Bridging sustainable business model innovation and user-driven innovation

A process for sustainable value proposition design

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Bridging Sustainable Business Model Innovation and User-driven Innovation: A Process for Sustainable Value Proposition Design

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ABSTRACT

With an increasing population, a growing middle class and increased resource use, our current ways of living and doing business are unsustainable. Next to the implementation of innovative technology, sustainable development based on innovative business models, better understating of customer needs and behavioural change are crucial. This research aims at combining principles from both *sustainable business model innovation* and *user-driven innovation* to develop more successful, radical and user-centred sustainable value propositions. *Sustainable business model innovation* entails developing value propositions that create value for multiple stakeholders at the same time, including customers, shareholders, suppliers and partners as well as the environment and society. *User-driven innovation* allows developing solutions that are meaningful for people and profitable for business by involving potential customers, users and/or other stakeholders in an experimental and iterative design process. The study adopts a *research through design* methodology, a qualitative research approach that uses design practice to inform research. To this end, a design project in the framework of the Climate-KIC (the largest European partnership addressing the challenge of climate change) was investigated. As a result, this paper proposes a process for *sustainable value proposition design* which adopts a thorough, dynamic and iterative perspective (talking to stakeholders, thinking about the problem, testing the product/service) that leads to an actual sustainable value proposition and to a superior problem-solution fit. In practice, managers are provided with an initial methodological framework for mapping and understanding the stakeholders in a broad sense (including and especially users), identifying their needs and interests, and progressively combining them into a more meaningful and enriching value proposition.

Keywords
Sustainable business model innovation, User centred design, Value proposition, Business design, Service design, Lean startup.

1. INTRODUCTION

The combination of a growing global population and increasing overall material consumption has implications for a finite planet: signs of unwanted impacts (e.g. climate change reducing crop yields; IPCC, 2014) and of irreversible changes (e.g. the increased rate of species extinction) are growing alarmingly (Royal Society, 2012). This means that our current consumption and production patterns are unsustainable. In this scenario, sustainable development—namely, innovation and development patterns that meet current human needs without compromising future generations' ability to meet their own (Brundtland, 1987)—becomes necessary, and companies can play a substantial role (Loorbach & Wijsman, 2013). Although companies attempt to embrace these sustainable patterns, they still use traditional innovation routines aiming prevalently (if not exclusively) at business growth and financial objectives (Ehrenfeld, 2009). Furthermore, companies' innovation efforts primarily focus on improving existing technologies and production systems through increased energy and resource efficiency, but not on other key drivers of successful sustainable innovation like combining customer benefits and technological efficiency in sustainable offerings (Keskin et al., 2013) and altering consumption patterns towards more sustainable behaviours and interactions with products (Daae and Boks, 2015). As a consequence, sustainable development might lead to incremental improvement, but not to the degree of change that would be required to address global environmental challenges. A fundamental shift towards a deeper integration of environmental and social needs within business activities and innovation practices seems necessary (Boons et al., 2013).

To this purpose, *sustainable business model innovation* is an emerging research stream that attempts to strengthen companies' ability to pursue sustainable development by integrating sustainability objectives into business models, and thus concurrently achieving profit and a positive impact on society and/or the environment (Schaltegger et al., 2015; Stubbs & Cocklin, 2008; Tyl et al., 2015). Focusing on the business model for achieving sustainable development offers opportunities for more thorough, long term and radical solutions, as modifying the business model might have implications for all the activities, processes and resources through which a company creates, delivers, captures and exchanges value (Teece, 2010). Hence, a sustainable business model has the potential of going beyond incremental innovation and/or the improvement of operational and technological efficiency. The core of a sustainable business model is a sustainable value proposition; namely, a value proposition that allows simultaneous value creation for multiple stakeholders, including customers, shareholders, suppliers and partners as well as the environment and society (Bocken et al., 2014; Donaldson & Preston, 1995; Tyl et al., 2015). Despite the relevance of this research stream, few tools

have been developed to support practitioners in the creation of value propositions for sustainable business models (Geissdoerfer et al., 2016). Such tools are either too complex, or prevalently conceptual, or fall short in supporting sustainable entrepreneurial practice (Bocken et al., 2013). This paper attempts to address this gap by proposing and exemplifying a hands-on process for *sustainable value proposition design*. Particularly, the process is derived by integrating *sustainable business model innovation* practices with *user-driven innovation* practices.

User-driven innovation posits that innovation is driven by users' needs, ideas and opinions, and is the result of a more or less close collaboration with users (Baldwin & von Hippel, 2011). User-driven innovation practices can benefit sustainable business model innovation in two ways. *First*, developing a sustainable value proposition is a long and challenging process that may require several product-market iterations, based on designing prototypes and interacting with stakeholders to progressively find an overlap between sustainability and economic objectives (Keskin et al., 2013; Keskin, 2015). User-driven innovation also stresses the importance of creativity and prototyping when innovating, in order to derive meaningful solutions for end-users (Brown & Katz, 2011; Ries, 2011). Furthermore, the practice of iteration is central in *user-driven innovation*; specifically, the practice of developing and testing solutions early to validate business viability gradually and up front, thus saving significant time and resources in the subsequent development process (Blank, 2013; Ries, 2011). *Second,* by integrating a user focus, tools for sustainable business model innovation can support companies in overcoming the pitfall of directing their sustainable development efforts exclusively on technological advancements and production efficiency. Instead, their focus is shifted to concurrently pursuing behavioural change—i.e. altering consumption patterns towards more sustainable behaviours and interactions with products (Daae and Boks, 2015)—as a way of achieving sustainable and performance objectives (Tukker et al., 2008).

Based on the above, this paper's research question can be summarized as follows: *How can sustainable development business practices be improved by combining sustainable business model innovation with user-driven innovation practices?*

The research question is addressed through a qualitative research approach—a *research through design* methodology (Stappers, 2007; Zimmerman & Forlizzi, 2008; Zimmerman et al., 2010)—in the context of sustainable innovation for energy efficiency. Particularly, a sustainable innovation project aimed at developing a value proposition to trigger energy saving behaviour in commercial office buildings is used to implement the method. This project was part of the Building Technology Accelerator (BTA) project of the Climate-KIC (Jaskiewicz & Keyson, 2015). The Climate-KIC is Europe's largest innovation partnership addressing the challenge of climate change. This project represents an appropriate empirical context because energy consumption in the building sector is a persistent sustainability challenge that would benefit from more innovative solutions (Heck & Tai, 2013) and a greater focus on buildings' occupiers and their behaviours (Berkhout et al., 2000; Hens et al., 2010). By developing a value proposition that combines technological

advancements with a deep understanding of user needs in order to induce behavioural change, the study also contributes to research on excessive energy consumption. Specifically, this would be a situation in which the demand for energy outpaces the sustainable generative capacity of the ecosystem, leading to scarcity in supply and concurrent environmental degradation (Holdren, 1990). Reducing energy consumption is a priority (Bertoldi et al., 2012; US Energy Information Administration, 2014). Despite the important role that technology plays in increasing energy efficiency, the diffusion of innovative technology-driven solutions remains minor compared to overall needs (Heck & Tai, 2013). Furthermore, recent studies have demonstrated that more energy efficient buildings and products do not automatically guarantee energy savings in practice if individual behaviours fail to take advantage of their improved characteristics (Berkhout et al., 2000; Hens et al., 2010). Adopting a user-driven approach might help in addressing the energy efficiency challenge.

