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Configuring new business models for circular economy

From patterns and design options to action

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Abstract

This article introduces the 'dynamic circular economy-driven business model configurator', which aims to guide companies in sensing opportunities and seizing/designing business model concepts for circular economy. The configurator is based on patterns and design options consolidated from theory, retrospective case analysis, and action research with five manufacturing companies.

Keywords

Business model innovation, circular economy, business model configurator, business model pattern, action research

Introduction

Often seen as a means to achieving sustainability, circular economy (CE) is gaining importance in the agenda of government, companies, investors and the civil society. CE aims to establish a resource effective and efficient economic system (Geissdoerfer et al., 2017a) by intentionally narrowing, slowing and 'ideally' closing materials and energy flows (Bocken et al., 2016; EMF, 2015).

From an organizational perspective, building capabilities for CE requires not only

technological or product innovation, but systemic value innovation with the configuration of new business models (BM) in fit with CE principles (Schulte, 2013). Designing and implementing these new BMs is challenging, as companies need to dare and discover how to break the incumbent 'industry recipes' (Matthyssens et al., 2006) or 'rules of the game' (Teece, 2010) impregnated with the linear (i.e. take-make-dispose) mental model.

Using the lens of dynamic capabilities (Matthyssens, 2019; Teece, 2017), Pieroni et al. (2019) suggests three stages to guide companies in breaking the linear 'industrial recipes' through CE-driven BM innovation. These are: (i) *sensing and making sense* of CE opportunities in the ecosystem, (ii) *seizing* the opportunities by designing new CE-oriented value generation architectures (i.e. CE-oriented BM concepts), and (iii) *transforming/renewing* operational capabilities accordingly to implement the CE-oriented BMs. The first stage of *sensing and making sense* of CE opportunities requires decision-makers in the companies to "recognize internal beliefs", "identify the need to learn about CE", "question linear assumptions" and adopt an "explorative attitude through *external sources*" (Pieroni et al. (submitted)).

The external sources to help the organizations are many, as different approaches on how to innovate BMs for CE are already available in academia/practice (Pieroni et al., 2019). The majority of conceptual frameworks for CE-oriented BMI are typologies and taxonomies (Accenture, 2014; Bakker et al., 2014; Bocken et al., 2016; BSI, 2017; Diaz Lopez et al., 2019; Forum for the Future and Unilever, 2016; Lacy et al., 2013; Lüdeke-Freund et al., 2019; Nussholz, 2017; Planing, 2018; Weetman, 2016; WRAP, 2018), which explain potential mechanisms or solutions (i.e. the new CE-driven 'recipes') for designing CE-oriented BMs. Additionally, inspirational cases of companies embracing the CE principles are flourishing. Despite this aforementioned diversity in intellectual content, a question that still remains is how to transfer this conceptual knowledge/learnings to the real world practice in an effective and useful approach?

First, some work is necessary to establish consensus on terminologies (Pieroni et al., 2019). Additionally, improvements are required to explore the full potential and possibilities of BM configurations to embed CE-oriented strategies (Pieroni et al., 2018). Lastly, companies deciding to perform CE-driven BMI ask for more specific, simple and 'digested' version of the 'external content/knowledge' to *make sense* of which type of CE-oriented BM would work for their context.

The aim of this research is to create a link between available conceptual knowledge and action. This article introduces the *dynamic CE-driven business model configurator,* which intends to guide companies in sensing and making sense of CE opportunities and seizing or designing CE-oriented BMs with systemic value concepts. Based on CE-oriented BM patterns consolidated from reviewing theory and practice (i.e. with retrospective analysis of more than 150 cases) and action research cycles with manufacturing companies, a prototype of the configurator (i.e. an Excel tool that generates content for a printed collection of patterns, design options and frameworks) was proposed and preliminarily tested in three companies from three industrial sectors.

The next three sections explain the research method applied to build the configurator, present the configurator logic and discusses initial application with manufacturing companies, and conclude with remarks about expected results, limitations and future research.

Research method

The development of the dynamic CE-driven BM configurator followed a hypothetic-deductive approach (Gill and Johnson, 2002), including cycles of theory development followed by empirical development and testing (Fig. 1).

