Selecting the Right Tool for the Right Moment

development of tool overview for a circular customer journey in practice

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Short paper for the 9th International Conference on New Business Models, Mondragon University, July 2024

Abstract

CESI (Circular Economy Smart Industries) is a Dutch national program to support entrepreneurs in developing circular business models . A collaborative project team of researchers from Saxion, Windesheim, and HAN universities of applied sciences explored tools to facilitate a circular transition in companies within the 'smart' manufacturing industry. This provides a unique opportunity for a deep dive into the vast expanding realm of tools for circularity on offer. The investigation involved analyzing various models, methods, and techniques related to circular transition, categorizing them based on functionality and utility. The results emphasize the need for a comprehensive overview and a standardized framework. Using design thinking principles, the circular customer journey was developed. Over 180 tools on offer were curated and classified. Twenty-two tools were eventually considered appropriate to support SMEs in the manufacturing industry for the various stages in their circular customer journey. While the project is still running, this contribution presents and discusses the preliminary results.

Keywords

Tool inventory, tool validation, circular customer journey

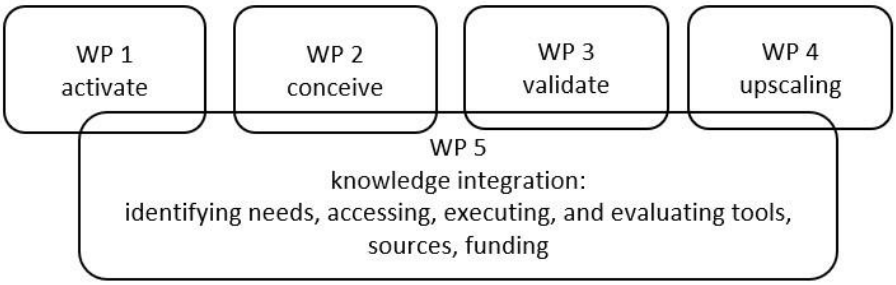
Main text

1. Setting the scene

CESI (Circular Economy Smart Industries, https://circulairemaakindustrie.nl/productgroup/smartcirculair/) is a Dutch national program supporting organizations in the manufacturing and smart industries to transition towards the circular economy (see, e.g.: BOOST, 2024; Versnellingshuis Nederland Circulair, 2023). CESI ON (Oost Nederland) is the regional program in the eastern Netherlands' provinces of Overijssel and Gelderland. The current CESI-ON program runs from 2022 to the end of 2024. The East Netherlands Development Agency (Oost NL) is a regional support organization for companies and is in charge of the CESI-ON program. Oost NL is partly funded by both provinces. In CESI-ON, seventeen partners collaborate, including a diverse range of first and second-tier service providers, industry associations, knowledge institutions, and financial organizations. The program consists of five Working Packages (WP) for assisting organizations in transitioning to circular business models. CESI-ON targets increasing resilience, ensuring supply reliability, reducing value loss, creating multiple values, and limiting environmental impact. In and in between these working packages, CESI-ON partners collaborate to support organizations in developing business models that contribute to a circular economy, focusing on cooperation within supply chains. Information, results, events, and links to supportive tools and organizations are disseminated via the website of BOOST, an independent collaboration platform for industry in the Dutch eastern provinces of Gelderland and Overijssel (www.boostsmartindustry.nl).

WP 5, addressed in this contribution, identifies the organizational and practical challenges for developing circular business models and gathers knowledge and tools to address them. The goal of WP 5 is to provide validated tools, knowledge, and support for each stage in the customer journey towards a circular business model. WP 5 is executed by collaborating researchers from 3 Dutch Universities of Applied Sciences in the region. Although various elements were determined in advance by the project plan, WP 5 created the opportunity to develop a practice-based methodology to curate the applicability of the ever-growing variety of tools that claim to be helpful in integrating circularity in a business model.

Figure 1. CESI-ON working packages



Objectives of WP 5 include:

1). Identifying and prioritizing companies' support needs in circular entrepreneurship in various stages of their circular customer journey.

2.) Creating an overview of the East Netherlands ecosystem for (support in) circular entrepreneurship. This objective relates to the mapping and evaluating tools and relating them to stages in the customer journey.

3.) Developing an (online) environment with a selection of tools and knowledge sources accessible via the website www.boostsmartindustry.nl

4.) Encourage companies to use fitting tools, assess their need for support in selecting and using tools, and evaluate the usability and added value of the tools in practice.

Section 2 addresses the first of these objectives; Section 3 addresses the second and third objectives. The fourth objective is currently developed based on the first three objectives. Section 4 discusses findings and future research.

