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Design Thinking for Sustainability; A Comprehensive Analysis of Design in Business Model Evaluation and Innovation

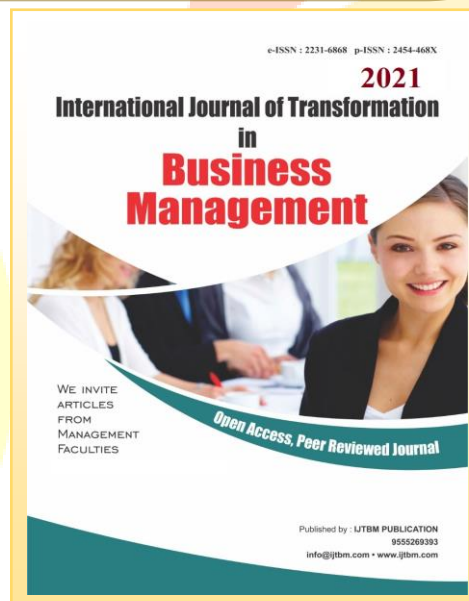
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ABSTRACT

The process of creating circular and sustainable business models is highly complicated, which prevents their widespread market adoption. There needs to be more clarification and rules for businesses. A promising technique for issue resolution called "design thinking" has the potential to speed up the invention process. However, design thinking has yet to be extensively investigated for business model innovation and does not necessarily involve sustainability considerations. Given the additional hurdles presented by the requirement for time efficiency and a digital environment, we have created a design thinking-based framework to direct the early development of circular business models in an effective online environment. The Circular Sprint is a brand-new process system. This includes seven phases and twelve specifically tailored activities. The framework was developed using an Action Design Research methodology, with 107 people working in 14 teams and iteratively mixing four streams of literature, advice from sixteen experts, and six workshops. The framework and its operations are described in this paper, along with assessments of the framework's utility and usability. Despite its difficulties, the study demonstrates that it is undoubtedly feasible to integrate sustainability, circularity, and business model innovation into a design thinking process. We provide a flexible system and a collection of context-adaptable activities that might help practitioners and innovators in the challenging process of developing new circular business models. These resources can also be utilised for instruction and training. Future scholars are encouraged to expand and change our framework and its components by customising it for their scenarios and objectives. The supplemental material includes a thorough, step-by-step user manual.

INTRODUCTION

However, over time, the execution of reasonable and round plans of action keeps excess moderately low (Bocken et al., 2017; OECD, 2019). The circular economy (CE) has recently been advanced as a likely arrangement in the dire progress to a more supportable financial framework. This is also

demonstrated by the ongoing demand for more comprehensive business model development processes and manageability-oriented development apparatuses, which is a response to the difficulty of operationalizing CE-based ideas in general and the lack of concrete rules for businesses (Blomsma & Brennan, 2017; Kalmykova et al., 2018; Pieroni et al., 2019a).

According to Buhl et al. (2019), configuration thinking (DT) is a creative, critical thinking strategy that has the potential to supportably situated activities, such as the establishment of Roundabout plans of action (CBM). Recently, DT-based structures have become more well-known due to their success in addressing complex problems when a diverse team is led through a collaborative and iterative process of learning, ideating, and testing (T. Brown, 2008; Carlgren et al., 2016b). Although the use of DT has indeed been examined in the progress of CE-based ideas, DT exploration and practice would often focus more on item-level development (IDEO and Ellen MacArthur Establishment, 2017) or precise CBM components, such as circular motivation (P. Brown et al., 2021). In addition, the few frameworks that guide a start-to-finish round plan of action development Process (Guldman et al., 2019; Shapira et al., 2017) remain exploratory, encouraging further research on the subject. This is especially important because businesses are frequently dealing with a highly influential business environment in which the success or failure of an advancement cycle may depend on the level of time productivity (Eisenhardt & Brown, 1998), development at the plan of action level

has become a crucial question of advantage (Verma & Bashir, 2017), or even endurance (Breier et al., 2021).

TECHNIQUE

Research plan

An action design research (ADR) approach was chosen to address the study question: How can design thinking be used to assist time-efficient, early creation of CBMs within an online collaboration context? Design science research (DSR) and action research (AR), two complementary research techniques that seek to increase scientific understanding and address practical issues, are combined in ADR (Collatto et al., 2018). On the one hand, DSR is a product of the design science paradigm and aims to generate prescriptive design knowledge by developing and evaluating novel artefacts that are intended to address a particular class of issues (Collatto et al., 2018; Dresch et al., 2015). Contrarily, AR is rooted in the natural and social sciences and aims to solve or explain systemic issues by iteratively involving researchers and practitioners in a cooperative and participatory manner, thereby producing knowledge for both theory and practice (Collatto et al., 2018; Dresch et al., 2015).

In conventional DSR methodologies, problem identification comes first,

followed by the artefact's creation and evaluation. As it pays little attention to how the artefact is (or should be) influenced by the organisational context, coming from the interplay between design and use, this sequential approach may limit its organisational relevance (Sein et al., 2011).

ADR has developed as a remedy for this restriction as a "research method for generating prescriptive design knowledge through building and evaluating ensemble artefacts in an organisational setting" (Sein et al., 2011, p. As a result, ADR was chosen because it can assist knowledge creation while guiding the rigorous development of an organizationally relevant artefact, such as the Circular Sprint framework and its tools (See section 3.2 for a complete explanation of the ADR process).

