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Incorporating Design Thinking into Sustainable Business Modelling

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Abstract *Purpose: This paper includes design thinking in the sustainable business modelling process to improve the creative process of embedding sustainability into the value proposition. A new workshop process has been developed and tested.*

Design/methodology/approach: On the basis of literature reviews and expert interviews as well as an existing value mapping framework, a new workshop framework was developed. Subsequently, the framework was piloted and transferred into a workshop routine, which was then tested with student groups as well as a company. The results of these tests were analysed and the workshop framework consequently refined.

Findings: A 'value ideation process' was developed for sustainable business modelling which comprises value ideation, value opportunity selection, and value proposition prototyping.

Practical Implications: This workshop supports ideation, understanding, and communication of opportunities to enlarge the value proposition of businesses to comprise additional forms of value and include formerly unattended stakeholders.

Originality/value: This workshop routine combines existing approaches of value mapping and Design Thinking in a novel way to assist companies in enhancing their value proposition in regard to the creation of positive value and the allowance for stakeholder interests.

Keywords: Business model, Sustainability, Business model innovation, Sustainable business model, Sustainable value, Value creation, Design Thinking, Value proposition prototyping

1. Introduction

As the unsustainability of the current economic system becomes increasingly apparent and acknowledged, efforts aiming at a transformation to an economically, socially, and environmentally sustainable system are gaining importance (WWF 2014; WBCSD 2010; Ehrenfeld 2008; Elkington 1997; Jackson 2009; Meadows et al. 2004). It can be argued that private businesses possess the right resources and capabilities to implement sustainability (Porter 2013; WBCSD 2010) and, so, are a

key actor to drive this transition. By embracing sustainable approaches, firms can gain competitive advantages by cost reduction, product diversification, risk mitigation, and additional value creation opportunities (Porter and Kramer, 2011). Cost reductions can be achieved due to efficiency gains, as demonstrated by a range of case studies in (Evans 2009) and (Bocken et al. 2014). Industrial sustainability strategies that maximise material productivity, resource efficiency and waste reduction (Bocken et al. 2014), thus can save environmental as well as economic costs. Diversification opportunities and customer benefits could arise from product, service, and product service system (PSS, see e.g. Tukker 2006) innovations that are developed to meet sustainability objectives. Risks from the organisation's environment can be mitigated due to active exchange with stakeholders and proactive management of their interests (Choi, Wang 2009). Finally, additional value creation opportunities in the firm's value network can be identified by closer and broader cooperation with various stakeholders (Nidumolu et al. 2009; Porter 2013; Evans 2009; KPMG 2014)

To make the transition to a sustainable industrial system, stepwise changes are required to the way business is done. One fundamental and therefore potentially very promising way for companies to realise competitive benefits and allocate the resources of business to the 'service of sustainability' is to implement sustainable value into the business model of firms, so that the business can create economic, social, and environmental benefits for a multitude of stakeholders. A key aspect in this transformation to a sustainable business model is the adoption of a sustainable value proposition that explicitly considers multiple-stakeholder value creation and particular considers 'society' and 'environment' as stakeholders (Bocken et al. 2013). Business model innovation for sustainability thus offers a platform for stepwise changes.

Designers are at the heart of new product (and service) innovation but are not necessarily equipped or trained to look at the wider impact and ways of creating value through new product and service innovations. However, this wider outlook is important to improve the success of sustainable product and service innovations. As Teece (2010) observes: every product innovation should be accompanied with a business model innovation, which defines the value capture and market penetration strategies, because product innovations in isolation do not guarantee success.

Sustainable business modelling refers to the process of developing a sustainable business model (Bocken et al., 2013). The conventional process of business model innovation is time and resource intensive, risky, and often fails to recognise the interests of all stakeholders adequately (ibid.). Various tools and methods have been developed to assist in sustainable business modelling such as the business model canvas (Osterwalder et al. 2010), the value mapping tool (Bocken et al. 2013), the strategic roadmapping tool (Phaal et al. 2004), and the sustainable business model archetypes (Bocken et al. 2014). However, this research area is still nascent and would benefit from learning from related approaches and processes.

To improve the business modelling for sustainability process and facilitate this broader way of thinking with designers, in this paper, Design Thinking principles are being incorporated in the sustainable business modelling process. Design Thinking is a collection of principles, methods, and a specific mind-set that focuses on integrating the concerns, interests, and values of humans into design efforts in an iterative and interactive way (Brown 2009; Meinel et al. 2011). A typical Design Thinking prototyping and testing phase, wherein vague but tangible prototypes of the business model are built and tested with representatives of all stakeholders could dramatically increase the probability of success of the business model innovation, while de-risking the process (Brown 2008).

