From Theory to Practice: Developing an Assessment Instrument to Measure Circularity Performance in Organizations

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Abstract

The growing interest in circular economy has fostered the rise of attention circularity assessment receives. This spark in interest has led to the development of several assessment instruments however to date, no instrument that focuses on assessment practicality and comprehensiveness exists. Therefore, this research aims to design an assessment instrument in a survey format and based on the Business Model Canvas elements to evaluate circularity performance in organizations. Action design research is employed in collaboration with a consulting company with a particular focus on the retail industry as the elaboration process develops from problem identification to design and development, instrument implementation, evaluation, reflection, and knowledge generation. For its structure and content, the instrument undergoes a thorough development procedure focused on item generation via workshop sessions and purification via feedback sessions. The survey is refined in one iteration concluding with an assessment survey consisting of 130 items, divided into five topics and 21 subtopics representing the Business Model Canvas. Thus, this study contributes to research efforts in advancing the discussion on circularity assessment by developing a new instrument that aims to fill the current holistic assessment perspective gap in the literature. From a practice perspective, this tool can assist organizations pursue circular transformation by making evaluation more accessible, helping them evaluate current performance and advance in their transition.

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1. Introduction

In an era of consumerism, resource exhaustion, and environmental degradation, the concept of circularity has developed as a compelling paradigm shift toward sustainable development. Circularity, with its principles of decreasing waste, increasing resource efficiency, and supporting regenerative processes, unlocks huge potential to transform the way companies do business, reduce environmental impacts, and cultivate long-term societal well-being (Kirchherr et al., 2017). As a result, the evaluation of circularity has become an important preoccupation for academia and practitioners alike, a major topic of concern focusing on creating assessment solutions (Corona et al., 2019).

1.1. Research gap

Considering the recent development of the business landscape, organizations are showing increasing appetite in evaluating their circularity performance (Deloitte, 2023). Yet, the currently accessible tools for evaluating circularity performance often lack practicality and comprehensiveness (Geissdoerfer et al., 2017). While there are various accessible frameworks and tools, from a layout perspective no assessment instrument in the form of a survey has been identified. This aspect is crucial as an assessment survey could represent a more accessible and user-friendly approach to perform an assessment. From a structure perspective, current solutions miss a unified approach that can assess a company's circularity across all its business model elements, from value creation to value capture (Nussholz, 2018). Available instruments may emphasize specific aspects such as waste management or product design but not address the effects of these aspects across the whole business model, therefore failing to deliver a holistic perspective on the company's entire circularity performance (Bocken et al., 2014). The Business Model Canvas represents a topic currently overlooked in the circularity context. However, the Business Model Canvas could highly benefit the comprehensive assessment of circularity performance due to the elements it addresses, starting from the value proposition up to the cost structure and revenue streams (Antikainen and Valkokari, 2016). This gap highlights the need for a practical and comprehensive circularity assessment instrument in the form of a survey and based on the Business Model Canvas that considers user engagement and the connection among various elements within a company's business model and recognizes opportunities for improvement. Such an instrument would deliver valuable insights and steer companies towards more effective circular economy applications, assisting their shift to more sustainable business models.

1.2. Research rationale

The research goal of this study is to elaborate a new assessment instrument in the form of a survey and based on the Business Model Canvas tool to evaluate the circularity performance of organizations. Therefore, the research question of this study focuses on "How should an assessment instrument be

envisioned to evaluate circularity performance within organizations?". Action design research is chosen to promote collaboration between academia and practice for delivering a relevant assessment instrument. This study represents a collaboration with an international IT and business consulting company, for which the retail industry represents a major business segment that will be taken into account in the content development of the instrument.

1.3. Contributions

From an academic perspective, the research makes several contributions. First and foremost, this study contributes to the methodology of evaluating circularity performance by elaborating a new assessment instrument. By focusing on the elements of the Business Model Canvas, it offers a new approach that takes into account the holistic nature of circularity, including value proposition, customer segments, revenue streams, and other key elements of the business model (Lindgreen et al., 2020). Second, this study extends the measurement of circularity performance by delivering a structured and comprehensive assessment instrument. By exploiting a survey-based approach, the study allows the quantification and comparison of circularity performance across an organization or monitoring circularity over time (Sassanelli et al., 2017). The combination of the Business Model Canvas elements add depth and granularity to the evaluation, capturing precise dimensions and aspects that influence circularity in organizations (Bocken et al., 2014). This research will also contribute with the research and practice collaboration perspective of designing a new assessment instrument with the use of action design research (Santa-Maria et al., 2022).

From a practical perspective, the focus of the research on designing a practical assessment instrument has implications for real-world applications and industry practices. By aligning the assessment with a survey format and the Business Model Canvas elements, the study delivers a user-friendly and actionable tool that can be implemented by organizations to evaluate their circularity performance.

The study proceeds as per the following outline. First, action design research will be presented. Afterward, the flow will continue with the development procedure employed to design the assessment instrument. Finally, the study will close with a discussion and conclusion

2. Action design research

The study focuses on designing a new assessment instrument that captures the circularity performance of organizations. In light of this, action design research was the approach selected to answer the research question "How should an assessment instrument be envisioned to evaluate circularity performance within organizations?". This research approach represents a blend between design science research and action research, two methods with a common objective to create and improve scientific knowledge while solving real-world problems (Collatto et al., 2018). It is frequently chosen in the field of management to approach difficult inquiries by combining research, design, and practical application. Action design research is especially appropriate for studies that engage in elaborating and assessing solutions to improve systems or processes.

The purpose of action design research is to create both theoretical knowledge and practical results by designing, implementing, and evaluating solutions in iterative rounds in a real-world context. This methodology usually adopts a cyclical process that includes phases. The first phase is problem identification in which the researcher identifies a problem or an opportunity for improvement. The second phase is design and development in which the researcher works on designing the solution that can fix the problem or exploit the opportunity for improvement identified. This phase can include literature exploration, and expert talks to elaborate an appropriate instrument. The third step implies solution implementation so that the elaborated tool is applied in a real-world setting. The fourth step is evaluation, which involves an assessment of the effectiveness of the intervention using both quantitative and qualitative approaches. The last step is reflection and knowledge generation, where the researcher reflects on the results and insights from the prior phases, deriving conclusions, and creating new knowledge. Further, these new findings add to the academic understanding of the research problem and can guide applicable recommendations for implementing circularity assessment in particular contexts (Sein et al., 2011).

Action design research is an appropriate methodology to organize a study that involves developing a new assessment instrument for a number of reasons. First, thanks to the iterative and participatory method, action design research focuses on iterative cycles of design, implementation, and evaluation (Sein et al., 2011). This allows for constant improvement of the assessment instrument based on feedback and insights from real-world implementation. Taking into account relevant stakeholders, such as industry practitioners and organizations in the study process provides that their views and requirements are included. The second reason is background relevance (Sein et al., 2011). Action design research emphasizes real-world contexts, making sure that the assessment instrument is elaborated and evaluated within the specific settings where it will be implemented. This supports the practical applicability and relevance of the study results. The third reason is the combination of research and design (Venable et al., 2012). Action design research integrates research and design activities, allowing the development of a well-designed assessment instrument that takes into consideration both academic knowledge and

practical implications. Therefore, this combination assists close the gap between research and practice. The last reason is actionable insights (Sein et al., 2011). The goal of action design research is to create insights and practical results. By elaborating on an assessment instrument, the study can back the transition and application of circularity through empowering organizations to evaluate and advance their performance via a practical and comprehensive approach.

3. Building the assessment instrument

3.1. Current circularity assessment context

Circularity assessment has an important role in evaluating the circularity performance of products, processes, and systems, and supporting the change towards a more circular economy (Valls Val et al., 2022). Initial studies focused on waste management and recycling rates, but the concept has extended to include broader aspects of circularity such as resource efficiency, material circularity, and product life extension (Saidani et al., 2017; Lindgreen et al., 2020). The expansion of circularity assessment exposes the increasing acknowledgment of the necessity to transition towards more sustainable and circular practices.

Circularity assessment can be based on various characteristics such as levels of assessment, measurement approaches as well as dimensions they take into account. In terms of levels of assessment, the macro level considers the evaluation of circularity principles and practices at a broad scale, such as global, national, or regional levels. The micro-level assessment refers to the evaluation of the organizational level as a whole (Valls Val et al., 2022; Oliveira et al., 2021; Saidani et al., 2017). This level is preoccupied with the integration of various business elements such as products, processes, supply chains, and business models (Lindgreen et al., 2020). The nano level concerns the evaluation of products, more precisely their components, and materials (Saidani et al., 2017). However, pursuing the analysis across the dimensions of a business model at the micro level still calls for a holistic perspective, where the macro, and nano levels are taken into account as they interact with each other and collaborate in the context of circularity transition.

In terms of measurement approaches, most of the assessment solutions propose a qualitative measurement approach (Valls Val et al., 2022). This option is very much aligned with the current sustainability measurement standards reflected in the mandatory non-financial or corporate social responsibility annual reporting guidelines. However, more recent studies argue that hybrid solutions that propose a combination of qualitative and quantitative information deliver more concrete information that can help improve performance (Dewick et al., 2020). The benefits of the quantitative approach imply the following. The first benefit focuses on objectivity and data-driven insights. As quantitative assessment focuses on objective data and measurable metrics, it delivers a more thorough and systemic analysis of

circularity performance in organizations. The second benefit implies benchmarking and comparison across various areas of business, as well as industry. Last, quantitative assessment facilitates ongoing monitoring and evaluation of circularity performance.

While the topic of circularity assessment is still advancing, the level of standardization varies. Currently, no generally standardized circularity assessment has been commonly adopted across industries. Various organizations, initiatives, and study projects have compiled their individual circularity assessment frameworks, methods, and indicators (Dewick et al., 2020).

3.2. Available assessment instruments

3.2.1. Methods

Life cycle assessment represents the most common methodology to asses circularity performance (Sassanelli et al., 2019). It is highly embedded in the idea of evaluating the environmental effect and resources used during the lifecycle of a product (Finnveden, et al., 2009). This method aims to track the product throughout value creation, delivery, and capture. The goal of the assessment is to analyze the current product and seek opportunities to improve for a lower environmental impact, and potentially a greater economic benefit. Patagonia conducted a life cycle assessment study for one of its most popular products, the Synchilla fleece jacket (Rattalino, 2017). Patagonia was able to identify opportunities to reduce its environmental impact by making changes to its supply chain, product design, and manufacturing processes. They began using recycled polyester in the production of their Synchilla jackets, which reduced the environmental impact of the raw materials used. The company also implemented a take-back program for its products, which allows customers to return used clothing and gear to Patagonia for recycling or repurposing. They experienced revenue growth thanks to the marketing campaigns in which they advertised these sustainable turnkeys that attracted not only existing customers but also experienced new heights.

A method complementing life cycle assessment is value chain mapping. While life cycle assessment emphasizes evaluating the environmental consequences of a product or process throughout the whole life cycle, value chain mapping delivers a wider understanding of the value creation process and the potential of circular practices. These two methods generate synergies in various ways. First, they enable comprehensive understanding. Value chain mapping assists in identifying and understanding the different phases, actors, and activities contributing to the value creation process, from resource extraction to end-of-life disposal. In contrast, life cycle assessment emphasizes particularly evaluating the environmental consequences related to each stage of the life cycle. By combining value chain mapping with life cycle assessment, both academia, and practitioners can explore a more comprehensive picture of the circularity performance and environmental impact within their products, processes, and business model (Nussholz, 2018).