Based on the project's development process and results, the empirical findings are combined with theoretical underpinnings to propose an iterative process for *sustainable value proposition design*. The paper is organized as follows. First, there is a literature review on *sustainable business model innovation* and *user-driven innovation*, linking these to the empirical problem and research objective. Subsequently, there is an introduction to the research through design methodology. The findings are then presented, which correspond to the results of the design project. Next, the empirical findings are reconnected with the literature followed by a proposed process for designing a sustainable value proposition. Finally, there is a discussion of the theoretical and practical implications of this study, the limitations of the research and directions for further research.

2. LITERATURE REVIEW

As stated in the research question, this paper aims at showing that by following the principles of *sustainable business model innovation* and *user-driven innovation*, the behaviours and needs of customers and stakeholders can be better understood and new, more innovative solutions to environmental challenges can be reached. Such principles are briefly reviewed in the following paragraphs.

2.1 Sustainable business model innovation

A business model describes the design or architecture of how value is created, delivered and captured by an organization (Teece, 2010). According the Richardson (2008), a business model consists of a *value proposition* (i.e., the products and/or services that a firm offers to deliver value to its customers), a *value creation and delivery system* (i.e., the system of activities, processes, capabilities and resources through which the firm delivers the value proposition to its customers and achieves competitive advantage); and *value capture* (i.e., the way in which the firm generates revenues and profits from the delivery of the value proposition). Business model innovation is about creating new value propositions, and the related value

delivery and value capture systems, in order to generate superior economic value (Richardson, 2008). Business model innovation refers to both the transition from one business model to another within established companies (e.g. after mergers and acquisitions), and the creation of entirely new business models in new ventures (e.g. Chesbrough, 2007; Giesen et al., 2007; Mitchell & Coles, 2004; Ostelwalder & Pigneur, 2013).

Relatedly, sustainable business model innovation aims at benefitting society and/or the environment by also generating economic value (Schaltegger et al., 2015). The core of a sustainable business model is a sustainable value proposition; namely, a value proposition that allows multiple-stakeholder value creation by considering the needs of customers, shareholders, suppliers and partners as well as the environment and society (Bocken et al., 2013; Donaldson & Preston, 1995; Tyl et al., 2015). Conceptualizing a sustainable value proposition is a critical task in sustainable business model innovation, because it requires understanding and managing several needs and objectives across a network of multiple stakeholders in order to create shared value (Allee, 2000; Bocken et al., 2013; Porter & Kramer, 2011). The criticality lies in the fact that sustainable development (both in research and practice) has given limited attention to understanding customer needs and in integrating them with technological innovations in order to generate value (Keskin et al., 2013). Furthermore, a holistic view of the value proposition is required, where the benefits and costs of the customers need to be combined not only with those of the firm, but also of a broader range of stakeholders, including investors and shareholders, employees, suppliers, the environment and society (Bocken et al. 2013). Ultimately a sustainable value proposition results from combining three interrelated building blocks: generating shared value for a network of stakeholders, addressing a sustainability problem, and developing a product/service that tackles this problem by taking the stakeholders into account (Figure 1).

Figure 1. Sustainable Value Proposition Framework (based on and adapted from Bocken et al., 2013; Osterwalder et al., 2015).

Despite the complexity, few tools have been developed to support practitioners in the creation of value propositions for sustainable business models (Bocken et al., 2013). Furthermore, existing tools are either complex, rather conceptual, or fall short in supporting sustainable entrepreneurial practice (Bocken et al., 2013). Improving the process of developing a sustainable value proposition would also offer a better input for existing tools that focus on developing the entire business model (including the value creation and value capture systems) – e.g., Strongly Sustainable Business Model Framework (Upward & Jones, 2015) and the Triple-layer Canvas by Joyce et al. (2015).

The Value Mapping Tool (Bocken et al., 2013; Bocken et al., 2015) was created as an attempt to provide entrepreneurial practice with a structured approach for supporting the conceptualization of sustainable value. It is a network-centric tool that enables the mapping of four key aspects of a sustainable value proposition (i.e. value captured, value destroyed, value missed and value opportunities) across a set of stakeholders. The tool allows an initial identification and understanding of different stakeholders' needs and objectives (including society and the environment), which is a fundamental first step in the development of a sustainable value proposition. However, developing a sustainable value proposition further is a long process that may require several product-market iterations, based on designing prototypes and interacting with stakeholders, in order to find an overlap between sustainability objectives and economic value (Keskin et al., 2013; Keskin, 2015). Accordingly, this study argues that the Value Mapping Tool and, more generally, literature on sustainable business model innovation would benefit by being integrated with principles from user-driven innovation—an approach to innovation that stresses the importance of creativity, experimentation and iteration as a way to address user needs while at the same time creating profitable business opportunities (Blank, 2013; Brown & Katz, 2011; Liedtka & Ogilvie, 2012; Ries, 2011).

2.2 User-driven innovation

User-driven innovation identifies business opportunities and develops new concepts by involving different groups of customers and/or potential users (Baldwin & von Hippel, 2011). Within *user-driven innovation*, design thinking is gaining popularity as an approach for doing business innovation (Liedtka & Ogilvie, 2012). Design thinking is defined as a user-centred innovation approach based on problem solving and a process of repeated iterations between the three creative phases of inspiration, ideation and implementation (Brown & Katz, 2011). Central to design thinking and relevant to *sustainable business model innovation* are practices such as problem reframing, knowledge brokering and co-creation of solutions (Calabretta & Gemser, 2015). Problem reframing implies changing the perspective on the problem in order to foresee alternative solutions (Dorst, 2011). Knowledge brokering refers to the use of information and expertise from prior and/or unrelated projects (e.g. in other markets and industries) in order to address the current project in a creative manner (Calabretta & Gemser, 2015). Co-creation is based on involving relevant stakeholders throughout an innovation project to ensure that their different and divergent needs are taken into account and addressed (Schneider & Stickdorn, 2011).

Another stream within *user-driven innovation* that is relevant to this paper is the lean startup movement, which focuses specifically on how entrepreneurs can start new ventures (Ries, 2011). Similar to design thinking, this approach is also user-centred and iterative. Lean startup is grounded in the customer development philosophy, which argues that, in contrast with traditional new product development approaches, most startups do not fail because they lack a product but because they lack customers (Blank, 2013). Achieving product-market fit is the foremost challenge of entrepreneurship and can be achieved by treating business ideas as hypotheses to be quickly tested in front of potential customers. Lean startup builds on these ideas and integrates them with the

lean manufacturing principles developed by Toyota in the early seventies (Womack, 2003). Lean startup is based on an iterative customer feedback loop of three steps: Build, Measure, Learn (Ries, 2011). *Build* involves creating a Minimum Viable Product (MVP); namely, the simplest possible prototype, which is to be tested with customers as early, quickly and cheaply as possible. *Measure* involves using specific metrics to evaluate customer feedback about the MVP. *Learn* refers to the collection of learnings validated by user feedback, which should then be integrated into the MVP itself to start a new lean development cycle. A MVP can also be sees as a bundle of features embedding assumptions that have to be tested (Ries, 2011).

