Design-thinking & Frugality; A workshop routine to capture the value of innovations for SMEs.

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Abstract

This full paper works towards merging 'frugality' and 'design thinking' into a simplified framework for a workshop routine as a stepping stone for SMEs in developed countries to create and capture value of frugal innovations. Innovations which are born out of the notion that we can do more with less, or for less. This framework is aimed at reaching a specific group of SMEs, in this paper called the peloton of SMEs, a large group of SMEs which generally have lower growth ambitions and growth potential in comparison to the frontrunners. This group is often overlooked by (regional) governmental innovation programmes due to a primary focus on the same industry's frontrunners.

The framework was first tested with students, discussed with experts and eventually tested with SMEs from the Agribusiness sector in the Netherlands. Frugal Elements added to the design thinking process are; (a.) a Frugal Lens (b.) Frugal Business Model Patterns for BMI (c.) Frugal leadership development (d.) Frugal Validation of the solution (e.) Frugal Intervention (limited time, limited theory, vertical learning community, practical tools).

Although the first Pilot has been a succes in terms of helping participating SMEs to create innovations, more research is necessary for the design of a final framework which is expected to contribute to the frameworks that are currently available to SMEs in frugal and sustainable business modelling.

Keywords

Frugal Innovation, Design Thinking, Busines Model Innovation, SMEs.

Introduction

Frugal innovations for recovery

This decade began with the arrival of a pandemic that has had a damaging effect on people and organizations, both in economic and social terms. According to Schumpeterian theories (Schumpeter, 1942; Korringa et al., 2016), sustainable economic growth can be aided by the introduction of successful new products, services and processes. It is the innovative entrepreneur who is the prime mover in this process (Spulber, 2014). In parallel to the pandemic there is maybe an even bigger crisis evolving; a sustainability crisis that also needs to be tackled. Increasing sustainability pressures warrant a better understanding of the impact of companies' BMI through a more comprehensive analysis of innovation and its consequences (Snihur & Bocken, 2022). Although organizations with environmentally friendly resources and capabilities have an advantage over their competitors(Iqbal & Ahmad, 2021), for SMEs creating sustainable value it is not the first priority. Continuation and survival, especially in times of crises, are key (Pisoni et al., 2018). In this paper, we examine the concept of frugality to assist SMEs in the creation of new products, services, processes and subsequently new business models (BMs) for creating the necessary financial value for recovery but also allowing for continued progress towards sustainability.

Purpose of the research

This research aims to contribute to the few tools or frameworks that are currently available to SMEs in sustainable business modelling (Geissdoerfer et al., 2016). Innovation in the development of sustainable business models has become a hot topic but is affected by a high failure rate due to a lack of reliable and efficient methods (He & Ortiz, 2021). According to Bocken, research indicates that tools or frameworks that fit needs and expectations are scarce or may be too complex and demanding in terms of time commitment (Bocken et al, 2019). Simplicity, as opposed to complex and demanding, is core to frugality. As frugal innovations have shown great success in driving inclusive growth by overcoming challenges like poverty and inequality, it is also expected to have high potential in advanced or developed countries driving sustainable growth of businesses without damaging the planet (Agarwal & Brem, 2017).

The purpose of this research is to explore whether the concept of frugality can be a transformed into a simple, easy to apply framework, in this case a workshop routine. A workshop routine is a set of consecutive workshops with a specific configuration, which has the potential to support SMEs in developed countries in creating and capturing value of frugal innovations, and possibly drive sustainable outcomes. This workshop routine should assist SMEs in finding new solutions or innovations.

Literature; reconciling concepts

This section highlights the theoretical background by drawing on two concepts: frugality and design thinking. This is followed by an explanation of the research gap and the resulting need for the presented study.

Frugality

According to the dictionary, the word “frugal” means “economical in use, or spending”, “requiring little expense or few resources” or “living without waste”. The notion of ‘frugal innovation (FI)’ was first introduced in the context of emerging markets, giving non-affluent customers opportunities to consume affordable products and services suited to their needs (Weyrauch & Herstatt, 2017). The value provided with FI started as inherently social because the goal was to give the poor access to products and services to empower them. However, the discourse on FI has been extended towards developed countries focusing on using less resources (Tiwari & Bergmann, 2018). The challenge for frugal innovation is to introduce something new whilst saving resources (Pisoni et al., 2018). That new solution can be a product, service, process, or even a new business model (Hossain, 2018).

Frugal innovation can be considered as an outcome but also as a process or a mindset (Pisoni et al., 2018). Frugality, or working with a frugal mindset could therefore mean using resources to their full potential. This paper applies this mindset in developing a framework for a workshop routine that opens up a path in creating new products, services, processes and subsequently new Business Models (BMs) that provide significant value while minimizing the use of resources such as energy, capital and time (Hossain, 2018; Radjou & Prabhu, 2015). Frugal innovation presents a promising way to tackle some of today’s pressing societal problems with new business models (Hossain, 2021). Although Frugal innovations do not all have an inherent sustainability impact (Rosca, 2017). The notion of frugality could also provide a new perspective on how to deal with the traditional trade-off between people and planet that is apparent in the body of literature on developing sustainable BMs (Arnold, 2018). Using this lens, we hope to show that frugality provides a promising perspective to make the transition to more sustainable BMs. In short, frugality could be explained as ‘doing more with less’ (Radjou & Prabhu, 2015).

In this paper, we will apply this mindset in developing BMs. Sustainable BMs require intentional design if they are to deliver aspired sustainability impacts (Bocken et al., 2019). One reason for Business Model Innovation (BMI) failure is a lack of supporting frameworks and tools (Weking et al., 2018), this is where Business Model Patterns (BMPs) come into play. BMPs could be used as an effective tool to capture and organise the knowledge about the creation of sustainable BMs and to creatively develop or adapt BMs by recombining existing patterns (Lüdeke-Freund et al., 2018). It is about making solutions that have been successful in the past in different industries or contexts, accessible to others (Amshoff et al., 2015). Recently, nine specific Frugal Business Model Patterns have been identified (Kraaij & Limonard 2021). These Patterns describe ways to create economic, social and ecological value by applying a frugal mindset. An example of a Frugal Pattern is to ‘Diminish resources’ (or Simplify), meaning stripping the product or service to the core by removing or reducing features, resources, required activities and/or waste streams.