This research investigates the following research question*: how can sustainable business modelling be enhanced by Design Thinking principles*?

In this paper a seven-step value mapping and value proposition prototyping workshop routine is developed which comprises value ideation, value opportunity selection, and value proposition prototyping to support multidisciplinary teams in ideation, understanding, and communication of opportunities to enlarge the value proposition of businesses in regard to comprising additional forms of value for additional stakeholders.

2. Literature review

The sustainable business model innovation area is still relatively nascent. In the literature review, first the area of sustainable business model innovation is briefly explained, followed by a section on Design Thinking as an approach to assist in sustainable business modelling and help designers in the process of rethinking not only products and services but also the business model for sustainability. Subsequently, the Value Mapping Tool, which lies at the foundation of this developed framework, is shortly introduced. Finally, the need for a sustainable business modelling process is briefly described.

2.1 Sustainable business model innovation

The concept of business models came in wider use in business practice during the dotcom boom of the 1990s (Osterwalder, Pigneur 2005; Magretta 2002; Zott et al. 2011). In this time the business model emerges as simplified description of a venture, which is aimed at attracting investors (Knyphausen-Aufseß, Meinhardt 2002). Subsequently, the concept became also subject to academic research, and a range of definition attempts have been made. Today, there is a variety of definitions, with different scopes and purposes, while, generally, “scholars do not agree on what a business model is” (Zott et al. 2011). Nevertheless, different authors such as (Zott et al. 2011) and (Rana et al. 2012) reviewed parts of the literature about the concept and identified similarities between the different definitions. Based on their work, business model can be described as simplified representations of the elements and the interactions between elements to create, deliver, capture and exchange value, which a profit-focused venture chooses. For organisations, the business model

concept can be useful for analysis, planning, and communication (Knyphausen-Aufseß, Meinhardt 2002), which makes it an promising starting point for management tools as realised, for instance, by Osterwalder et al. (2010) in their Business Model Canvas.

The concept of *sustainable* business models is elaborated upon in a range of definitions in the academic literature. Lüdeke-Freund (2012) defines sustainable business models as business models that develop competitive advantage through greater customer value, while at the same time benefiting the long-term development of the company and creating private and public benefits for society. A sustainable manufacturing perspective is offered by Garetti and Taisch (2012), who require sustainable business models to follow a global market approach that takes the development of emerging economies into account, offer more sustainable products and services, consider sustainability trade-offs, and enhance efficiency by lean principles. The concept of a sustainable business models by Stubbs and Cocklin (2008) includes structural and cultural capabilities as well as collaboration with a broad range of stakeholders to achieve economic, social, and environmental sustainability for the organisation and its environment. Schaltegger et al. (2011) define a business model for sustainability as one that actively manages social, environmental, and business activities to deliver customer and social value, while at the same time measurably or at least justifiably mitigating social and environmental concerns and creating economic advantages. Finally, according to Rana et al. (2012), “Sustainable business models seek to go beyond generating economic value primarily for customers and shareholders, but try to create social, environmental and economic value for a broader set of stakeholders in the industrial network. As such, a sustainable business model is the holistic value logic that encompasses economic, environmental and social goals while aligning the interests of all stakeholder groups.” As these definitions suggest, sustainable business models are a concept that can be based on the three different notions, business models, stakeholder management, and sustainable value creation (people, profit, planet), building on the definitions in Rana et al. (2014). While the concept of the business model has been described, sustainable value creation and stakeholder management will be elaborated upon here.

Sustainable value creation is the creation of long-term positive value in the form of well-being, improvement, continuity, and preservation of humans, companies, the society, and the environment in a way that does not compromise inter-generational equity. It should ideally deliver economic, environmental, and social benefits. The created *economic* value can include, for instance, profit, growth, or financial resilience, while the *environmental* value can manifest itself for example in guaranteeing complete regeneration and renewal of resources, avoidance of emissions, or protection of bio-diversity, and the *social* value can include poverty alleviation, community development, equality, health, safety, and secure and meaningful employment (Rana et al. 2014).

To connect the idea of sustainable value with the business model concept, the notion of stakeholder value is important. Stakeholders are individuals or groups whose interests affect or are affected by the interests of the entity considered (DIN ISO 26000; Post et al. 2002; Freeman 1984). This concept aims at delivering several kinds of value for all stakeholders of a business as opposed to delivering only monetary value to shareholders (Rappaport 1998; Freeman, Reed 1983). As illustrated in Figure 1, based on these three concepts - business models, sustainable value, and stakeholders - a sustainable business model can be defined as a simplified representation of the elements and the interactions between these elements which a venture chooses to create, deliver, capture, and exchange economic, social, and environmental value for and in cooperation with as many of its stakeholders as feasible.