3.2.2. Frameworks

European Environmental Agency (EEA, n.d.) published a framework precisely to enable circularity in business models. Through a multi-level perspective, it focuses on the interaction between macro-level actors such as social innovation, policy enablers, and behavioral and education enablers with micro-level factors such as technical innovation and business model innovation. The idea of the European Environmental Agency is that a circular business model should support the implementation of circular product cycle and value chain strategies, thus circularity achieving holistic integration. H&M for example used this framework to develop a number of initiatives to reduce waste and promote sustainability throughout its operations and supply chain. The company has experimented with new business models based on sharing platforms and product as a service to see if they can trigger behavioral enables to support sustainability. In light of this, the company launched a clothing rental service in 2019, which offered the opportunity for customers to rent clothing for a while rather than buying it (H&M, n.d.).

Antikainen and Valkokari (2016) elaborated on a business model framework that promotes evaluation from a system perspective. As presented in Figure 1, the three system elements are, the business ecosystem level which deals with trends, drivers, and stakeholders' involvement, the business model level that encapsulates Osterwalder and Pigneur's (2010) Business Model Canvas, and the sustainability impact level which covers sustainability requirements and benefits. The purpose of this tool is to assist companies evaluate opportunities to adopt circular strategies. The authors tested their framework on a Finish social enterprise, and elaborated on different possibilities for revenue models, and cost-benefit analysis, ultimately helping the company imagine its value proposition to meet both sustainable and circular goals.

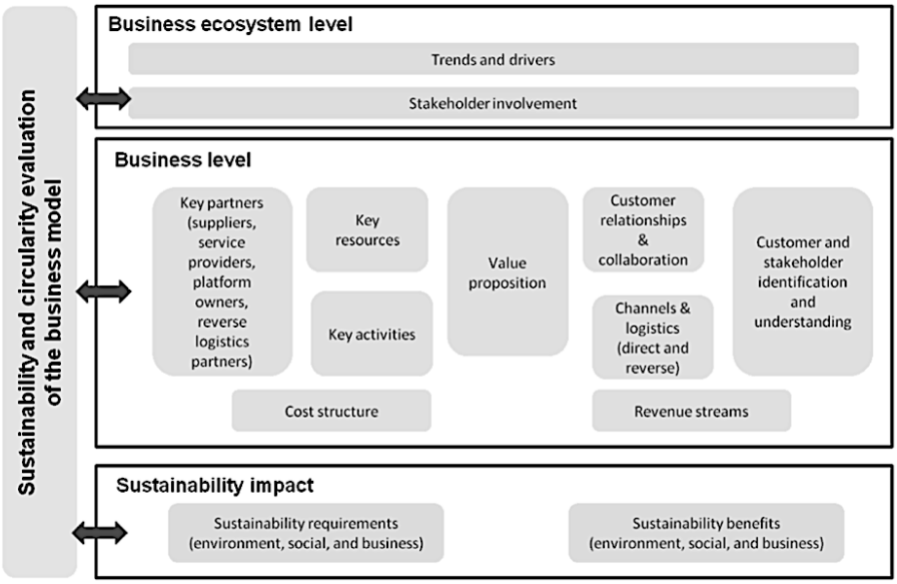

Figure 1: Sustainable circular business model framework (Antikainen and Valkokari, 2016, p.9)

Nussholz (2018) also elaborated on a business model framework, presented in Figure 2, from a lifecycle value management perspective and with a circular strategy rationale focused on slowing and ultimately closing the loop. Like Antikainen and Valkokari (2016) this framework is also based on the value elements analysed across the Business Model Canvas developed by Osterwalder and Pigneur (2010). The author established a lifecycle rationale that refers to four stages to maximize product potential namely the first sale, the take-back, the additional sale, and the material recovery. For each of these activities, four interventions are mentioned in order to increase the value potential of the product, namely prolonged use, collection, reintegration, and recovery. This framework reflects on how the value elements in the business model should be innovated to maximize the lifecycle, and consequently the value of the product to ultimately increase the circularity performance of organizations. This framework was tested on an electronics manufacturer and retailer that also incorporated social enterprise characteristics into its business model and revealed potential areas that could benefit from the interventions.

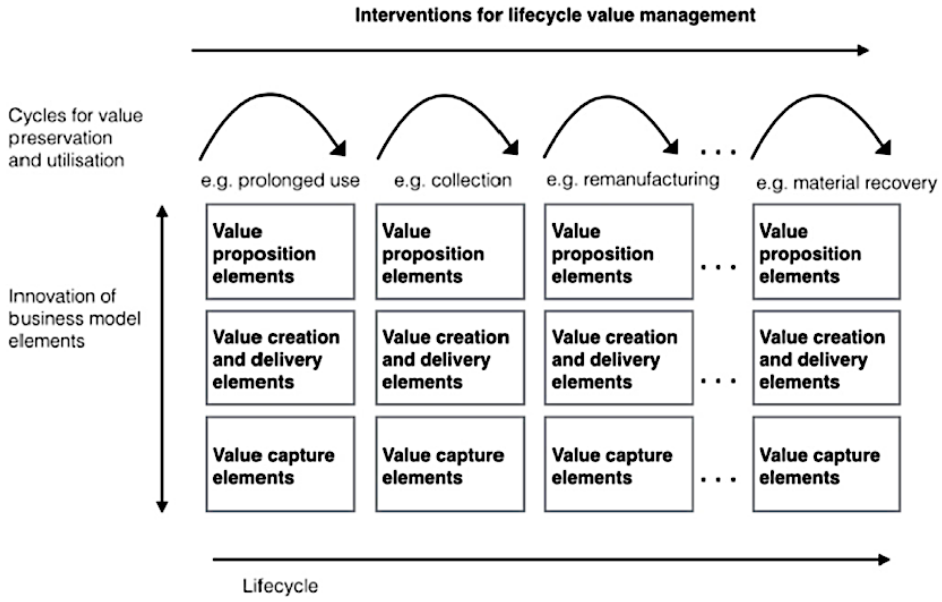

Figure 2: Circular business model framework (Nussholz, 2018, p. 187)

With a focus on solutions developed by practitioners, a widely known circular economy assessment tool has been identified. It is called “Circulytics”, developed by the Ellen MacArthur Foundation, and is regarded as the most comprehensive assessment tool currently on the market. This tool is based on an assessment framework designed for companies to assess organizational progress and performance, including business model evaluation, toward circular economy transition. In terms of method, this solution assists companies in evaluating their circularity performance through a compilation

of 37 indicators across 11 themes and 2 categories as displayed in Figure 3 (Ellen MacArthur Foundation, n.d.). The two assessment categories are represented by enablers and outcomes. Enablers account for aspects that could enhance the circular transition. The themes evaluated in this category include strategy and planning, innovation, people and skills, operations, and external engagement. The outcomes category evaluates how the company is at present. Here, themes include product and materials, services, plant, property equipment assets, water, energy, and finance. Companies can choose only the themes in line with their characteristics, which is the first step Circulytics imposes in order to provide specific outcomes.

The assessment is based on a quantifiable and measurable framework, addressing both quantitative and qualitative information. This solution requires disclosure of several reports such as sustainability and environmental, social, and governance reporting of the organization taking the assessment. Their survey compiles a set of 77 questions divided into assessment areas such as basic company information, and company characteristics, where the companies can choose the categories and themes suitable for them and the subsequential weighting of the themes. This partially enables the practical applicability and scalability of their solution. The set of questions mentioned is wide-ranging, with several sub-questions and extensive information required per assessment area.

However, Circulytics does not address business models particularly, in a designated assessment area within the overall organizational assessment. The most problematic topic when addressing this particular assessment is transparency. While it has been mentioned in other research papers, none discussed it extensively due to the lack of transparency. There is no access to look into the assessment without being a preselected organization. The Foundation did not extend the invitation to researchers yet.

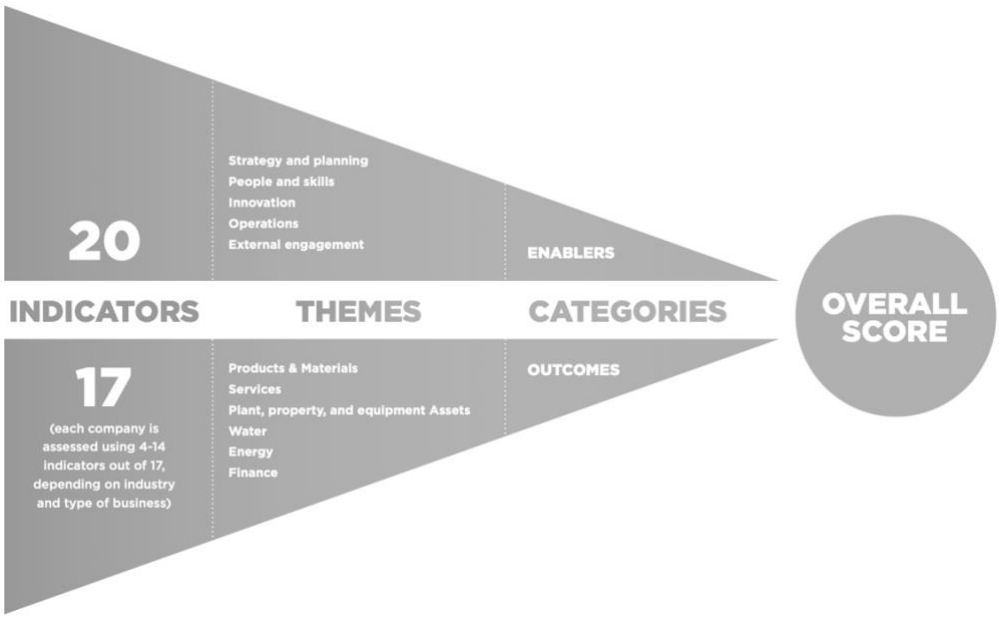

Figure 3: Circulytics framework (Ellen MacArthur Foundation, n.d.)

3.2.3. Indicators

As acknowledged by Oliveira et al. (2021, p. 456) circularity indicators “focus on measuring the degree of association of a system, or part of one, to practices and strategies applied to develop a circular economy further". Material flow analysis is a quantitative indicator that evaluates flows and stocks of materials in a system. The rationale of this indicator is that it tracks material throughout an entire chain of activities from the extraction to production and use, and beyond that to waste management and residuals (Sassanelli et al., 2019; Pauliuk, 2018). However, if it is combined with an additional assessment focused on the cost related to material flow, it delivers a more business-focused application which is called Material flow cost accounting. This indicator is preoccupied with establishing the costs of the material flow at each step of the process. In this way, the two combined offer the opportunity to understand the environmental and financial consequences of current business practices and seek to improve them. One indicator application was documented from H&M as in 2013 the company used Material flow analysis and cost accounting to identify opportunities to reduce costs and improve environmental performance. By pursuing this analysis, the retailer was able to reduce the amount of fabric waste generated during production by optimizing its cutting process and reducing the amount of excess fabric used (Corvellec and Stal, 2017).

3.3. Problem identification

The goal of the problem identification phase of this study was to recognise the gap in the existing practices of evaluating circularity performance within organizations. For this, the researcher explored the current assessment context and available assessment instruments as elaborated in sections 3.1 and 3.2.

The problem identified focuses on the lack of a practical and comprehensive assessment instrument that evaluates circularity performance in organizations. First, with regard to the practical aspect none of the available instruments explored provide an convenient solution to perform an assessment. The instruments mentioned require extensive guidance and assistance for their use. The practicality of an assessment instrument is crucial for its successful application within organizations. A new instrument that concentrates on practicality ensures user-friendliness in terms of ease of administration, data collection, and evaluation which further implies that the outcomes can be easily interpreted and acted upon by organizations. A new instrument that focuses on practicality delivers actionable insights that organizations can use to recognise precise areas for improvement. Second, currently available assessment instruments do not precisely reflect upon the interconnection between circularity and the elements of a business model. A new instrument that incorporates the elements of the Business Model Canvas delivers a comprehensive assessment approach, as it directly links circularity performance with essential aspects of a company’s business model. This alignment allows organizations to understand how circularity impacts different business elements and identify opportunities for improvement and optimization in those particular areas.