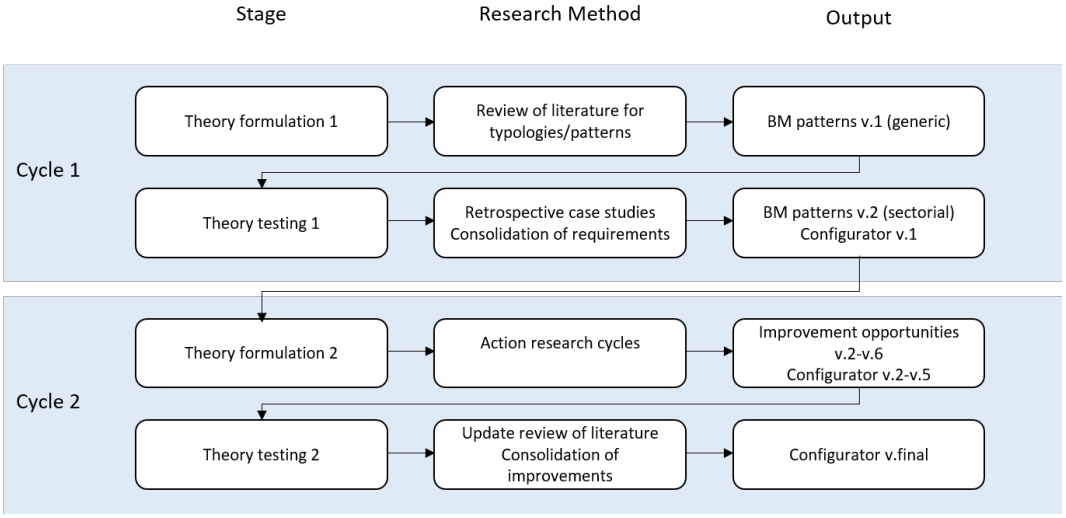

Fig. 1- Research method.

Cycle 1

Existing conceptual patterns (i.e. archetypes, types, typologies, strategies) of BMs for CE were identified from a previous literature review study (in Pieroni et al. (2019)). By applying content analysis (Dresch et al., 2015), the patterns were

compared, consolidated and categorized in two clusters: (i) upstream and (ii) downstream (Urbinati et al., 2017). Due to the complexity of CE, spanning the boundaries of single organizations, the patterns within each of the aforementioned clusters were further categorized based on Amshoff et al. (2015), who suggest that patterns affect different hierarchical levels. Two sub-clusters were introduced: prototypical (i.e. describing the logic of an industry or role of actors in the value chain) and solution patterns (i.e. describing building blocks or elements of one BM) (AMSHOFF et al., 2015).

Afterwards, retrospective case studies were conducted to add a contextual perspective and provide insights about potential sectorial particularities (Wells, 2016). Grey literature was reviewed to identify existing cases of companies that have adopted CE-oriented BMs. The cases were selected from secondary sources – i.e. knowledge databases on CE developed by international organizations (Ellen MacArthur Foundation and the Knowledge Hub developed by Circle Economy). Primary source - i.e. companies websites and public reports – were checked for additional information when necessary. The selected cases followed two criteria: (i) explicitly present examples of new BMs for CE; and (ii) from specific industry sectors: electronics, capital goods, textile, furniture, medical devices, and food.

The analysis of the cases, for extraction of patterns, followed the same aforementioned procedure, adding one more category, i.e., industry sector. The patterns emerging from the retrospective case analysis served the purpose of testing the validity of the generic patterns emerging from literature. Additionally, the sectorial patterns contributed to expanding or adding particularities for the breadth of patterns (typology) and for the logic of patterns combination (taxonomy/morphology).

Lastly, information about possible BM design options associated with the different patterns and their combinations were extracted and categorized according to BM elements: systemic outcomes/potential for CE (economic, resource decoupling, and secondary environmental or social effects); value proposition statement; offering (products/services); customers; value/benefits for customers; network; value/benefits for network; upstream or delivery capabilities; downstream or creation capabilities; revenue mechanisms; costs; and financial model. These twelve elements were adapted from previously developed BM frameworks (Biloslavo et al., 2018; Kraaijenhagen et al., 2016), which build on the ‘value concept’ largely disseminated in BM literature/industries (Osterwalder and Pigneur, 2010; Richardson, 2008).