Design Thinking

As stated by Brown (2008), design thinking is a means to provide innovative solutions for complex problems for organizations. At its core, design thinking is a human-centred approach for innovation by co-creation, inspired by the way designers tend to think and act (Klenner et al., 2021; Brown, 2008). It is a method for generating (innovative) solutions for wicked problems by deliberately incorporating the concerns, interests and values of humans into the design process (Brown, 2009; Meinel & Leifer, 2011).

Design thinking has moved beyond its original implementation in new product development and has been successfully applied in an ever-wider spectrum of areas, such as sustainable BMI (Geissdoerfer et al,. 2016). The design thinking process is deliberately iterative and aims to rapidly develop and test multiple, possible solutions to arrive at an optimal one (Geissdoerfer et al., 2016; Brown, 2008). To make this process more accessible and explicit, easily understandable and applicable in businesses, the British Design Council developed a graphical based diagram, describing the divergent

and convergent stages of the design process (Designcouncil, 2018). This Double Diamond design process model consists of four quarters; 'Gaining insights, discover, be curious', 'Define the core challenge (= problem definition)', 'Potential solutions', 'Solutions that work & receive feedback' and is the base of the proposed preliminary framework for a workshop routine.

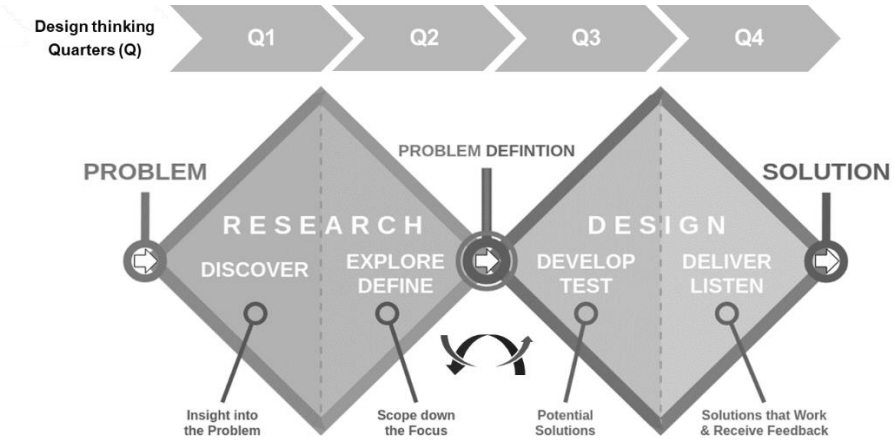

Figure 1 Design Thinking Process - Double Diamond (Designcouncil, 2018).

The first quarter of the Double Diamond represents the initial divergent part of the project in which the designer is searching for brand new opportunities, trends, markets, information and insights. The second quarter, which ends the first Diamond, marks the Definition stage, a filter where the first insights are reviewed, selected and discarded.

The third quarter of the Double Diamond signifies the period of Development. It covers the initial development of project ideas, in which the designer must engage with the wider context of the identified opportunity. We find ourselves again in a period of divergency. Solutions are developed, iterated and tested under the use of dedicated tools such as brainstorming, prototypes and experimentation combined with financial validation. In the last, fourth quarter of the Double Diamond, the final concept is taken through final testing, production and launch (Designcouncil, 2018).

The need for merging Frugality & Design Thinking for SMEs

In a recent literature review by Pisoni et al (2018), the foundations on frugal innovation were laid for subsequent works, by identifying gaps in the current knowledge and by recommending new directions for future research. We aim to address the gap of a frugal approach to innovation in SMEs in developed countries.

Design thinking, with its broad and generic applicability, has proven to provide an effective way for organizations to create (product, service, process, and business modelling innovation (Hossain, 2018) solutions for problems. At the same time, design thinking could also be resource-intensive, requiring special workspaces and consuming a considerable amount of time (Bocken et al., 2019). Resources are scarce for SMEs and startups. Such enterprises often start with the means at their disposal, and not by considering those they could acquire in the future (Ghorberl et al., 2021).

Frugality, or working with a frugal mindset, is proven successful in using limited resources to their full potential. It helps enterprises to do more with less, or for less. Frugal innovations are by definition non-complex and are created by entrepreneurs who do not aim at a high (financial) growth potential.

Is a clever combination of Design Thinking and Frugality beneficial? Can we make design thinking more accessible and valuable by means of adding frugality? Design Thinking is a proven concept and a good base for the creation of innovations. By first identifying and then adding specific frugal elements to the design thinking process, means and resources can be reduced, synthesizing the best of both worlds. By merging 'design thinking' and 'frugality' into a workshop routine, a specific group of SMEs can be challenged to capture and create value. Therefore, the main research question that this study addresses is: "How can frugal elements enhance the design thinking process, to support SMEs in creating, commercializing, diffusing frugal products, services and/or processes?"

Method

Framework for a Design Thinking workshop routine with Frugal Elements

To address the research question, we have developed a framework to find solutions for SMEs by adding frugality to the design thinking process. This method section explains the step-by-step development procedure for creating such a framework. Figure 2 provides an overview of the research methods used in this study, which is structured in four phases: (1) Discovery, (2) Conceptualization, (3) Effectiveness & Improvement and (4) Continuous improvement. An introduction of the implemented approaches for each phase is followed by an explanation of the respective methods and a description of the result(s) per phase.