For companies, establishing a sustainable business model aims at improving the economic, environmental, and social effectiveness of the business. This improvement is achieved by increases in operative efficiency on a technological basis, by improvements in the value generation capabilities of the factory management, and by performing effective stakeholder management from a strategic management perspective. Thus, a sustainable business model could enable companies to adapt optimally to their environment and achieve sustainable competitive advantages (Porter, Kramer 2011; Schaltegger et al. 2011; Hillman, Keim 2001; Nidumolu et al. 2009). A possible leverage point for companies to transform their business model is the value proposition (Osterwalder et al. 2014). The value proposition solves problems and satisfies needs for stakeholders and is a core element of business models (Osterwalder et al. 2010). By modifying the value proposition to include additional sustainable value for additional stakeholders it is proposed to ignite the transformation from a conventional to a sustainable business model.

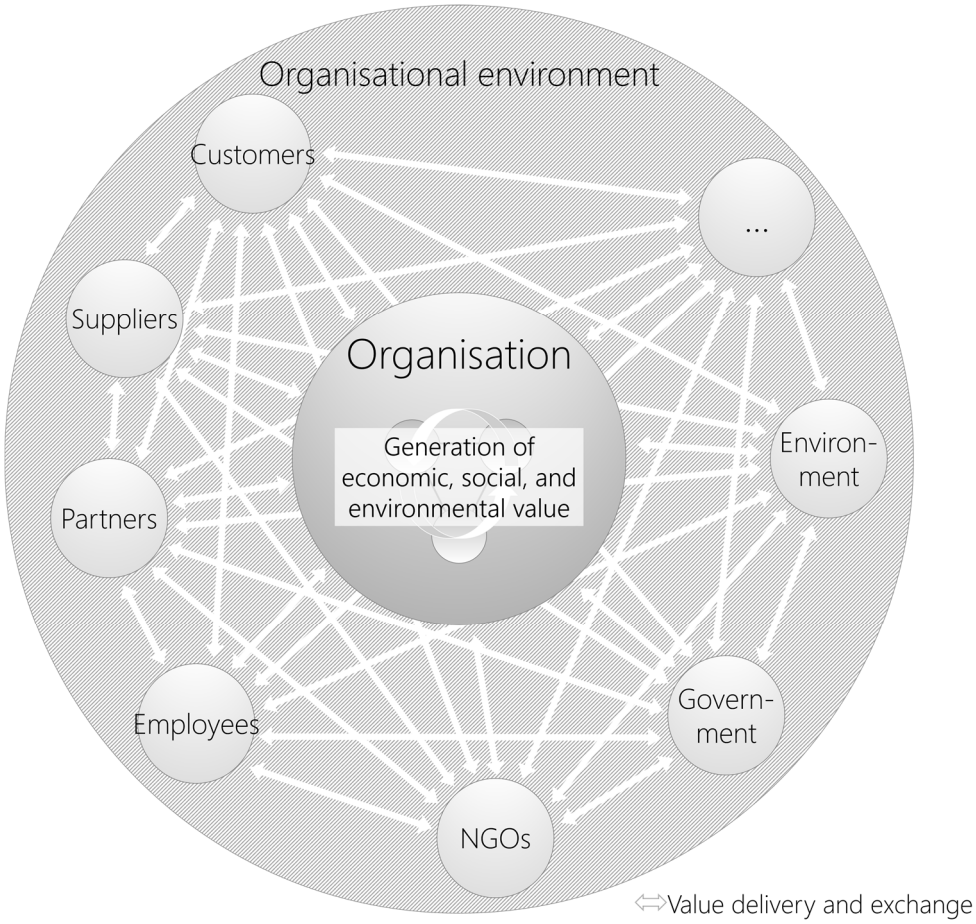

Figure 1: Sustainable business model

2.2 Design Thinking

Design Thinking embraces different notions and a specific mind-set or mentality that focuses the design process around the concerns, interests, and values of humans in an iterative and interactive way (Brown 2009; Meinel et al. 2011). Design Thinking is an iterative method for the development of innovative ideas to solve complex problems. The focus lies on innovation and the development of novel concepts. The Design Thinking process is deliberately iterative and the return to one or more phases is allowed for. The aim is to test multiple possible solutions to arrive at an optimal one (Denning 2013; Brown 2008).