3.4. Instrument design and development

3.4.1. Instrument validity and reliability

To ensure validity and reliability throughout the instrument development the procedure advanced by Kump et al. (2019) was applied. Even though the instruments differ in their details the general process and quality criteria can be taken into account. Therefore, the following three steps were followed.

For the first step, which is scale generation, functional requirements and structural and dimensional elements of an assessment instrument were compiled based on literature insights and collaboration with consultants. For the functional requirements, this research applied the comprehensive assessment of circularity featured in Vall Val et al., (2022), Santa-Maria et al., (2022), and many others as well as the adaptability and scalability nature of the Business Model Canvas endorsed by Lindgreen et al. (2020), and Guldmann et al. (2019). The survey format of this scale together with the 5-point Likert scale implementation suggestion come from the collaboration with the consultants and represent the newness of this instrument in this particular context of assessing circularity performance in organizations.

In the second step, item generation, assessment items were developed based on workshop sessions with consultants. The decision to pursue this choice of generation occurred based on two considerations. The first one is conceptual, and it focuses on the fact that while at the beginning of the design and development of the new instrument the researcher considered combining existing frameworks of Antikainen and Valkokari (2016) and Nussholz (2018), this was not possible. Both frameworks rely on different interpretations of circularity and the rationale of a circularity assessment. For example, Antikainen and Valkokari's (2016) framework is more preoccupied with how to integrate sustainability and circularity to enable comprehensive assessment of business models. Nussholz's (2018) framework is more preoccupied with assessing how to integrate circular interventions to optimise the value creation of a business model from a circular standpoint. Therefore the instrument required refined operationalization of the items and homogenous phrasing of the items in the different assessment subsegments with a focus on evaluating the overall segment.

In the third step focused on item purification, best practices for circularity for the elements of the business model were gathered from literature and the items gathered from workshops were compiled in best practices themes to investigate whether they correspond to theory. The expected outcome was that the best practices themes in general resemble the practices highlighted by literature with few differences given by the real-world context represented by the consultants.

The fourth step focused on scale purification. Data was collected from feedback sessions with consultants to investigate if the assessment items developed measure the specified practice, subtopics, and topics they are part of and remove or improve items of low quality if necessary.

3.4.2. Scale generation

3.4.2.1. Functional requirements

Functional requirements are distinctive attributes and capabilities that an assessment instrument must have to deliver desired functions and fulfill user needs (Avgeriou et al., 2003). The method applied to compile the functional requirements for the assessment instrument for circularity performance combined literature exploration with a consultant discussion. These requirements represent the starting point in the design and development of the assessment instrument. Table 1 provides an overview of the considered functional requirements, together with their considerations and origination.

First, for the functional requirement of developing a comprehensive assessment the need to study the product, processes, and systems together was emphasized. To meet this requirement the assessment was set to be based on the business model level as regarded in the literature (Lindgreen et al., 2020; Santa-Maria et al., 2022). However, to enable circularity evaluation throughout the business model, value chain mapping was selected to organize key activities and key partners together in the value creation process.

In terms of user engagement requirements, the user experience consultant stretched the importance of having an easy-to-use assessment application, intuitive and with low training requirements in order to ensure practicality. Consequently, a survey format was selected.

In terms of scalability and customization, making use of the Business Model Canvas as a basis for the assessment was emphasized in the literature. The reason for this is that it can deliver a modular structure with a high degree of customization, giving companies from different industries and with different business extents the opportunity to make the assessment (Guldmann et al., 2019).

For the data collection and analysis functional requirement, the need to focus on quantitative collection was expressed by the consultant in order to meet the practical consideration of the assessment. While the existing literature explored tends to recommend a hybrid assessment approach, it still encourages research to explore quantitative ways of assessing circularity performance (Valls Val, et al., 2022). Therefore, a quantitative survey based on 5-point Likert scale statements was found appropriate to enable organizations to use the assessment instrument without extensive guidance. The Likert scale offers a series of benefits. First, it delivers balance and flexibility. It offers respondents a sufficient number of options without overwhelming them with too many options. Second, the ease of use, it is straightforward and easy for respondents to comprehend and use. Third, the incorporation of a neutral midpoint lets respondents express their lack of opinion or neutrality on a particular statement. Fourth, the 5-point Likert scale offers sufficient response choices to distinguish between several levels of agreement and disagreement. Fifth, it delivers enough variability in responses to deliver statistical analysis and allows the researcher to investigate trends, calculate means, and other statistical analyses to recognize patterns. Last, it facilitates consistency throughout the survey, which enables response comparison (Likert, 1932). Overall, it is widely accepted and used, therefore appropriate for this assignment.

Functional requirements category	Rationale	Highlighted in literature	Highlighted by the consultant
Comprehensive assessment	Touch base on products, processes, and systems, therefore focus on the business model level.	x	
User engagement	Survey to enable ease of use, intuitive format with low training.		x
Scalability and adaptability	Make use of the Business Model Canvas to comprise a modular and adjustable structure.	x	
Data collection and analysis	Opt for a quantitative, 5-point Likert scale evaluation.		x

Table 1: Functional requirements circularity assessment

3.4.2.2. Business Model Canvas

As defined by the widely acknowledged Osterwalder and Pigneur (2010, p.14), " A business model describes the rationale of how an organization creates, delivers, and captures value". The authors propose a structured business model illustration composed of nine elements as presented in Figure 4. A business model analysis based on this tool starts from the center which is the value proposition. This element represents the value the company promises to deliver to its customers and it triggers the value creation, delivery, and capture. Key partners, key activities, and key resources account for value creation. These items highlight back-of-the-house activities such as processes and operations from which the products and services are created. Customer relationships, customer segments, and channels account for value delivery. These elements represent the front-of-the-house activities and account for to whom and where the products and services are delivered. Revenues and costs focus on value capture. The back and front house activities are important means for realizing the economic profitability of the value proposition.

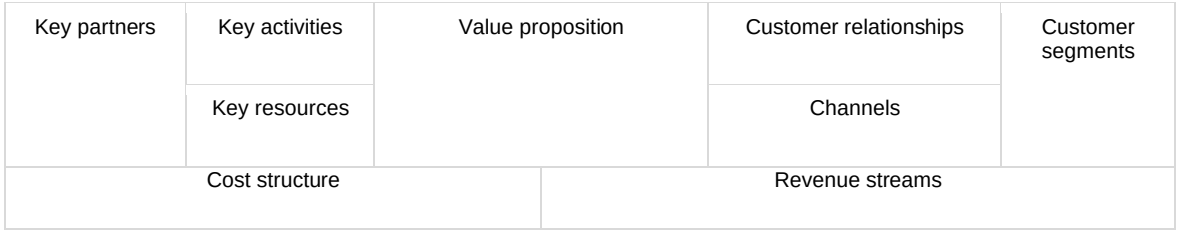

Figure 4: Business Model Canvas (Osterwalder and Pigneur, 2010)

The transition to a more circular economy demands a change in the way businesses operate, moving away from linear production and consumption models towards more sustainable and regenerative ones (Susur and Engwall, 2013). Understanding the link between circularity and business models is essential for organizations to transition toward circular practices. By choosing the structure of the

Business Model Canvas a new assessment instrument can meet the requirement of comprehensive assessment of circularity performance in organizations. As showcased in section 3.2.2. Frameworks, researchers such as Antikainen and Valkokari (2016), and Nussholz (2018) provide examples of how to integrate the Business Model Canvas in frameworks that focus on assessing circularity.

3.4.2.3. Instrument structure

The instrument structure was divided into 4 segments and 10 subsegments as can be observed in Table 2. The first segment of the assessment is the value proposition of the organization and it addresses the environmental, social, and economic aspects. The second topic is value creation, where circularity is evaluated across six activities, procurement, manufacturing, logistics, sales and marketing, product use, end of life disposal. The third topic, the key resources and capabilities section looks into the same topics as the value chain but from a different perspective. The value chain assessment area focuses more on identifying how the organization deals with certain activities and the afferent relationships with other stakeholders. The key resources and capabilities look more into the know-how and tools in place for the organization to build its circularity performance. The fourth topic is value delivery and it concerns customer segments, channels, and customer relationships. Here, the highlighted idea is that channels act as a bridge between the customers and the relationship the retailer builds with them. The fifth topic, value capture looks into details about cost structure and revenue streams.

Instrument segment	Rationale	Literature origination
Value proposition	Assess the fundamental building block of a business model.	Osterwalder and Pigneur (2010)
⇒ Environmental	Ensure comprehensive evaluation of the value proposition of the overall impact of the value proposition.	Lambert et al. (2012); Ludeke-Freund (2016)
⇒ Social		
⇒ Economic		
Value creation	Comprehend how effectively the client's operational processes and resource distribution support circular practices.	Osterwalder and Pigneur (2010)
⇒ Value chain (Key Activities and Key Partners)	Combine key activities and partners into the value chain mapping to identify barriers, and challenges in the business model.	Santa-Maria et al. (2022)
⇒ Key resources	Evaluate what the client has in place to drive towards a circular business model.	

Value delivery	Assess how effectively a company engages with customers and delivers the circular value proposition.	Osterwalder and Pigneur (2010)
⇒ Customer relationships		
⇒ Channels		
⇒ Customer segments		
Value capture	Look into the financial viability and sustainability of the circular business model.	Osterwalder and Pigneur (2010)
⇒ Cost structure		
⇒ Revenue streams		

Table 2: Instrument segments and subsegments overview

3.4.3. Items generation

3.4.3.1. Items origination

The purpose of the two workshop sessions was to collect qualitative data and identify the indicators which are relevant to include in a circularity assessment that evaluates the performance of the organizations from the practitioner's perspective. The researcher invited six consultants from the consulting company creating a diverse group of participants as can be observed in Table 2, to ensure a comprehensive perspective both on aspects concerning circularity and business models. They were also distributed evenly in the sessions to ensure an equal level of group experience. The context and goal of the workshop activities were communicated to the participants prior to the workshop participation.

Participant	Position	Expertise	Workshop session
Participant 1	Director Consulting Expert	Sustainability and Finance	1
Participant 2	Manager Corporate Services Expert	Sustainability and Retail	2
Participant 3	Senior Consultant	Sustainability, Utilities, and Manufacturing	2
Participant 4	Senior Consultant	Sustainability, Retail, and Consumer Services, and Supply Chain	1
Participant 5	Senior Consultant	Sustainability and Energy	1
Participant 6	Consultant	Sustainability	2

Table 3: List of workshop participants

The agenda of the workshops started with an introduction to the workshop objectives, specified the context, and defined the key terms related to circularity assessment, business models, and the retail industry. The reason for including the retail industry in this context has to do with the affinity of the consulting company to enable creating an assessment instrument that can serve their clients from this specific industry.

To create the workshop materials, the researcher consulted the circular Sprint for business models workshop developed by Santa-Maria et al. (2022). From here, activities were selected and adjusted to meet the indicator collection scope and the two-hour time availability of the participants. The workshop sessions took place in an online visual and collaborative platform called Mural. This supported the interaction with the materials and engagement among participants to generate recommendations for the indicators. The workshop activities included interactive exercises in which participants had to contribute their ideas by writing recommendations on sticky notes for qualitative data collection purposes. Table 3 provides an overview of the eight workshop activities carried out, duration, and tools that assisted in facilitating the sessions.

180 indicator recommendations were collected in total. The first activity which was about circularity assessment, and the second activity regarding retail business model circularity assessment were more general introductory activities to get acquainted with the topic. From the third activity, the consultants actually started to brainstorm about what the actual circularity assessment that tracks the circularity performance of organizations should contain. The most extensive activities were the fourth and the fifth exploring the value chain mapping and key resources and capabilities topics. Consultants had to think about indicators based on a six-phase value chain addressing procurement, manufacturing, logistics, sales and marketing, product use, and end-of-life disposal, compared to value proposition,

value delivery, and value capture activities that implied exploring practices only across two or three dimensions.