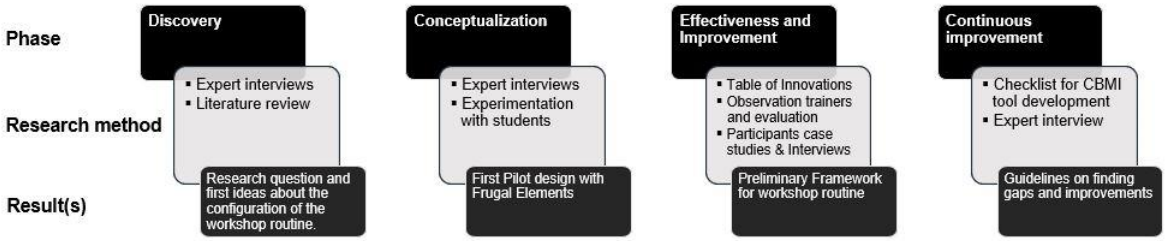

Figure 2 Overview of Phases, Research methods and Result(s)

Phase 1; Discovery

The first phase was about discovering the idea's origin and necessity for creating such a framework for a workshop routine. The main research method employed in this phase was semi-structured interviews with three experts on Frugal Innovation, Design Thinking and Innovation Management. Additionally, literature studies on the relevant concepts were reviewed. The interview with the academic researcher on Frugal Innovation, focussed on the idea's origin and stakeholders. This interviewee also has expertise on Design Thinking. The second expert, also an academic researcher, has a PhD in Innovation Management and is an experienced trainer. The third expert has developed considerable knowledge on Design Thinking as an SME management consultant and trainer. During all these interviews, special focus was given on the specific needs of the target group, the SMEs.

The literature review started by screening journal articles on Frugal Innovation and Design Thinking. These literature sources were identified in the Web of Science database by using the search terms 'frugal innovation', 'literature review' and 'design thinking'.

Results from expert interviews and literature reviews yielded a research question, relevant assumptions and first ideas about configuration of the workshop routine.

Phase 2; Conceptualization

Phase 2 focused on designing the first framework for the workshop routine to use in subsequent testing during the next phase. The conceptualization was based on two different methods: a round of iterative expert interviews and experimentation of frugal elements within student projects.

Firstly, a round of iterative expert interviews was conducted to conceptualize a workshop routine based on the framework drafted in the preceding exploration phase. The same experts, as mentioned in the previous phase, were interviewed, and asked to provide input on the different building blocks necessary to create the First Test Pilot configuration of the workshop routine. Again, specific attention was given to the needs of the target groups, the SMEs. Possibilities of Design Thinking were discussed, and how frugal elements could be added to the Design Thinking process.

Secondly, frugal elements were conceptualized and tested in an educational environment. Each year the Institute International Centre for Frugal Innovation organizes a unique, educational program for third year bachelor students from Leiden University, TU Delft and Erasmus University Rotterdam - the minor Frugal Innovation for Sustainable Global Development (ICFI, 2022). In this program, participating students have the opportunity to work with students from other universities and disciplines, allowing them to step outside of their monodisciplinary frame of reference centered around the concept of Frugal Innovation. In this Minor, students are asked to create financially viable enterprises that commercially achieve the goals of a selected NGO. For this, frugal elements were added to the program.

Based on the results of the expert interviews and the experimentation, the authors developed an initial framework for a workshop routine, suitable for a first Pilot in the next phase.

Phase 3; Effectiveness and Improvement

The third phase comprised the testing of the developed framework for the workshop routine. The framework was evaluated for gaps and improvement possibilities. Such improvements were subsequently incorporated. The main method employed in this phase was testing the concepts by conducting a pilot workshop with SME participants (entrepreneurs and their employees), facilitated by one of the authors and a fellow lecturer who is also an interviewed expert. During, and after the workshops, data was gathered in four different ways: by observation of the lecturers, a participant questionnaire, an overview of participants and innovations and two/three short case studies on the innovations of the participants.

Firstly, the workshop routine was analyzed afterwards by the lecturers through observing the participants. The lecturers filled out a prepared data sheet with improvement questions identical to the ones in the participant questionnaires and discussed the effectiveness and improvements for the workshop routine.

Secondly, questionnaires were handed out to the participants after the presentations at the end of the workshop routine, requesting them to evaluate each part of the routine on a five-point Likert-type scale ranging from ‘very bad’ to ‘very good’ to identify strengths and improvement possibilities. After the workshop, three selected participants were interviewed and asked about their innovation based on the returned questionnaires. These entrepreneurs were selected from the participants’ list based on their willingness to be interviewed and full participation in the workshop routine. A feedback session was held where improvement suggestions and other items important to the participants were discussed to obtain additional information on the workshop routine design.

Thirdly, an overview of the participants’ innovations was created to determine the effectiveness of the pilot in the form of a table of all the solutions of innovations that were created during the workshop routine. The innovations were coded to see whether the Innovation is Frugal, Sustainable or Social in nature and if sales were realized two months after finalizing the workshop routine.

Fourthly, The same three participants who were initially interviewed were also interviewed four months after finalizing the workshop routine. Their innovation itself, linking to the workshop routine and possible success of the innovation were briefly discussed together with their assessment on the effectiveness and improvement of the workshop routine. Special attention was given to the frugal elements in relation to the innovations or solutions from the workshops.

From the previous steps, conclusions could be drawn on the effectiveness and possible gaps and improvements. Based on these finding an improved and semi-final framework for a workshop routine could be presented.

Phase 4; Continuous improvement

This fourth and final phase is aimed at future iterations. We have only tested the workshop once with actual practitioners. Further iterative development, including multiple tests with users, is also an important element in design research (Lofthouse, 2006). The workshop routine needs to be further evaluated for effectiveness, benefits, gaps and further improvement possibilities. Data on gaps and such improvements need to be systematically collected and need to be subsequently incorporated in the design of the framework. This cycle needs to be repeated until no further major improvements can be identified. Due to time constraints on what post-workshop feedback can be reasonably expected from the participating SMEs, the evaluation needs to be focused on the most important items. Seeking guidelines, the checklist for Circular BMI tool development was used (Bocken et al., 2019), this checklist was discussed with one of the interviewed experts. The checklist defines 10 criteria that are aimed at guiding future research (and practice) contributions in “sustainability-oriented innovation” and is specifically aimed at sustainability tool developers.

