

A Design Thinking Framework for Circular Business Model Innovation among South African SMEs

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Abstract

There could be immense advantages in the use of circular business model innovation (CBMI) among Small and Medium Enterprises (SMEs); however, the implementation of business transiting to circular business models (CBM) is still ambiguous to potential playmakers. The process of transitioning these SMEs to CBMI still has gaps to be filled and tools for its support are largely missing. This study is purposed to fill the transition gap by proposing a framework for CBMI based on a design thinking perception, which can support the CBMI process. Multiple case studies are used in the derivation of the CBMI framework. Four South African case firms are selected to create circular business models in partnership with the researchers. A prospective study (three to six months) was designed in which the CBMI processes are monitored from their onset in the circular economy and circular business models in the firms. Essentially, three innovation environments constitute the design thinking protocol, the exploratory, ideation, and archotyping & testing environment. However, from the findings of this study, two more environments are revealed, that is, the introductory (preliminary) and alignment (configuration) environments, for CBMI. The four case firm results indicate that the proposed framework together with its tools and mechanisms are essential for CBMI.

Keywords

Design thinking, Small and Medium Enterprises, Circular Business Models.

Introduction

The rate of replenishment for the used limited resources is way under the rate at which they are used by human activities. This results in the wearing out of the ecological structures that human and animal communities thrive on (Guldmann et al., 2019). There is an observable reuse of scarce resources in a circular economy; in that, regenerated products and materials at the bottom of the life cycle are further used. This practice ensures that optimal value for products is obtained. However, the advantages of such a green economy and the prospects to produce low carbon outputs, refabricate worn out products, and make value of them, are not being optimally enhanced at the global level (Mativenga et al., 2017). Again, the concept of circular economy has been perceived as a manufacturing economy that largely depends on the reuse of worn out natural resources, focusing on minimizing waste, and employing renewable energy sources while getting rid of potentially harmful materials (Rizos et al., 2015). Manufacturing firms have endeavored to incorporate cleaner production, efficiency enhancement, eco-design, life cycle administration, and corporate social responsibility all aimed at improving production and sustainable development (Sihvonon & Partanen, 2017; Pollard et al., 2021). However, a number of scholars and researchers have noted that there are inadequate incremental product, process, and technological innovations to enable organizational transformation in the direction of sustained development (Renning, 2000). The mechanisms presently employed could assist in lowering the environmental damage, however, cannot bring about a broader form of value enhancement. The measures currently employed may lead to a reduction in environmental harm, though cannot guarantee a wider perspective of value creation, let alone, to the next stage of maintainable entrepreneurship in which the organization could have a significantly positive effect in the community.

Globally, several organizations have embraced CBMs and these serve as case examples (Guldmann et al., 2019; Blundo et al., 2019). However, the cases don't provide an in-depth perspective on how organizations commence on the journey toward a circular business. It is, therefore, important that a well-grounded procedure on how firms carry out the innovation process through to enhance change be presented. The procedure could include information on how to develop a relevant CBM for the firm (Lüdeke-Freund, 2020) also document on how to go about the associated changes in the firm (Linder & Willander, 2017) as well as the value chain (Hultberg & Pal, 2021). In the South African perception, a genuine commercial opportunity exists for entrepreneurs thanks to the circular economy. Nearly 90% of South Africa's garbage is disposed of in landfills, but recycling, repairing, redesigning, or remanufacturing it might provide millions of Rands in additional revenue for the country's economy. This calls for the establishment of a road map that will help South African businesses transition to CBMs.

Hobday et al. (2012) document that essential mischief exists throughout which is the design problem. A lot of hard work and patience are required to overcome mischievous challenges and resilience problems that could even end up not being solved. It could result that the proposed remedies are either better or otherwise as opposed to appropriate ones taking a substantial period of time to assess the solutions that could perhaps overcome the challenge (Guldmann et al., 2019). Design thinking (DT) is a design philosophy that brings about a relevant method to design challenges of this complex nature (Figueiredo, 2021). The endeavor is to explore DT's potential in crafting likely solutions to wicked challenges through nurturing learning and managing uncertainty (Jamal et al., 2021) that appear plausible from a CBMI perspective.

Nevertheless, the application of the DT phenomenon to scoop up the opportunity of leveraging CBMI has not been extensively studied. In this respect, this study is aimed at addressing that gap in the current studies by assessing whether DT is an important method to CBMI. This is performed by addressing the research questions; what is the appearance of a DT model accustomed to CBMI? The approach to responding to this research question is through the employment of a multiple case study.

The rest of this article is presented as follows. Section 2 designates key theoretical concepts for this research and Section 3, the research methods. Section 4 presents results from the study, and the article is summarized by conclusions, implications of the study, and suggestions for further research in Section 5.

Theoretical Background

1. Circular Economy

For a circular economy, resources are recycled repeatedly for a long time ensuring optimum mining of value at the same time obtaining and renewing important products and materials at the final stage of each cycle. However, prospects of such a green economy and the ability to design lesser carbon materials, utilization of superannuated products and recuperate useful materials, are utilized at an insignificant level worldwide. [Mativenga et al. \(2017\)](#) documented that, in 2015, the European Union (EU) had an output of over 300,000 tonnes of composite waste of which an approximately 250,000 was as not worthy to be reused (end-of-life, EOL) waste. It is stated that about 98 percent of combined waste is predisposed to landfills indicating that the industry encounters a real waste problem given the volumes involved ([Davis & Song, 2006](#)).