The outputs of Cycle 1 were used as foundations to create a conceptual framework or initial version of the dynamic CE-driven BM configurator to be refined/validated in practice in Cycle 2. The configurator was inspired by previous works (Barquet et al., 2013; Hellek et al., 2013) that applied similar approach from Design Sciences to propose practical tools able to support BMs' design during the development of product-service systems.

Cycle 2

Action research (AR) cycles were carried out in five manufacturing companies from three sectors (i) capital goods, (ii) electronics, and (iii) furniture sectors. AR is a form of applied research that combines scientific methods with organizational knowledge and involves the active collaboration of researchers and companies' members to propose solutions to real organizational problems while building theory in practice (Coughlan and Coghlan, 2002; Goedkoop et al., 1999; Mathiassen, 2017). The cycles of AR were carried out from February 2018 to February 2019. After each AR cycle, improvement opportunities for the configurator were identified and considered for changing the configurator throughout cycles, generating different versions (e.g. v1, v2…vfinal). In parallel to these AR cycles, new theoretical relevant scientific articles emerging from literature after we had already started the AR cycles were collected and considered for expanding or also validating the configurator´s 'backbone' (e.g. the sustainable or CE BM patterns taxonomy documented in Lüdeke-Freund et al. (2018) and Lüdeke-Freund et al. (2019)). The output of Cycle 2 was the final version of the configurator with sector-specific recommendations for the capital goods, electronics, and furniture sectors.

Preliminary Results

The dynamic CE-driven BM configurator

The *dynamic CE-driven BM configurator* is structured in three modules: (1) identification of opportunities, (2) configuration of BM ideas, and (3) configuration of BM concepts. Each module of the configurator is supported by specific conceptual frameworks (Fig.2).

The first module is supported by typologies of CE-oriented patterns for upstream and downstream BM architecture and including both generic and sectorial particularities. The second module is supported by a taxonomy with potential combinations of patterns, i.e., based on sectorial case studies. The third module is

supported by a morphologic box organizing the design options according to the specific BM patterns. The application of each module is explained next.

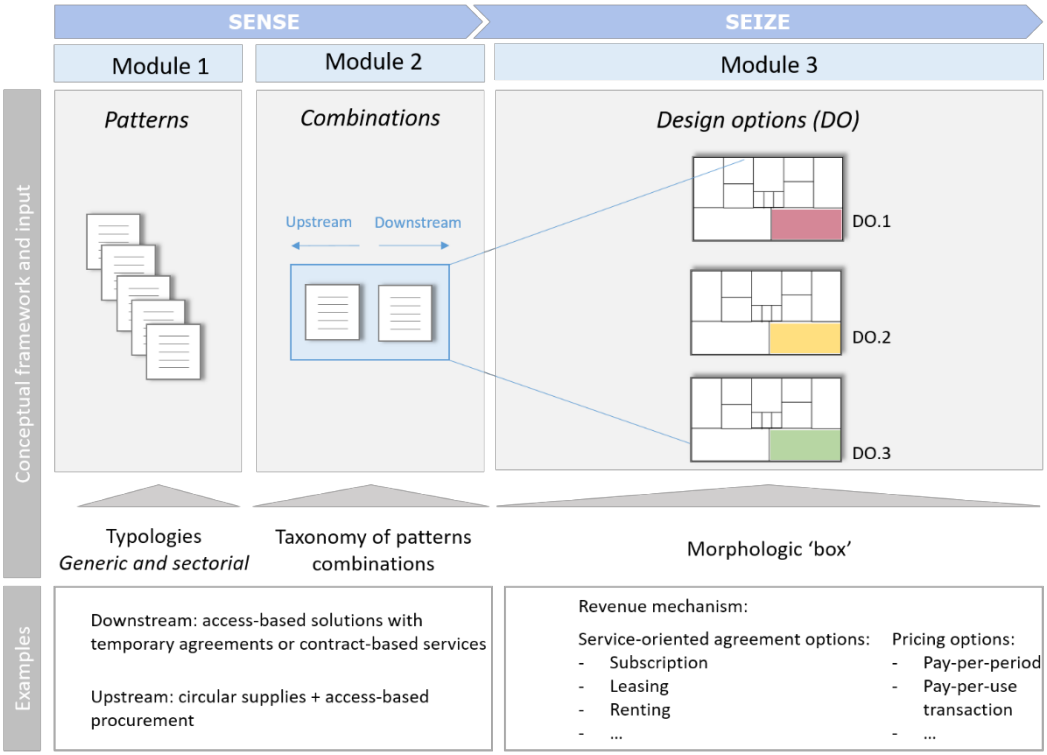

Fig. 2- Foundations of the CE-driven BM configurator.