Results

This section presents the findings per phase while creating the framework for the workshop routine. It illustrates the idea’s origin and endorses its necessity, the conceptualization of the workshop routine, evaluation by the participants and lecturers on the first pilot, with suggestion for continuous improvements.

Phase 1; Discovery

The idea to create a framework for a workshop routine with frugal elements originated from a dialogue between a policy maker of a regional governmental agency in the province South-Holland, the Netherlands, and one of the foremost specialists in Frugal Innovation. The policy maker was introduced to the concept of Frugal Innovation and the idea was discussed whether Frugal Innovation, which is usually associated with developing countries (Pisoni et al., 2018), could also be used in a developed context to ‘persuade’ SMEs to innovate. More specifically, SMEs that were currently not reached by different innovation programs and policies run by the regional governmental agency.

This group of SMEs could be described as the non-gazelles. Not the frontrunners (gazelles), but the followers. In analogy with cycling, this is the group behind the frontrunners. The so-called peloton, who often do not have a high, financial growth ambition and are usually not high-tech oriented, but crucial to the frontrunners’ success and often large in size / numbers. This group has been proven difficult to reach because they believe that innovation programs are not suited for them due to the return on investment. However, this peloton of SMEs is very important in economic terms and the necessity for cashing in on this idea was demonstrated.

To overcome this problem and lower the threshold for this group of SMEs in participating in innovation programs run by the regional government, the idea was born to introduce Frugal Innovation to a workshop routine for SMEs on 'How to innovate'. Frugal innovations are by definition non-complex and are created by entrepreneurs who do not aim at a high (financial) growth potential.

The three experts were interviewed and it was mutually decided that the workshop routine should be based on the Design Thinking process, more specifically the Double Diamond, since this concept has a proven record in creating innovation (Brown, 2008). The expert on Innovation Management recommended that the workshop routine could be based on the notion of adding frugal elements to the Design Thinking process. Adding frugal elements could even be interpreted as a process innovation itself. The frugal elements could be conceptualized and be experimented with, to see what works best. Additionally, relevant assumptions provided by all three experts can be found in the table below.

Frugal Innovation expert	Design Thinking & SME expert	Innovation expert
Frugal Innovation is a useful concept for the creation of innovation in the context of the developed world.	This kind of entrepreneurs prefer to talk to other entrepreneurs instead of listening to theoretical lecturers/ academics.	Don't use the word Frugal Innovation in the beginning but use the word "Smart Innovation" and clarify the meaning later in workshops
Participants should be owners or higher management.	Time is the most scarce resource for entrepreneurs. Limit time on theory but use the time for active engaging in discussion between entrepreneurs. Maximum 4 workshops.	One or two participants per SME depending on management situation
Participants should all be working in the same sector but should not be direct competitors.		Timing; Two weeks between each workshops. Max 4 workshops.

Table 1 Assumptions relevant for the workshop routine

These findings were connected with the literature review, especially the directions for future research (Pisoni et al., 2018). Based on these findings and the literature review, the presented research question ("How can frugal elements enhance the design thinking process, to support SMEs in creating, commercializing and diffusing frugal products, services and/or processes?") was confirmed.

Phase 2 Conceptualization

Based on these preliminary findings, a first framework for the workshop routine was designed. With the Double Diamond as a starting point, each quarter (four in total) represents one session, with two weeks between sessions. During the sessions the participants are able to diverge and converge by discussing with other participants on what the actual problem is from a customer's perspective, and later on what possible solutions could be.

During the first quarter, the participants gain insights on trends within the industry and they visualize their own Business Model using the Business Model Canvas (Osterwalder & Pigneur, 2009) or Business Model Template (Jonker & Faber, 2021). By empathizing with customers the participants are able to re-define and/or clarify a business related problem in the second quarter. The participants brainstorm about potential solutions during the third quarter and try to create a problem-solution fit while having dialogues with fellow participants. These dialogues could be referred to as a first 'sanity'-check. Finally, in the fourth quarter solutions or created innovations are presented to the group and feedback can be gathered from fellow participants and lecturers.

The process described above can be defined as a regular Design Thinking process for SMEs. However, the uniqueness of this workshop routine lies in the addition of specific frugal elements. In discussions with the experts three elements have been defined:

- Frugal Lens
- Frugal Business Model Patterns
- Frugal Intervention

In the first quarter of the Double Diamond, participants are introduced to the Frugal Lens, a different perspective on innovation. The expert on Frugal Innovation stated that innovation is usually seen as high-tech solutions, created by high-tech companies, for customers who are able to afford such solutions. But that does not necessarily needs to be true. Why not offer simplified solutions by regular companies for customers who cannot afford top quality products? Innovations born out of the notion that we can do more with less, or for the less. This lens can be applied in innovating both internal processes, products, or services. Rethinking innovation this way can create new solutions that are otherwise overlooked.

During the second and third quarter of the Double Diamond, participants are familiarized with Business Model Innovation by introducing successful Frugal Innovations and Frugal Business Model Patterns in their industry. These examples and patterns can be used by the participants to creatively develop, or adapt their current Business Model Canvas by re-using successful solutions or recombining with other solutions. It also helps the participants with the diffusion and commercialization strategies of innovations. Using Frugal Business Model Patterns was tested successfully in student projects.

The Frugal Intervention takes place during all quarters of the workshop routine. Meaning minimising resources as much as possible, because they can be scarce, while creating innovations and meeting the SMEs needs. This was realized by: a) limiting the time necessary to participate in this workshop routine; b) limiting the amount of time spent on explaining theoretical frameworks by maximising action-based learning; and c) inviting industry likeminded participants to accelerate the learning process by not losing any time on discussing industry differences.