Presently in Africa, the economic structure is inclined on extracting raw materials for products that are eventually rendered as waste ([Manjengwa, 2019](#)). There is likely to be a critical problem to such a linear production system as raw materials get depleted. Thus, a call for alternative measures for which circular economy (CE) has been proposed to this production archetype ([Mendoza et al., 2019](#)). The idea of CE stems from already available phenomena, like the philosophies of recycle, reuse and reduce ([Korhonen et al., 2018](#)); however, enunciates cognitive unit relative to the rest of the archetypes given its more transparent intonation of resources life-extension as a way of developing value and to lower value demolition ([Böhmecke-Schwafert et al., 2022](#)).

Circular economy, as well entails an aspect of biological nutrition and its distinction from technical nutrients is also explained by CE ([Guldmann et al., 2019](#)) also carefully illustrated in [Figure 1](#) with the left-hand and right-hand sides representing biological and technical environments respectively.

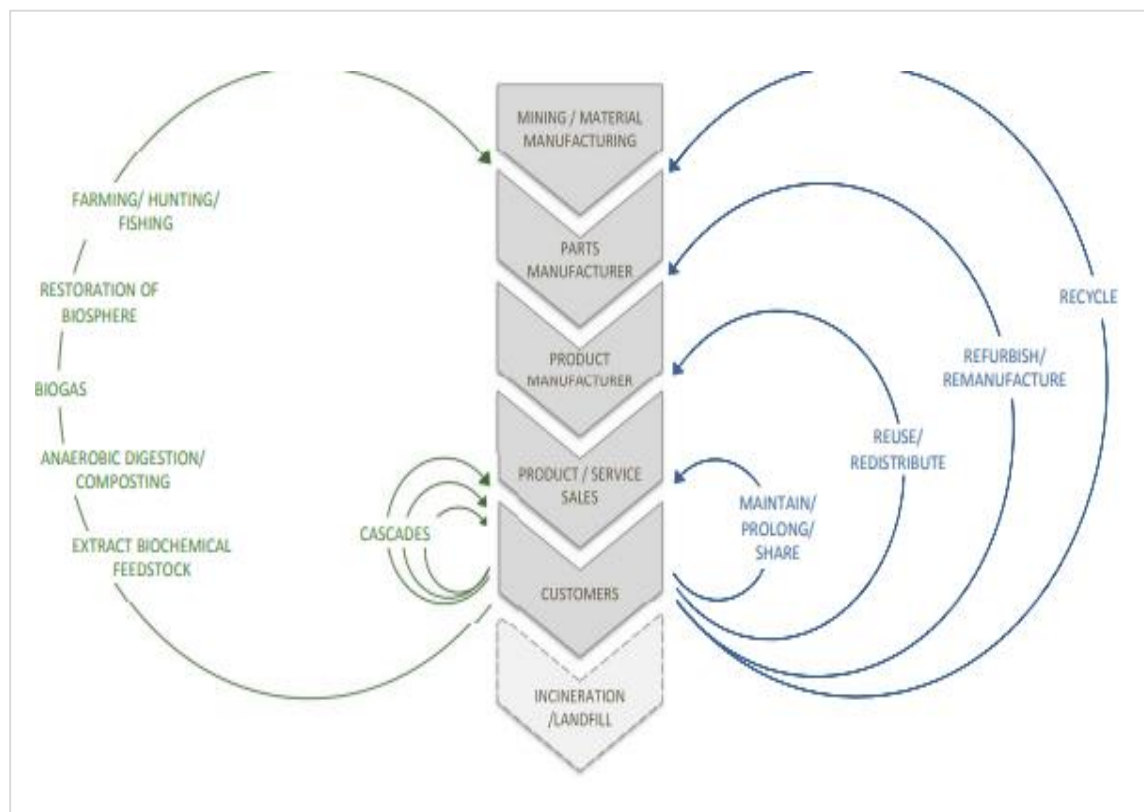


Figure 1: System diagram showing biological (green) and technical (blue) resource loops in a Circular Economy. Adapted from Ellen MacArthur Foundation ([MacArthur et al., 2015](#)).

2. Circular Economy Business Models

Definitions

The concept of circular economy can be understood based on the already present and well-observed perceptions, namely, cleaner production, ecological efficiency, etc., termed as cradle to cradle (Ünal & Shao, 2019; Kristensen & Mosgaard, 2020) or regenerative design. It is stated that owing to the reason mentioned, it is hard to put up with a unified and globally accepted definition of the circular economy. Some practitioners such as Ertz et al. (2019) and Brendzel-Skowera (2021) contended that the concept of CE is superficial and anarchic, more of an assortment of ideas from a number of areas. The eventuality of this is to develop a number of circular business models.