ADR is divided into four stages. The first step is problem formulation, which involves identifying the foundations and contributions of theory and practice and perceiving or predicting a problem (See parts 1 and 2).

Research Process

The applied ADR process involved repeating between a writing survey, master criticism and a progression of

studios that elaborate a sum of Fourteen groups and 107 members. The strategy is portrayed in the accompanying sections, and a rundown of the BIE phase of the ADR cycle can be tracked down in Fig. 1. The studios are portrayed in Table 1. When the underlying issue and exploration question were figured out (see areas 1 and 2), an underlying investigation of the writing was embraced to plan the primary variant of the system. This elaborates joins four critical writing surges, specifically (i) customary DT structures. (T. Brown, 2008; Lewrick et al., 2018; Liedtka, 2015; Micheli et al., 2019), (ii) the plan run process (Knapp et al., 2016), (iii) chose best practices and devices from the regular BMI field (Heikkilä et al., 2016; Massa and Tucci, 2014; Tauscher and Abdelkafi, 2017), and (iv) the development comes closer from the SBMI and CBMI writing (Bocken et al., 2019; Pieroni et al., 2019b). The underlying draft structure was talked about by the current creators, and criticism was mentioned by six specialists in development, plan thinking or round economy. The specialists were reached through the current creators' organization. This prompted the plan of the alpha variant of the Round Run system. This was at first guided in an inside 3-h studio with seven scholastics.

Before long, the model was tried in a 6-h studio with 39 supportability experts (i.e., 30 analysts, six private area experts, two public area delegates and one non-benefit representative) working in five equal gatherings inside a scholarly meeting, to produce CE-based answers for work on the maintainability of metropolitan portability in Graz. This meeting gave a contribution to fostering the beta rendition. Chosen exercises of the system were then evaluated in two separate 3-H

studios with expert's level understudies from the College of Graz (Austria) and Han College of Applied Sciences (Netherlands). 29 and 20 understudies working in four and three equal gatherings, separately, teamed up in producing BMs to work on the circularity and supportability of four and three, genuine contextual analyses. Their input prompted the refinement of the gamma form.

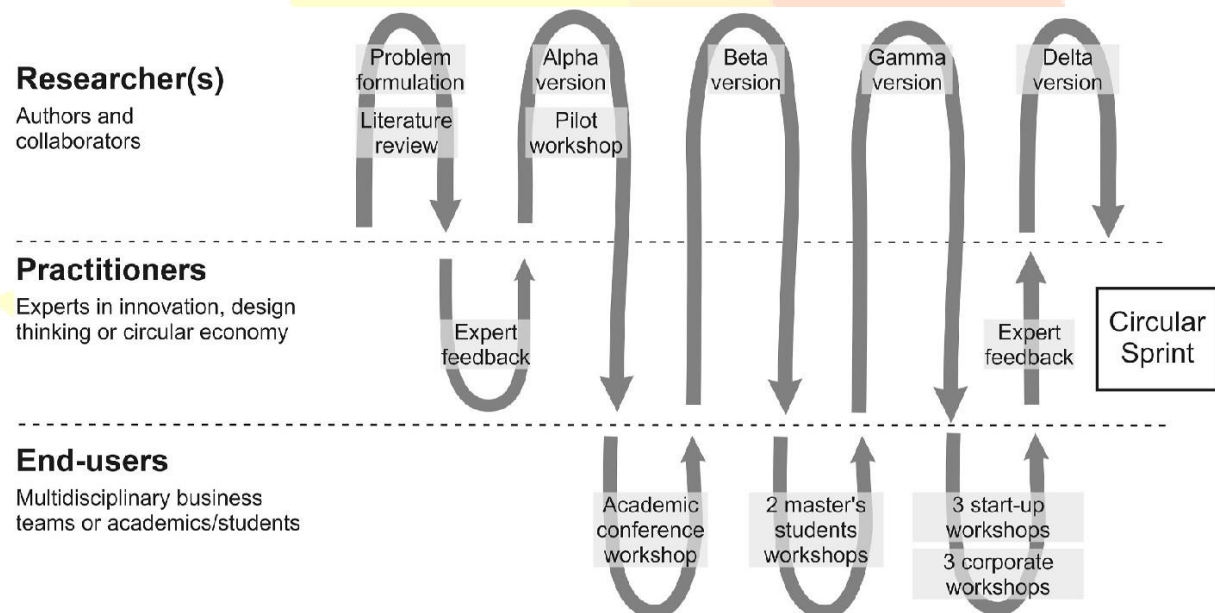


Fig. 1. The building, intervention and evaluation (BIE) stage of the action design research process applied to develop the Circular Sprint, adapted from (Sein et al., 2011).

Table 1. Description of test workshops during the Circular Sprint development cycles.