In Figure 3, the graphical representation of the first framework for the workshop routine is being illustrated, based on the combination of the Double Diamond (Designcouncil, 2018) and the defined Frugal elements.

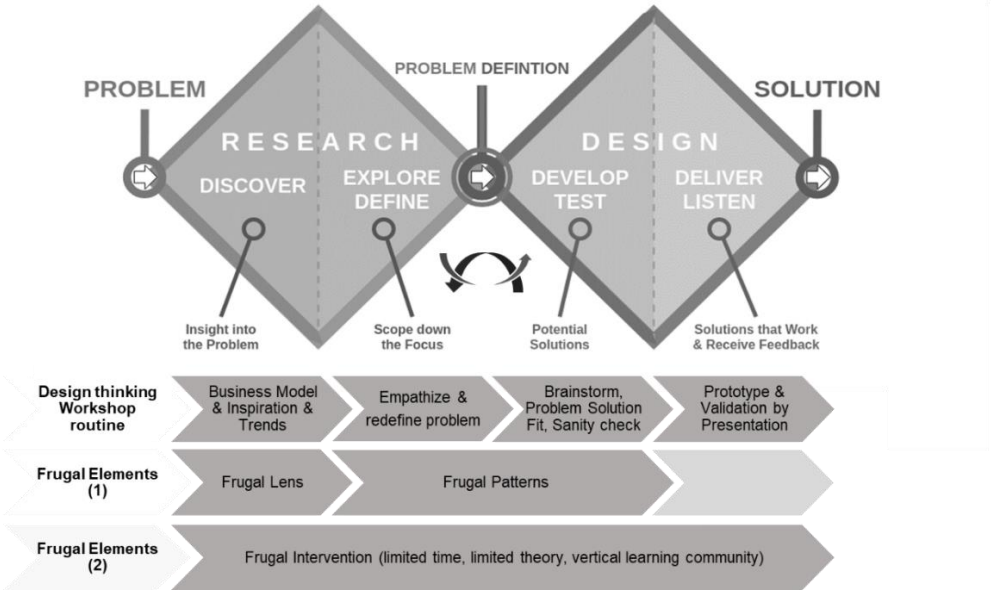

Figure 3 First framework for the workshop routine.

Phase 3; Effectiveness and Improvement

Participants for testing the first framework for the workshop routine were recruited through local agribusiness associations and Social media. As expected, it wasn't easy to persuade participants to this free-of-charge workshop routine and several stakeholders used their professional network to directly invite entrepreneurs. Frequently heard reasons for not participating were: 'I don't have enough time', 'Innovation programs are not for my kind of company' and 'I do not need help from government to run my business'. To reach a minimum amount of 10 participants, two members of the same SME could partake, under the condition that both members had a senior position in the business. The first framework for the workshop routine was tested in one trial run with 10 participants, representing seven SMEs from the Agribusiness industry in the Westland region in the Netherlands. This pilot took place in the Summer of 2021 at the Erasmus university campus in Rotterdam.

In the Table below you will find a participants' overview, including the created innovations and categorisation of these innovation based on frugality, sustainability, and realised sales:

SME	Function	Innovation	Product /Process?	Frugal?	Sustainable/ Social?	Realized Sales?	Inter-view
Solar energy solutions for growers	Owner Manager	**Frugalize solar heat battery** for low-tech greenhouses based on the already developed heat battery that focused on high tech growers.	Product	Frugal	Social & Sustainable	No, in development	Yes
Producer of organic substrates	Owner	Unique **colorful socks** produced from fishing nets taken from the bottom of the sea.	Product	No	Sustainable	No	
Chrysanthemum grower	Owner	**Christmas chrysanthemums (1).**	Product	Frugal features	Sustainable	Yes	Yes
	Owner	**Simplified processes** (2) in the greenhouse.	Process	Frugal features	Neither	N.a.	
Exporter of fruit and vegetables	Owner Manager	**Frugal Order Picking System.** Simplified warehouse procedures based on human experience instead of complex ICT solutions.	Process	Frugal features	Social	N.a.	
Wholesaler in Lilies	Owner	Unique **ceramic vases** as a co-sale to existing customers.	Product	No	Neither	Yes	
Fern grower	Owner	**Baby Ferns:** Blue fern cuttings in a box for end-consumers.	Product	Frugal features	Sustainable	Yes	Yes
Technical Services for Agribusiness	Manager	**Mechanical Trip Sweeper.** Instead of using chemical the Trip bugs will be swept up by a moving piece of cloth	Product	Frugal features	Sustainable	No	

Table 2 List of innovations and categorizations from the Pilot workshop

All participating SMEs who started the workshops presented a product (5), process (1) or product combined with a process innovation (1) in the final quarter. Three of those product innovations have already been commercialized. Moreover, out of the eight innovations in total, six had either frugal features (e.g. simplifying processes in the organization without using ICT solutions) and six were social or sustainable to a certain degree. These results exceeded the expectations of the stakeholders.

Immediately after finalizing the workshop routine evaluation forms were handed out to the participants. In the Table below the results are presented:

		Yes	%	No	%
1	This training has inspired me to come up with new solutions for my company?	**8**	*100%*	**0**	*0%*
2	This training has helped me grow my business?	**8**	*100%*	**0**	*0%*
3	I have become better at innovating thanks to this course?	**6**	*75%*	**2**	*25%*
4	Frugal innovation' is relevant for entrepreneurs in general?	**8**	*100%*	**0**	*0%*
5	I now have a good idea of what 'frugal innovation' means?	**8**	*100%*	**0**	*0%*
6	Frugal innovation' is relevant for me as an entrepreneur?	**8**	*100%*	**0**	*0%*
7	I am now better able to come up with ideas/solutions which are more Frugal?	**7**	*88%*	**1**	*13%*
8	Have I already applied the lessons of 'frugal innovation' within my company?	**4**	*50%*	**4**	*50%*
9	Will I continue to use the 'smart, sober and simple' principle of 'frugal innovation' in my work?	**8**	*100%*	**0**	*0%*
10	I would also recommend this training to other entrepreneurs?	**7**	*88%*	**1**	*13%*
11	I found it valuable to follow this course with fellow entrepreneurs?	**8**	*100%*	**0**	*0%*
12	I felt comfortable sharing experiences with fellow entrepreneurs during program?	**8**	*100%*	**0**	*0%*

Table 3 Participants Evaluation

Due to the limited number of SMEs participating in this first pilot it is presumptuous to draw any conclusions on the workshop's routine effectiveness from these answers. However, the answers implicate that: a) the workshop routine helped the participants to innovate and they became better at innovating; b) Frugal Innovation is a relevant concept for the participants; and c) the participants would recommend this free-of-charge workshop routine to others.