Module 1 – Identification of opportunities of BMs for CE

This module involves an analysis of the current BM in terms of CE strategies (i.e. which linear and circular characteristics/patterns are present).

Moreover, change drivers that can lead to opportunities or restrictions for developing CE-oriented BMs are investigated, with the support of a structured checklist covering trends in (1) market, (2) collaboration and value network, and (3) macro-factors following a PESTEL (political, environmental, social, technological, economic and legal) analysis.

Lastly, several BM opportunities or possibilities of BM patterns (i.e. generic mechanisms or solutions for designing CE-oriented BM (Lüdeke-Freund et al., 2019; Remane et al., 2017) – see Fig. 2) with case studies examples are available to support companies in ideating about what would be the most adequate for their context. The configurator also provides guidance on the selection of adequate patterns suggesting promising alternatives that relate with the input of opportunities or restrictions.

Module 2 – Configuration of CE-oriented BM ideas

Inspired by the value innovation literature (Matthyssens, 2019), we define CE-oriented BM ideas as specific mechanisms for CE-oriented BM innovation adapted/specified to each company's context, usually adding information that is not generalizable – e.g. customers; value proposition – and triggering a deeper questioning of existing frames. CE-oriented BM ideas can be understood as combinations of patterns (previously identified in Module 1) specified for a particular organizational context. The combination of BM patterns to configure/create BM ideas occurs in two steps by asking the questions:

(i) 'What will the company offer?' - aiming to capture patterns related to the downstream part of the BM.

(ii) 'How will that be offered?' – aiming to explore patterns for the upstream part of the BM.

After combining patterns in different potential BM ideas/configurations (downstream and upstream), the configurator provides a 'benchmarking' or 'estimation' of potential benefits (i.e. systemic benefits for economy, environment and society, plus benefits for customers assembled from case studies) to support companies in making a prioritization or decision of which BMs to detail further.

Module 3 – Configuration of CE-oriented BM concepts

The third module involves two steps. First the prioritized CE-oriented BM ideas are transformed into solution principles with initial value proposition concepts. This involves: indicating key stakeholders that could benefit from the BM idea, describing 'what would the stakeholders get' (i.e. implicit promise) with the BM idea, and consolidating/confirming the potential benefits/values for the stakeholders and for the aspects of CE and sustainability (e.g. economic, resource decoupling, or secondary environmental/social effects).

As a second step, the configurator suggests design options (i.e. available options or attributes for designing the elements of the BM (Lüdeke-Freund et al., 2019), e.g., 'pay-per-use') to configure all twelve elements of the BM. Moreover, it highlights the potential differences in configurations, providing information about cases that can support the discussion and decision/choice. The final deliverables of this module are BM concepts, which are representations that enable

articulating the complete logic of how the new/reconfigured CE-oriented BM will work (Lay et al., 2009). Differently than Amshoff et al. (2015), the BM concepts generated by this configurator are more specific and closer to the context of the companies, because of the sectorial logic of the patterns. However, a further stage of assessment and detailing (customization) are important, as explained in the conclusions.

Application of the configurator in manufacturing companies

For the initial application, the configurator was structured in Excel. Future versions envision the utilization of more dynamic software. The Excel version of the configurator was used as a supporting tool for the application in the five manufacturing companies, generating information to populate more interactive frameworks (e.g. a collection of printed patterns or design options in the format of cards, printed frameworks for combination of patterns or visualization of the BM concept) that are more suitable for groups' discussion.

Modules 1/2 and 3 occurred in two separate workshops, lasting approximately 6h each and involving participants with diverse skills and expertise, e.g. marketing/sales, services/product development, after sales/customer services, operations, corporate social responsibility, IT, business strategy and finance. Representatives from the company leadership or top management participated in all workshops. The number of participants varied from three to ten, according to the company size.

Based on the results obtained in each AR cycle (Table 1 and Fig. 4), there is a strong indication that the configurator is useful to facilitate fast ideation and simulation sessions of CE-driven BM innovation, providing knowledge about CE from external sources in an interactive and focused process.