The strand of Design Thinking that is considered in this project is originated with industrial product design in the company IDEO, which was founded in 1991 by David Kelley together with partnering design firms. By founding the Stanford Design Center

at the University of California, Berkeley in 2006, Kelley further popularised the concept in academia and research. This in turn prompted the public sector to apply Design Thinking whereupon different agencies commissioned IDEO to improve their processes. As a result, the company and therefore the notion of Design Thinking managed to receive a lot of public attention by successful government projects (Denning 2013).

According to SAP, a software company which applies Design Thinking in its development processes, the five core characteristics of Design Thinking are a human-centered approach, a strong integration of experimenting with artefacts, collaboration in multi-disciplinary teams, an integrative and holistic view on complex problems, and a characteristic six step process (Waloszek 2012), which can also be depicted as containing five steps (d.school 2010). These steps are “understand”, “observe”, “point of view”, “ideate”, “prototype”, and “test” (Waloszek 2012). In the five-step framework, the first two steps have been combined to “empathise”, while “point of view” was renamed to “define”. However, the content of each step seems to be almost identical in both processes.

Similar to the notion of experimentation, prototyping is concerned with investigating and enriching different idea solutions through low-resolution and rapid prototypes (i.e. early versions of a product/ service). In doing so, various forms of prototypes can be used that consist of tangible objects like post-it boards, artefacts, or role-playing activities (Brown 2009). Design prototypes are tangible artefacts which facilitate thinking, understanding, learning from, and communicating concepts and ideas (d.school 2010). These characteristics are intended to enhance the sustainable business modelling process by integration into the value mapping workshop.

2.3 Value mapping tool

The value mapping tool, illustrated in Figure 2, was developed by Bocken et al. (2013) to support businesses in sustainable business modelling. By assisting both start-ups and incumbent organisations in formulating or modifying their value proposition to incorporate economic, social, and ecologic value, ‘sustainability’ is to be integrated into the core of the business model. The tool provides companies with different stakeholder perspectives and a network rather than firm centric view on value and facilitates an analysis of the current value proposition, the value currently destroyed, wasted, and missed, as well as new value opportunities for a range of possible units of analysis. The value mapping tool has a circular shape, where stakeholders each represent a slice of the ‘pie’ and the different forms of value (e.g. missed, destroyed) are represented by a separate ‘ring’ and brainstorm. The objective of the tool is to enable organisations to create sustainable value within their business models (Bocken et al. 2013).