The common denominator of design thinking and lean startup is the use of creativity and experimentation-pursuing innovation. Solutions are developed iteratively, and with the involvement of potential users, in order to validate their business viability and customer desirability gradually and up front. This saves significant time and resources in the product development process (Blank, 2013; Brown & Katz, 2011; Ries, 2011). Ultimately, the two processes can be framed together as an iterative three-step process based on (1) *talking* to users, customers and stakeholders; (2) *thinking* about potential solutions; and (3) *testing* these solutions early on moving towards problem-solution fit (Figure 2).

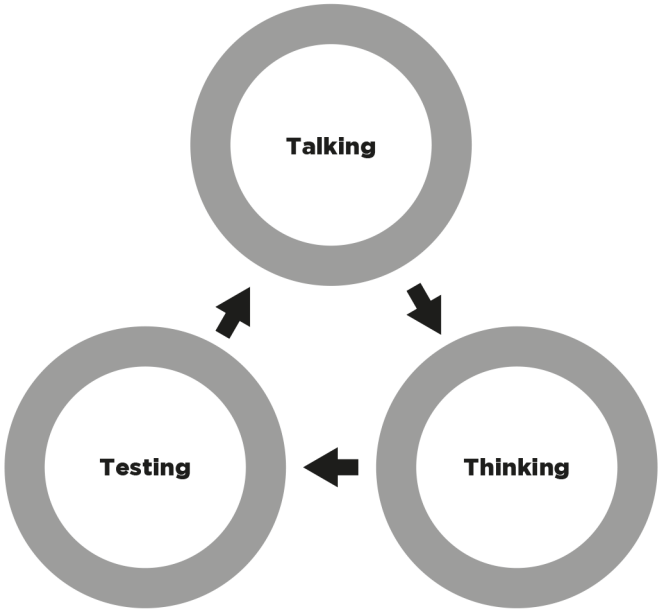

Figure 2. User-driven iterative process for developing value propositions (based on Brown & Katz, 2011; Ries, 2011).

This paper leverages principles from both *sustainable business model innovation* and *user-driven innovation* to advance business practices in sustainable innovation in general, and to address the challenge of energy efficiency in particular. The focus is on developing a process for sustainable value proposition design by combining the sustainable value proposition framework (Figure 1) and the user-driven iterative process for developing value propositions (Figure 2). Through the empirical study, the paper aims at contributing to academic research on *sustainable business model innovation* by integrating it with principles from *user-driven innovation* and ultimately proposing an iterative process for *sustainable value proposition design.*

3. METHODS

3.1 Research approach

Research through design is an iterative qualitative research approach that uses design practice to inform research (Stappers, 2007; Zimmerman & Forlizzi, 2008; Zimmerman et al., 2010). Methods, processes and artefacts derived from a design project are employed to develop conceptual frameworks, processes and guiding principles. The *research through design* process is an iterative spiral of generative and evaluative cycles converging towards a design objective (Stappers, 2007). In this process, knowledge is gradually gathered, integrated and contextualized. This method was selected because it allows building tangible solutions and knowledge simultaneously. In this paper, it is relevant for advancing theoretical research in the domain of *sustainable business model innovation* while simultaneously addressing the empirical problem of energy efficiency in the building sector.

In line with this methodological approach and the research question, a design project within the Building Technology Accelerator (BTA) flagship project (Jaskiewicz & Keyson, 2015) was selected. This project is part of the Climate-KIC, Europe's largest innovation partnership addressing the challenge of climate change. The objective of the design project was to develop a value proposition to trigger energy saving behaviour in commercial office buildings. The project provided a suitable empirical context for the research because it required the design of a value proposition and a business model for a service addressing a sustainability problem while creating shared value for a network of stakeholders: corporate clients and office workers (users). Thus, it offered an appropriate endeavour for observing how the principles of sustainable business model innovation and user-driven innovation interact. Furthermore, reducing energy consumption in the building sector is a priority (Bertoldi et al., 2012; US Energy Information Administration, 2014); consequently, the project also offers a good context for studying how combining sustainable business model innovation and user-driven innovation can contribute to addressing the energy efficiency challenge.

3.2 Research process

The research process (Figure 3) followed to implement the methodology is based on the research through design principles described in the previous section (i.e., iterative spiral of generative and evaluative cycles, the use of design artefacts and outcomes to generate knowledge).

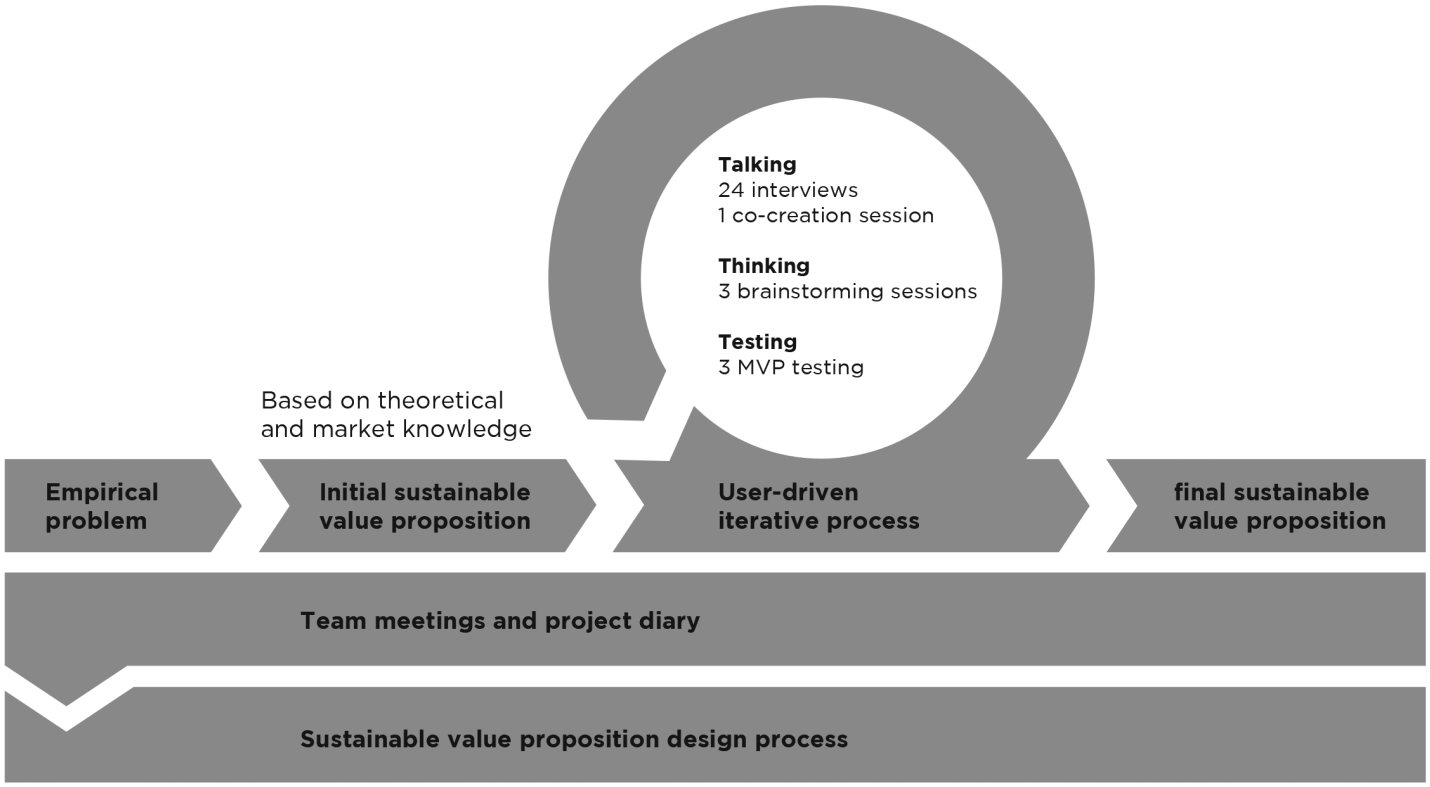

Figure 3. Methodology to design a sustainable value proposition for energy efficiency in commercial office buildings, and to extrapolate a conceptual process for *Sustainable Value Proposition Design* (based on Brown & Katz, 2011; Ries, 2011; Stappers, 2007).