	Pilot test	Academic conference	Master's students 1	Master's students 2	Start-up	Corporate project	Total
Dates	Sep. 2020	Sep. 2020	Dec. 2020	Feb. 2021	Feb. 2021	Mar. 2021	
N° participants	7	39	29	20	4	8	107
N° teams	1	5	4	3	1	1	14
Duration	3:00	6:00	3:00	3:00	3 x 4:00	3 x 4:00	38:50
N° activities	5	6 + CE intro.	4 + CE intro.	5 + CE intro.	12 + CE intro.	12 + CE intro.	
N° feedback surveys		21	7	10	4	2	44

Accordingly, the two most essential and complete intercessions were attempted, each enduring three half-days and going through seven DT stages and twelve consecutive exercises. Initial, a roundabout fire-up that fostered a restrictive innovation to create bioplastics out of remaining waste from the milk creation process was upheld in promoting its underlying action plan. The members were a multidisciplinary group of four (i.e., Chief, learner, counsel and coach). Second, a cooperative corporate venture intended to foster innovations for electric-vehicle battery second-life applications was upheld in conceptualizing plan of action options. The members were eight workers from five consortium associations.

At last, a professionally situated client guide of the Roundabout Run and its 12 exercises specifying the apparatuses and application steps were created and imparted to thirteen chosen specialists on development, plan thinking, and round economy, who were then approached to give criticism. The contributions for the beginning up and corporate studios and the master criticism permitted us to refine the interaction system and the devices to frame a delta form of the Round Run. This

is introduced in segment 4 (see beneficial material for the last rendition of the Roundabout Run Client Guide).

The studio structure was adjusted to suit each utilization case and match members' time accessibility. This brought about an assortment of blends of exercises, as should be visible. All through the 6 studios and master input meetings information was gathered through unknown member reviews, studio documentation and analyst/ facilitator notes. This contributed to refining and working on the structure and devices throughout the BIE stage. The member study utilized a 5-point Likert scale and mentioned criticism on the apparent helpfulness and usability of every action, depicted in the writing as determinants of client acknowledgement (Davis, 1989; Venkatesh et al., 2003). Unassuming inquiries supplemented this.

Moreover, the last master review requested reactions on the degree to which Roundabout Run objectives were met (see overview results in segment 3.2). The leading creator of this study was the essential facilitator of each studio, upheld by extra analysts recently prepared in the strategy applied. All studios were performed web-based, joining a video

stage (i.e., Zoom, MS Groups or BigBlueButton) and Miro's web-based visual coordinated effort stage, which upheld the layouts/solicits for movements of every sort. The methodology depicted here is predictable with the ten models of the CBMI apparatus improvement agenda proposed by Bocken et al. (2019).

RESULTS

This segment is partitioned into two sections. To start with, the last adaptation of the round Run structure and the twelve exercises, which were deliberately adjusted and joined, are momentarily introduced (an itemized the bit-by-bit guide can be viewed as valuable material). Furthermore, the experimental aftereffects of the structure, mediation and assessment (BIE) the phase of the Round Run advancement process is introduced, counting the end-client results and the specialist criticism studies.

Developed artifact: The Circular Sprint

The activity configuration research approach in the current exploration improved the Roundabout Run system and its twelve devices (see Fig. 2). In view of configuration thinking, this reasonable interaction model can direct experts in the early improvement of a CBM in a period proficient way and on

the web setting. A versatile structure can be applied in various circumstances, from supporting a beginning-up participating in the underlying conceptualization and testing of a CBM to helping an immense farmland to expand or change its ongoing plans of action toward the CE. This working system might be adjusted for eye-to-eye or half-breed settings with restricted extra exertion, and the devices and exercises given are likewise versatile to address explicit issues. Albeit individual activities might be utilized in disconnection for specific advancement purposes, the strength of the Roundabout Run lies in its sequenced and iterative application of actions. The current paper delineates those exercises which we found to work best. Notwithstanding, we welcome scientists to proceed with the system refinement process in ongoing examinations. The last system introduced here, the Roundabout Run - or Plan Thinking Run for Roundabout Plan of action Development comprises a pre-studio readiness stage, trailed by seven unmistakable DT stages I., e., rouse, comprehend, characterize, ideate, choose, model and Test. The planning stage comprises an issue outlining meeting – suggested somewhere around fourteen days before the principal studio arrangement - and foundation research

exercises supplement it. The system's centre starts with a CE presentation meeting and twelve cooperative practices. The suggested request for the activities, their individual DT stages and an outline portrayal (counting key references) can be tracked down in Fig. 2. Kindly see the strengthening material for an itemized

specialist situated bit by bit guide, counting a duplicate of the activity materials upheld by Miro's online visual joint effort stage. The exercises were chosen in light of an audit of the significant writing (see Area 2) and were redone to conform to our targets and the requirement for online execution.