Taking a closer look at three participants who were interviewed and asked about their innovation in relation to the workshop routine, led to the following statements about the effectiveness of the workshop routine and improvements:

Questions	Participant 1	Participant 2	Participant 3
What was the innovation(s) that you have created during the workshops period?	*Two innovations. First we simplified working routines in the greenhouse and second "Christmas Chrysanthemums". In the winter, the chrysanthemum greenhouses are empty because wholesalers are convinced that Chrysanthemums are not in demand in winter. By offering chrysanthemums in sustainable Christmas packaging, we convinced wholesalers and end-customer otherwise.*	*I came up with a product called 'Baby Ferns'. This is nice little box with blue fern cuttings with all the right ingredients and a step-by-step instruction. The cuttings are leftovers. My expertise on growing Ferns is put into that box. Through this box we can directly reach end-customers and become less dependent on wholesalers.*	*In the workshop we discussed changing our current product (Solar heat battery for greenhouses) into a bootstrapped version, a frugal solar heat battery designed for low-tech greenhouses. With this adapted product, our customer base might change from 400 high tech growers in the Netherlands to possibly millions based around the equator.*
Would the innovations be created without the workshop?	*No, both innovations, process and product are a direct result of the workshop.*	*No, the workshop were essential. In my company it is difficult to discuss innovations with my subordinates.*	*No, I would not. The workshop opened our mind so that innovating is not necessarily about increasing complexity.*
What is your take on the assumptions on which the workshops are build?	*I endorse all assumptions but I would like to add that we would not have participated if a direct competitor would have joined.*	*All the assumptions are correct in my opinion.*	*I agree with all however I would like entrepreneurs from other sectors to be invited as well to enhance cross-sector innovation.*
What is your take on the effectiveness improvement of the workshop routine?	*The strength of the workshop lies in discussion between entrepreneurs within the sector and questions from the coaches. We have repeated the workshop in our organizations with employees. We are a family business; it helped the owners to agree on strategy and leadership style*	*The biggest learning lesson was that by mapping my BM and BM from other participants and BMs of successful innovators you can see where you can innovate.. Frugal Innovation gave me the insight that you can innovate on something that is already in the organization, in our case left-over cuttings.*	*Empathizing with customers and examples of Frugal BM Patterns inspired us to "Simplify" our product. By offering the frugal version to Bottom of the Pyramid growers we created a possible new market of millions and can contribute to food security (SDG2).*
What would you add or delete from the Course?	*Additional Tooling that we can re-use within the company.*	*Every participant should be asked to come up with a Frugal Innovation for one of the other SMEs. This increases one's ability to innovate, might present you with an interesting innovation but also strengthens the vertical learning community.*	*Further validation of the proposed solution as homework for the last session. Both financial validation and customers or colleagues' validation. More attention for multiple value creation. Also, more Tooling that we can re-use for future innovations.*

Table 4 Case studies / Interviews with three participants

The case studies / interviews confirm that the participants experienced the workshop routine beneficial in the creation of a relevant innovation. Also, the assumptions on which the workshop routine were based and learning how to innovate were being confirmed by the participants. Some even re-did the workshops within their own company to extend the effect of the workshop routine. Some ideas for improvement were proposed by the participants. Suggestions were: Allocating more time to validation of the proposed innovation e.g. financial validation; additional tooling which is transferable to other innovations; extra attention to multiple value creation and increasing the ability to innovate by innovating for others as well.

When comparing observations of both lecturers during and after finalizing the workshop routine, both lecturers agreed that the pilot has been a success in terms of creating innovations in a relatively short period of time. However, there is still room for incremental improvements. Some ideas for improvement according to the lecturers are:

- The workshop increased the agility of the SMEs to innovate during changing conditions. The SMEs have superior knowledge of their own processes and markets. The workshop helps participants to look beyond their markets / industry;
- In addition to the Frugal lens a "multiple value-lens" could be added to the first session, in order to increase the likelihood of innovations being either social or sustainable. An entrepreneur's main focus is financial, but this could be extended. This can replace general clips on innovation outside the industry which did not resonate well with the participants;
- When two participants from the same SME join the workshops this leads to an unexpected by-product. The creation of a new innovation resulted not only in an innovation but also in the development of a shared view on leadership within the SME. Innovating is also deciding on how to approach future challenges. The workshop triggered vital discussions. Pairs should be stimulated to join the workshop and the leadership development should be a part of the workshop routine.
- Allocating enough time before the last session in order to create a prototype and financial validation of the innovation, and prompting participants to present such findings in the final session. The session can be combined with feedback from other participants.
- The trainers' role for this target group (the peloton of SMEs) should be primarily facilitating dialogue between participants, limit theoretical frameworks, simply explain the tools and maximise action learning, but also ask critical questions regarding the innovations. The perspective of somebody not working in the sector was much appreciated by the participants.

The gathered data on the effectiveness and improvements resulted in an improved framework design of the workshop routine with incremental changes based on the input from the participants and the lecturers. The incremental changes are in black.