The starting point of the research process is the empirical problem of energy efficiency in the building sector. According to the *sustainable business model innovation* approach, this sustainability problem should be addressed by concurrently creating economic, societal and environmental values. Based on theoretical and market knowledge, the initial sustainable value proposition was defined as follows: *providing an alternative energy awareness program to corporate clients who want to reduce energy consumption in their office buildings with a cost-effective solution (unlike complex and expensive technology-based interventions)*. During the project, this initial value proposition was developed further by iterating the three steps of the user-driven process: talking, thinking, testing.

The *talking* phase aimed at involving relevant stakeholders in the identification and discussion of core elements of the proposition. To this purpose, qualitative field research was used. The first author started with interviewing a potential client who was the energy manager of an international company. The interview was conducted with an informal conversational approach and audio recorded (Patton, 2002). The conversation topics focused on understanding the importance of energy efficiency in a building for a company, and the current and desired solutions for pursuing energy efficiency. Afterwards, a group of potential end-users (ten office workers from a Dutch company) were involved in the process through a co-creation session (Calabretta & Gemser, 2015; Sanders & Stappers, 2012). Participants were given stickers and drawing material and were asked to associate energy saving behaviours to desired rewards. Subsequently, the participants were asked to generate ideas for energy saving office products or services on the basis of the rewarding mechanism that they

valued most. The co-creation session was video recorded. Both the interview and the co-creation session have been transcribed for data analysis.

In line with the guidelines of qualitative data analysis methodology, the analysis of the transcribed material was coded by following several steps (Eisenhardt, 1989; Miles & Huberman, 1994). First, in line with the research questions, the first author analysed the interview and the co-creation session separately, and selected quotes exemplifying key drivers of energy saving behaviours and key elements to be included in a value proposition for triggering such energy saving behaviours in office buildings. Based on the selected quotes, the first author completed an initial list of the main themes, which was then discussed and iterated with the second and the fourth author in two sessions. During these sessions, the 'analysis on the wall' approach was used as an appropriate technique for capturing the richness of the data set, and as suggested by the research through design methodology (Sanders & Stappers, 2012). The most relevant findings of the talking phase were visualized into a set of insightful infographics (Charmaz & Belgrave, 2002; Dunleavy, 2015; Stappers, 2007).

The *thinking* phase aimed at using the previously collected insights for ideation; the infographics were used for this purpose. During this phase, additional market and literature research on the topics that emerged from the previous phase was performed. The authors also brokered knowledge from a former project, in which one of the team members had been involved, to shape the development of the value proposition (Calabretta & Gemser, 2015). As a result, the problem was reframed and a new version of the value proposition was crafted accordingly (Dorst, 2011). Finally, the authors engaged in a series of brainstorming sessions with different (potential) stakeholders. The resulting ideas were clustered by using the 'analysis on the wall' approach (Sanders & Stappers, 2012), and subsequently channelled into a service concept based on the value proposition.

The *testing* phase aimed at early testing of the value proposition with relevant stakeholders (Ries, 2011). A Minimum Viable Product of the service concept was built using an existing instant messaging application as the enabling platform. The objective was to simulate the interaction with the service concept with ten office workers over the course of five days. The results of the user test were measured quantitatively with a specific metric to assess the robustness of the value proposition (Ries, 2011).

The testing phase flowed into a *first iteration* of the user-driven process aiming to further develop the value proposition towards a better problem-solution fit. A new talking phase consisted of ten follow-up individual interviews with test participants, which aimed at a qualitative assessment of the concept and underlying value proposition that they had been testing. The interviews have been transcribed and analysed with the same coding process described in the first talking phase. In addition, another potential client (the Sustainability Manager of an international company) was also interviewed. A new thinking phase involved a team brainstorming session to refine the value proposition according to the new feedback obtained from the stakeholders (Ries, 2011).

Finally, a new version of the MVP was built and tested again with ten office workers as participants over the course of ten days.

The first iteration flowed into a *second iteration*, including a new talking phase with *twelve additional interviews* (ten follow-up interviews with the participants of the latest MVP testing, one interview with another potential client—the Sustainability Manager of another international company—and one interview with a potential partner, the president of a foundation engaged in social and environmental initiatives); *a new thinking phase*, with an additional team brainstorming session to integrate the new feedback into a new value proposition; and *a new testing phase*, where a new version of the MVP was built and tested again with four office workers for twenty days. The positive outcome of the second iteration provided the necessary validated learning for the definition of a preliminary business model around the value proposition (Blank, 2013), which, however, falls outside the scope of this research. Figure 4 summarizes, describes and categorizes the stakeholders involved in the data collection. Each relevant stakeholder is included: the office workers are used as a proxy for 'society', the company stakeholder represents 'profit', and partners from environmental organisations were used as a proxy for 'environment'.