Activity number	Topic	Activity question	Duration (minutes)	Assisting tools
1	Circularity assessment	What are important specific characteristics of a circularity assessment?	5	Sustainability and circularity similarities and differences (Antikainen and Valkokari, 2016), Sustainability maturity assessment tool (CGI, n.d.)
2	Retail business model circularity assessment	What are specific retail characteristics that should be highlighted in a circularity assessment?	5	Basic business model archetypes (Weill et al., 2005)
3	Value proposition	What should a retail company aim to propose to highlight its circular transition from an environmental, social, and economic perspective?	5	Business model canvas tool (Osterwalder and Pigneur, 2010)
4	Value creation	What are the main actors, value chain inefficiencies, and challenges and barriers that influence the circular transition of key activities?	10	Business model canvas tool (Osterwalder and Pigneur, 2010), Value chain mapping (Santa-Maria et al., 2022)
5	Key resources and capabilities	What are important resources and capabilities for companies to unlock the circular transition?	10	Business model canvas tool (Osterwalder and Pigneur, 2010), Value chain mapping (Santa-Maria et al., 2022)
6	Key resources and capabilities Data	What topics should a retail company cover in their data collection to understand their current circular state and potential further transition?	5	Business model canvas tool (Osterwalder and Pigneur, 2010), Value chain mapping (Santa-Maria et al., 2022)
7	Value delivery	How could a retail company pursue its value proposition through the value delivery actors? What are important topics to cover in a circularity assessment in terms of value delivery?	10	Business model canvas tool (Osterwalder and Pigneur, 2010)
8	Value capture	What are important economic points a circularity assessment for retail should seek to cover in terms of cost structure and revenue streams?	10	Business model canvas tool (Osterwalder and Pigneur, 2010)

Table 4: Workshop overview

3.4.3.2. Items development

The goal of this step was to elaborate on the content of the assessment instrument. The researcher tried to achieve this goal by creating assessment items in the form of statements based on the indicators gathered from the workshop sessions. As per Figure 5, the process of creating the assessment items started with collecting together in a spreadsheet all 180 indicators received from consultants during both workshop sessions. Next, an analysing has been performed to identify which workshop activities received the most recommendations and reasons for this affinity.

The second step focused on filtering and sorting the indicators. Repetitive recommendations as well as assisting recommendations such as examples of companies were identified in the first two introductory activities. As a result, the indicators were removed. Redundant indicators that reoccurred

throughout different activities with the same specified context were also removed. This usually occurred as a result of combining the items from both workshop sessions. However, this, in turn, provided a nice opportunity to recognise that different consultants from different workshop sessions shared the same recommendations. This reinforced the idea that those specific indicators should be addressed in the assessment.

For sorting the researcher looked into a series of patterns. The first pattern focused on best practices themes. The researcher tried to group together several indicators that met the same practice theme in a workshop activity. Some indicators were identified as reoccurring throughout a workshop activity with multiple subtopics. For example, participants mentioned resource efficiency throughout multiple subtopics of the value chain activity, namely manufacturing, logistics, channels, and disposal. Sticky notes with recommendations to explore design also reoccurred on multiple occasions such as when discussing the environmental aspects of the value proposition, manufacturing in the value chain, and customers in the value delivery.

Next, inside the themes, the researcher tried to sort the indicators from more general recommendations to more specific ones. A sequence of indicators flow was recognized. Participants generally started adding indicators into the activities from a broad concept to a more detailed aspect of circularity. For example, in the key resources and capabilities activity within the topic of product use, the consultants started from the idea of “product longevity”, which further led to the idea of “quality improvement” which was succeeded by the idea of “customer feedback” for quality improvement. This in turn determined the depth of the assessment.

Last, recommendations such as “maintain affordability while transitioning towards sustainability” were recognised to only be appropriate for particular cases such as fast fashion. This could be a result of the consultants' work within some specific industries or client companies. These findings were classified and further enabled the scalability and customization of the assessment instrument.

Once this flow of indicators was finalised the researcher started to create the assessment items. The assessment item development step implied taking one indicator, looking into its workshop context, understanding where it belongs in the compiled hierarchy, the specific business model topic and subtopic it was part of, and formulating a statement that addresses it. For example, the indicator "reusable materials" appeared in the value proposition with regard to environmental aspects. The workshop context given for addressing this practice was "important element to consider in connection with understanding biodiversity and building resource efficiency". By looking into the workshop context, and hierarchy, the business model topic of value proposition, and the environmental subtopic, the researcher developed the statement “As part of our circular economy transition, we incorporate regenerative materials and products, which are designed to promote and support the restoration and regeneration of natural systems and resources, into our strategy.”

After all items were developed a few were removed, or rearranged to meet the assessment rationale of first touching base on more general items and further cascading into more detail, or combined as they were viewed to either meet the same scope or similar scopes.

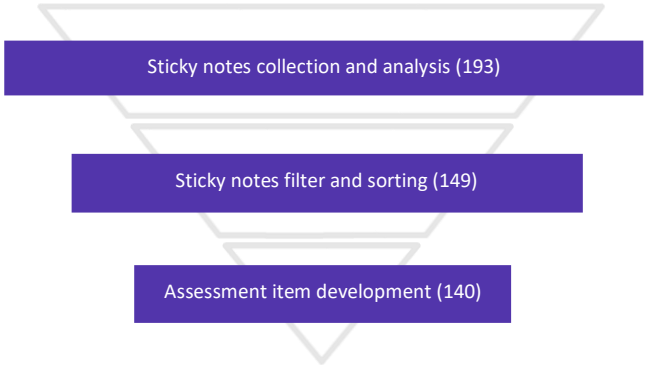

Figure 5: Assessment item development process

3.4.4. Items purification

3.4.4.1. Best circularity practices for business model elements

Literature was explored in an effort to identify what best practices for circularity in business models. The practices were compiled based on the value elements of the business models.

3.4.4.1.1. VALUE PROPOSITION

Literature highlights the following practices for companies that would like to elevate their circularity starting from the value proposition with environmental, social, and economic focus. From an environmental perspective, companies should consider at least the following three practices. First practice concerns sustainable sourcing and supply chain. Here, the literature emphasises the need to use sustainably originated materials, and involve in responsible sourcing practices through the supply chain. Some initiatives include lowering carbon emissions, promoting biodiversity, and decreasing environmental impacts (Ritala and Sainio, 2018). The second practice implies energy efficiency and renewable energy. Companies need to switch to energy-efficient practices and allocate financial resources towards renewable energy alternatives to lower their carbon footprint. The literature casts light on a few activities for this practice such as improving store operations, applying energy-saving technologies, and obtaining renewable energy for various business locations (Bocken et al., 2014). The last practice refers to circular product design and life cycle management. With this, the literature recommends companies create products for circularity by incorporating principles such as durability, reparability, and recyclability as well as integrate strategies for product recovery, recycling, and responsible disposal to decrease waste production (Stahel, 2016).

From a social perspective, the following have been identified as practices for companies to improve their circularity. The first practice focuses on ethical and fair trade (Boons et al., 2013). This means encouraging ethical and fair trade practices by providing safe working conditions, fair wages, and respect for human rights throughout the supply chain. Companies should also collaborate with suppliers that follow social responsibility standards. The second practice refers to stakeholder engagement and collaboration. Companies should involve stakeholders, meaning customers, employees, communities, and non-profit organizations to recognise their considerations and integrate their input into the decision-making process. It is important to promote collaboration to tackle social concerns and give back to community well-being (Chung-Wha et al., 2020). The last practice focuses on diversity and inclusion. With this literature emphasises supporting diversity and inclusion within the company, reinforcing equal opportunities, and embracing a culture of respect. This in turn can contribute be employee participation, customer satisfaction, and whole social impact (Catalyst, 2013).

From an economic perspective, a few best practices have also been identified to promote enhanced circular performance. The first practice concerns circular business models. It is important to investigate and apply circular business models such as product as a service, sharing platforms, or leasing and rental options. Such models can enable new revenue stream opportunities, boost customer loyalty, and increase resource efficiency (Tukker et al., 2015). Another practice emphasizes cost improvement through resource efficiency. By implementing resource-efficient initiatives, decreasing waste, and increasing the use of resources costs can be optimised. This practice implies adhering to lean principles such as improving logistics and adding circular procurement strategies. (Ludeke-Freund, 2020). One last practice refers to product differentiation and branding. By emphasising circularity and sustainability as core brand values the company can differentiate the brand from its competitors. Also, it is important to talk about the economic advantages of circular products and services to clients, focusing on cost savings, prolonging product life, and value for money (Bocken et al., 2016).

3.4.4.1.2. VALUE CREATION

Throughout studies, several practices have been emphasized to improve the value creation of an organization by taking into account the key activities, resources, and partners to enhance circularity performance. Within the key activities, the following have been discovered as best practices to improve circularity performance. The first practice is product design for circularity. Integrating circular design values into the product road map, concentrating on aspects such as durability, reparability, recycling, and modular design. It is also important to focus on the use of sustainable materials and production processes (Bocken et al., 2016). The second practice emphasises remanufacturing and refurbishment. Companies should create remanufacturing or refurbishment processes to prolong the life cycle of products. It is essential to develop capabilities to repair, upgrade, or repurpose products, decreasing the need for new production (Singhal et al., 2020). The third practice focuses on waste management and recycling. Companies should incorporate effective waste management systems, including recycling programs, to

correctly collect and recapture materials from product packaging and end-of-life disposal. It is vital to collaborate with recycling partners to guarantee responsible disposal and recycling (Muthu et al., 2016).

For key resources, several practices to implement for better circularity performance have been uncovered. The first one is about sustainable and local suppliers. Companies should source materials and products from sustainable suppliers that follow circular principles. It is important to emphasize local sourcing as a way to reduce shipping-related emissions and promote the local economy (PWC, 2019). The second practice focuses on reverse logistics infrastructure. Companies need to improve infrastructure and capabilities for efficient take-back logistics, supporting gathering, categorising, and relocating of sent-back products or materials for reuse, refurbishment, or recycling (Govindan et al., 2015). One last practice emphasizes circular technology and innovation. Companies need to invest in study and advancement to recognise and implement new technologies and innovations that back circularity. Such applications include innovative recycling technologies, internet-of-things-driven product tracking, or circular economy software tools.

With regard to key partners, a few best practices to improve circular performance have been recognised. The first practice concentrates on collaboration with suppliers. Companies should cooperate closely with suppliers to promote sustainable practices throughout the supply chain. It is important to engage in mutual initiatives, for example, waste depletion programs or eco-design activities, to advance overall circularity (Masi et al., 2017). The second practice addresses the partnership with recycling and recovery facilities. Organizations should create collaborations with recycling and recovery units to allow for appropriate disposal and recapture of materials. Some options for this include closed-loop systems that permit the recuperation of useful resources from waste (Castro et al., 2022). The last practice is about collaborating with stakeholders and non-profit organizations. It is essential for organizations to engage important stakeholders, including non-governmental organizations, industry associations, and local communities, to receive support, knowledge, and insights into circularity best practices.

3.4.4.1.3. VALUE DELIVERY

For companies to improve circularity throughout their value delivery via customer relationships, channels, and customer segments the following practices have been supported by literature. When considering customer relationships the next best practices should be considered. The first practice concerns education and engagement. Companies should educate and involve customers in circularity, sustainability, and the environmental benefits of conscious consumption. It is important to promote a sense of shared responsibility and enable customers to make educated choices (Kortmann and Piller, 2016). The second practice emphasises customer co-creation. Companies should involve their customers in the co-creation of circular products and services, by asking for opinions on product design or integrating them into sustainable product development initiatives. This practice helps towards promoting a sense of ownership and improves customer relationships (Bocken et al., 2014). One last practice here focuses on transparency and communication. Companies are advised to be transparent about their

circular initiatives, practices, and improvement. It is important to communicate the environmental and social effects of products to gain trust and credibility from customers (Geissdoerfer et al., 2017).