As earlier mentioned, CE needs compliance with the 3R principles (i.e. reduce, reuse and recycle) all as a result of human activity (Milios, 2018). A great number of business units ought to change from a linear model aspect of production to a circular-based model aligned with the mentioned 3R principles. In the most possible instances, reuse and remanufacture are preferred to recycling for reasons purely economic and its part of value addition in the original production process (Linder & Williander, 2017; Lahti et al., 2018). In the practical aspect, Circular economy business models (CBM) are entrepreneurial models that apply the principles of CE (Hultberg & Pal, 2021).

Guldmann et al. (2019) and Hultberg and Pal (2021) described a CBM as a form of ecological business model. Many definitions of what constitutes a CBM have been suggested, however, no worldwide and agreed-upon definition has been zeroed yet (Beulque & Aggeri, 2015). Researchers, such as Boldrini and Antheaume (2019), have advised that CBMs should incorporate both environmental and economic aspects to ensure value creation. This could be achieved by generating business profits on an ongoing basis of reused material and products or a longer period of time. In this respect, it is thus seen that CBMs are focused on maintaining the value of the produce at the highest standards possible (Saidani, 2018).

Business Model Innovation

Contemporary organizations have had to ensure business model innovation (BMI) in order not to be left out and, as well, to cope with the current market competitiveness and respond to the ever-changing entrepreneur space. Business model innovation is understood as a type of organizational innovation (Hamani & Simon, 2020) associated with the enhancement of new patterns of the business model in an overstayed organization or regeneration of a whole new business model for the new or within a novel business area of an overstayed organization (Maucuer et al., 2020). This is arguably regarded as a substantial area of business innovation (Bernard & Barbosa, 2016), as well as a conduit to business transformation directed towards sustainable improvement (Ayerbe et al., 2020).

There are primarily four research strands that are embroiled within the BMI theory (Hamani & Simon, 2020): Conceptualisation and classification of business model innovation; definition of novel business models which are a result of the innovation development; assessment of the repercussions of BMI on company performance; and examination of BMI as an organization process (Guldmann et al., 2019). Nevertheless, this research focuses on CBMI as an ever-changing organisational process. In line with the entire process trend, as changes to the primary elements of the company are made, BMI will ever encompass dynamism to the fundamental entrepreneurial logic (Gallouj & Weinstein, 1997) which is undoubtedly the scenario in CBMI as the classical linear business, for which profits are derived from a once off sale of company products. This is to be replaced with a circular value creation logic; in this perspective, profits are derived from an ongoing flow of reused materials and products for a long time (Jonker, 2014).

Contextual factors are also a key concern, since CBMI, as any innovation, takes place within a given society, Guldmann et al. (2019) clearly discuss the Contextual factors that are a key concern. These are important since CBMI occurs as an innovation within a specified social and individual environment that is meant to shape the process.

Design Thinking

This concept of design thinking (DT) is at times seen as a miracle recipe in the era of innovation, suited for a number of areas, right from entrepreneurship to education, through the public (Beudon, 2017). For an insightful perspective, one ought to go beyond the mindset of regarding design thinking as being focused on the manufacture of deluxe and futile products (Beudon, 2017).

The ambiguity that is cofounded in CBMI (Hofmann, 2019) as well as the empirical learning that is largely emphasized in literature provides an excellent relation to DT. Design thinking is regarded as an effective concept for encountering uncertainty and in reverse to classical methodologies, DT enthusiastically does away with presenting definitive choices for a great time possible in order to optimize learning as an outright uncertainty reduction method (Liedtka, 2018).

The concept of DT can be defined as *the application of design methods by multidisciplinary teams to a broad range of innovation challenges* DT can be defined as *the application of design methods by multidisciplinary teams to a broad range of innovation challenges* (Guldmann et al., 2019). It is further stated that this strategy to innovation has been largely embraced attention by academics and practitioners lately (Guldmann et al., 2019). In this study, the focus on DT takes the direction of innovation management structure, which is employed to shape the approach of designing new CBMs. An important description of DT which is applicable to the context herein is *a discipline that uses the designer's sensibility and methods to match people's needs with what is technologically feasible and what a viable business strategy can convert into customer value and market opportunity* (Brown, 2008; Matthews & Wrigley, 2017). Precisely, DT is capable of assimilating both customer and feasible entrepreneurship model requirements.

Research Problem

The need to embrace sustainable development calls for appropriate and broader acceptance of CBMs (Van Wassenhove, 2019). Nevertheless, recent studies by Murray et al. (2017), Jabbour et al. (2019), and Fehrer and Wieland (2021) indicate that there are no clear processes that can be adopted by organizations to enable a seamless transition to readily available sustainable business models in use. Are the required approaches an organization should follow in the process available?

Patwa et al. (2021) documents that a number of challenges entail CBMIs at various levels, that is, at the employee, organizational, value chain, and institutional levels. Lim et al. (2022) points out that the challenges have a direct link to lock-ins in connection to value creation logic and structures which eventuates into firm stagnation. Thus, there is a call for tools to enhance organisations in designing sustainable business models (Marrucci et al., 2022), that ought to be circular in nature.

Magistretti et al. (2022) states that DT looks to be a capable method for addressing the challenges which are present and notable researchers have examined DT in line with sustainable BMI, in which they have put emphasis on formats to develop sustainable value proposals in given environments.