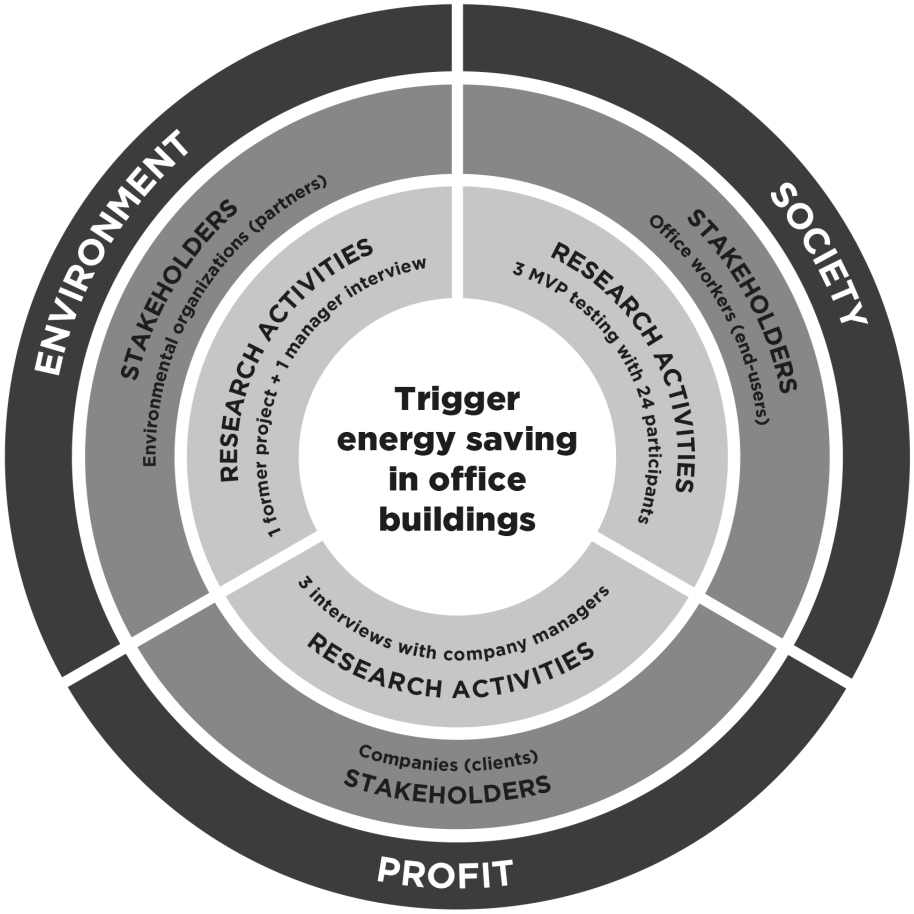

Figure 4. Stakeholders involved to design the value proposition for energy saving behaviour in commercial office buildings (based on Allee, 2000; Bocken et al., 2013; Donaldson & Preston, 1995; Porter & Kramer, 2011).

Finally, during the course of the project, regular team meetings took place to discuss the adopted methodology and the emerging outcomes. The project development process, as well as the outcomes of the meetings, were documented in a visual project diary providing a rich set of qualitative data. Upon project completion, such data

have been analysed and reconnected with theory from the literature review to conceptualize the iterative process for *Sustainable Value Proposition Design*.

4. FINDINGS

This section reports the empirical findings on how a sustainable value proposition for energy efficient behaviours in commercial office buildings can be designed by combining the *sustainable business model innovation* approach with practices from *user-driven innovation*. Particularly, the focus is on how the value proposition evolves and improves through the different practices. Subsequently, in the discussion section, these findings are used to extrapolate a process that brings together the two innovation approaches and serves the hands-on needs of practitioners engaged in the development of sustainable value propositions. The findings are structured according to the three steps of the user-driven design process (i.e. talking, thinking, testing) and their iterations.

4.1 Talking

The design process of the sustainable value proposition started with a *talking* phase, in which relevant stakeholders were involved in the identification and discussion of core elements of the proposition. This phase was supported by two main practices, namely a conversational interview with a stakeholder and a co-creation session.

The interview with the potential client confirmed interest in the core of the value proposition: reducing energy consumption in the office building through a cost-effective solution based on behavioural change. Since every office building is different, the energy saving actions should be tailored on the characteristics of the building. Furthermore, it was discovered that the main interest of the company is not cutting costs on the utility bills but improving the public image and engaging the employees through corporate sustainability. For this reason, the company makes corporate donations to support environmental projects. It was concluded that corporate sustainability, entailing public image and employee engagement should be a central aspect of the value proposition.

The results of the co-creation sessions with end-users highlighted a paradoxical situation: many office workers liked the idea of being sustainable and working for a sustainable company but at the same time found it hard to maintain their behaviour afterwards. Office workers are focused on their daily tasks; they do not know exactly what to do to save energy, they do not feel individually responsible for energy consumption and forget about it. However, they also think it is very important to protect the natural environment. When probed, some of them explained that seeing images of climate change consequences on the natural world could be a way to remind

and motivate them to save energy. Thus, it was concluded that the value proposition has to recall specific energy saving actions and establish a connection with their environmental impacts, giving office workers tangible proof that their individual behaviours make a difference, but without intruding into their daily working routine.

4.2 Thinking

The talking phase was followed by a *thinking* phase, in which the conclusions from the interview and the co-creation session were iterated with market and research knowledge, and subsequently integrated into the problem definition, providing the foundations to design the core elements of the value proposition. This phase was supported by three main practices, namely problem reframing, knowledge brokering and brainstorming.

The talking phase highlighted that the potential client is not interested in energy saving primarily from a financial perspective, but rather in the competitive advantage deriving from being a sustainable firm. To explore and validate this finding, the authors engaged in a brief literature review focused on corporate sustainability drivers. The literature confirmed that, for most companies, energy costs are not a primary concern and the business case for energy efficiency should tap into the sources of value creation of sustainability more than into cost reduction motivators (Berns et al., 2009; Holmberg & Roth, 2005; Prindle, 2010; Sullivan, 2009). Particularly, the business case for corporate donations is improved public image and employee engagement through sustainability (CECP, 2014). Based on these notions, the problem frame was broadened from energy efficiency to providing a solution for corporate sustainability.

At this stage, knowledge brokering also played an important role. One of the researchers had worked in a design project where the client was an environmental organization and provided the following two insights. First, the environmental organization required innovative solutions for triggering people into donations through digital media; thus, the digital media element was brought into the scene. Support for using digital media for influencing sustainable behaviour was also found in the literature, indicating that technological aids can play an important role in reducing overall energy consumption, but are largely absent from current initiatives (Bin, 2012; Lopes et al., 2012). Furthermore, research has proved that energy displays are very effective in stimulating people to use less energy in domestic environments (Darby, 2006; Barbu et al., 2013). As a second relevant insight, many environmental organizations receive annual funding from large companies that do this as part of their Corporate Social Responsibility (CSR) strategy. This new knowledge led to the decision to include donations in the value proposition and to position environmental organizations into the stakeholder network (next to corporate clients and office workers). This decision is also grounded in the literature, according to which, for pursuing successful sustainable innovation, the value proposition should be grounded within the cultural references and positive associations already present in the cultural context of the user (Santamaria et

al., 2016); that is, donations to environmental organizations in the context of the project investigated in this study.

As a result, the aim of the project became to combine individual energy saving behaviour with corporate donations to environmental organizations as a unique corporate sustainability effort. Literature on behavioural change was again used to consider the triggering mechanism. According to studies, energy awareness programs for office workers represent a cost-effective solution for favouring conservative energy behaviours in office buildings (Nguyen & Aiello, 2013). However, they are largely absent from current practices (Bin, 2012), or they are structured as one-way communication means (e.g. posters, stickers), which remind employees of the importance of energy saving behaviours but do not engage them (Prindle, 2010). In most cases, such solutions fail to attract the end-users: office workers are not intrinsically motivated to save energy at the workplace because they do not profit directly from it (Siero et al., 1996). Furthermore, workers may not only be unaware of how much energy they use, but they may also feel that their individual behaviours do not significantly impact energy consumption (Barbu et al., 2013). Therefore, engaging energy consumption feedback mechanisms emerges as a most effective strategy for reductions. Appealing visuals increase the feedback effectiveness (Darby, 2010), while gamification and goal setting favour long term engagement (Knol, 2011).

Based on this knowledge, a brainstorming session was used to detail some desirable features of the value proposition and embed them into a service concept called THANKS. The core idea is to trigger office workers into saving energy by empowering them to make a donation with corporate money to an environmental organization of their choice. The money is drawn from the Corporate Social Responsibility (CSR) budget, which is already allocated for company donations. In this way, a clear connection between simple daily actions and a tangible impact on the natural environment is established; that is, a clear feedback mechanism with engaging goals is created. As shown in Figure 5, THANKS creates shared value for the stakeholders in the network as laid out in Figure 4. Environmental organizations receive donations from the company and increase their public awareness. Corporate clients gain competitive advantage by improving their public image and engaging their employees while also reducing energy costs on the utility bills. Office workers earn the gratitude of environmental organizations for their support—the office workers' gain is intangible yet significant.