2. Conceiving the 'circular customer journey'

The concept of Circular Economy (Jonker & Faber, 2021) and related terminology, such as circular business models, circular entrepreneurship, or circularity, represent relatively recent efforts to shorten

or close material loops. The researchers involved in this project work at Universities of Applied Sciences. The three participating research groups focus on multiple value creation, sustainable, and circular business models. For CESI-ON, the definition of Circular Economy provided by BOOST is adopted: *Circular Economy is a system of production and consumption in which existing materials and products are being shared, leased, reused, repaired, refurbished, and recycled in order to create more value and diminish waste* (https://boostsmartindustry.nl/circulair). The researchers encounter questions from entrepreneurs related to developing circular or sustainable business models daily. The researchers observe in practice that circular economy and related terminology are multi interpretable. Public and private institutions offer a vast, ever-expanding offer of instruments, crash courses, and quick scans, generally referred to as 'tools,' to help organizations adapt their business models. CESI-ON aims to bring clarity to the abundance of available choices.

Exploring the recent and expanding realm of 'tools for circularity', the research phase within WP 5 was developed in practice using design thinking principles (e.g., Guldman et al.,2019; He & Ortiz, 2021). During an initial brainstorm by researchers from the three participating research groups, questions from entrepreneurs considering aspects of circularity were inventoried and categorized. The results were refined in consecutive sessions, proposing a practice-based 'circular customer journey' consisting of five stages and associated questions (Haaker et al., 2022). Each stage of the circular customer journey represents unique challenges, questions, and requirements.

For validation, the proposed customer journey and the accompanying questions were presented to five companies considered advanced in implementing circular innovations. Four companies responded. Their answers were summarized, analyzed, and integrated into the initial draft of the customer journey, resulting in an adapted description of the circular customer journey in five stages (Haaker et al., 2022), which is summarized below:

Stage 1). *Orientation*. In this stage, knowledge is gathered about why circularity is relevant for an organization and how it positions itself regarding this theme. Questions include: What is circularity, and why should I engage? What are the benefits? What opportunities does it offer? What risks do I face if I don't address the theme? What are the consequences for the business operations? How do I currently score on the theme compared to others? What am I already doing? What does the market expect from me? What does the government expect from me?

Stage 2). *Opportunities*. In this stage, a profound understanding of fitting opportunities to engage in circularity is created. Questions include: How do my material flows (primary and secondary) run? What does the market and/or supply chain demand from me? Which product/process/proposition offer circular opportunities? What circular ambitions do we have? Which R-strategies can we employ? What business/earnings model fits this? What impact do we expect to achieve? What are we currently doing regarding circular (and sustainable) practices?

Stage 3). *Feasibility and Choice*. This stage offers insight into the feasibility and prioritization of interventions contributing to circularity. Questions include: What is the financial feasibility of my circular idea? Is it organizationally feasible? Is it technologically feasible? Is it socially desirable and feasible? Is it legally possible? Is it ethically and ecologically responsible?

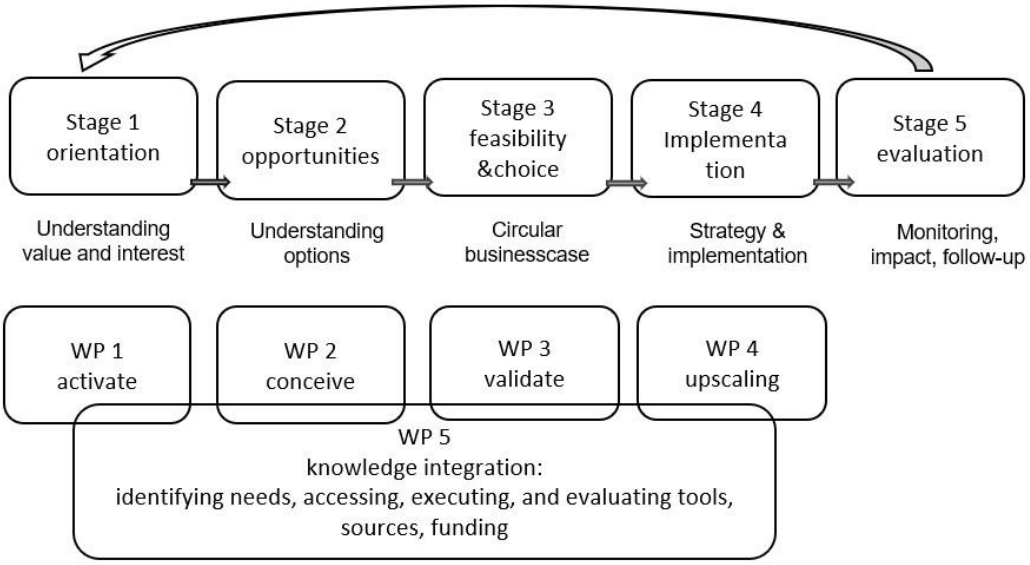
Stage 4). *Implementation*. This stage addresses how feasible circular interventions can be implemented in a business model. Questions include: What does the (strategic) implementation plan look like? With whom do I need to collaborate? How do I finance my circular business case? What requirements do financiers have for my plans?