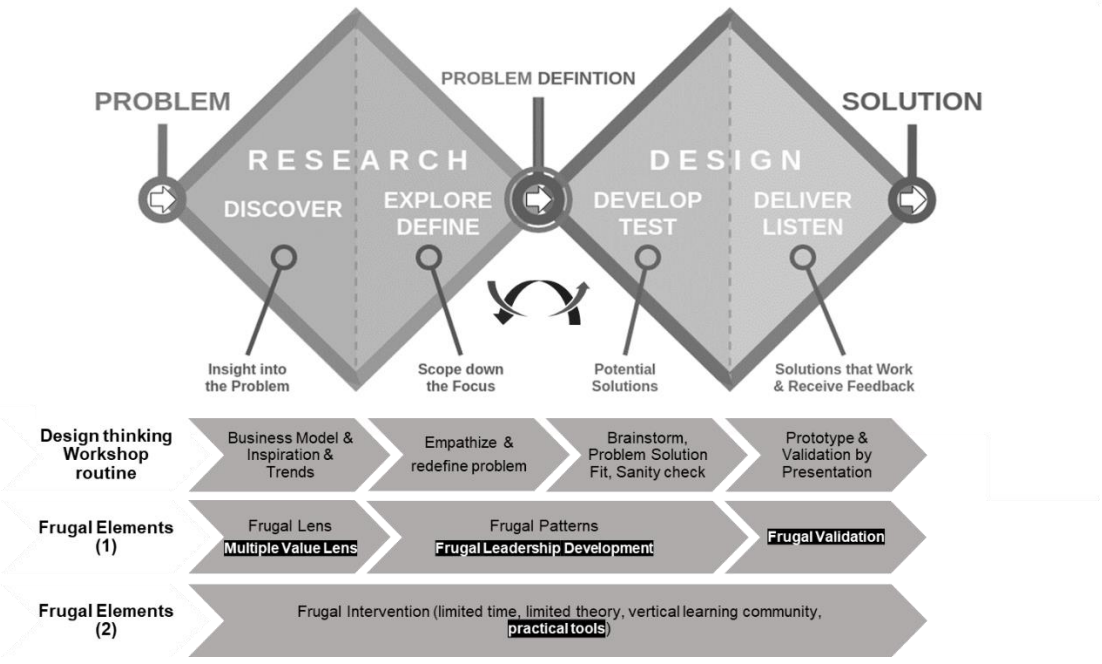

Figure 4 Adapted workshop routine after feedback from participants and trainers

Four items were added to the routine. At the start of the workshops attention should be given that the goal of the workshop is value creation, creation of value for customers and employees, financial value for continuity but also value for the planet as a whole. This may lead to even more sustainable innovations. As a by-product, pairs from SMEs experienced growth in common understanding of future strategy and leadership within the SME. This should be addressed explicitly at the start, and before the workshops. The proposed solutions should be validated better but in a time efficient (Frugal) way. Finally, participants requested additional, practical tools (e.g. financial validation) for implementation after the workshop. These improvements should help SMEs to increase their innovation ability beyond the innovation created during the workshops.

Phase 4; Continuous improvement

This framework for a workshop routine is a work in progress. Only one pilot has been completed with actual practitioners. When writing this paper, already other workshop routines for SMEs operating in other industries besides the Agribusiness industry have been pre-discussed with different policymakers of the regional governmental agency. After each future iteration, the framework for the workshop routine needs to be evaluated using observations, discussions and questionnaires. This, in order to determine benefits, remaining gaps and possible improvements.

However, to be considered 'validated in practice', the framework for the workshop routine must be empirically tested and needs to be documented in a future publication. When applying Bocken's checkbox for Circular BMI tool development Bocken et al., 2019a) not all criteria have been met.

Criterion	Result	Remark
The workshop routine is purpose-made for sustainable BMI?	Yes/No	Indirect
The workshop routine is rigorously developed—from both literature and practice insights?	Yes	
The workshop routine is iteratively developed and tested with potential users?	Yes/No	Only one Pilot
The workshop routine integrates relevant knowledge from different disciplines?	Yes	DT & FI
The final workshop routine version has then been used by practitioners, preferably multiple times and an evaluation of this process is done to assess workshop routine usefulness?	No	Final version not available
Evaluation of this process is done to assess workshop routine use and usefulness?	Yes/No	More iterations are necessary
The workshop routine provides a transparent procedure and guidance on how others can use the Workshop routine?	No	Not available yet
Sustainability objectives and impact are firmly integrated into the workshop routine?	No	Could be improved
The workshop routine is simple and not too time-consuming?	Yes	Frugal Intervention
The workshop routine inspires or triggers (business) change?	Yes	
The workshop routine is adaptable to different (business) contexts?	Yes	

Table 5 Checklist for CBMI tool development (Bocken et al., 2019a)

This needs to be accomplished in the coming period with a special focus on gathering data for improvements in future iterations and increasing the sustainability impact. The latter could be attained, according to one of the interviewed participants, by extending the focus on multiple value validation, exceeding the financial value.

Discussion and preliminary conclusions

The concluding section of this paper summarises the key findings and addresses the key research question – how frugal elements could enhance the design thinking process, to support SMEs in creating, commercializing and diffusing frugal products, services and/or processes – by developing a framework for a workshop routine. This is followed by limitations & recommendations for future research directions. Subsequently, a final important implication of this research is discussed.

Key findings & policy implications

The common thread when developing this framework for a workshop routine was doing more with less. By adding frugal elements to the design thinking process, a workshop routine was created. The workshop routine should result in the creation and commercialization of several innovations/solutions for a specific group of SMEs. This specific group of SMEs, the 'peloton' are normally hesitant towards innovation programmes, often overlooked due to the governments primary focus on the industry's frontrunners.