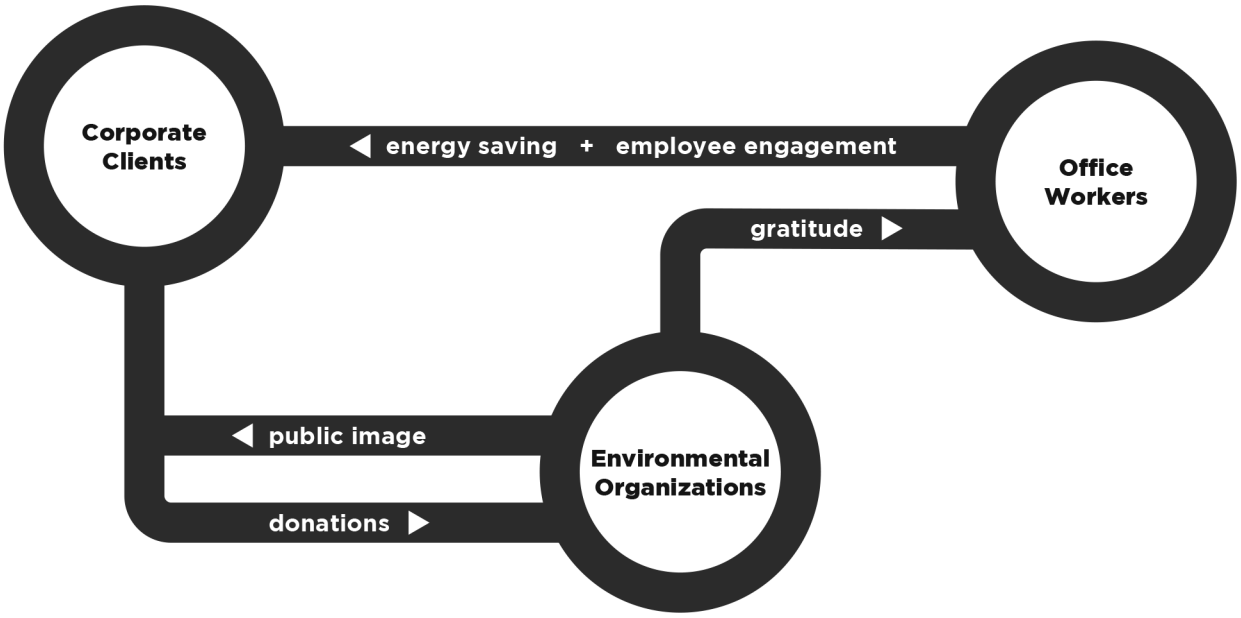

Figure 5. Sustainable value proposition addressing the empirical problem of energy efficiency in commercial office buildings.

4.3 Testing

The thinking phase was followed by a *testing* phase, in which a Minimum Viable Product of the service concept was built to validate the value proposition with relevant stakeholders. This phase was supported by three main practices, namely assumption definition, feature testing and evaluation of the results.

During the thinking phase, energy saving actions and donations to environmental organizations were combined as a unique corporate sustainability effort. The results of the MVP testing gave a preliminary validation of the concept. This process was based on the three practices. First the combination of energy saving actions and donations was defined as an assumption to be tested. Secondly, this assumption was embedded into a bundle of specific, tangible features. Office workers were sent a daily message containing the following features: an energy saving reminder (e.g. '*Turn off the computer at the end of the working day*') and a link to an update related to the activities of an environmental organization. By reading and replying with the word 'donate' to the message, they could donate 1 euro to the environmental organization. Finally, results were evaluated with a quantitative parameter. The ten participants donated 32 out of a maximum of 50 euros over the five days of the experiment. The conclusion was that office workers become engaged by feeling empowered when enabled and prompted to donate corporate money to environmental organizations.

4.4 First iteration

The testing phase naturally flowed into a first iteration of the user-driven process aimed at further developing the value proposition. During this iteration, follow-up interviews (talking) with participants from the MVP testing revealed that the service concept has an effect on energy efficient behaviours: office workers reported

increased awareness and attention in this regard during the course of the experiment. However, they complained about being unable to choose the organization receiving the donation, and especially about the message not reminding them about energy saving in the right place and at the right time. In parallel, the findings of the interview (talking) with the potential client pointed out that the most relevant element of the value proposition is employee engagement.

These findings fuelled a team brainstorming session (thinking) to plan further testing. The team decided to run a second test with a new MVP focusing on employee engagement as a main aspect of the value proposition. Consequently, it was decided to allow office workers to choose the organizations receiving the donations. The results of the new MVP testing reinforced the findings of the first one. By scanning energy saving reminders next to QR codes placed in strategic locations (e.g. on the personal computer), office workers could donate money to an organization of their choice. The ten participants donated 87 out of a maximum of 100 euros during the ten days of the experiment. The conclusion was that employee engagement is indeed a fundamental aspect of the value proposition from a client's perspective, and that allowing office workers to choose the receiver of the donations may have a positive effect on it.

4.5 Second iteration

The first iteration was followed by a second one, which started with follow-up interviews (talking) with the participants of the latest MVP testing. They confirmed that allowing office workers to choose the receiver of the donation had a positive effect on their engagement. However, some of the participants complained that, after a while, scanning the QR codes did not feel as a tangible donation experience and that interest could wear off over time. This was also due to the lack of feedback about the overall impact of positive behaviour at the end of the experiment. In parallel, the interviews with the potential client and the potential partner (talking) revealed significant interest in running a small-scale pilot of the service, which gave a positive indication on the business viability of the value proposition.

Based on these findings, the team conducted another brainstorming session on how to proceed (thinking). It was decided to build a new MVP that would provide office workers with a more tangible donation experience as well as feedback about positive behaviours. By putting physical tokens of different colours associated to different energy saving actions inside a piggy bank with three separate slots placed on their desk, office workers could choose to donate money to three different environmental organizations. By counting the tokens of different colours at the end of the experiment, the participants could receive feedback on how many times they performed a certain energy saving action and the related environmental impact (e.g. kWh saved by shutting down the computer overnight for multiple days and avoided CO_2 emissions). Participants could also be informed about how much money they donated to each environmental organization. The four participants donated 68 out of 100 Euros during the twenty days of the experiment.

In conclusion, the experience of a physical donation, the possibility to choose the receiver of the donations, and the provision of feedback about positive behaviour are all key aspects of the value proposition, thus allowing office workers to engage with energy saving over longer periods.

The positive outcome of the second iteration facilitated the definition of a preliminary business model around the value proposition, and the impetus towards a small-scale commercial pilot with a potential company client. These activities, however, fall outside the scope of this research.

5. DISCUSSION: Sustainable Value Proposition Design

The *sustainable business model innovation* approach aims at achieving sustainability objectives by generating economic value. In this context, the development of a sustainable value proposition—that is, an offering addressing a sustainability problem, creating shared value for a network of stakeholders—is central. *User-driven innovation* is an approach to business innovation that can help overcome some key challenges in the development of sustainable value propositions. This paper explored the connections between these two approaches through a project aimed at developing a sustainable value proposition for increasing energy efficiency in office buildings through behavioural change.