It is worth noting that, much as some features of DT with particular tools have been assessed in line with sections of the CBMI process, embracing a DT framework and selection of tools for the CBMI structure in its totality have not been extensively examined. On the foundation of a case study entailing multiple cases, the current research proposes a framework and tools that relate to DT philosophies that are capable of enhancing wholly, the CBMI process. This could be a bridge greatly sought in the present studies.

Methods

In this research, an exploratory study of 4 companies was preferred (Chiarini et al., 2020; Pereira et al., 2022). Alahyari et al. (2019) and Gauthier et al. (2021) suggest that a case study method be employed if the topic under study is multifaceted and requires contextual learning. In this way, the researcher is permitted to grasp multifaceted conditions and describe actors in an easy way (Makris et al., 2019; Jumah et al., 2022).

Employing a multiple-case study helps in the identification of similar patterns and features that exist within the cases (Jumah et al., 2022) and is undoubtedly important in enhancing methodical generalization over the given research phenomena (Lerman & Sadin, 2022).

Action research (Mertler, 2017; Oberschmidt et al., 2022) was embraced in this study Figure 2. In this kind of research, the research process is oriented on the cycles of planning, acting and observing, and reflecting (Guldmann et al., 2019; Oberschmidt et al., 2022), indicating that, on the basis of preliminary planning and organization of the entire research process, all research components will not be availed at the onset. However, sharing and reflecting within the research team (Mertler, 2017) and other stakeholders on the generated data form interventions that will direct the next course of action for the process, Figure 3.

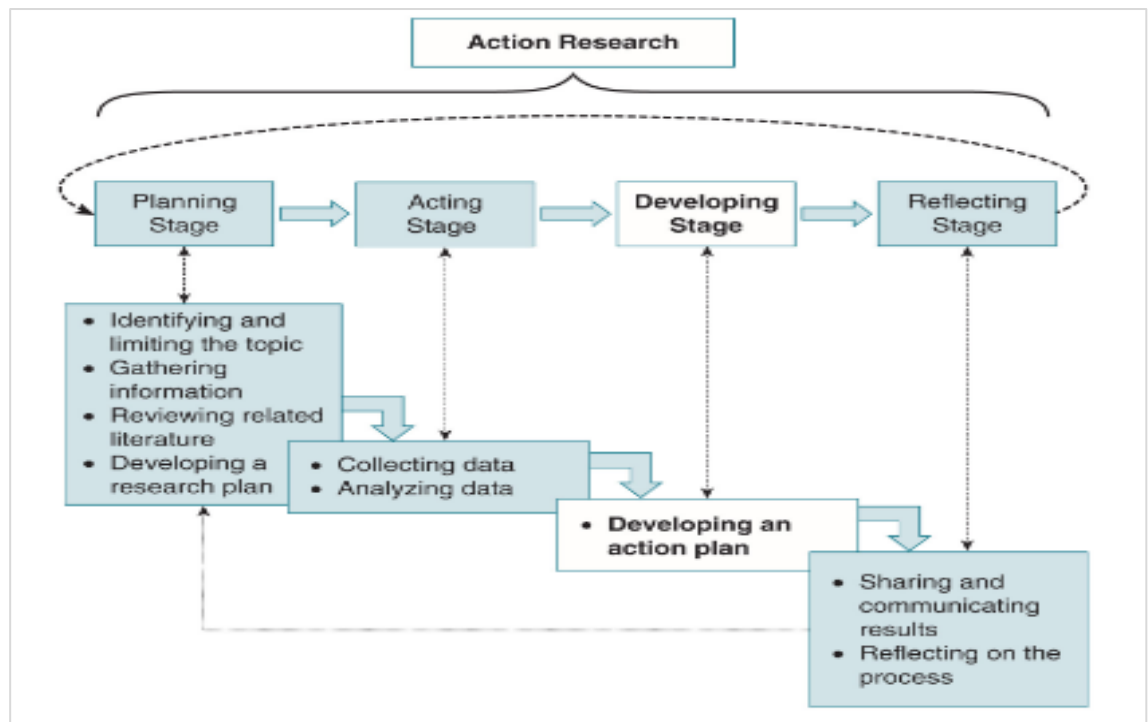


Figure 2: Sharing and reflecting on the action research. Adapted from Mertler (2017).