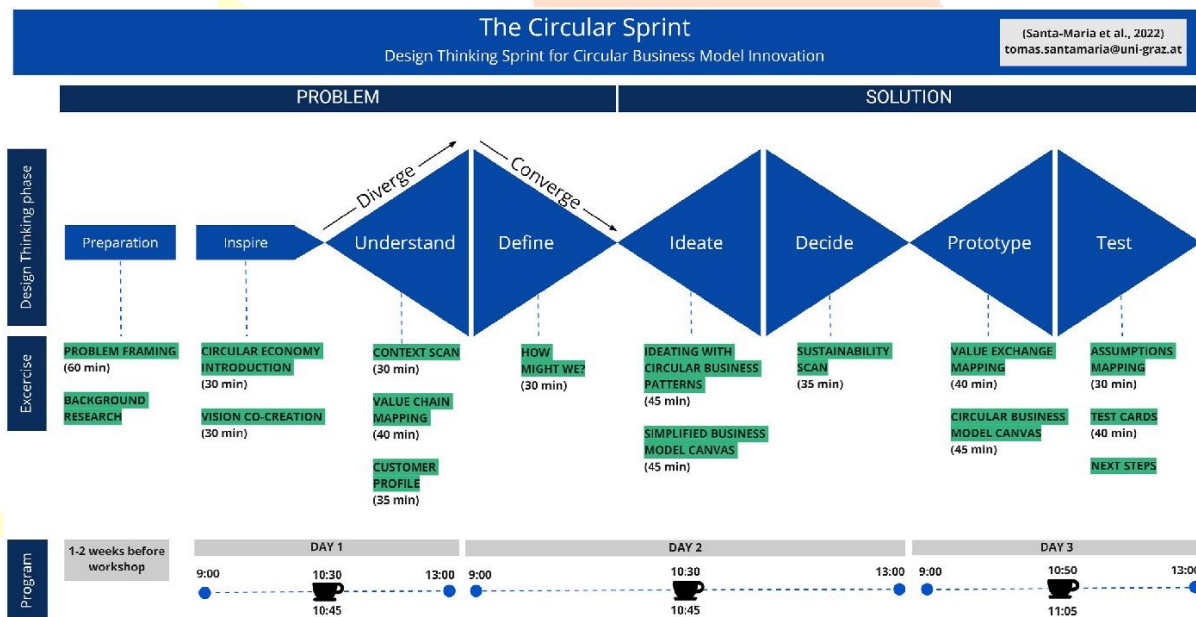


Fig. 2. The Circular Sprint framework. The figure contains the process phases, the activities, and a proposed timeline, which may be adapted according to the use case.

Antique assessment: Criticism study results

Throughout the BIE patterns of the Round Run improvement process, the system and its activities were repeatedly assessed, contributing to refinement and client acknowledgement evaluation. The subjective substance gathered in criticism reviews and facilitator notes upheld the

changes made to every action. For instance, the enhancements made to the Worth chain planning movement and their reasoning. Making sense of exhaustively how every development developed in the meantime and a total organization of criticism inputs is past the extent of the current paper. Notwithstanding, the accompanying passages sum up the most applicable

quantitative input results, zeroing in on the general system assessment.

The Client's acknowledgement of every movement was surveyed about its seen convenience and usability (Davis, 1989; Venkatesh et al., 2003), and was assessed through close-finished overview questions shipped off all studio members utilizing a 5-point Likert scale. Combined results for every action is introduced in Figs. 3 and 4 and show the rate of answers per classification (from "1 = emphatically conflict" to "5 = emphatically concur"). Focal inclination is shown by the interjected middle esteem (IM), a graphic measurement that changes the worth of the middle (up to $\pm 0,5$ for this situation) toward the path wherein the information is more intensely weighted, and is appropriate for introducing the aftereffects of ordinal information with few other options, for example, those portrayed on Likert scales (Gallego et al., 2008; Schweiger et al., 2019). The

handiness of exercises got a positive assessment by and large with 89% of answers being "concur" or "unequivocally concur" and a complete IM of 4.36 (see Fig. 3). The exercises that were seen as being more helpful were "Suspicious Planning", "CBM material", "Setting check", and "Esteem trade planning" and those considered less critical were "Client profile", "Improved on BM material", "Supportability check", and "Vision co-creation". Also, the usability of exercises was emphatically assessed by and large, with 90% of answers being "concur" or "firmly concur" and an all-out IM of 4.35 (see Fig. 4). Those exercises got an assessment of 'all the simpler to-utilize was the "Ideating with CBM designs", "Manageability filter" and "CBM material" and those evaluated as less simple to-utilize was "How could we", "Worked on BM material" and "Test cards".