Following the user-driven innovation approach, the sustainable value proposition was designed by talking with relevant stakeholders, thinking about potential solutions and testing such solutions early on to iterate towards a problem-solution fit. The outcome is a sustainable value proposition, which combines energy saving behaviours with donations to environmental organizations as a unique corporate sustainability effort. THANKS is an innovative solution that leverages on business incentives (increasing employee engagement and improving public image) and behavioural changes (empowering and engaging employees to make a positive impact at the workplace and giving them feedback about the effects of their behaviour) so as to deliver superior value for multiple stakeholders, including environmental organizations (who receive donations from companies while engaging office workers with their causes and promoting pro-environmental behaviours).

The empirical findings can be reconnected with the literature on *sustainable business model innovation* and *user-driven innovation* to derive a process for *sustainable value proposition design* (Figure 6). The upper half of the circle represents the sustainable value proposition and its three building blocks. The lower half represents the design process based on *user-driven innovation*. The core idea of this process is that a sustainable value proposition (and its three building blocks) can be designed through an iterative process involving three activities.

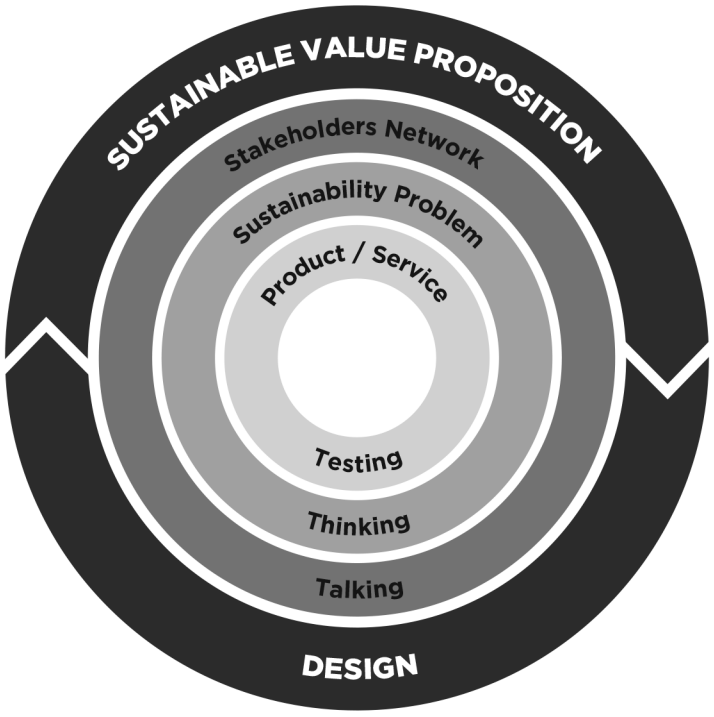

Figure 6. Process for sustainable value proposition design.

The first activity combines the first building block of the sustainable value proposition with the first step of the user-driven process: *talking to the network of stakeholders*. The findings suggest that companies developing sustainable value propositions should identify relevant stakeholders (including users), and discuss the core elements of the value proposition with them to discover novel and multiple perspectives on the sustainability problem as well as unexpected connections with other types of problems and with other stakeholders. Going a step further, companies could use this activity to reconfigure the network of stakeholders according to the context. Adding stakeholders generates additional and unexpected opportunities for shared value creation inside a broader network of interactions. Based on the literature review and the analysis of our design process, we maintain that this objective can be addressed through two practices: conversational interviews and co-creation sessions.

In the context of this study, the combination of conversational interviews (Fontane & Frey, 2000) and co-creation sessions with different stakeholders allows to gain a multifaceted stakeholder perspective and consequently identify a stakeholder network. In line with the literature, the latter is in the first place a relational and conversational challenge, because it requires understanding and mediating several needs and objectives across a network of multiple stakeholders in order to create shared value (Allee, 2000; Bocken et al., 2013; Porter & Kramer, 2011). According to our findings, conversational interviews emerge as a particularly suitable practice to his end. Furthermore, the stakeholder network should not only include potential clients for the envisioned value proposition but also the end-users and all other parties that may be relevant for the sustainability problem (Allee, 2000; Donaldson & Preston, 1995; Porter & Kramer, 2011). In fact, adopting a multifaceted stakeholder perspective—instead of a simple customer centric—allows the discovery of opportunities for shared value creation that would otherwise be missed (Bocken et al., 2013). In this project,

corporate social responsibility, public image and employee engagement emerged as value drivers for companies and as areas of opportunity to be considered in the ensuing stages. Furthermore, by talking about the sustainable value proposition with the initial set of stakeholders (i.e. corporate clients and office workers), it was discovered that environmental organizations could play a role, and it was decided to include them in the network.

The second activity combines the second building block of the sustainable value proposition with the second step of the user-driven process: *thinking about the sustainability problem*. The empirical data suggest that companies should refine (or redefine) the sustainability problem according to stakeholder feedback, and consequently conceptualize a related product/service idea that creates shared value for the network stakeholders. By combining the literature review and the empirical findings, we propose that this objective can be addressed through the following interrelated practices: problem reframing, knowledge brokering, brainstorming.

In the context of this study, reframing (Dorst, 2011) is based on combining the sustainability problem with other stakeholder needs and goals, merging information coming from different parties into a unique and broader problem definition that can be addressed by an innovative solution. In this project, the initial problem frame was centred on energy efficiency. Subsequently, through discussions and iterations with a broader spectrum of stakeholders and through knowledge brokering (Calabretta & Gemser, 2015) from a former project, the problem frame was broadened to corporate sustainability. Finally, brainstorming allowed to conceive a product/service concept combining energy saving actions with corporate donations to create additional value through improved public image and employee engagement.

The third activity combines the third building block of the sustainable value proposition with the third step of the user-driven process: *testing the product/service.* We argue that companies developing a sustainable value proposition should create a MVP of the product/service idea, and quickly verifying whether its features effectively deliver the intended value across the network of stakeholders. The practices that enable this activity include assumption definition, feature testing, and evaluation of the results.

In the context of this study testing is done in line with the lean startup approach to achieve problem-solution fit (Ries, 2011). Assumptions to be tested are defined up front. Consequently assumptions are embedded into specific product/service features to be tested in front of stakeholders (Blank, 2013; Osterwalder et al., 2015; Ries, 2011). Finally, results are measured with specific parameters (Ries, 2011). These three practices lie at the core of building the MVP (Blank, 2013; Osterwalder et al., 2015; Ries, 2011). Our first MVP was developed to test the feature of a text message reminding office workers to save energy and empowering them to donate corporate money to an environmental organization. The amount of donated money was used as a parameter for the test performance. The outcome of this activity is a Minimum Viable Product and validated learning about the sustainable value proposition.

In the context of this study iteration of the three activities aims to the further development of the value proposition towards problem-solution fit. Iteration should be continued until sufficient validated learning allows the definition of a preliminary business model (Blank, 2013). This involves repeating the three activities and related practices described above: talking again to the stakeholders in order to redefine the problem and finally updating the MVP for further validation. During the iterations of this project, employee engagement emerged as a prominent element of the sustainable value proposition when approaching a potential client, and QR codes as a way to improve the user interaction with the service.

