support activities. The role of creating new suitable structures fits very well into the creation perspective in the sustainable entrepreneurship literature (see Section 2.1.1) emphasising the active role of universities in creating sustainability-oriented change and their proactive role as creativity supporting and action oriented platforms.

Analysing the institutional element ‘strategy’ in more detail, we were able to differentiate between different design strategies for specific support systems. In our small sample the top-down approach was the dominant strategy. In the US U2 case, which had low top-down influence, many obstacles were reported and the supporting activities focused mainly on a single school rather than the whole university. Based on this analysis, the top-down approach seems to be an important factor driving the development and implementation of the specific support systems. Strong leadership commitment and good governance seems to be crucial to developing a comprehensive support system for sustainable entrepreneurship.

Education was the third most frequently used activity field of university support for sustainable entrepreneurship in our case studies. Education is important for sensitising students and developing their skills and expertise. Curricular courses play an important role in the long-term implementation of sustainable entrepreneurship education. However, extracurricular courses are often used to integrate knowledge from external partners (e.g., entrepreneurs and industrial partners) and are also an essential part of the pathway to actual practice.

The framework element that appeared least was the ‘research’ category. With the exception of GER U1, few specific research activities on sustainable entrepreneurship were identified. This may indicate that, in comparison with other elements of the university support system, research on sustainable entrepreneurship is lagging behind.
6 Conclusions

Our research suggests a growing number of universities are embracing the notion that sustainability should and can be integrated into the university support system for entrepreneurship, or that sustainability activities should be implemented and promoted with entrepreneurial spirit. This relates positively to the demands by policy makers that green entrepreneurship should be addressed in (higher) education to prepare the mind-set of future green entrepreneurs, and that it should be encouraged by helping potential entrepreneurs identify sustainable business opportunities, including through new creative forms of cooperation between business and academia (European Commission, 2014). At the same time, our literature review illuminates the lack of research on university support systems for sustainable entrepreneurship. Our case studies support this finding. Even among the four leading cases of university support for sustainable entrepreneurship that we examined, only a few specific research activities could be identified.

With regard to our research question ‘How do leading universities support sustainable entrepreneurship and how are their support systems designed?’ our case study results suggest that the efforts of leading universities have been hitherto focused principally on the transformation of institutional framing and on implementing practical support for sustainable entrepreneurship in transfer activities. Specific research on sustainable entrepreneurship is a minor field of activity in comparison to these main fields of university support. Given that support for sustainable entrepreneurship is a very new field of university activity, and that very little experience and knowledge is as yet available, we conclude that the present low level of research activity is a clear deficit and that research should be increased in order to generate empirical insights on the requirements and success factors of implementing effective university support systems for sustainable entrepreneurship.

6.1 Insights for future research

Our research results provide initial insights and are a basis for future research.

First, we have developed a conceptual framework that structures the unit of analysis and classifies potential activity fields of university support for entrepreneurship. The framework proved suitable for empirical investigations and supports future research by providing a descriptive model which subdivides the university support system into five key areas of support activity. It was helpful to base the framework on an interactive paradigm and to use interactive concepts such as the triple helix model and the open innovation concept. The differentiation between inside-out transfer activities, cooperation (industry cooperation and cooperation within networks and initiatives) and outside-in transfer activities was also of value. It also proved to be helpful to employ a conceptualisation of sustainable entrepreneurship (see Section 2.1.1) that includes opportunity seeking as well as a creation perspective which emphasises the active role of universities in creating sustainability-oriented change. This creation view of universities is very useful for understanding the role of universities in supporting sustainable entrepreneurship.

Second, we identified different approaches and designs of support systems for sustainable entrepreneurship. In the group of 41 good practice examples, which included the four detailed case studies, we did not observe a single dominant support design. This
is understandable as the phenomenon of university support for sustainable entrepreneurship is still in an early and experimental phase. The case studies show that different design strategies can be distinguished. We identified top-down, bottom-up and combined implementation strategies as well as integrative and additive support approaches for sustainable entrepreneurship.

Third, our results support the assumption that the external contextual setting (public funding of research projects, regional entrepreneurs as mentors, private beneficiaries of university programs, university networks, regional clusters, etc.) actually influences how sustainable entrepreneurship support activities are organised. Therefore a conceptual framework for further research is needed which includes interaction with the environmental context. This would allow an understanding and explanation of why and how university support systems for sustainable entrepreneurship are implemented and what options for intervention exist.

6.2 Managerial implications

Looking at the approaches of the good practice cases, the following learning and recommendations can be derived. Integrative approaches which clearly define the concept of sustainable entrepreneurship and are focused on it are important to take advantage of the specific opportunities and meet the challenges of sustainable entrepreneurs. However, general and additive approaches can be practical in order to reach a larger target group. In both cases, the university strategy and mission need to be defined and implemented with specific objectives for the integrative or additive perspective of sustainable entrepreneurship. Institutional framing and capacity building for effective university support systems seem crucial. Accordingly, structures like centres, professorships and programs focusing specifically on sustainable entrepreneurship and innovation should be implemented on a long-term basis. Curricular and extracurricular courses should be combined to provide basic and theoretical content together with practical learning. Interactive knowledge transfer between universities and external partners in the field of sustainable entrepreneurship should be pursued in various ways (inside-out, outside-in, and cooperation). And finally, research on sustainable entrepreneurship, the integration of results into teaching, and concrete start-up and entrepreneurship support activities all need to be intensified.

Our investigation demonstrates an emerging field of action which is characterised by experimentation. No dominant design of support systems for sustainable entrepreneurship can yet be observed. Therefore transparency of different approaches is needed and good practice exchange between practitioners and policy makers in the field of university and entrepreneurship policy will help them to learn from each other and to develop appropriate support systems for different university contexts. It remains open whether support systems will converge to ‘one best way’ to organise university support systems in the future or whether there simply is no ‘one best way’ to support sustainable entrepreneurship but rather various design configurations that correlate with different contingency factors.

6.3 Limitations

Our results are limited to a group of 41 good practice examples from five countries, and four detailed case studies. As the field of university support systems for sustainable
entrepreneurship is new and dynamic, it was appropriate to take a qualitative approach. Once university support for sustainable entrepreneurship is more widespread, a quantitative approach should be taken to verify and generalise our results. The diverse factors influencing the evolution of support systems for sustainable entrepreneurship appear to be an interesting topic for further research. When analysing design strategies of effective university support systems for sustainable entrepreneurship, the concept and literature of organisational change could assist in developing strategies for redesigning, transforming and expanding existing university support systems.

Acknowledgements

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