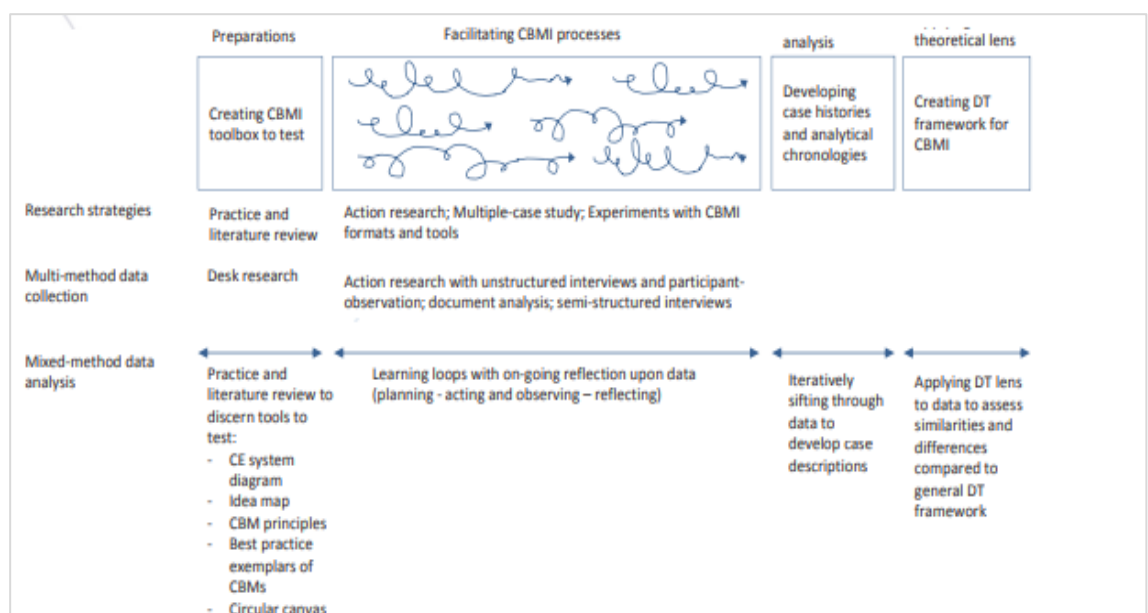


Figure 3: An outlay of the research process based on the Action research. Adapted from Guldmann et al. (2019).

In the event that there is a need to fast-track research to ensure reasonable advances, action research is required (Bermingham, 2011), as it permits experimentation with a number of interventions that bring about dynamism in contrast to detached observation, and it performs well when integrated with case studies (Qian et al., 2021). The involvement of the research activities in line with the problem environment and selected data points (Table 1) resulted in the acquisition of rich information concerning the study phenomenon. To ensure high quality data, triangulation between the multiple data sources, for example respondent-observation and unstructured interviews, research team involvement as well as reviews of gathered data by practitioners is conducted. All these approaches were embraced in the current study in order to minimize bias and ensure quality results.

Table 1: Case enterprise overview. Small enterprise have between 5-9 employees and small enterprise 10-49 (Bhorat et al., 2018).

Case Enterprise	Scale of Enterprise (Size)	Industry	Customer Segment	Project Anchoring	Collaboration Period	Arrangement of CBMI Process
C1	Small	Food stuff	Business	Owner-manager in charge of sustainability	2 years	Meetings with the owner-manager and employee, with potential new value chain partners and with experts on food processing.
C2	Small	Metal working	Business	Project director, in charge of sustainability	4 years Working meetings with the project manager	Meetings with the director and employees, with potential new value chain partners and experts on metal recycling.
C3	Medium	Information Technology	Business and consumer	Project manager, sustainability department	2 years	Meetings with the technical advisor as well as cross-company meetings and with diverse internal stakeholders. Interviews with key customers
C4	Medium	Pharmaceutical and healthcare	Business	Project manager, sustainability department	6 months	Meetings with directors. Collaboration with academic institutions to design new product concepts.

Research Preparation

1. Selection of Research Cases

When studying business models using exploratory research approaches, business units do not necessarily have to be compared (Rayna & Striukova, 2021), given that, business model studies are not limited to comparable companies. In this research, the four presented firms were developed and engaged in selling physical products, however, they were of different magnitudes, belonged to two different industries, and were primarily serving business customers and consumers. The study of the enterprise similarities and differences was enabled by their various characteristics. This presents an advantage that *similarities observed across a diverse sample offer firmer grounding for propositions than constant elements observed in a homogenous sample* (O'Connor et al., 2003).

2. CBMI Toolbox

In line with a case study structure (Guldmann et al., 2019), it was a requirement to design appropriate basic tools that served as interventions for experimentation within the firms under study.

Tools were designed with the aim of enhancing all the different stages of the innovation process, at the same time to align them with instruments that were adequately general to operate in all the firms that took part in the study, and on one side, informative enough to drive the principles and capabilities of the CE and CBMs in a rather sufficient manner, they were capable of enhancing the development of ideas and enabling precise deliberations. Experimentation was done with the aid of the designed tools all over the four CBMI processes to assess their practicality.

3. CBM Strategies Adopted

Reduction in the speed of the resource loops through the introduction of maintenance, repair, and remanufacturing activities as encouraged in the CBMI process. The essence of doing this was based on the idea that the developed CBM was anticipated to give fundamentally novel and environmentally friendly remedies and would have a multifaceted innovation approach.

Data Collection

In the first stage, data obtained from the firms focused on parameters such as the scale of business, industry, customer segment, age, etc., and information related to the firm’s sustainability activities. These parameters did give the study the historical background of the companies that partook in the research. The primary sampling unit (PSU) was the company involved in the study. Furthermore, the unit of analysis was the CBMI process.

In this study, the preferred sources of data were respondent-observation and unstructured interviews (Kang & Hwang, 2021), since the study adopted action research. In addition to this, semi-structured interviews and document assessment (Table 2), were used to supplement the data earlier collected using methods previously stated.

Table 2: Data collection in the case enterprises.