Stage 5). *Evaluation*. This stage addresses monitoring, evaluating, and managing a circular business model over time. Questions include: How do we monitor our impact? How do we manage our circular innovation? What will be our next step? How do we continue to innovate and link back to stage 2?

Actions during the first four stages of the proposed circular customer journey show parallels to actions associated with the first four working packages of CESI-ON, as depicted below in Figure 2.

It should be noted that the here proposed circular customer journey is a work in progress that addresses an ideated, linear development of a circular business model. Organizations aiming for circularity only sometimes go through all five stages of the proposed customer journey. Feedback from consulted entrepreneurs indicates that the proposed stages are considered fitting but somewhat traditional. The journey towards circularity can commence anywhere in an organization and then gradually expand, often due to trial and error. The respondents suggest that choices are generally made during stage 2 and subsequently executed. Stages 3, 4 and 5 can quickly become intertwined. One respondent pointed out that the circular customer journey is a cyclical process in itself, as evaluation will result in new orientations and opportunities.

Figure 2. Stages of circular customer journey and CESI-ON working packages



3. Development of tool inventory

The main goal of CESI-ON is to support SMEs in the manufacturing industry in Gelderland and Overijssel in transitioning to circular entrepreneurship. Next to addressing the customer journey, the researchers of Working Package 5 were challenged to curate the vast offer of tools for supporting organizations that aim to address circularity in their production process and supply chain. There is a vast, growing amount of instruments, methods, quickscans, workshops, etc. on offer for organizations aiming to incorporate sustainability or circularity into their workings. Within the CESI program these are all considered possible tools. The wide and ever growing variety is offered in various forms by various public and private institutes. At first sight, it is difficult to fathom the purpose and impact of tools (e.g.: Bouwman et al., 2018; Breuer et al., 2018, Yishake & Haaker, 2023). To address this issue, the researchers were provided by Oost NL with a long list of tools, knowledge platforms, and subsidy schemes considered relevant to the CESI-ON program. Through snowballing, the researchers extended the longlist to 118 items by December 2022. The resulting tool overview intends to provide information on tools, knowledge

platforms, and subsidy schemes. It provides information on, e.g., requirements, conditions of use, and associated investment in time or money.

The initial longlist was divided into different sections. To address tools as intended by the CESI-ON program, the researchers categorized instruments intended to support decisions towards intervening in a business model, such as (quick) scans, workshops, Life Cycle Assessments (LCAs), and Massive Open Online Courses (MOOCs), as tools. The resulting detailed inventory provides almost 40 characteristics and properties per tool (figure 3):

The elaborate checklist includes detailed qualitative and quantitative information on, amongst others, purpose, results, intended user type, costs, estimated time, expected outcome, and customer journey stage. Subsidy schemes and knowledge platforms serve different purposes and are much more dynamic. Thus, they were categorized differently. The authors intend to publish a full paper on the emergent process of selecting and refining criteria after evaluation of the project by the end of 2024.

After categorizing the tools, information on actual user experience and perceived added value and results from the tools was needed. The researchers organized multiple sessions to discuss and develop a practical method for establishing the usability and quality of various tools. This proved challenging since available information diverges per tool. The researchers developed a short questionnaire for semi-structured interviews with tool providers to complete information per tool. After testing, the questionnaire was used for interviewing tool providers during semi-structured interviews. Interviews were recorded, transcribed, and analyzed to complete the information on tools

In approaching tool providers, the researchers encountered various hiccups. First, identifying and reaching the correct contacts for online tools proved challenging. Next, many tool providers do not keep or share data on use and evaluation after launching a tool. Thus, in many cases, it is still to be determined whether, how, by whom, and with what results tools are used. Also, various tools depend on temporary grants, affecting lead time and updating. For example, multiple tools that appeared in use in 2022 ceased to exist in 2023 due to grants ending.