When looking into the precise topic of channels several best practices to increase circularity performance have been identified. The first practice focuses on online platforms for circular offerings. Companies should leverage digital tools to offer consumers access to circular products, services, and details. It is important to develop online marketplaces, sharing platforms, or resale outlets that enable circular transitions (Ludeke-Freund, 2020). The second practice implies a seamless omnichannel experience. Companies should adopt an omni channels strategy to provide seamless customer experience across various interaction points, such as brick-and-mortar stores, web shopping, and mobile tools. This could assist customers to take part in circular practices through their desired channel (Verhoef et al., 2015). The last practice is about collaborative partnerships. Companies should form alliances with external organizations or platforms that focus on circular products or services. It is important to collaborate with sharing economy platforms, sustainability-focused marketplaces, or recycling actions to broaden the accessibility to circular offerings (Friant et al., 2020).

Best practices for customer segments are also essential to take into consideration when tapping into circular performance. The first practice suggests sustainable lifestyle targeting. Companies should recognise and focus on customer groups that associate with sustainable lifestyles and values. It is important to personalise marketing content and offers to attract environmentally conscious buyers who prioritise circularity (Charter and Tischner, 2018). The second practice addresses segment-specific circular offerings. Companies should design circular products, services, and experiences that serve specific customer segments. Such offerings include conscious fashion lines for eco-conscious clients or offer circular house appliance rental services for environmentally-focused households (Stahel, 2016). One last practice pursues collaboration with influencers and communities. Companies should engage with environmental influencers and get involved with online communities dedicated to circular approaches. It is important to take advantage of their reach and endorse circular initiatives and products to a larger audience (Chen et al., 2020).

3.4.4.1.4. VALUE CAPTURE

To advance circularity via the value capture elements, mainly cost structure and revenue streams, companies could adhere to the following best practices. For cost structure, three important best practices have been identified. The first practice considers resource efficiency and waste reduction. Companies should implement measures to improve resource consumption, reduce waste production, and lower operational costs. To seek such targets, it is important to embrace lean practices, implement energy-efficient technologies, and adjust the packaging to minimise material consumption (Ghisellini et al., 2016). The second practice focuses on reverse logistics and circular supply chains. Companies should engage in developing efficient reverse logistics systems to recapture value from take-back programs, decrease waste, and reduce costs connected with disposal. It is important to create circular

supply chains that are preoccupied with product recovery, remanufacturing, and refurbishment to decrease the dependency on new resources (Liao, 2018). The last practice involves collaborative partnerships. Companies should tie collaborations and partnerships with suppliers, manufacturers, and service providers to improve costs and join resources. It is important to analyse joint initiatives for product design, combined logistics, and waste management, which could lead to cost savings and improved circularity (Ludeke-Freund, 2020).

When looking into circularity enhancement and the revenue stream topic, several practices could be sought. The first practice regards circular product sales. Companies should create circular products and services that provide distinctive value propositions to customers, such as products put together for durability, repairability, and modularity. This could appeal to clients who are up for paying a higher price for sustainable and life-extended products (Bocken et al., 2016). Another practice highlights extended product life models. Companies should initiate business models that prolong the product life cycle, for example, product rental, subscription services, or resale programs. Such models could make extra revenue streams by exploiting the value of current products after the first sale (Tukker et al., 2015). The last practice introduces value-added services. Companies should provide value-added services connected to circularity, for example, product repair, maintenance, or upgrade options. Like this, more revenue could be generated while improving customer satisfaction and loyalty (Charter and Tischner, 2018).

Overall, the mentioned above represent best practices for advancing business models toward the circular transition and key points to integrate into the evaluation of the circular performance from a theoretical perspective.

3.4.4.2. Best practices comparison

The comparison between best practices highlighted by literature and best practices compiled from the workshops with consultants emphasizes the importance to balance between theoretical thoroughness and practical relevance. When designing a new assessment instrument to measure circularity performance in organizations taking into account both research and practice is essential for delivering a practical and comprehensive outcome for the following reasons.

The first reason is research rigor and validity (Saidani et al., 2017). Best practices found in the literature are based on thorough research and ample data analysis. Best practices compiled from workshops with consultants may be practical and based on real-world experiences. They may lack the same academic thoroughness but they benefit from the expertise and insights of consultants who actually work with business models and sustainability.

The second reason is scope and diversity of examples (Dragomir and Dumitru, 2022). Literature practices usually cover a variety of industries, therefore present a comprehensive overview of business model practices. Workshop-derived practices might have a narrower scope and focus on specific industries like in the case of this research's collaboration with a consulting company focused on the retail

industry. Therefore, they provide more detailed insights into practical challenges and adaptations relevant to the consultant's specific work.

The third reason is applicability and contextual relevance (Blomsma et al., 2019). Literature best practices might be more general and occur across various organizational contexts. Best practices compiled from workshops could be more industry-specific and personalised for the needs of the consultants. Therefore, they are likely to deliver practical solutions that effectively address the challenges they experience in their work.

The fourth reason is innovation and novelty (Lingreen et al., 2020). Literature practices may include groundbreaking research and novel business models that are leading the progress toward circular economy. The practices from workshops may be more oriented towards the practical application of the currently known circular models or modifications of traditional business models.

Another reason is stakeholder involvement (Ahmed et al., 2022). Practices mentioned in the literature might lack direct engagement with stakeholders during their development. They promote already established methodologies and may not observe the unique perspectives of practitioners. Practices collected from the workshops benefit from the engagement with consultants, enabling direct involvement, co-creation, and capturing real-time feedback from those who work to implement circularity in business models.

The goal of this study was to create a new assessment instrument that is both practical and comprehensive by engaging in action design research to combine research with practice. Out of the 33 best practices for business models derived from the literature more than half were also directly recognised when compiling the best practices themes with the workshop indicators. For the ones that could not be identified directly, the researcher went back and identified them in assessment items. Like this, it was confirmed that the instrument developed via the workshops was still touching base on aspects both relevant for research and practice.

Considering that action design research implies taking into account the implementation context and the perspective of the practitioners the instrument developed with items based on the workshops is valid.

Segment	Subsegment	Best practices literature	Best practices practitioners
Value proposition	Environmental	1. Sustainable sourcing and supply chain (Ritala and Sainio, 2018) 2. Energy efficiency and renewable energy (Bocken et al., 2014) 3. Circular product design and lifecycle management (Stahel, 2016)	1. Waste reduction 2. Sustainable sourcing and supply chain 3. Circular product design 4. Resource efficiency
	Social	1. Ethical and fair trade practices (Boons et al., 2013) 2. Stakeholder engagement and collaboration (Chung-Wha et al., 2020) 3. Diversity and inclusion (Catalyst, 2013)	1. Ethical and fair trade practices 2. Stakeholder engagement and collaboration 3. Promote customer behavior
	Economic	1. Circular business models (Tukker et al., 2015) 2. Cost optimization through resource efficiency (Ludeke-Freund, 2020) 3. Product differentiation and branding	1. True pricing 2. Circular business models 3. Cost optimization through resource efficiency 4. Investment in circular technology and innovation
Value creation	Key activities	1. Product design for circularity (Bocken et al., 2016) 2. Remanufacturing and refurbishment (Singhal et al., 2020) 3. Waste management and recycling (Muthu et al., 2016; add)	1. Product design for circularity 2. Circular procurement 3. Optimised manufacturing for resource efficiency 4. Optimised logistics for circularity 5. Conscious and transparent marketing 6. Prolong product use through circular practices and customer ownership shift 7. Circular disposal
	Key resources	1. Sustainable and local suppliers (PWC, 2019) 2. Reverse logistics infrastructure (Govindan et al., 2015) 3. Circular technology and innovation (Ludeke-Freund, 2020)	1. Multiple-purpose and modular design 2. Access to circular suppliers and materials 3. Lean and agile and end-to-end manufacturing 4. Logistics infrastructure and means 5. Know-how for building a community and convince the customer to become a user 6. Incentives to provide feedback on use 7. Take back schemes 8. Data – KPIs, waste, water, energy, life cycle assessment, material flow, customer behavior, financial, track, and trace,
	Key partners	1. Collaboration with suppliers (Masi et al., 2017) 2. Partnership with recycling and recovery facilities (Castro et al., 2022) 3. Engaging stakeholders and NGOs (Geissdoerfer et al., 2017)	1. Collaboration with the whole value chain (procurement, manufacturing, logistics, sales and marketing, product use, product disposal)
Value delivery	Customer relationships	1. Education and engagement (Kortmann and Piller, 2016) 2. Transparency and communication (Geissdoerfer et al., 2017) 3. Customer co-creation (Bocken et al., 2014)	1. Customer co-creation (design and preferences) and interaction (use) 2. Quick and responsive customer service 3. Customer relationship management system

	Channels	1. Omni channels experience (Verhoef et al., 2015) 2. Online platforms for circular offerings (Ludeke-Freund, 2020) 3. Collaborative partnerships (Friant et al., 2020)	1. In-store circular service offerings (repair and take back) 2. Social media circular offerings visibility
	Customer segments	1. Sustainable lifestyle targeting (Charter and Tischner, 2018) 2. Segment-specific circular offerings (Stahel, 2016) 3. Collaboration with influencers and communities (Chen et al., 2020)	1. Specific customer segments for circularity 2. Extend existing customer segments
Value capture	Cost structure	1. Resource efficiency and waste reduction (Ghisellini et al., 2016) 2. Reverse logistics and circular supply chains (Liao, 2018) 3. Collaborative partnerships (Ludeke-Freund, 2020)	1. The true cost of waste management 2. Sharing costs 3. Opportunity cost analysis 4. Total cost of ownership
	Revenue streams	1. Circular product sale (Bocken et al., 2016) 2. Extended product life models (Tukker et al., 2015) 3. Value-added services (Charter and Tischner, 2018)	1. Circular product sale 2. Extended product life models 3. Value added services 4. Sell waste

Table 5: Best practices for circularity in business models comparison literature versus practitioners

3.4.5. Scale purification

3.4.5.1. Instrument implementation

The goal of the implementation phase was to apply the designed instrument in practice and observe how it performs in a real-world context. The researcher tried to achieve this goal by implementing the designed assessment instrument in the context of the collaborating consulting company. To ensure the instrument is well-received and aligned with the needs of the consulting company the researcher engaged with consultants from the consulting company in a feedback session of the instrument to review the assessment items. The sample was composed of four participants, with different experience levels and varied expertise backgrounds as can be noticed in Table 5.

Participant	Position	Expertise
Participant 1	Vice President Consulting Services	Circular economy and Retail
Participant 2	Senior Consultant	Sustainability, Retail, and Consumer Services, and Supply Chain
Participant 3	Senior Consultant	Sustainability and Energy
Participant 4	Senior Consultant	Sustainability and Digitalization

Table 6: List of feedback session participants

The feedback sessions were employed to assess the usefulness of the 140 statements using both quantitative and qualitative data. For this, the consultants received the instrument exactly in the same format that would be provided to organizations but with different assessment criteria.

First, give a score to each statement based on a 5-point Likert scale. When giving a score in this feedback session, the participants were asked to take into consideration for each statement the following specifications: relevance, clarity, and appropriateness. In this context, relevance refers to how important or meaningful the statement is to the specific assessment segment and subsegment under which it was included. Clarity refers to how clear and easy to understand the statement is for the survey respondents, in this case, sustainability consultants or sustainability representatives of clients. Appropriateness concerns how suitable and relevant the statement is to the target audience of this assessment, in our case the retail industry. By taking into account these specifications in the assigned score, the researcher saw how well the instrument delivers the goal of the study, to develop an assessment instrument that captures the performance of organizations in a practical and comprehensive way.