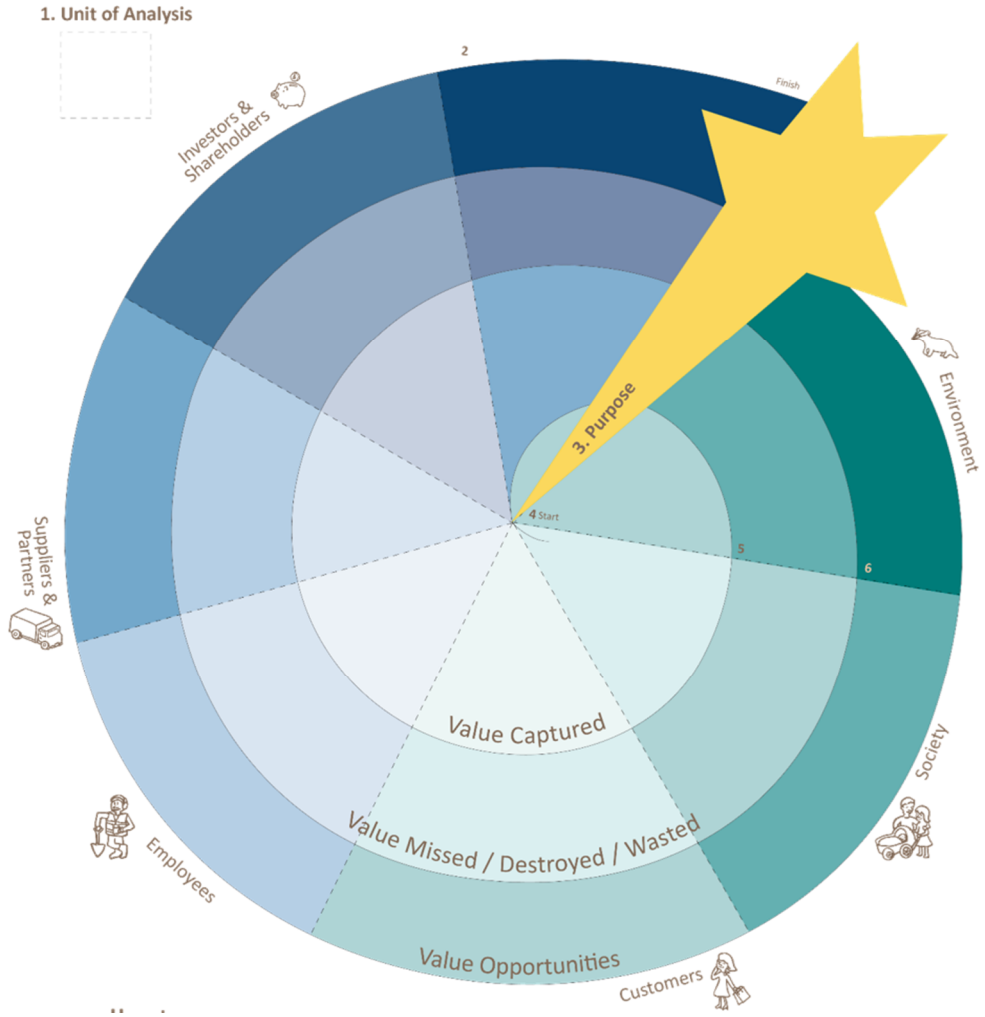

Figure 2: The Value Mapping Tool (Bocken et al. 2013).

2.4 Need for sustainable business modelling process and research question

Rana et al. (2014) identified a clear need for a comprehensive and easy to use sustainable business modelling framework, because pre-existing sustainable business modelling processes were found to be relatively complex and to require extensive guidance. Design Thinking could be a potential alternative to entire or at least parts of current sustainable business modelling processes because of the broad and generic applicability of the concept (Brown 2008). However, in comparison with the framework of (Rana et al. 2014), Design Thinking is resource-intensive: it needs special working space and facilities, it requires a considerable

amount of time which is especially hurtful when many stakeholders are involved and it needs extensive guidance, training, or expensive external professionals (Hasso Plattner Institut 2014). Nevertheless, Design Thinking has qualities that could benefit a business modelling process. For example, a potential weakness of the value mapping workshop which could be identified when participating is the difficulty to communicate ideas and form a common understanding of the created value propositions in multidisciplinary teams. Participants often understand what they want to hear, defend their own ideas and mental drafts by non-communication of potentially criticisable own concepts, or ignore conflicting input from other participants. Moreover, participants may find it hard to communicate filled in post-its to outsiders especially when communicating these to stakeholders outside the firm. This could be amplified by different professional and educational backgrounds of the involved stakeholders, which manifests in differences in "thinking", familiar concepts, and mental templates.

Incorporating a Design Thinking style think-with-your-hands group prototyping of the resulting value proposition, whose resulting prototype is afterwards presented to other groups, non-participant-stakeholders, or the facilitator team into the value mapping process could yield the following potential advantages (d.school 2010):

- *Empathy gaining:* Prototyping is a tool to gain understanding of the solution space and the targeted population, even at early stages of projects.
- *Exploration:* Building to think facilitates the creation and exploration of different solutions.
- *Testing:* Prototyping allows for the integration of representatives of the target population and context into the solution refinement process.
- *Inspiration:* Prototypes facilitate inspiring communication to outsiders like teammate, customers, or investors
- *Learning:* Prototypes can be richer in information than pictures or words alone.
- *Disagreement solving:* Prototyping can eliminate ambiguity, assist in ideation, and reduce miscommunication.
- *Conversation prompting:* Prototypes can prompt interaction with target population.
- *Fail quickly and cheaply*. Rapid and rough prototypes at early stages of projects allow for testing many ideas with comparably little effort in time and resources.
- *Structuring the problem solving process:* Prototypes assist in breaking down a large problem into solvable tasks.

Hence, this research investigates the following research question*: how can sustainable business modelling be enhanced by Design Thinking principles*?

3. Proposed value mapping process incorporating Design Thinking

A workshop design was developed, based on the sustainable business modelling process by Rana et al. (2014) that was designed in the course of SustainValue, a European Commission's 7th Framework Programme (FP7/2007-2013), that combines existing approaches of value mapping and Design Thinking in a novel way to assist companies in enhancing their value proposition in regard to the creation of sustainable value for additional stakeholders and the allowance for stakeholder interests.

Value mapping can be applied in a workshop that comprises the three steps: 1) setting the scene, where the unit of analysis (product, service, business unit, etc.), stakeholders, and the business purpose are determined, 2) mapping the current value situation, where the current value currently captured, missed, and destroyed by the business is identified for each stakeholder, and 3) ideating for value opportunities where ways the business can eliminate the value destroyed, realise the value missed, and identify new opportunities are investigated (Rana 2014, based on Bocken et al. 2013). These three value mapping steps are entirely integrated in the developed workshop and are complemented by a prototyping phase that consists of three additional steps: a value opportunity selection step, a prototype building step, and a presentation and feedback step.