Figure 3. Checklist tools

Variable
Orientation CE (Circular Economy)
Opportunities
Feasibility
Implementation
Evaluation
Instrument/Activity
Brief Description
Website
Current Executor
Cleanup/Note/Selection
Interview Status
Warm Contact?
CESI-ON Partner
Instrument Type
End Product? What does the tool contribute to?
In Use
Number of Users
User Satisfaction
Planned Improvements/Development
Applicable Geographically (EU/NL/ON/GLD/OVL)
Region(s): Zwolle, Twente, Cleantech Region/Stedendriehoek, North Veluwe, Foodvalley, Achterhoek, Rivierenland, Region Arnhem-Nijmegen
Specific to Circular Economy? (Yes/No)
Program Budget Costs Within the Work Area (Per Instrument/Activity)
Program Budget Costs Outside the Work Area (Per Instrument/Activity)
Estimated time investment
Feedback?
Tool at Micro-Meso-Macro Level
Intended Audience (Sector, Type of Company, or Person)
Validated Tool? (Track Record)
Requirements for Tool Users?
Can it be filled out independently or requires guidance?
Online and / or On-site
Tool for Individuals or Groups?
Tool for Integral Business Model or Specific Functional Areas?
For which phase of the customer journey?
Tool openly accessible or restricted?
What WP

Tool selection: additional criteria.

The tool overview was developed to serve two purposes: 1.) supporting entrepreneurs in selecting suitable tools for transitioning towards circular entrepreneurship and 2.) guiding CESI-ON's five working packages in supporting entrepreneurs in their circular customer journey by selecting and promoting the right tool at the right moment. For this, a customized refinement of the longlist was needed. The researchers discussed a selection protocol with the CESI-ON program management and representatives

of all working packages, which include business representatives and consultants who will work with the final selection of tools.

This resulted in the following selection criteria:

1). Tools included in the selection must be in accordance with BOOST Smart Industry Circular's definition of Circular Economy (see section 1)

2). Only tools that align with one or multiple stages in the circular customer journey are included. The initial focus should be on tools aligning with WP 1 and 2, if possible.

3). Selected tools must be available to all conceivable entrepreneurs

4). Only tools that are actively in use (including support) are included

5). Tools supported by the CESI-ON program must be included.

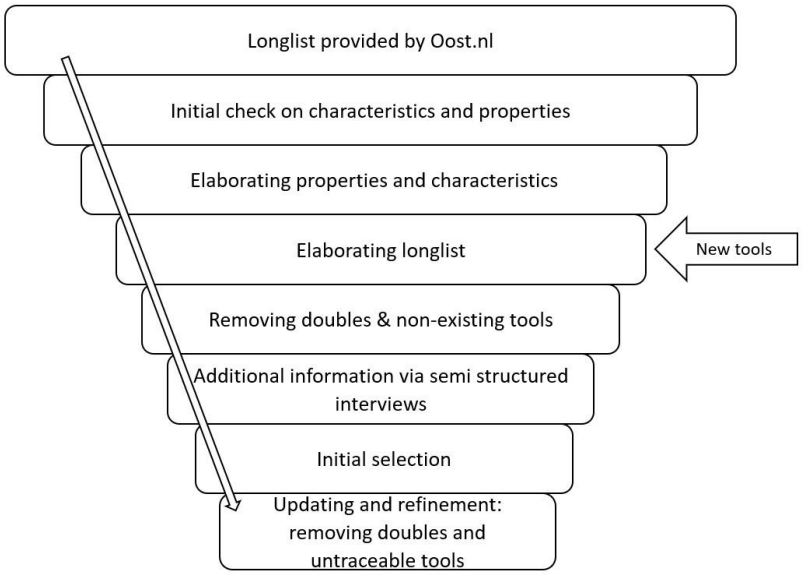
The fifth criterion exemplifies the dynamics of practice-based research. Like many other tools in the longlist, obtaining correct and complete information on tools supported by the CESI-ON program was not easy. While lacking and unclear information was a reason to exclude other tools from the final selection, tools supported by CESI-ON must be included in the final tool overview, even if the information still needed to be included. Thus, the final selection of tools is a compilation of tools curated by the research team and CESI-ON tools. The researchers intend to further examine the CESI-ON tools by joining meetings where they are used during 2024.