The feedback provided by individual participants were also positive to the usefulness of the configurator. Participants mentioned that the configurator "made the process easier" and "has clarified and confirmed many choices that have been based on assumptions earlier". Moreover, according to their opinion, strengths or differentials of the configurator are: "the use of examples from different industries to stimulate ideation", "interesting/great to see more/different cases/examples of companies experimenting with circular BMs and the information of what works and trade-offs, also showing cases of discontinuation of initiatives".

However, improvements related to the usability of the configurator were suggested. Some of these were incorporated along the AR cycles, producing positive effects in the usability as illustrated in Fig. 4 and also with the increased efficiency in the transformation of BM ideas into BM concepts (Table 1).

Table 1 – Results obtained with the application of the configurator in the action research (AR). Legend: BM- business model.

AR# *Sector*	**CE-oriented BM ideas** *Modules 1 and 2*	**CE-oriented BM concepts** *Module 3*
01 *Electronics*	68	4
02 *Capital goods*	31	3
03 *Furniture*	10	8
04 *Electronics*	19	8
05 *Furniture*	4	4

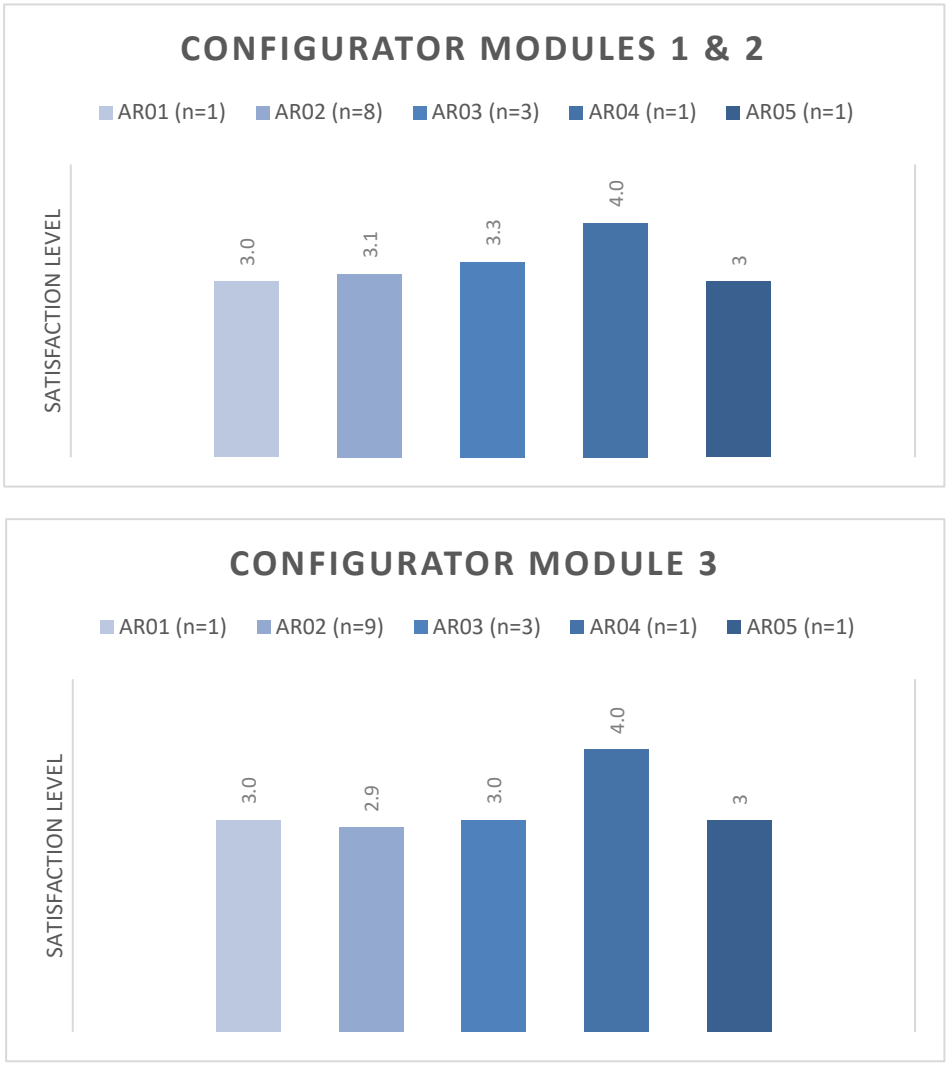

Fig. 3 - Feedback provided by individual participants in each action research (AR) according to the configurator modules (Legend - Scores: 1 = Unsatisfactory; 2 = Needs improvement; 3 = Satisfactory; 4 = Very satisfactory/ n = participants).