The three activities and their iterations are summarized in Table 1, including their objective, underlying practices and outcome accompanied by an example from the empirical context.

	TALKING	**THINKING**	TESTING	ITERATIONS
Objective	Identifying relevant stakeholders (Including users) and discussing the value proposition with them to discover different perspectives on the sustainability problem as well as connections with other problems and stakeholders.	Redefining the sustainability problem using stakeholder feedback and knowledge brokering to conceptualize a product/service to address the problem while creating shared value for the stakeholders.	Creating a prototype of the product/service idea, and verify if its features deliver effectively shared value across the network of stakeholders.	Iterating the development of the sustainable value proposition towards problem-solution fit by talking to stakeholders, redefining the problem and finally testing the updated solution.
Practices	- Conversational interviews - Co-creation sessions	- Problem reframing - Knowledge brokering - Brainstorming	- Assumption definition - Feature testing - Evaluation of the results	- Iterating the practices
Outcome	A stakeholders' network as a system of needs and goals related to the sustainability problem.	A broader problem frame and a product/service concept to address it.	A Minimum Viable Product and validated learning about the sustainable value proposition.	An updated version of the Minimum Viable Product and additional validated learning to define a preliminary business model.
Example	Environmental organizations are introduced into the stakeholders' network next to corporate clients and office workers.	The frame is broadened from corporate energy efficiency to corporate sustainability and THANKS is conceptualized.	A message is designed to test if office workers are engaged with energy saving and corporate donations.	Employee engagement is highlighted as a core element of the sustainable value proposition, and a more tangible donation experience is introduced to improve the user interaction with the service.

Table 1. Actions, outcomes and practical examples from the design project related to the three activities, and their iterations supporting the process for sustainable value proposition design.

6. CONCLUSION

This paper focuses on combining sustainable business model innovation with user-driven innovation for addressing the challenges of sustainable development through the design of sustainable value propositions that combine economic and environmental objectives. By addressing this topic, the paper contributes in different ways to theory and practice.

First, the paper contributes to academic research on sustainable business model innovation. This approach maintains that business model innovation driven by profit is an effective way to address sustainability objectives (Schaltegger et al., 2015). Central to this approach is the creation of sustainable value propositions, which address sustainability problems through products or services providing shared value for a network of stakeholders (Bocken et al., 2013). Developing a sustainable value proposition is a long process that may require several product-market iterations (Keskin at al., 2013; Keskin, 2015). In this regard, the paper argues that the *sustainable business model innovation* approach would benefit by being integrated with principles from *user-driven innovation*, an approach to business innovation based on deep user understanding, experimentation and iteration (Blank, 2013; Brown & Katz, 2011; Karpen et al., *forthcoming*; Ries, 2011). Particularly, by gaining a deep understanding of the users, the development of sustainable value proposition can be steered towards directions that are more desirable for the users themselves and that are able to influence their behaviours in a virtuous manner (Boons et al., 2013; Santamaria et al., 2016). Furthermore, iterating the value proposition with an extended range of stakeholders creates larger acceptance, commitment and support for sustainable innovations that are not merely incremental or aimed at technological efficiency (Geissdoerfer et al., 2016).

The paper consequently shows how the two approaches can be combined into practice through a process for *sustainable value proposition design*. While there are many tools supporting practitioners in the development of conventional value propositions, this is not the case for tools integrating sustainability considerations (Bocken et al., 2013). The process depicted in this paper aims at filling this gap. Particularly, one of the few tools that support practitioners in the development of sustainable value propositions allows an initial identification and understanding of different stakeholders' needs and objectives, which is indeed a fundamental first step (Bocken et al., 2013). The process for *sustainable value proposition design* proposed in this paper goes a step further, adopting a dynamic and iterative perspective (talking to stakeholders, thinking about the problem, testing the product/service) that leads to an actual sustainable value proposition and to a superior problem-solution fit. In this way, managers are provided with an initial methodological framework for mapping and understanding the stakeholders in a broad sense, identifying their needs and interests, and progressively combining them into a more meaningful and enriching value proposition, which is also financially viable and sustainable.

Furthermore, the paper contributes to the literature in energy efficiency by combining technological advancements with a deep understanding of human needs in order to induce behavioural change (Barbu et al., 2013). By analysing the specific context of commercial office buildings, a value proposition for energy efficiency centred on behavioural change was conceptualized. Current solutions to energy efficiency through behavioural change are based on energy awareness programs, which strive to engage office workers and do not tap sufficiently into corporate strategic objectives (Prindle, 2010). Unlike current solutions, the value proposition developed through the approach proposed in this paper leverages on business incentives and behavioural science to deliver superior value for multiple stakeholders (corporate clients, office workers and environmental organizations). While gaining a deep understanding of human behaviour is required for triggering energy saving behaviours, methods adopting this approach in the domain of energy consumption are currently lacking or very complex (Heiskanen, 2013). This paper proposes a process to understand user needs and influence their behaviours by involving them in the development of the value proposition.

User-driven innovation emerged as a suitable approach for addressing the energy efficiency challenge in combination with the sustainable business model innovation. Other researchers could explore if the same combination could effectively be used for other sustainability challenges. For instance, sustainable innovation to overcome pollution and resource depletion also clashes against resistance to change and the intricate and contrasting interests of several stakeholders. Using this study's process for sustainable value proposition design could promote behavioural change as an innovation direction to address those challenges. Furthermore, testing the process proposed in this paper in different contexts could validate and further improve the process itself, thus contributing to overcoming one of the main limitations of this study: the reliance on a single project.

This study is an exploratory endeavour, based on a single project focusing on a specific type of sustainability problem. This limitation affects the generalizability of the findings, as some context-specific factors might have steered the project in a certain direction and/or interacted with the interventions of the researchers. For instance, the list of practices that we associate to each stage of the process is an exploratory attempt to guide practitioners in the development of a sustainable value proposition, but is certainly not exhaustive. We expect further research to support and extend that list, and even to identify new practices and methods to support each step. Additionally, another challenge during our empirical investigation was the lack of direct contact with all types of stakeholders that might be relevant in the development of a successful value proposition (e.g., business managers/developers, governmental institutions). Additional case studies where all stakeholders are involved could provide further validation and generalizability to our findings. Furthermore, future work should focus on testing the validity of the process in relation to different sustainability problems, and consequently integrate additional findings into the theoretical foundations of the process itself.

Overall, the *sustainable value proposition design* process proposed by this paper offers more solidity and innovative drive to sustainability objectives by framing them into the structure of a value proposition that delivers shared value to all stakeholders. Furthermore, the process allows to define up front the value

proposition in close contact with prospective customers, business stakeholders and environmental stakeholders. In this way, if the value proposition falls short in delivering the intended value, adjustments can be made according to stakeholder feedback. On the contrary, as the value proposition succeeds, key connections for the future business are also being established at an early stage. This approach can save significant time and resources on product and business development when starting a new venture, and can potentially reduce the innovation perceived risks and the success odds. While THANKS—the value proposition developed in the project used for this study—is about to be introduced into the market, that only represents anecdotal and preliminary evidence for the impact of sustainable value proposition design on sustainable innovation performance indicators. Further research could adopt a more longitudinal approach by following similar projects for longer periods of time, thus yielding additional support—and even improvement—to the model.

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