The value opportunity selection consists in either choosing the value opportunity with the highest feasibility, which means the lowest costs as well as implementation time and the highest impact on the business in regard to achieving the purpose of the business, or selecting the value opportunity which covers the most sustainable business model archetypes as a proxy for the potential to learn from pursuing this opportunity (Bocken et al. 2014).

The subsequent prototype building step consist of creating a conceptual prototype of the selected value proposition's elements and interactions by utilising office and handicraft materials to build symbols which are associated with an explanation that defines their meaning (Brown 2009). Guidance is provided by a facilitator, pictures of other conceptual and Design Thinking prototypes, and the following five prompting questions:

1. Build one prototype as a group, the prototype being and artefact, plus the product and/ or service idea, plus the wider system-perspective
2. Think with your hands and communicate what you think
3. Explain to the others what you do and ask them for feedback
4. Ask when you think something is wrong or missing
5. Think about how to present the prototype to the other groups while building, consider storytelling or acting to complement your prototype

Finally, the resulting prototype is presented and explained to other participants, the facilitator, and/or non-participants (superiors, clients, peers, etc.), feedback is provided, and details are discussed.

4. Method

How can sustainable business modelling be enhanced by Design Thinking principles? To address this research question and develop the intended workshop design, the research method illustrated in Figure 3 is used.

First, in several rounds of literature reviews and expert interviews with 20 sustainable manufacturing and industrial design researchers as well as three consultancy professionals and a pilot workshop, initial questions on purpose and potential configuration of a possible combination of value mapping and Design Thinking are investigated. Based on the gained insights, a first workshop design, as presented in the previous section, is developed, piloted, and refined. By testing the resulting design with students and professionals, potential improvements were identified and incorporated in the process. For instance, initially the workshop participants were free to decide upon selection criteria to evaluate the ideas, but to improve the workshop flow the criteria were fixed to ‘feasibility’ and ‘impact’. This and other improvements led to the workshop design presented in this paper.

Figure 3: Overview of research method

The initial questions are: what principle of Design Thinking should be addressed and at which state of the sustainable business modelling process, what are the objectives and the intended benefits, and how can implementation look like, using which Design Thinking instruments and what inputs and outputs? After having answered these questions, a first workshop design could be developed and discussed as well as piloted with fellow researchers to identify gaps in facilitation and applicability as well as to create additional ideas to complement the concept. The discussions and pilot lead to a refined workshop process, which is subsequently tested in two student workshop sessions with 28 and 23 students, respectively, and a workshop carried out with the top five employees of a bio-refinery company. Table 1 provides an overview of the different sessions.

Session number	Date	Organisation and location	Type of participants	Number of workshop participants (not authors)	Additional tool or process elements tested
Pilot	23/07/2014	University of Cambridge, Cambridge, UK	Researchers	3	Semi-structured pilot
1.	12/08/2014	Technical University of Berlin, Berlin, Germany	Graduate students	28	One group was provided with case study
2.	30/10/2014	Vietnamese German University, Ho Chi Minh City, Vietnam	Graduate students	23	Groups had conceptualised case companies before the workshop
3.	24/11/2014 25/11/2014 28/11/2014	Genis hf., Siglufjordur, Iceland	Pharmaceutical SME	5	Divided in three sessions, Conceptualisation of a sustainable value proposition for the company

Table 1: Test workshop setting, overview

In these workshops, data are gathered in three different ways: by an assistant, a group feedback session, and participant questionnaires. First, the workshops are supported by an assistant who interviews and watches participants and fills out a prepared data sheet with improvement questions identical to the ones in the participant questionnaires. Second, questionnaires are handed out to the participants after the workshop which ask for an evaluation of each individual workshop step on a five point scale from “very bad” via “bad” and “neutral” to “good” and “very good” to identify strengths and improvement potentials. Furthermore, the feedback form enquires about concrete improvement proposals for every step as well as for the overall workshop, asking for aspects to start, continue, consider, and stop. Finally, a feedback session is held after the questionnaires are returned where participants in person are asked for improvement suggestions and to get additional

information on the design of the workshop. This also helps distinguish between suggestions that are caused by the specific workshop circumstances on-site (e.g. size of the room) and those related to the workshop design itself.

5. Results

An overview of the workshops' results is provided in Table 2. The response rate of the feedback is very high (96%) and the overall workshop is consistently rated "good" by the participants (with six "very good" and three "neutral" evaluations). This assessment is also supported by the praise, which was provided by many participants in the feedback discussion sessions and instead of the requested improvement proposals in the questionnaires.