In a pilot, this peloton of SMEs was challenged to capture and create value with frugal innovations in their products, services and/or processes, and improve their overall sustainable business modelling process. The Pilot was successful in the creation of products, process or business model innovations. 75% of the innovations can be classified as sustainable or social. All participants perceived the workshop as successful in assisting them to innovate. Adding frugal elements resonated well with this target group. Valuable feedback from the participants was gathered to further improve the effectiveness of the workshop routine.

The key research question of this paper has been answered by developing a framework for a workshop routine based on the Double Diamond process, describing the divergent and convergent stages of the design process (Designcouncil, 2018) and the following Frugal elements:

- Frugal Lens with a focus on (multiple) value creation
- Frugal Business Model Patterns
- Frugal Leadership Development
- Frugal Validation
- Frugal Intervention (limited time, limited theory, vertical learning community, practical tools)

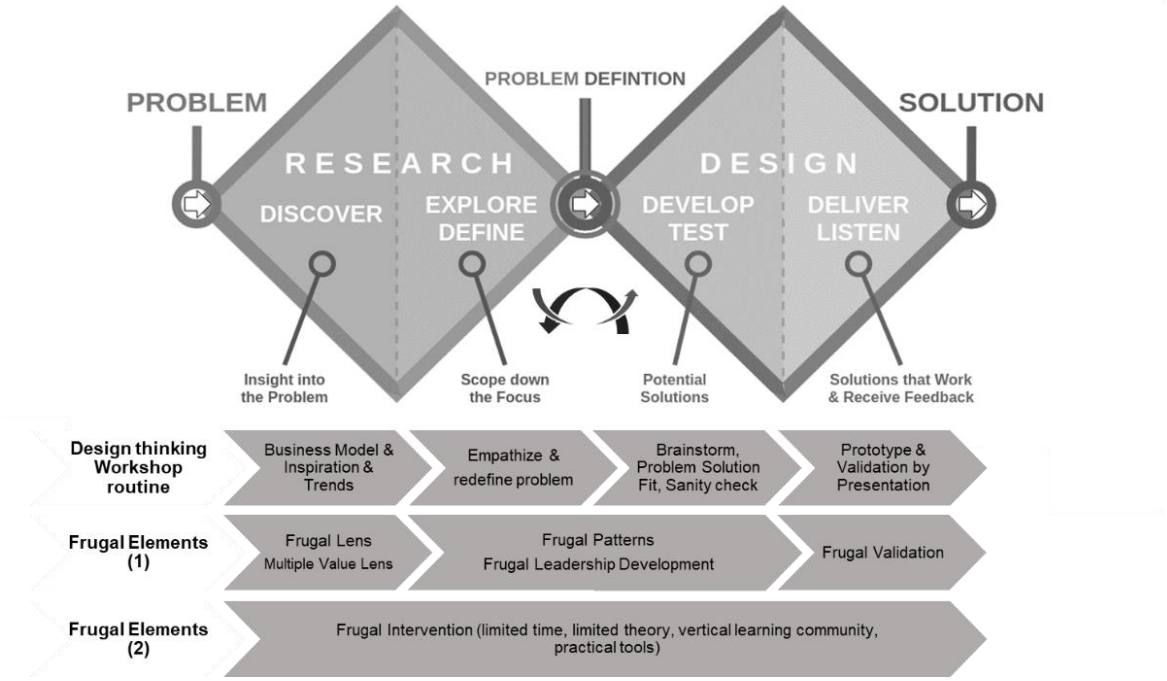

Figure 5 resulting preliminary workshop design

Although design thinking has already been successfully applied to such fields as product innovation and business model innovation(Geissdoerfer et al,. 2016), the present study was, as far as we know, the first attempt to make the design thinking process itself frugal. By 'Frugalising' the design thinking process with its focus on simplicity and limited resources, the specific target group of SMEs might be willing to invest some of their precious resource time to innovate. And policy makers might start to pay extra attention to this, in economic terms, interesting group, next to the industry's frontrunners. This particular focus might indirectly create innovations that are sustainable although this was not be the primary focus of the SMEs at the start as was shown in the Pilot.

Limitations & recommendations

Although the pilot could be considered a success based on the amount of product/process innovations that have been created by the participating SMEs and already partially commercialized, future iterations are necessary to reach a fully developed framework for the workshop routine. Therefore, a recommendation would be to execute several more pilots over the coming years, in order to enable these future iterations and validation of the framework in practice. Only then, the framework for the workshop routine can be empirically tested and documented in a future publication.

To further accelerate such future iterations and validation, another recommendation would be to develop transparent procedures and guidance on how to facilitate the workshop routine. Recruiting and educating a group of trainers, next to the current two trainers, is meant to minimise the risk of research stagnation and increase independency. Special focus on SMEs should be taken into consideration while recruiting and educating these trainers.

Applying the framework for the workshop routine in different industries might also result in different combinations of frugal elements, with different successful or less successful outcomes. Based on one pilot it is not possible to draw any conclusions regarding the success rate in different industries. Therefore, a final recommendation would be to run pilots for pelotons of SMEs operating in different industries.

Further implications

For SMEs creating sustainable value is not on the forefront of their mind. Continuation, especially in times of crises, is foremost (Pisoni et al., 2018). Therefore, sustainability objectives were not explicitly incorporated into the design of the framework for the workshop routine. It was assumed that it might avoid SMEs from not participating in the workshop.

Although, sustainability had not been included as a topic, it was still surprising to discover that six out of the eight innovations created during the pilot showed sustainable or social features. These results implicate there is a need to further understand the link between the frugal elements and sustainable outcomes.

Also sustainability could be addressed more prominently during the workshop routine. One of the interviewees even suggested to increase the scope of value creation to the SDGs. This could be done by quantifying the financial, social or sustainable impact of the created innovations. Adding practical tooling – based on the 17 Sustainable Development Goals of the United Nations (Kraaij & Poldner, 2021)– will make it possible to simultaneously measure the social and sustainable impact of frugal innovations (Pisoni et al., 2018) and persuade this group of SMEs that it is worthwhile to put sustainability in the forefront of their mind.

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