Second, the participants were asked to leave written comments for the assessment items they gave a score lower than "4=Good" to provide an explanation for their judgment and directly contribute to the process of improving these items. “4=Good” implies that an item is appropriate for the specific indicator it aims to measure, clear in terms of how it delivers the inquiry, and relevant for measuring circularity performance in organizations. The midpoint of the scale is “3=Acceptable” and it implies respondents are neither positive nor negative about the item.

3.4.5.2. Instrument evaluation

3.4.5.2.1. OVERALL PARTICIPANTS FEEDBACK

First, a quantitative analysis of the instrument implementation was performed. The feedback from the four participants was gathered in a spreadsheet format. This file was uploaded to the IBM SPSS Statistics program where data was cleaned. Further data was also recoded from 5-point Likert scale ordinal values into numerical values to be able to perform descriptive statistical analysis. A mean survey score per participant and the whole sample was compiled to get an initial impression of how the new instrument items were evaluated. As displayed in Table 7, all participants rated the items on average above "3=Acceptable", close to "4=Good". Compiling all participants' survey averages resulted in an overall average score for all assessment items above "4=Good". This implies that overall, from the consultants' perspective, the assessment measures well circularity performance in organizations.

Participant	Score Mean
Participant 1	3.69
Participant 2	3.99
Participant 3	4.53
Participant 4	4.40
Participants Mean	4.15

Table 7: Initial survey participants' feedback

3.4.5.2.2. ASSESSMENT ITEMS FEEDBACK

For the qualitative analysis, only the items that compiled a mean score based on all participants lower than “4=Good” were selected. The reason why the researcher chose “4=Good” as a threshold is because the respondent should have a somewhat positive perception of the item to be considered good. About 20% of the items in the assessment instrument ended up meeting the criteria.

The comments received throughout the review of the statements from all four feedback participants were gathered together, analysed, compared, and categorised into four categories of actions required to improve the items and consequently the overall instrument. The categories were rephrased, combine, rearrange, and remove. The comments received were in general aligned among the participants. Most of the comments received were focused on rephrasing the items, while adding more details to the statements, including definitions, to increase the clarity of the statements and in turn the accuracy of the response. Additionally, respondents suggested removing or combining statements, as they perceived them as overlapping. The last category of improvement comments focused on rearranging statements within a specific subtopic to improve the flow. Appendix B showcases an overview of the items that scored below “4=Good”, together with the comments received and the action they were categorised in.

For each of the actions, one example is showcased. For rephrase for example the item "Our company ensures that its operations and supply chain does not harm biodiversity.” received feedback that it is “Too broad.", “I wouldn't use does not harm”, and “Recommendation to rephrase in minimize biodiversity harm.". These comments were analysed, compared, and implemented and the item was rephrased as "Our company strives that our operation and supply chain minimize its biodiversity.”.

The item "Our company ensures collaboration and dependency with both external and internal stakeholders to achieve sustainable and circular business practices." was combined with the item before it after receiving the comments "Possible a bit redundant to the one above (26) but I do like the short

framing of it.", "Not sure, but collaboration and dependency feels a bit contradictory. I think you want to ensure collaboration by minimizing dependencies". It now states "As part of our circular economy approach, we involve various stakeholders to collaboratively define what sustainability means and identify gaps in knowledge to ensure the use of sustainable."

The statement "In order to gain a comprehensive understanding of our product flows and identify opportunities for circularity, we effectively implement track and trace systems to capture data on the entire lifecycle of our products, from sourcing to disposal." received the feedback "It is a smart idea but how are to do use track & trace systems for usage of a customer." and "Order wise it would be helpful if similar topics are grouped together, this one is something that groups well with 98." therefore it was moved into the logistics section of the key resources and capabilities from the data section of the same topic.

The item "Our company ensures that we are not unknowingly promoting fake news about their sustainable practices." received the following comments "Should contradict with the due diligence statement." and "Can be read as we might promote fake news and if we do we will tell you." therefore it was removed. With these adjustments, the survey was narrowed down to 130 items. The entire assessment instrument can be consulted in Appendix A.

4. Discussion

4.1. Psychometric quality of the instrument

The research pursued both scale and item development for designing the new instrument to measure circularity performance for organizations. The steps undertaken, namely scale generation, item generation, item purification, and scale purification ensured the instrument is reliable and valid. This suggests that the research offers a thorough contribution to other studies that could benefit from a set of items such as Antikainen and Valkokari (2016), and Nussholz (2018) or a scale configuration based on the Business Model Canvas to measure circularity in a more practical manner. It could also contribute to studies that compiled best practices for business models by expanding Ritala and Sainio (2018), Bocken et al. (2014), and others' lists with practices endorsed from practitioners' perspectives. However, as this study only pursued one round of iterations for the scale and items it would be beneficial if future studies continue the refinement. Moreover, the analysis of this study did not focus in detail on how the items delivered in specific assessment subsegments such as the environmental, social, and economic assessment subsegments of the value proposition. Further research could focus on studying each of the assessment subsegments and refine the items based on that.

The last step in the validity and reliability process is scale confirmation. This step was not part of the research. This is due to the time limitations and resources obtained for this study. However, this step would be vital to determine further the instrument's psychometric properties and further improve the vigor

of the measurement. Therefore, future research could look into applying this new instrument to a particular case study to see how it captures the organization's performance.

Another important aspect to consider is the thresholds for performance assessment. Further studies could reflect upon what could be considered low and high-performance scores. This would be an important step towards enabling benchmarking and comparison as well as monitoring progress over time.

4.2. Theoretical implications for further developing the instrument

While the Business Model Canvas is a popular tool among business model studies, it has not received considerable attention in the context of circularity. This is due to the belief that the Canvas, in its traditional form, promotes a linear economy. This research contributes to the gap in the literature that addresses the need to experiment with the Business Model Canvas in more circular contexts (Guldmann et al., 2019; Lindgreen et al., 2020) and integrates value chain mapping to organise key activities and partners together and enable the transition toward a closed loop system (Santa-Maria et al., 2022). However, available research has not yet explored whether by integrating the value chain mapping into the Business Model Canvas context activities might overlap with those occurring more in the value delivery or value capture for example. This could be an important aspect to consider for many reasons including optimising the number of assessment items. As previously mentioned the developed assessment instrument contains 130 assessment items that could potentially benefit from being scaled down.

Other theoretical implications for further developing the instrument could direct toward compiling a standardised list of best practices for business models circularity, in a similar way as Kirchherr et al. (2017) elaborated the most comprehensive circular economy definition so that research can align on the topic of performance assessment. Even though most of the practices identified in the literature were mentioned in the general context of business models some were stated in studies with more focus on manufacturing for example remanufacturing and refurbishment in key activities mentioned by Singhal et al. (2020).

In order to develop this new instrument further research should be consulted with regard to the quantitative assessment of circularity to gain knowledge of the variety of insights quantitative data could reveal (Pauliuk, 2018).

5. Conclusion

In conclusion, "How should an assessment instrument be envisioned to evaluate circularity performance within organizations?". First, it should account for both theory and practice. By engaging in action design research, both the literature and consultants contributed toward the design of a new instrument to measure circularity performance in organizations, through problem identification, development of scale and items, implementation in a real-world context, evaluation, and reflection. Second, as recognised in the problem identification, it should propose a practical and comprehensive assessment to facilitate organizations to measure their performance and account for a holistic perspective. Therefore, an instrument based on a quantitative survey format structured by the Business Model Canvas elements is a first step toward designing a new instrument that promotes methodological advancement in measuring circularity performance to advance circular transition in organizations. The assessment should also account for both a scale and items development through the process of generation and purification, ensure the validity and reliability of the instrument overall. Literature and practice should be combined in order to elaborate a relevant instrument and iterations must occur to ensure continuous improvement.

While the study has some limitations, such as the confirmation step in the development process, and the lack of application on a case study, these limitations can guide future research to advance the topic and lead to further improvement. Overall, this study and, implicitly the assessment instrument, represent a commitment to promote and engage in circularity and, in turn, a step towards a more sustainable way to conduct business.

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7. Appendix A: Assessment instrument

Topic	Subtopic	#	Question	Answers				
				Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Value proposition	Environmental	1	Our company approaches waste reduction to promote circularity.	1	2	3	4	5
		2	We incorporate upcycling into our circular economy strategy.	1	2	3	4	5
		3	As part of our circular economy transition, we incorporate regenerative materials and products, which are designed to promote and support the restoration and regeneration of natural systems and resources, into our strategy.	1	2	3	4	5
		4	Our company promotes the use of renewable and reusable of materials as a key component of your circular economy strategy.	1	2	3	4	5
		5	We prioritize and improve resource efficiency within our circular economy strategy.	1	2	3	4	5
		6	Our company strives that our operation and supply chain minimize it's biodiversity harm	1	2	3	4	5
		7	As part of our circular transition, we approach Greenhouse Gas (GHG) reduction in all our business model processes.	1	2	3	4	5
		8	Our company approaches sustainable logistics, such as the use of alternative fuel vehicles, and route optimization to minimize fuel consumption and emissions within our circular economy strategy.	1	2	3	4	5
	Social	9	Our company has strategies in place to ensure the quality and longevity of products for consumers, in order to reduce waste and promote circularity.	1	2	3	4	5
		10	We engage with local communities to promote circular economy principles and encourage more sustainable consumption and production behaviours.	1	2	3	4	5

		11	As part of our circular economy strategies, we incorporate resell and repair options to encourage customer adoption by making it more desirable and a cool trend.	1	2	3	4	5
		12	Our company is taking steps to implement a purpose-driven marketing strategy that focuses on the longevity of products, emphasizing their value and potential to last for a long time, and encouraging customers to invest in quality products that will serve them well over time.	1	2	3	4	5
		13	We take steps to create effective take-back schemes for products at the end of their useful life.	1	2	3	4	5
		14	In the context of circular economy, we approach job creation along the entire value chain.	1	2	3	4	5
		15	We aim to ensure safe working conditions throughout the whole supply chain no matter whether it is about our own facilities such as stores, warehouses, or workers in foreign countries.	1	2	3	4	5
		16	As part of our circular economy transition, we contribute to the social and economic development of the communities where we operate.	1	2	3	4	5
		17	Our company prioritizes serving a greater purpose beyond just financial gain. We measure and communicate the impact of our efforts to all stakeholders, including customers, employees, and investors.	1	2	3	4	5
	Economic	18	We work towards the 'true pricing' of products and services to account for the full lifecycle costs and externalities, such as environmental and social impacts, from sourcing materials to end-of-life disposal.	1	2	3	4	5
		19	As part of our circular economy strategies, we look to identify and develop new revenue streams by incorporating circular economy principles, such as product-service systems, waste-to-resource conversion, and closed-loop supply chains.	1	2	3	4	5
		20	Our company identifies cost savings opportunities through implementing circular economy practices, such as reducing waste, reusing materials, and designing for longevity.	1	2	3	4	5

		21	We approach the development of new materials and processes with a circular economy perspective in mind, ensuring that they are sustainable, recyclable, and have a low environmental impact throughout their entire life cycle.	1	2	3	4	5
		22	Our company balances the trade-off between offering affordable products and producing sustainably.	1	2	3	4	5
		23	As part of our circular economy adaptation, we incorporate the assessment and management of non-financial capitals such as social, natural, human, and manufactured capitals into our decision-making processes.	1	2	3	4	5
Value chain	General/Overall	24	Our company takes steps to assess the cost and flow of the product ecosystem, including the resources, energy, and waste involved in the production, transportation, use, and disposal of products.	1	2	3	4	5
		25	We use specific criteria to determine whether a material is truly sustainable, which as per the European Union standards, should be a material that is resource efficient, non-toxic, low carbon, circular, and socially responsible.	1	2	3	4	5
		26	As part of our circular economy approach, we involve various stakeholders to collaboratively define what sustainability means and identify gaps in knowledge to ensure the use of sustainable materials in our products and supply chain.	1	2	3	4	5
	Procurement	27	We assess the closed loop efforts of our suppliers and ensure that they adhere to circular economy principles, such as reducing waste and using renewable resources.	1	2	3	4	5
		28	Our company is taking action to phase out the use of unsustainable materials in our products and packaging, and transition towards more sustainable alternatives, as part of our commitment to a circular economy.	1	2	3	4	5
		29	As part of our circular economy transition, we assess the environmental, social and economic impact of buying waste from other companies and pursue to include this action into our strategy.	1	2	3	4	5
		30	Our company assesses and prioritizes the use of local resources in our supply chain and operations.	1	2	3	4	5