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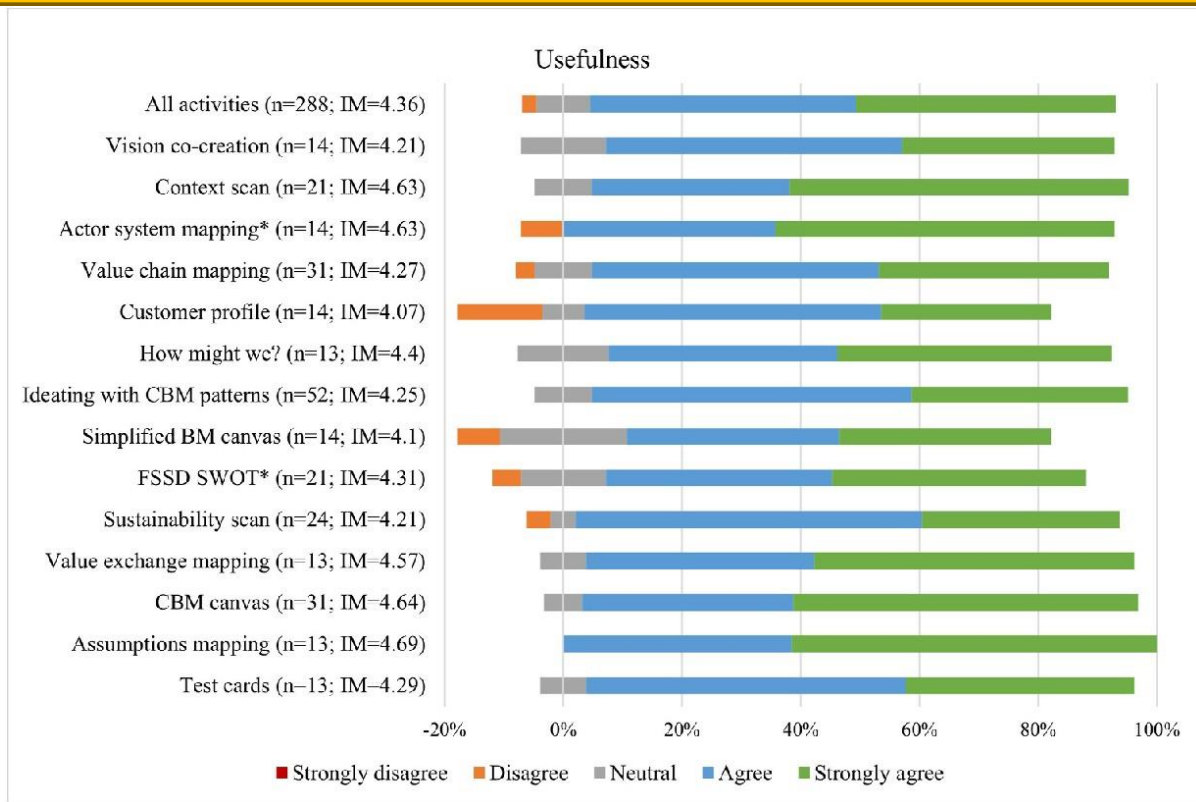


Fig. 3. Activity usefulness survey results, using a 5-point Likert scale (1 = strongly disagree; 5 = strongly agree). The diverging stacked bar chart presents the percentage of answers per category (n = number of answers; IM = interpolated median; * = activity excluded in the final version of the Circular Sprint).

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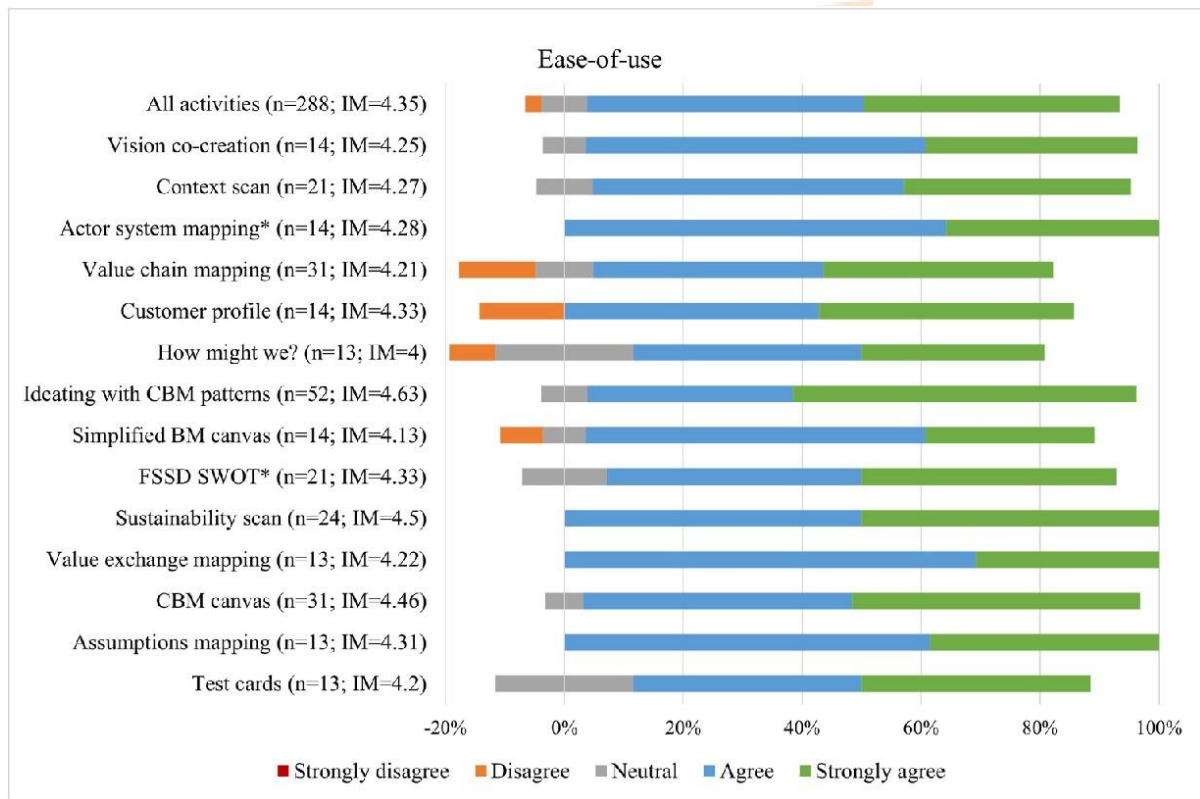


Fig. 4. Activity ease-of-use survey results, using a 5-point Likert scale (1 = strongly disagree; 5 = strongly agree). The diverging stacked bar chart presents the percentage of answers per alternative (n = number of answers; IM = interpolated median; * = activity excluded in the final version of the Circular Sprint).