Tool selection: final round

Based on the five additional selection criteria, a list was compiled of seventeen tools for supporting circularity considered fitting from the perspective of CESI-ON by December 2022. During the spring of 2023, this list was updated with new tools found by the researchers, new tools supported by the CESI-ON program, and adjusted information on various tools subject to change. For curating new tools, first, the above-mentioned additional criteria were checked. When a tool fitted these criteria, properties and characteristics were researched using the elaborate checklist from the tool overview. Again, getting the requested information on various tools was a challenge. The researchers found that different organizations offered similar tools under different names. Also, some tools appeared to have ceased to

exist. To the researchers, this proves how tricky it must be for an entrepreneur to find the right tool immediately. The process of tool curation is summarized below in Figure 4

Figure 4. Process of tool selection



Eventually, a final selection of 22 tools was determined and presented by the end of 2023. This final selection includes the tools supported by CESI-ON. The selection contains various tools for various stages in the customer journey. Comparing the working of most tools is virtually impossible due to their different nature and aims. The final tool selection only includes long-term programs that may seem less suitable for interventions during a distinct stage. As a next step, this selection must be elaborated with a practical search menu and integrated into the BOOST website during the spring of 2024. The researchers recommend further differentiation on the BOOST website in tools, networks, grants, educational programs, and knowledge sources.

4. Preliminary conclusions and discussion

The practice-based approach to the main tasks in WP5 resulted in a structured approach for optimizing tool selection, utilization, and adaptation. The researchers opted for an interpretive, adaptive approach from a practice-based perspective, mirroring how entrepreneurs encounter the ever-expanding offer of tools. By structuring and monitoring this approach, a methodology grounded in practice emerged.

Further steps in 2024 must ensure a comprehensive and effective support system by providing practical tools for organizations transitioning to a circular economy in the smart manufacturing industry.

Observations regarding the circular customer journey

The assessment of stages in the circular customer journey draws upon the theoretical foundations of customer journey models. The practical implementation of the model in organizations necessitates flexibility and creativity, given the evolving nature of circularity and the transformations occurring in traditional business and revenue models. Moreover, the transition to a circular economy involves a shift from linear to cyclical processes, challenging the traditional sequencing inherent in conventional models.

The research process encountered various interpretations of the term 'circular economy' broadly summarized in two categories. One group adopts a 'narrow' definition, focusing on shortening, narrowing, and closing material and resource loops. At the same time, the other embraces a 'broad' approach, interpreting circular economy as an integral sustainability strategy encompassing social and economic dimensions.

The design thinking principles align well with practical efforts in circular entrepreneurship. The proposed stages in the circular customer journey serve to classify tools. It is conceivable to envision these stages as cyclical while diverging from the 'linear' customer journey process. It is crucial to state and illustrate that circularity is a cyclical, continuous improvement process. The CESI/BOOST website communication should also emphasize the importance of this cyclical and continuous nature for entrepreneurs.

The circular customer journey and the overview and selection of tools have been developed during the first stage of the CESI-ON program. At the start of the CESI-ON program, the perspective was predominantly from the supply side. In 2023, the focus broadened, and the program started, amongst others, collaborating with the EDIH (European Digital Innovation Hubs) program. EDIH brings additional perspectives and data on entrepreneurs integrating digital and circular innovation. It also indicates the dynamic reality of doing practice-based research since the target group of entrepreneurs expands with different organizations, different questions, and different tools. As pointed out before, this reflects the dynamic reality for entrepreneurs.

Observations regarding the tool selection

The researchers acknowledge that the resulting tool overview is a dynamic document. New tools are continuously launched, publicly but also by private consultants. Next to this, existing tools are susceptible to changes, as do the organizations that develop and support them. It is a given that the tool inventory itself is and will remain incomplete and that validation of tools and their impact is just starting.. Thus, the systemic approach of curating tools must be adapted for systemic use by practitioners. The extended methodology used to create the tool inventory is time-consuming and needs to be simplified. The researchers thus propose to develop a manual that includes given selection criteria and a selection of essential characteristics from the tool inventory. This manual serves to select and disseminate future tools for the BOOST website. During 2024, the final tool list will be integrated into the BOOST website. When writing this contribution, deliberations with the webmaster of BOOST are in full swing. The researchers have proposed a navigation program, which still needs to be implemented. Whether the selected tools and the selection menu are helpful for entrepreneurs is still being determined at the time of uploading this contribution. It remains difficult for the researchers to access timely information on using tools in practice. Observations and interviews with users will continue during the spring of 2024. While researching the tools, it became clear that intermediaries such as business consultants need more time and knowledge to select appropriate tools for their clients. The researchers have recommended and offered to develop a short but effective training program for intermediaries participating in the CESI-ON program to introduce the circular customer journey and the 22 selected accompanying tools.

Next to this practice-based follow-up, the researchers intend to use the elaborated longlist for further research into the development, use, effects, and evaluation of instruments for enhancing circular business. The elaborate inventory of properties and characteristics can be refined and expanded to a Dutch or international database. A longitudinal follow-up, possibly aided by AI search, provides interesting data that may be used for a deeper understanding and, eventually, a better connection between the supply and demand of instruments for supporting circular business models.

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