		31	We ensure supply chain transparency to promote circularity and accountability in the sourcing of materials and production processes.	1	2	3	4	5
		32	When considering procurement, our company reduces its environmental impact without sacrificing financial growth and profitability.	1	2	3	4	5
	Manufacturing	33	As part of our circular approach, we evaluate and select production partners and collaborators to ensure they align with our circular economy goals and values.	1	2	3	4	5
		34	Our company assesses the potential for using less materials that can fulfil multiple needs or end products in order to reduce waste and improve circularity.	1	2	3	4	5
		35	We have strategies in place to address the high refurbish costs associated with extending the life of products.	1	2	3	4	5
		36	As part of our circular economy transition, our company ensures that manufacturing techniques used for our products are sustainable and do not contribute to the depletion of natural resources.	1	2	3	4	5
	Logistics	37	Our company takes steps to ensure that forwarders and distributors involved in our supply chain adhere to our sustainability/circularity policies and practices.	1	2	3	4	5
		38	We ensure that our warehouse operations align with circular economy principles, such as reducing waste, optimizing resource use and recycling.	1	2	3	4	5
		39	As part of our circular strategies, we optimize our last mile delivery operations, such as picking up returns, from a circular economy perspective to generate additional value beyond the primary delivery purpose.	1	2	3	4	5
		40	Our company addresses the environmental impact of long transit, such as the increased carbon footprint of products as they require more fuel for transportation, in its circular economy assessment.	1	2	3	4	5
		41	We allocate the production and distribution of products and services with the least environmental impact throughout its value chain, from sourcing to disposal.	1	2	3	4	5

		42	As part of our circular transition, our company is adapting to the shift from a centralized economy of scale model to a decentralized model based on local hubs, in order to promote circularity and reduce the carbon footprint of our supply chain.	1	2	3	4	5
		43	Our company has already implemented reusable packaging solutions.	1	2	3	4	5
	Sales and marketing	44	We have already implemented circular economy principles in the store channels, such as reducing waste through recycling programs, using sustainable materials in displays and fixtures, and promoting products that align with circular values.	1	2	3	4	5
		45	As part of our circular goals and values, we have taken steps to conduct comprehensive due diligence.	1	2	3	4	5
		46	Our company is shifting its sales and marketing campaigns towards encouraging consumers to adopt more circular behaviour rather that only focus on the sale.	1	2	3	4	5
		47	We ensure that our sustainability claims are not just greenwashing by always making sure we are transparent and honest, by backing up our claims with evidence, using recognised standards, and avoiding vague language.	1	2	3	4	5
		48	Our company ensures that we are not unknowingly promoting fake news about our sustainable practices. For this we verify sources, we fact check information, we remain transparent, avoid sensationism and encourage critical thinking	1	2	3	4	5
		49	Our company effectively showcases total impact, including environmental, social and economic factors, to our stakeholders and consumers.	1	2	3	4	5
	Product use	50	As part of our circular enhancement, we assess and improve the environmental impact of our products during their use phase, as well as encourages and educate customers to use products in a more sustainable way.	1	2	3	4	5
		51	Our company prioritizes the needs and values of the user, rather than solely focusing on the needs and wants of the traditional customer, in the design and production of products and services.	1	2	3	4	5

		52	We have take steps to address repair costs for products, which can discourage customers from repairing and prolonging the life of their items.	1	2	3	4	5
		53	Within the circular economy framework, our company prioritizes customer ownership in a way that we see the customer not just as a passive consumer of products and services but rather as an active participant in the design, development and delivery of the products and services whose input and feedback is valued.	1	2	3	4	5
	End of life disposal	54	Our company involves customers in the end-of-life disposal of our products.	1	2	3	4	5
		55	We optimize our channels to encourage and facilitate the proper disposal of our products at the end of their useful life, with a focus on circular economy principles.	1	2	3	4	5
		56	As part of our circular economy strategies, we ensures the availability of take-back schemes to facilitate end-of-life disposal of products.	1	2	3	4	5
		57	Our company approaches the recovery and repair of products at the within their life cycle, particularly at the end, as a part of your circular economy strategy.	1	2	3	4	5
		58	We incorporate the principle of "designing products with the end in mind" to ensure that end-of-life disposal options are considered during the product development phase.	1	2	3	4	5
Key resources and capabilities	General	59	As part of our circular transition, our company has put in place key performance indicators (KPIs) to measure progress towards a circular economy.	1	2	3	4	5
		60	Our company facilitates collaboration between experts, managers and employees to ensure that circular economy principles are incorporated into decision-making processes and business strategies.	1	2	3	4	5
		61	We adopt strategies to define clear overall goals for our circular economy efforts.	1	2	3	4	5
	Procurement	62	Our company improves its procurement process to ensure access to circular supplies and materials.	1	2	3	4	5
		63	As part of our circular approach, we have in place strategies to procure and source new innovative methods and materials in a sustainable and circular manner.	1	2	3	4	5

		64	Our company ensures that circular products and services are procured under conditions that promote circularity, such as extended producer responsibility and take-back schemes, as part of our overall procurement strategy.	1	2	3	4	5
		65	We improve our circular economy performance by finding suppliers that are located closer to their manufacturing facilities and/or using more sustainable sourcing methods in their procurement phase.	1	2	3	4	5
		66	As part of our circular economy adaptation, our company prioritize the procurement of renewable and materials that enable increased lifespan of our products.	1	2	3	4	5
		67	Our company collaborates and incentivizes suppliers and partners to share relevant information about products and processes in order to enable more sustainable and circular practices throughout the value chain.	1	2	3	4	5
		68	We ensure the protection of our intellectual property and assets while also collaborating and incentivizing suppliers to share relevant information for the purpose of advancing circular economy practices and goals.	1	2	3	4	5
	Manufacturing	69	As part of our circular strategies, we adapted our manufacturing processes to align with the paradigm shift in how things are made, from a linear "take-make-dispose" model to a circular model that prioritizes resource efficiency, waste reduction, and product reuse and recycling.	1	2	3	4	5
		70	Our company has been preoccupied to increase our use of renewable energy to power our factories and production sites.	1	2	3	4	5
		71	We approach manufacturing products with multiple added value streams, considering the circular economy principles. With multiple added value streams we imply creating multiple revenue streams from a single product or material, by extracting and repurposing additional value at each stage of its lifecycle.	1	2	3	4	5
		72	In the context of a circular economy, our company ensures lean and agile manufacturing processes, helping us to achieve greater efficiency, flexibility, and sustainability in our operations.	1	2	3	4	5

		73	Our company ensures a circular mindset throughout the end-to-end manufacturing process, from product design to the end-of-life disposal stage, to minimize waste and maximize resource efficiency.	1	2	3	4	5
		74	We balance the need for automating human-dense processes in manufacturing with the potential negative impacts on job displacement and social sustainability in the circular economy.	1	2	3	4	5
	Logistics	75	Our company is looking into reverse logistics. We offer a variety of return options to support product recovery and sustainable end of life disposal such as recycling.	1	2	3	4	5
		76	We encourage the use of the shortest and most energy-efficient delivery routes, both for customers and internal operations, in order to reduce carbon emissions and improve circularity in logistics.	1	2	3	4	5
		77	Our company optimizes its logistics infrastructure to localize recovery and recycling processes in order to reduce the environmental impact of transportation and improve the efficiency of the circular economy system.	1	2	3	4	5
	Sales and marketing	78	We have processes in place to ensure that our sales and marketing practices align with our circular economy goals, and effectively communicate our commitment to sustainability/circularity to our customers.	1	2	3	4	5
		79	To promote circularity and reduce waste, our company focuses more its sales and marketing approach towards building a community and promoting the longevity of its products, rather than constantly promoting new products.	1	2	3	4	5
		80	Our company approaches sales and marketing strategies that aim to encourage customers to become users of our products, rather than just one-time buyers.	1	2	3	4	5
		81	We communicate the importance of circularity and the benefits it brings to customers, communities, and the environment through our sales and marketing strategies.	1	2	3	4	5
		82	As part of our circular strategies, we enhance the customer experience by integrating circular economy principles into our sales and marketing strategies.	1	2	3	4	5

		83	Our company uses incentives and cost improvements to promote circular economy practices in their sales and marketing strategies.	1	2	3	4	5
	Product use	84	We prioritize understanding our customers' needs and preferences in order to design products and services with increased usability and longevity.	1	2	3	4	5
		85	As part of our circular adaptation, we take measures to create guides and manuals that educate customers on how to best take care of the products they purchase, in order to enhance their longevity and reduce waste from premature disposal.	1	2	3	4	5
		86	Our company encourages customers to continue using their products and prioritize repairs instead of replacement and ensures the longevity and continuous quality improvement of products to promote circularity and minimize waste in the product use phase.	1	2	3	4	5
		87	We incentivize our customers to provide feedback on the usage of our products and services, in order to improve their design and promote circularity.	1	2	3	4	5
	End of life disposal	88	Our company has in place strategies to minimize waste at the end of a product's life.	1	2	3	4	5
		89	We ensure that products are designed with end-of-life disposal in mind to enable efficient recycling and minimise waste.	1	2	3	4	5
		90	As part of our circular economy strategy, we incorporate repurposing of products or materials at their end of life.	1	2	3	4	5
		91	Our company has implemented facilitating systems for the collection and sorting of end-of-life products to ensure they are repurposed or recycled properly.	1	2	3	4	5
	Data	92	We use data collection methods to track waste generation throughout the supply chain, from design, procurement, manufacturing to end-of-life disposal.	1	2	3	4	5
		93	To promote a more circular economy, we collect and analyze energy and water data throughout our supply chain to identify areas where energy usage can be reduced.	1	2	3	4	5
		94	Our company has processes in place to conduct full life cycle assessment with collected data.	1	2	3	4	5

		95	We collect and analyze material flow data to identify opportunities for circularity in your supply chain.	1	2	3	4	5
		96	Our company collects and utilizes data from third-party suppliers to assess the circularity of our products and operations.	1	2	3	4	5
		97	We collect and analyze logistics data to optimize transportation and reduce emissions in the supply chain.	1	2	3	4	5
		98	Our company collects and analyzes financial data that reflects the true costs associated with our products and operations, including the costs of waste and emission.	1	2	3	4	5
		99	To identify opportunities for implementing circular economy practices, we collect and analyze data on consumer behaviour and usage patterns.	1	2	3	4	5
		100	Our company is utilizing new pricing structure algorithms to reflect the true costs of products, including their environmental and social costs.	1	2	3	4	5
		101	We assess the dependency tree for product flow, which consists of visualization of the relationships between different products and their components, as well as the dependencies between different stages of the supply chain and factor in the true costs associated with each step of the process, from raw material extraction to end-of-life disposal.	1	2	3	4	5
		102	In order to gain a comprehensive understanding of our product flows and identify opportunities for circularity, we effectively implement track and trace systems to capture data on the entire lifecycle of our products, from sourcing to disposal.	1	2	3	4	5
		103	We have in place measures for proper data governance to ensure its reliability, consistency and security. We ensure the quality and accuracy of the data collected on the circularity of our products.	1	2	3	4	5
		104	In the context of circular economy initiatives, we ensure that roles and responsibilities are clearly defined and communicated to all employees, stakeholders, and suppliers.	1	2	3	4	5
Value delivery	Customer relationships	105	Our company prioritizes customer engagement in its circular economy initiatives.	1	2	3	4	5