The correlation of the criticism results from individual studios focuses on the pertinence of adjusting the mix of exercises for each utilization case. For example, "Client profile", "Worked on BM material", and "Supportability filter" got low handiness assessments for the corporate undertaking case (IM of 2.0, 2.5, and 3.5, individually), while they were high for the beginning up case (IM of 4.5, 4.83 and 4.83, individually).

This might be made sense of by the way that the corporate task case related to refining an underlying BM idea with existing client prospects and was connected more to productivity than to supportability. Conversely, the beginning of BM's idea had no plainly distinguished clients and put areas of strength on manageability issues.

To show enormous fulfilment with the system's design, the criticism review

likewise found out if members concurred that "exercises were reciprocal, non-repetitive and introduced in the ideal request". This brought about a positive assessment (IM = 4.68). Furthermore, members were gotten some information about their degree of concurrence with the assertion that "virtual setting further developed results contrasted with an up close and personal studio". The reactions here were nearly unbiased in general (IM = 3.09). However, they showed significant changeability (range = 4). The last master input study (n = 9) was intended to acquire a sign of the degree to which the Roundabout Run agreed with its fundamental goal (i.e., supporting beginning phase CBM advancement) and its six wanted essential qualities. That's what the effects propose; as indicated by a well-qualified assessment, the principal objective of the system is unequivocally upheld (IM = 4.4) and shows an upbeat assessment of the six essential qualities. Specialists thought that the trademark best accomplished was the transformation to an online climate, trailed by tending to all stages of a DT interaction and effectively implanting maintainability and circularity. Considering a well-qualified assessment, the qualities that might have been accomplished are the viable age of

results at the plan of action level and time productivity. Notwithstanding, assessments wandered extensively on the last option (Reach = 3).

CONCLUSION

Creating a sustainable and circular BM is tricky, preventing widespread market adoption. We have created, tested, and iteratively improved a process framework for directing the early-stage development of a CBM in a digital and time-effective way by merging DT-based frameworks with best practices from the BMI, SBMI, and CBMI literature. The framework requires that 12 exercises be modified and combined to be used during seven unique DT stages.

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REFERENCE

1. Aguilar, F.J., 1965. Formulating Company Strategy: Scanning the Environment. Graduate School of Business Administration, George F. Baker Foundation, Harvard University.
2. Badke-Schaub, P., Roozenburg, N., Cardoso, C., 2010. Design thinking: a paradigm on its way from dilution to meaninglessness. Proc.Think. Res. Symp. 39–49. <http://dab.uts.edu.au/research/conferences/dtrs8/docs/DTRS8-Badke-Schaub-et-al.pdf>.
3. Baldassarre, B., Calabretta, G., Bocken, N., Jaskiewicz, T., 2017. Bridging sustainable business model innovation and user-driven innovation: a process for sustainable value proposition design. J. Clean. Prod. 147, 175–186. <https://doi.org/10.1016/j.jclepro.2017.01.081>.
4. Baldassarre, B., Konietzko, J., Brown, P., Calabretta, G., Bocken, N., Karpen, I.O., Hultink, E.J., 2020. Addressing the design-implementation gap of sustainable business models by prototyping: a tool for planning and executing small-scale pilots.
5. J. Clean. Prod. 255 (120295) <https://doi.org/10.1016/j.jclepro.2020.120295>. Bland, D.J., Osterwalder, A., 2020. Testing Business Ideas. John Wiley & Sons, Inc., Hoboken, New Jersey.
6. Blomsma, F., Brennan, G., 2017. The emergence of circular economy: a new framing around prolonging resource productivity. J. Ind. Ecol. 21 (3), 603–614. <https://doi.org/10.1111/jiec.12603>.
7. Blomsma, F., Pieroni, M., Kravchenko, M., Pigosso, D.C.A., Hildenbrand, J., Kristinsdottir, A.R., Kristoffersen, E., Shabazi, S., Nielsen, K.D., Jonbrink, A.K., Li, J., Wiik, C., McAloone, T.C., 2019. Developing a circular strategies framework for manufacturing companies to support circular economy-oriented innovation.
8. J. Clean. Prod. 241 (118271) <https://doi.org/10.1016/j.jclepro.2019.118271>. Bocken, N., 2015. Conceptual framework for shared value creation based on value mapping. Global Clean. Prod. Conf. Barcelona 1–4. November 2015, August.
9. Bocken, N., Ritala, P., Huotari, P., 2017. The circular economy: exploring the introduction of the concept among S&P 500 firms. J. Ind. Ecol. 21 (3), 487–490. <https://doi.org/10.1111/jiec.12605>.