Final considerations about usefulness

The configurator is a planning tool suited for the very early stage of when manufacturing companies decide to move towards circular economy. Its purpose is to trigger change of mindset towards CE by acting around the dynamic capabilities concept (individual managerial and organizational skills). As mentioned in the introduction, CE will require 'breaking industry recipes' and consequently the silo/organizational-centric view. However, we understand that this require parsimony to increase awareness and change the organization capabilities while respecting and convincing people. Hence, the configurator starts

with the organizational-centric approach (e.g. using BM frameworks that are inheritances from linear economic logic or having one company leading the process), but it leads the companies to gradually realize the importance of collaborations and the organizational or ecosystem view for CE. For instance, one of the patterns' category for the 'upstream' is called 'collaborate to close the loop', and they contain several ways or actors being created in the value chains of specific industries (or cross industries) to guarantee the circularity of products and materials. In our view and also in accordance to recent research (Perey et al., 2018), some actor(s) in the value chain have to take the lead and start thinking about CE first internally, then absorb the concepts, and then lead the initiatives that will definitely occur collaboratively. The configurator wants to incentivize more of those individual actors acting in the position of manufacturers to change their perspectives and way of operating and inevitably influence others. From the preliminary applications, we noticed a positive uptake of this logic, as all five companies realized the importance of partnerships and necessary changes in the value chain either because they lacked the capabilities required for CE or to justify the investments for establishing reverse flows. Therefore, the companies proceeded with this investigation of how to collaborate and promote changes in the value chain based on their planned BM concepts, but using other methodologies.

Conclusions

To answer to the question - how to transfer conceptual knowledge and learnings about CE-driven BMI to the real world practice in an effective and useful approach - this article introduces the *dynamic CE-driven BM configurator.* The configurator was built from CE-driven BM patterns consolidated from reviewing theory and practice (i.e. with retrospective analysis of more than 150 case studies for BMs), followed by action research cycles with manufacturing companies in electronics, capital goods and furniture.

This managerial tool intends to guide decision-makers in companies with sensing and making sense of CE opportunities and seizing or designing CE-oriented BMs with systemic value concepts.

This research contributes to the academic community and the New Business Models conference by building knowledge in the intersection of CE and new BMs/ BM innovation literature, envisioning both academic and practitioner perspectives. Moreover, the logic of the configurator could be expanded to fit

other applications/drivers of BMI (e.g. servitisation, digitization). This work will also largely benefit companies that are planning to engage in CE and need to define where and how to start with fast modelling and simulations of scenarios of different CE-oriented BM concepts.

Some limitations or challenges of this research are related to the nature of the literature review techniques (i.e. snowballing and grey literature reviews) and retrospective case studies (i.e. based mainly on content analysis of primary and secondary sources of information), potentially leading to selection bias. Moreover, inclined to create a tool that will be understood and practically applied by companies, the configurator still rely on some well-known concepts of linear economic dynamics (e.g. using BM frameworks that are inheritances of linear economic logic or having one company leading the process), which might mislead some users in underestimating the complexity/dimension of changes required for linear economy. Furthermore, the configurator still requires further development to cope with requirements appointed by the companies and empirical verification.

Future research to address those challenges envisions:

(i) the inclusion of a 'module 4', to enable the assessment of customer value potential (qualitative), economic potential (quantitative), resource decoupling potential (quantitative), and potential secondary effects on environmental or social aspects for BM concepts;

(ii) transferring the configurator to a more flexible/dynamic software (ideally online tool);

(iii) adjusting the level of information in the design options (more concise/abstract);

(iv) refining the logic of suggestion of patterns configurations;

(v) conducting new AR cycles for expanding the coverage of industrial sectors (food, medical devices and textile);

(vi) testing the final versions of the configurator by consulting specialists from academia and practice;

(vii) conducting case studies with a broader group of manufacturing companies in different organizational contexts.

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