		106	We design game challenges that engage customers in circular economy practices, such as recycling and reducing waste, while also providing incentives and rewards for participation.	1	2	3	4	5
		107	Our company focuses to understand how customers use our products.	1	2	3	4	5
		108	To promote circularity and a sustainable approach to production, our company involves customers in the design process of products and ensure transparency in the manufacturing and sourcing of materials.	1	2	3	4	5
		109	As we are committed to the circular economy, we assess whether our customers prefer easily renewable products or products with longevity, and how can we ensure our product offerings align with their preferences and values.	1	2	3	4	5
	Channels	110	We have in place channels for circular service offerings such as product take back to promote a circular economy.	1	2	3	4	5
		111	Our company has strategies in place to engage with and utilize community platforms in order to promote circular economy principles and increase awareness among customers about sustainable consumption and waste reduction.	1	2	3	4	5
		112	To support circular economy practices, our company ensures quick and responsive customer service, such as product returns and repairs.	1	2	3	4	5
		113	We use social media to engage with customers and promote circular economy practices, such as sustainable product design, end-of-life disposal options, and closed-loop systems.	1	2	3	4	5
		114	Our company engages in workshops and customer relationship management to promote circular economy practices and improve customer understanding and awareness of sustainability/circularity.	1	2	3	4	5
		115	As part of our circular approach, we ensure convenient return channels for customers to return products at the end of their life cycle.	1	2	3	4	5

	Customer segments	116	Our company identifies and targets specific customer segments that are most likely to engage with circular economy principles and practices.	1	2	3	4	5
		117	We use strategies to extend our existing customer segments, such as customization, collaborations and partnerships in the context of promoting circular economy principles and practices.	1	2	3	4	5
		118	Our company identifies whether our customers appreciate sustainability and circularity in our products and services.	1	2	3	4	5
Value capture	Cost structure	119	As part of our circular transition, we have taken steps to incorporate the true cost of waste management into our overall cost structure.	1	2	3	4	5
		120	Our company optimizes its cost structure by implementing material sharing practices, such as reusing or recycling materials, in order to promote circularity.	1	2	3	4	5
		121	We have in place strategies to partner and share costs with other co-creators and actors in the value chain to promote circularity.	1	2	3	4	5
		122	As part of our circular strategies, we evaluate the total cost of ownership of products from a circular economy perspective.	1	2	3	4	5
		123	We conduct opportunity cost analysis to determine the potential benefits and drawbacks of shifting towards a circular economy model.	1	2	3	4	5
		124	Our company's cost structure accounts for all bottom lines, such as environmental and social costs associated with our products and services, not just profit, in the context of a circular economy.	1	2	3	4	5
	Revenue streams	125	Our company explores the revenue potential of various complementary models such as Product-as-a-Service (PaaS) model, or Software-as-a-Service (SaaS) and this approach helps to align the company's revenue streams with circular economy principles.	1	2	3	4	5
		126	We generate revenue by selling waste products and materials.	1	2	3	4	5
		127	Our company measures the revenue generated from long-lasting customer relationships.	1	2	3	4	5

		128	In the context of circular economy, we balance the desire for rapid revenue growth with the need for long-term sustainability and resilience.	1	2	3	4	5
		129	Our company leverages repair services as an opportunity for extra sales, by encouraging customers to make additional purchases while in-store for repairs or service.	1	2	3	4	5
		130	We incorporate social enterprise models, which implies that we seek to achieve social and environmental goals while also generating revenue and profits into our revenue streams.	1	2	3	4	5

8. Appendix B: Assessment items feedback

Item	Participant 1	Participant 2	Participant 3	Participant 4	Action
Our company ensures that its operations and supply chain does not harm biodiversity.	*Too broad. Possible to add something like: "We are continuously working on reducing the negative impact on bio diversity."*	*I wouldn't focus only on biodiversity, maybe include all environmental impacts/effects like air, water, soil, noise and light.*	*Recommendation to rewrite to "Our company strives that our operation and supply chain minimize it's biodiversity harm".*		Rephrase
As part of our circular transition, we approach carbon neutrality in in all our business model processes.	*Good to get the over grasping view of the full business model to work continuously on how to reach the hard but important goal of Carbon neutrality. NOTE that there are discussions on the "carbon neutrality" as a statement and how/if companies actually should state this as it is today very hard to reach. As much of what any company does releases some carbon. And if buying emissions right actually can be seen as OK for a company to be carbon neutral .*	*I would choose for Net Zero instead of carbon neutrality, meaning reducing all greenhouse gas emissions.*	*Recommendation to rewrite to "As part of our circular transition, we approach Greenhouse Gas (GHG) reduction in all our business model processes."*		Rephrase
We ensure fair and safe working conditions not only for workers in foreign countries but also on-site.	*Possible needs to be rephrased, we ensure safe working conditions for our own locations/stores/warehouses as well as for workers in foreign countries. I would say that companies first address the local and internal work conditions and then with code of conducts and/or other measures enforce impact on third-party suppliers.*	*Maybe can be rephrased more general like, fair and safe working conditions in our entire supply chain for the workers and on-site.*			Rephrase
Our company balances the trade-off between offering	*Could be more clear on the question and purpose of the statement.*	*I think I understand what you mean, but using the word 'Cheaper' can feel a bit offending. Maybe the word*			Rephrase

cheaper products and producing sustainably.		*'Affordable' fits better. In the end, you want to have affordable and sustainable products.*			
Our company ensures collaboration and dependency with both external and internal stakeholders to achieve sustainable and circular business practices.	*Possible a but redundant to the one above (26) but i do like the short framing of it. Possible to distinguish these to questions more or set to one?*	*Not sure, but collaboration and dependency feels a bit contradictory. I think you want to ensure collaboration by minimizing/eliminating/managing dependencies with the stakeholders.*			Combine
Our company reduces its environmental impact without sacrificing financial growth and profitability.	*This is a hard one! I do love the question to see if a company answer yes on this. As i do see the transitioning will cost money and therefore initially decreasing the growth and revenue in the short term to enable slower growth but being able to stay relevant for the future.*	*Not sure if it fits the category Procurement, maybe it fits better in the category General/Overall.*		*There should maybe be a time aspect to this statement. Since there is a risk of being dependant on some raw materials already today, and may be even further in the future. The financial growth parameter should be calculated with a longer perspective in relation to sustainability and some reductions of environmental impacts will hence possibly improve financial growth in the future.*	Rearrange

As part of our circular transition, our company is adapting to the shift from a centralized economy of scale model to a decentralized model based on local hubs, in order to promote circularity and reduce the carbon footprint of our supply chain.	*This is one thought of process. Companies can argue that economy of scale is better as shipping on sea fright from China has less CO2 emission per ton compared to road traffic within EU. This is a statement which could be argued.*	*This might be a tricky one, because this might not be applicable for some companies.*			Remove
Our company improves its sales and marketing conversion rate while also ensuring that its products and messaging align with circular economy principles.	*Should be rephrased. I do like the ending of the sentence, but not following the start with Conversion rate. Could be something like… our company balance and/or shifting the marketing campaigns focused on more sales towards nudging consumers to adopt more circular behaviour?*	*Tricky question as more consumption always have a negative impact on the environment. It might have an short term positive impact on the social aspect as it creates more job opportunities. But to which true cost?*			Rephrase
We ensure that its sustainability claims are not just greenwashing.	*I think this question is a given that all companies would say YES. Elaborate on the process companies has to ensure their claims are not greenwashing.*	*Might need a bit of rephrasing.*			Rephrase
Our company ensures that we are not unknowingly promoting fake news about their sustainable practices.	*Should also here take emphasise on the processes to ensure not fake news are released and that the due diligence is done.*	*Can be read as we might promote fake news and if we do we will tell you.*			Remove

Our company prioritizes the needs and values of the user, rather than solely focusing on the needs and wants of the consumer, in the design and production of products and services.	*OK but could be rephrased. As the consumer and user is the same, but in an circular flow I do believe user or customer is better thus say the consumer as it should be focusing on the longevity of a user/partner/customer than a consumer that is more just focus on consumption.. Which we want to move away from.*	*What is the difference between an user or a consumer?*			Rephrase
Within the circular economy framework, our company prioritizes customer ownership.	*Elaborate on customer ownership. I suppose you mean that the longer relationship between the brand/company and the customer and how a product can live longer through adoptions of repairs and care guides?*			*I think a definition is needed of what is meant with costumer ownership in this case.*	Rephrase
As part of our circular strategies, we evaluate and prioritize suppliers/factories that implement circular handling practices for materials such as water, garments, fabrics, etc., and are located close to our retail stores.	*Possible again bit redundant but a great statement.*				Remove

We approach manufacturing products with multiple added value streams, considering the circular economy principles.	*Unclear what you are aiming for here.*	*Maybe rephrase it like "we approach our manufacturing products to maximize our resources efficiency by creating multiple added value streams, considering the circular economy principles".*			Rephrase
We balance the need for automating human-dense processes in manufacturing with the potential negative impacts on job displacement and social sustainability in the circular economy.	*Good on the social aspect, but possible that it is more ESG related than just to circularity.*				Remove
Our company approaches reverse logistics. We offer a variety of delivery options to support a circular economy.	*Change the wording of approach, does not seem like the company is doing anything, but rather just "looking into it".*	*Maybe add some return options as well?*			Rephrase
As part of our circular approach, we optimize our logistics operations to reduce emissions from product recovery and ensure sustainable end-of-life disposal of products.	*Bit redundant to 78 and also the reuse statements previously. But i do think the essence of the statement should be something on how to ensure a emission free or low emission reverse logistics for recycling products.*				Remove
Our company ensures quality improvement and engagement with customers to encourage longer use of products and services.	*I understand this as if i have a phone and want to change the memory size i can do this without buying a new one. Focus on the modular?*	*Maybe you can combine it with 88 and/or 89?*			Combine
Our company is implementing convenient systems for the collection and sorting of end-of-life products to ensure they are repurposed or recycled properly.	*Should it not be has or have, and also there could be many interpretations on convenient.*	*Might fit better at logistics?*			Rearrange
We assess the dependency tree for product flow and factor in the true costs	*Not heard about the dependency tree, but I do see it as being a good methodology.*	*Not familiar with dependency tree for product flow. If you want to use it be sure that it is explained somewhere.*			Remove

associated with each step of the process, from raw material extraction to end-of-life disposal.					
In order to gain a comprehensive understanding of our product flows and identify opportunities for circularity, we effectively implement track and trace systems to capture data on the entire lifecycle of our products, from sourcing to disposal.	*It is a smart idea but how are to do use track & trace systems for usage of a customer. This usage data usually comes from Questioner and people who are willing to share. Would not say many customers would like to be tracked and traced by a company. BUT for technology as cars, e-bikes etc this could be more relevant.*	*Order wise it would be helpful if similar topics are grouped together, this one is something that groups well with 98.*			Rearrange
We ensure the quality and accuracy of the data collected on the circularity of our products. We have in place measures for proper data governance to ensure its reliability and consistency.	*Like the data governance, but would shift the place of the two parts of this statement. Start with data governance processes and end on circularity.*	*Secure data is also important.*			Rephrase
Our company's circular economy assessment and practices compare to globally recognized frameworks such as the Ellen MacArthur Foundation's Circular Economy 100 or the United Nations Global Compact's Sustainable Development Goals.	*Not sure if it is the greatest of idea to bring up Ellen MacArthur here as they also are doing an assessment. SO if a company is doing the Ellen MacArthur assessment why do they do CGI's assessment? But good on checking in on if they are comparing them self with already set benchmarks to see their maturity.*	*Sentence doesn't read well, please revise.*			Remove