The amount of improvement proposals met expectations, but the suggestions could only partly be allocated to certain workshop steps, since all steps were consistently evaluated positively by the participants. For instance, participants asked for more examples for clarification without indicating where such further explanation was desirable (in which steps of the process). Furthermore, some of the outcomes of the feedback process were highly dependent on characteristics of the specific setting (i.e. venue and date), which cannot always be influenced by the author. Finally, several improvement suggestions were contradictory, such as requests to provide more or less building materials or allocate more or less time to the workshop.

Session number	Type of participants	Number of workshop participants (not authors)	Received feedback forms	Average evaluation by participants on a five point scale	Number of improvement proposals
Pilot	Researchers	3	-	-	-
1.	Graduate students	28	27	4	27
2.	Graduate students	23	22	4	13
3.	Pharmaceutical SME	5	5	4	6

Table 2: Test workshop results, overview

Nevertheless, valuable improvements could be identified and implemented. Those applied include:

- to provide the groups with case studies that serve them both as an initial more detailed example as well as a rich unit of analysis to work with,
- to explain colour coding and remind participants to apply it,
- to instruct the participants to use a simple impact-feasibility matrix made of adhesive tape to facilitate prioritisation and selection of value opportunities,
- to use labels for each stakeholder to facilitate discussion,
- to print bigger posters to facilitate use of the value mapping tool as well as to provide more space around them,
- to hand out printed lecture and instruction material only after the workshop,
- and to provide more time for discussions and documentation, as well as to prompt more feedback in the final presentation and discussion phase.

6 Resulting framework

The findings were incorporated in the process, resulting in the workshop framework presented in Figure 4. Consisting of seven steps and an introduction, the workshop can be conducted with varying numbers of participants. Ideally, these participants are representatives of the six stakeholder groups, customers, society, environment, employees, suppliers and partner, as well as investors and shareholders, but the application is also possible with proxies (for example, a member of the purchasing department argues for the interests of the suppliers).

As illustrated in Figure 4, the workshop usually starts with an introduction into the workshop and its context. Extent and content of this introduction can differ depending on background and knowledge of the participants, but it has to be ensured that all persons involved understand the basic concepts and notions to the necessary extend for executing the workshop. The introduction is followed by the seven-steps of the workshop, which can be structured in three parts. The first part includes the three steps of value mapping developed by Bocken et al. (2013) aiming at brainstorming and idea generation for value opportunities. The second part consists of the three steps of value proposition prototyping which focus at refining and combining ideas, forming common understanding of those ideas, aligning the interests of the addressed stakeholders, identifying relationships and gaps in the value proposition, prompting feedback, and communicating the results. The final part is the documentation wherein the workshop results are summarised and recorded for further processing, such as management discussions or roadmapping.

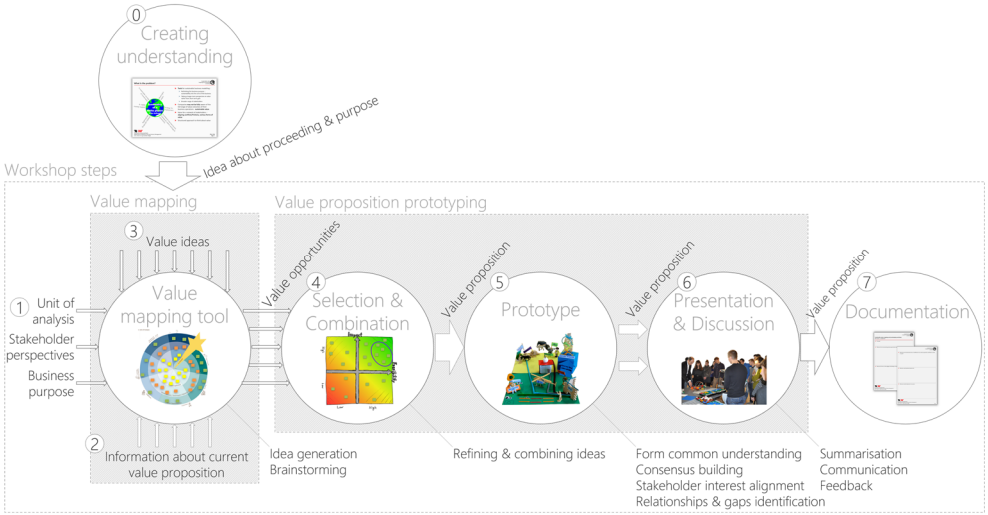

Figure 4: Workshop framework

The seven steps described in the following can be conducted in two alternative ways. Either, every stakeholder is represented by a participant that works on the stakeholder category's pie slice from the inner circle of the Value Mapping Tool (see Figure 2) to the outer one, or all participants edit the tool together, following the spiral from mapping the current value for the environment all the way to ideating value opportunities for investors and shareholders. In detail, the steps are:

1. **Setting the scene:** In this step, the unit of analysis (product, service, business unit, company, industry, etc.) is determined, stakeholders are added or modified to ensure that the ones relevant for the business are represented, and the business purpose is formulated.
2. **Mapping of the current value situation*:*** The second step is concerned with determining the current value captured as well as the value missed and destroyed by the business for each stakeholder.
3. **Ideation for value opportunities:** This phase aims at eliminating the value destroyed by the business by identifying and solving conflicts between stakeholders, utilising the value currently missed for the business, and searching for opportunities to create entirely new value.
4. **Clustering and selection of value opportunities:** In this step, several value ideas are selected and clustered to value proposition innovations which can complement the current value proposition by discussing how stakeholders' needs can be satisfied and problems be solved most effectively and efficiently (Osterwalder et al. 2010). This can be accomplished by using a simple impact feasibility matrix and additional sticky notes to discuss, combine, and choose value ideas.

5. **Prototyping of the selected value proposition:** In the course of this phase, a conceptual prototype of the extended value proposition chosen in the previous step is build out of office and handicraft materials. It can be complemented by acting and storytelling. The elements of the prototype are usually not self-explanatory but consist of symbols and their explanation.
6. **Presentation of the results and feedback:** The sixth step refers to presenting and discussing the prototype to the audience. The elements and their interactions are explained, the business and its purpose are delineated, and major problems for implementation of the value proposition are discussed, before questions of the audience are answered and feedback is provided.
7. **Documentation of results for further processing:** In the last step, the results considered most important by the participants are recorded for further processing, for instance in a further business modelling process as developed in the European Commission's Sustain Value project (Rana et al. 2014). This can be realised by a documentation sheet comprising record of the target outcomes, the identified value opportunities, major challenges for implementation, lessons learned about the potential value proposition innovation, and a short roadmap for implementation.

7. Conclusions

The research question, how a sustainable business modelling could be enhanced by Design Thinking principles, was investigated by developing a Design Thinking based prototyping phase and integrating it into an existing value mapping process as a potential step in sustainable business modelling. A respective workshop design referred to as the "*value ideation process"* was developed and tested with students and a company. During the tests, further improvement potentials could be identified and enhancements incorporated. The workshop was found to be adequate by all participants who tested and provided feedback on it. The participants' results are fulfilling or succeeding the initial expectations, and interesting, innovative, and promising ideas could be created during the sessions.

This suggests that design thinking can be a useful approach to assist in sustainable business modelling and should be explored further. The workshop design can help mitigate differences in understanding between the participants, catalyse agreement on, disagreement on, and inclusion of aspects that are important to each individual, facilitate communication, prompt additional direct intra-group, inter-group, and external feedback, support the identification of weaknesses and gaps, create additional and enhanced ideas, prioritise different possible value proposition modifications, as well as detect and discuss conflicts between stakeholders, all of which were the expected benefits of Design Thinking as observed in Section 2.4. Consequently, the developed workshop could have specific benefits that would make it advantageous in comparison with conventional value mapping workshops under certain conditions. Thus, it could improve the sustainable business modelling process in these circumstances.

To validate these assumptions, considerably more testing is necessary. The hitherto conducted test workshops aimed at identifying weaknesses and improvement potentials and did not explicitly enquire the benefits of the concept. Only by validating the intended benefits, industry acceptance and consequently wider utilisation of the workshop can be achieved. Further testing would also allow for additional improvement of the concept. The number of test cases was owed to the constraints in time and resources within the limits of this project and is not considered to be sufficient to assume a reasonable development stage of the workshop yet. However, a promising basis was developed and the designed method allows for implementation in a much more comprehensive project by simply iterating the last steps of testing and refinement until a satisfactory result is obtained. As discussed above, a further validation of benefits has to be included, though.

The goal of this approach is to provide an industry-tested step in a future standardised, easy to use business modelling process that facilitates the creation of viable and sustainable business models even for small companies and would-be entrepreneurs. Thus, the workshop could contribute to design pragmatically improved business models and better integration of sustainability into the value propositions of businesses. By more comprehensively integrating stakeholder interests as well as creating and realising additional forms of value, this could enable companies to make a significant difference in areas as diverse as resource consumption, emissions, or intra- and intergenerational equity, while, at the same time, the firms could realise new opportunities to mitigate risks and utilise opportunities in their company's environment.

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