Enterprise	Participant-Observation and Unstructured Interviews Sessions	Telephonic-Meetings for Unstructured interview sessions	Semi-structured interviews	Examples of documents
C1	4	2	Outlet manager in Johannesburg	- Company website - Marketing material
C2	4	3	Director in Bloemfontein	- Marketing material
C3	3	3	Sales agent in Johannesburg	- Sustainability reports - Company website
C4	5	2	Outlet manager in Johannesburg	- Sustainability reports - Annual reports - Company website

The introduction of CE and CBMs was done in all four case enterprises at their request. These enterprises had earlier agreed that they would embrace CE and CBMs within the two 18-month research periods.

Data Analysis Including Cross-Case Analysis

In the analysis process, inductive data analysis was embraced. It commenced in parallel with the outcomes of the CBMIs processes. During the process, research notes in the field were applied in order to reveal the emerging patterns from the experimental data and this was to help point out the next course of the CBMI process in the enterprise. To be more specific, close readings of the text and examination of the many meanings it contains, came first in the inductive coding process. Second, text segments with meaningful units were found, and labels for new categories to which the text segments were assigned were then created.

Through the study period, case company history was designed through a number of restatements in order to come up with the logical steps (analytical chronologies) of the respective company, that to say, case description with the focus on *getting on top of the data to clarify sequences across levels of analysis, suggest causal linkages between levels of analysis, and establish early analytical themes* (Evans et al., 2017). An expert who had vast experience working in some of the sampled companies was consulted to review the case histories and the analytical chronologies. Also, a neutral person who was not part of the entire research was consulted to give her insights and perhaps point out some inconsistencies and likely biases due to the researcher thereby bringing on board researcher triangulation (Farquhar et al., 2020).

Guldmann and Huulgaard (2020) suggested that at this level of data analysis embracing appropriate literature, and the characteristic features of CBMI processes that resulted in the assessment of the DT appropriate literature and develop the research question that is addressed in the current study. Assessment of the research question involved a comparison of multiple-case studies with a perspective of the DT framework (Evans et al., 2017; Table 1), regarded as pattern matching. Using a systematic procedure and assessing each CBMI independently, pattern matching involved four levels which were;

1. Spaces of the overall DT framework that the CBMI procedure traversed in line with the goal and approach of the respective DT space.
2. Did any reasonable CBMI activities present in the case enterprise?
3. The type of tools employed in the business unit of the company.
4. Any noticeable differences or similarities among the procedures in line with spaces covered, applied tools, robustness in progress, and output?

Results

CBMI tools in the innovation process are presented. Demonstration of the point at which the innovation development united with the innovation spaces of the overall DT framework and sections that required more spaces to get the characteristic features of the entire processes.

Innovation Approach

Firstly, it was to clarify the enterprise context as the knowledge of past experience with CBM practices was being investigated by the research team; sustainability practices in the enterprise, potential links among the phenomenon of CE, strategic tactics, and human resources available to the CBMI scheme. The application of unstructured interviews with the business unit employees did supplement the document analysis of the annual reports, sustainability reports, and company websites.

Considering enterprise C1, the innovation procedure was all about the assessment of a number of ways to close the loop when a new recipe on chicken wings is finally accepted by about 80 % of their daily clients. The study put emphasis on already appreciated and proposed recipes as a result of the enterprise's constant innovations. At enterprise C2, several product concepts were being designed that encompassed sustainability considerations to narrow loops into the output designs. Enterprise C3 had proposed a number of CBM philosophies, including repair, remolding and sales of already used apparel, to dwindle loops, apparel recycling, and close resource loops. The collaboration here is still ongoing, and likely to develop into a number of resourceful ventures for the stakeholders. Enterprise C4 proposed and designed different CBM concepts and since it deals in human drugs, pretesting of some of the products had already been done given that several protocols are needed in this venture. However, the packaging of their products was the main thing in this study. They had several ideas on this and tested the opinions of external appropriate stakeholders and customers. The philosophies here were aimed at dwindling the resource loops through recycling and reuse.

Findings on Various Tools Usage

During the CBMI procedure in the sample enterprises, tools from the primed CBMI toolbox were employed in conjunction with overall innovation tools. Constituents of the toolbox were;

1. CE system illustration: This is as demonstrated in [Figure 1](#). This portrays the important principles of a CE, illustrating both the biological and technical resource loops.
2. dea map: Classification and visual inspection of the CBM ideas in regard to the resource loops of the structure.
3. Circular Business Model principles, ([Evans et al., 2017](#)).
4. Recommendable practice archetypes of CBMs ([Guldmann, 2016](#)).

[Table 3](#) illustrates the CE system, CBMI toolbox showed flexibility in application as indicated in [Table 3](#); as well the CE scheme, idea map, fine exemplars and CBM principles were well applied in the sampled case enterprises.

Table 3: Application of CBMI's specific tools in the case enterprises. An "x" signifies that the respective tool in the subject was applied by the corresponding enterprise and (-) implies that the tool was not used.