10. Bocken, N., Short, S., Rana, P., Evans, S., 2013. A value mapping tool for sustainable business modelling. *Corp. Govern.* 13 (5), 482–497. <https://doi.org/10.1108/CG-06-2013-0078>.
11. Bocken, N., Strupeit, L., Whalen, K., Nußholz, J., 2019. A review and evaluation of circular business model innovation tools. *Sustainability* 11 (8), 2210. <https://doi.org/10.3390/su11082210>. Bocken, N., Weissbrod, I., Antikainen, M., 2021.
12. Business model experimentation for the circular economy: definition and approaches. *Circular. Economy Sustain.* <https://doi.org/10.1007/s43615-021-00026-z>. Bonakdar, A., Gassmann, O., 2016. Design thinking for revolutionizing your business models. In: W, B., F, U. (Eds.), *Design Thinking for Innovation*. Springer international publishing, pp. 57–66. https://doi.org/10.1007/978-3-319-26100-3_4.
13. Breier, M., Kallmuenzer, A., Clauss, T., Gast, J., Kraus, S., Tiberius, V., 2021. The role of business model innovation in the hospitality industry during the COVID-19 crisis.
14. *Int. J. Hospit. Manag.* 92 (102723) <https://doi.org/10.1016/j.ijhm.2020.102723>. Breuer, H., Fichter, K., Lüdeke-Freund, F., Tiemann, I., 2018. Sustainability-oriented business model development: principles, criteria and tools. *Int. J. Entrepreneurial Ventur.* 10 (2), 256. <https://doi.org/10.1504/IJEV.2018.10013801>.
15. Brillinger, A., 2018. Mapping business model risk factors. *Int. J. Innovat. Manag.* 22 (5), 1–29. <https://doi.org/10.1142/S1363919618400054>.
16. Broman, G.I., Robert, K.-H., 2017. A framework for strategic sustainable development.
17. *J. Clean. Prod.* 140, 17–31. <https://doi.org/10.1016/j.jclepro.2015.10.121>. Brown, P., Baldassarre, B., Konietzko, J., Bocken, N., Balkenende, R., 2021. A tool for collaborative circular proposition design. *J. Clean. Prod.* 297, 126354. <https://doi.org/10.1016/j.jclepro.2021.126354>.
18. Brown, P., Bocken, N., Balkenende, R., 2020. How Do Companies Collaborate for Circular Oriented Innovation? *Sustainability* 12 (4), 1648. <https://doi.org/10.3390/su12041648>.
19. Brown, T., 2008. Design thinking. *Harv. Bus. Rev.* 86 (6), 84. Buhl, A., Schmidt-Keilich, M., Muster, V., Blazejewski, S., Schrader, U., Harrach, C., Schäfer, M., Süßbauer, E., 2019. Design thinking for sustainability: why and how design thinking can foster sustainability-oriented innovation development. *J. Clean.*

20. Prod. 231, 1248–1257. <https://doi.org/10.1016/j.iclepro.2019.05.259>. Carlgren, L., Elmquist, M., Rauth, I., 2016a. The challenges of using design thinking in industry - experiences from five large firms. *Creativ. Innovat. Manag.* 25 (3), 344–362. <https://doi.org/10.1111/caim.12176>.
21. Carlgren, L., Rauth, I., Elmquist, M., 2016b. Framing design thinking: the concept in idea and enactment. *Creativ. Innovat. Manag.* 25 (1), 38–57. <https://doi.org/10.1111/caim.12153>.
22. Centobelli, P., Cerchione, R., Chiaroni, D., Vecchio, P., Del, Urbinati, A., 2020. Designing business models in circular economy : a systematic literature review and research agenda. *Business Strategy and the Environment*, May 2019, 1–16. <https://doi.org/10.1002/bse.2466>.
23. Collatto, D.C., Dresch, A., Lacerda, D.P., Bentz, I.G., 2018. Is action design research indeed necessary? Analysis and synergies between action research and design science research. *Syst. Pract. Action Res.* 31 (3), 239–267. <https://doi.org/10.1007/s11213-017-9424-9>.
24. Davis, F.D., 1989. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3) 319. <https://doi.org/10.2307/249008>.
25. Dell’Era, C., Magistretti, S., Cautela, C., Verganti, R., Zurlo, F., 2020. Four kinds of design thinking: from ideating to making, engaging, and criticizing. *Creativ. Innovat. Manag.* 29 (2), 324–344. <https://doi.org/10.1111/caim.12353>.
26. Desai, A., Lindahl, M., Widgren, M., 2017. Actors and system maps: a methodology for developing product/service systems. In *sustainability through innovation in product life cycle design*. <https://doi.org/10.1007/978-981-10-0471-1>.
27. Dresch, A., Pacheco Lacerda, D., Cauchick Miguel, P.A., 2015. A distinctive analysis of case study, action research and design science research. *Rev. Business Manage.* 17 (56), 1116–1133. <https://doi.org/10.7819/rbgn.v17i56.2069>.
28. Eisenhardt, K.M., Brown, S., 1998. Time pacing : competing in markets that won’t stand still. *Harvard Business Rev.* 59–70.
29. Ellen MacArthur Foundation, 2014. *Towards the Circular Economy Vol.3: Accelerating the scale-up across global supply chains*.