Case Enterprise	CE System Structure	Idea Map	CBM Principle	Fine Practice Exemplars	Business Model Elements
C1	X	X	-	X	X
C2	X	X	-	X	X
C3	X	-	X	X	X
C4	X	X	X	X	X

Other general approaches namely; brainstorming, interviewing customers, and surveys were used in addition to the already mentioned techniques. Also, competitor analysis, trend analysis and assessment of the best available technologies were employed. Such kinds of approaches to enhance a given innovation process, are an integral part of the overall DT framework, [Table 1](#). The approaches were discovered to be applicable in the CBMI context.

Findings on Space Innovation Procedures

1. Investigative
2. Ideation
3. Archetype
4. and Testing spaces.

Analysis of data on the innovation concept for the respective case enterprises showed that, even though each of the procedures was different from the other, the previous innovation spaces; the investigatory, the ideation, and the archetype and testing spaces were readily seen in all the CBMI procedures.

The investigative space eventually turned into a stage where an in-depth understanding of the enterprise environment together with the CBM opportunities were created via the interaction process with internal and external stakeholders. The ideation space was not limited to where 100 ideas and phenomena for CBMs were generated all over the enterprise, but a place of greater and high level thinking and remedies to enterprise challenges. For the archotyping and testing space, four of the fine ideas were assessed and enhanced further. The data exploration also pointed out that the DT framework never entirely captured the way the CBMI procedures unfolded. The spaces explored in each enterprise were introductory, ideation, archetype, and alignment spaces ([Evans et al., 2017](#)).

On an All-Inclusive Framework

The overall and the CBMI specific tools which were involved in the research have been set in line with the spaces in which they were employed in one or more of the enterprises in which they applied [Table 4](#).

Table 4 illustrates innovation spaces derived from the analyzed data. Administrative principles and the spaces are also clearly demonstrated in Table 4. The framework impression demonstrated in Table 4 is visually an attractive tool for CBMI in SMEs (Figure 4).

Table 4: Design thinking framework for CBMI in SMEs.

		Design thinking phase			
Administrative principle		Basic points			
		<ul style="list-style-type: none"> - Collaboration across functions, perspectives and experience bases inside and outside the enterprise - Iterative cycles of moving through innovation spaces Emphasize learning 			
Innovation spaces	Introductory space	investigative space	Alignment space	Ideation space	Archetype and testing space
Aim of spaces	Determine the company setting including the basis for CBMI. Present CE and CBM principles. Inspire action	Explore CBM opportunities in the specific company setting	Investigate alignment between CBMI and extant strategies and aspirations	Generate multiple CBM ideas. Seek higher-order thinking and systemic solutions	Examine CBM ideas and develop the best ideas further
Tools and techniques for individual spaces	Communication tools: <ul style="list-style-type: none"> - Enterprise demonstration - Demonstration of CE and CBMs by employing system diagram, CBM principles and fine practice exemplars 	Communication tools: <ul style="list-style-type: none"> - Demonstration of CE and CBMs employing system diagram, CBM principles and fine practice exemplars 	Communication tools: <ul style="list-style-type: none"> - Enterprise demonstration with strategic agenda and aspirations 	Sense-making and ideation tools: <ul style="list-style-type: none"> - CBM best practice exemplars - Brainstorming - Cluster analysis - Concept development approaches 	Prototyping and testing approaches: <ul style="list-style-type: none"> - To-be mapping e.g. using an idea map or circular canvas - Prototyping techniques such as scenario building

Table 5: Key to the proposed model in Figure 4.

Indicator	Description	Indicator	Description
1	INTRODUCTORY SPACE	F1	Communication tools: <ul style="list-style-type: none"> - Enterprise performance - Exhibition of CE and CBMs by the use of system diagram, CBM principles.
2	EXPLORATORY SPACE	F2	Communication tools: <ul style="list-style-type: none"> - Exhibition of CE and CBMs by the application of system diagram.
3	POSITION SPACE	F3	Communication tools: <ul style="list-style-type: none"> - Enterprise exhibition plus involving tactical agenda
4	IDEATION SPACE	F4	Ideation tools: <ul style="list-style-type: none"> - CBM finer practice exemplars - Brainstorming
5	ARCHETYPING and TESTING	F5	Archotyping and testing methods: <ul style="list-style-type: none"> - To-be mapping i.e., by use of idea map - Prototyping methods, like, scenario construction
A	Regulate Enterprise environment together with the basis for CBMI.	D	Create several CBM ideas.
B	Investigate CBM chances in the particular enterprise environment.	E	Scrutinize CBM ideas and enhance finer ideas further
C	Explore the position between CBMI and extant schemes and aspirations		