30. Gallego, M.D., Luna, P., Bueno, S., 2008. Designing a forecasting analysis to understand the diffusion of open source software in the year 2010. *Technol. Forecast. Soc. Change* 75 (5), 672–686. <https://doi.org/10.1016/j.techfore.2007.02.002>.
31. Garcia, R., Dacko, S., 2016. Design thinking for sustainability. In: Luchs, M.G., Swan, K. S., Griffin, A. (Eds.), *Design Thinking: New Product Development Essentials From the PDMA*. John Wiley & Sons Inc, pp. 381–400. <https://doi.org/10.1002/9781119154273.ch25>.
32. Gassmann, O., Frankenberger, K., & Csik, M. (2014). *The business model navigator: 55 models that will revolutionise your business*. Pearson UK.
33. Geissdoerfer, M., Bocken, N., Hultink, E.J., 2016. Design thinking to enhance the sustainable business modelling process – a workshop based on a value mapping process. *J.Clean. Prod.* 135, 1218–1232. <https://doi.org/10.1016/j.jclepro.2016.07.020>.
34. Geissdoerfer, M., Pieroni, M., Pigosso, D.C.A., Soufani, K., 2020. Circular business models: a review. *J. Clean. Prod.* 277 <https://doi.org/10.1016/j.jclepro.2020.123741>.
35. Geissdoerfer, M., Savaget, P., Bocken, N., Hultink, E.J., 2017. The Circular Economy a new sustainability paradigm? *J. Clean. Prod.* 143, 757–768. <https://doi.org/10.1016/j.jclepro.2016.12.048>. September. Geissdoerfer, M., Vladimirova, D., Evans, S., 2018. Sustainable business model innovation: a review. *J. Clean. Prod.* 198, 401–416. <https://doi.org/10.1016/j.jclepro.2018.06.240>.
36. Guldmann, E., Bocken, N., Brezet, H., 2019. A design thinking framework for circular business model innovation. *J. Business Model.* 7 (1), 39–70. <https://doi.org/10.5278/ojs.jbm.v7i1.2122>.
37. Guldmann, E., Huulgaard, R.D., 2019. Circular Business Model Innovation for Sustainable Development. In: *Innovation for sustainability. Business Trans. Towards Better world*. Palgrave Macmillan, pp. 77–95. https://doi.org/10.1007/978-3-319-97385-2_5.
38. Hansen, E.G., Große-Dunker, F., 2013. Sustainability-oriented innovation. In: Idowu,
39. S. O., Capaldi, N., Zu, L., Das Gupta, A. (Eds.), *Encyclopedia of Corporate Social Responsibility*. Springer Berlin Heidelberg, pp. 2407–2417. https://doi.org/10.1007/978-3-642-28036-8_552.
40. He, J., Ortiz, J., 2021. Sustainable business modeling: the need for innovative design thinking. *J. Clean. Prod.* 298 (126751) <https://doi.org/10.1016/j.jclepro.2021.126751>.

41. Heikkilä, M., Bouwman, H., Nicolas, C.L., Riedl, A., 2016. Business model innovation paths and tools. In: 29th Bled EConference Digital Economy, pp. 571–587.
42. Hernández-Ramírez, R., 2018. On design thinking, bullshit, and innovation. *J. Sci.Tech. Art.* 10 (3) <https://doi.org/10.7559/citarj.v10i3.555>.
43. IDEO and Ellen MacArthur Foundation, 2017. The circular design guide. <https://www.circulardesignguide.com/>.
44. Kagan, S., Hauerwaas, A., Helldorff, S., Weisenfeld, U., 2020. Jamming sustainable futures: assessing the potential of design thinking with the case study of a sustainability jam. *J. Clean. Prod.* 251 (119595) <https://doi.org/10.1016/j.jclepro.2019.119595>.
45. Kalmykova, Y., Sadagopan, M., Rosado, L., 2018. Circular economy – from review of theories and practices to development of implementation tools. *Resour. Conserv. Recycl.* 135, 190–201. <https://doi.org/10.1016/j.resconrec.2017.10.034>.
46. Knapp, J., Zeratsky, J., Kowitz, B., Spoluautoř, J., 2016. *Sprint: How to Solve Big Problems and Test New Ideas in Just Five Days*. Simon and Schuster.
47. Kolko, J., 2015. Design thinking comes of age. *Harvard Business Rev.* 66–71. Kudyba, S., 2020. COVID-19 and the acceleration of digital transformation and the future of work. *Inf. Syst. Manag.* 37 (4), 284–287. <https://doi.org/10.1080/10580530.2020.1818903>.
48. Laursen, L.N., Haase, L.M., 2019. The shortcomings of design thinking when compared to designerly thinking. *Des. J.* 22 (6), 813–832. <https://doi.org/10.1080/14606925.2019.1652531>.
49. Lewrick, M., Link, P., & Leifer, L. (2018). *The design thinking playbook : mindful digital transformation of teams, products, services, businesses and ecosystems*. John Wiley & Sons, Inc.
50. Liedtka, J., 2015. Perspective: linking design thinking with innovation outcomes through cognitive bias reduction. *J. Prod. Innovat. Manag.* 32 (6), 925–938. <https://doi.org/10.1111/jpim.12163>.
51. Linder, M., Williander, M., 2017. Circular business model innovation: inherent uncertainties. *Bus. Strat. Environ.* 26 (2), 182–196. <https://doi.org/10.1002/bse.1906>.
52. Lüdeke-Freund, F., Gold, S., Bocken, N., 2019. A review and typology of circular economy business model patterns. *J. Ind. Ecol.* 23 (1), 36–61. <https://doi.org/10.1111/jiec.12763>.

53. Martin, R., 2009. The Design of Business: Why Design Thinking Is the Next Competitive Advantage. Harvard Business Press.
54. Massa, L., Tucci, C., 2014. Business model innovation. In: The Oxford Handbook of Innovation Management, pp. 420–441.
<https://doi.org/10.1093/oxfordhb/9780199694945.013.002>.