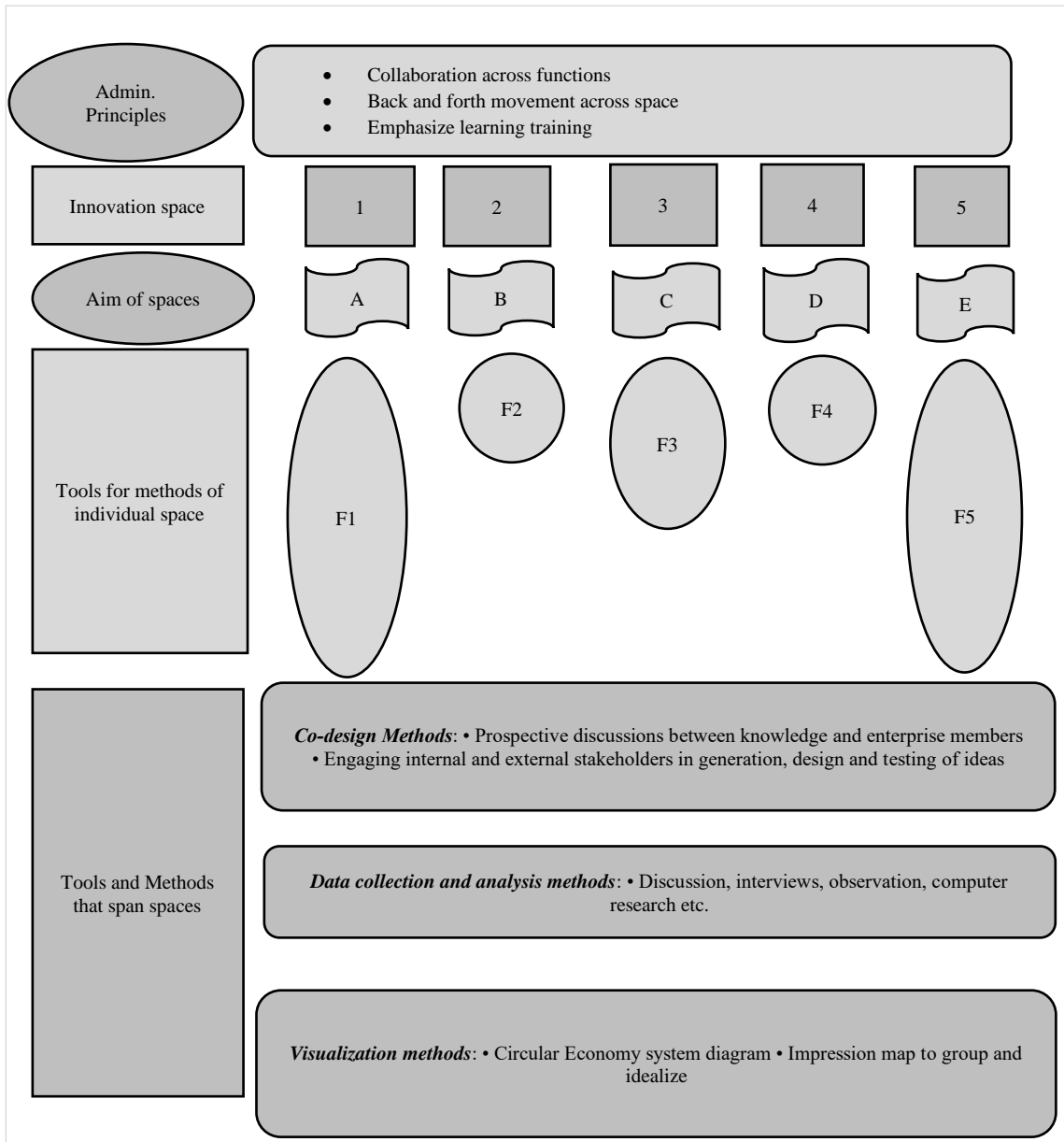


Figure 4: Proposed Framework and tools for Circular Business Model Innovation for the study.

The presented tools were adjusted in such a way that, they fitted each case enterprise environment. Business model innovation is an overwhelming process, and designing a model in less than three years is impractical (Evans et al., 2017). Chesbrough (2007) documented that designing a model in two-three years is too small a time to *develop business-model experiments, obtain clear results, interpret and understand the results, and then carry out a broad deployment of those results*. It is the same case in CBMI for which a novel circular business philosophy has to be designed from scratch and integrated into the existing SME models.

Conclusion

The principal aim of this exploratory research was to investigate the different ways in which the DT phenomenon does enhance the CBMI process. The specific objective was to design a CBMI framework that can be adopted by SMEs to improve their business. Different tools were used in the experimentation within the DT concept using action research.

In line with what has been discussed, this study contributed to the existing literature; advancement of a DT framework (adapted from [Guldmann et al., 2019](#)) in CBMI for SMEs and a detailed application of DT and its usefulness in CBMI. Again, clear assessment of the procedures and levels that are integral in the process of CBMI.

The first contribution of the study was the design of a DT framework for the CBMI spaces, that is, the innovation space and the position space which are proposed to supplement the other readily available and known, exploratory, ideation, and archotyping and testing spaces of DT in order to embrace the CBMI concept.

This study has revealed the need to position CBMI events with enterprise strategies and aspirations; this is in the position space. However, further studies need to be done to explore the association between particular entrepreneurial, communal and industrial environments, and the appropriate positioning of the CBMI process. [Guldmann et al. \(2019\)](#) stated that the research carried out in such areas will entail settings that are presently less explored within a broader scope of BMI literature.

Limitations to the Research

This work is generally investigative and descriptive in nature because CBMI is currently considerably understudied and a new field of study ([Kozlowski & Chamberlin, 2019](#)), with an effort to create the first draft of an explanation for some of the events that have been noticed. It is anticipated that some of the findings will serve as pertinent hypotheses for follow-up studies.

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