Design Education Forum of Southern Africa

DESIGN+ Disruptions, Realities, Futures

18th DEFSA Conference 18 –19 September 2025

Exploring circularity to inform contemporary South African design process

Mohammed Jogie, Tshwane University of Technology
Herman Botes – Tshwane University of Technology
Selma Schiller – Tshwane University of Technology

Abstract

In the Anthropocene, evidence points to humans depleting Earth's resources at an unsustainable rate. Designers unwittingly contribute to resource depletion through traditional design approaches. As a lifelong designer-researcher, like many of my peers, our collective aim is to effect positive societal, environmental, and stakeholder impact through design. While global design frameworks often rely on purpose-driven foundations, their applicability within the South African visual communication design context is underexplored. This paper reports on my Master of Arts and Design study, specialising in communication design. The research presented in this paper discusses how global frameworks and their embedded teleologies could be adapted to enhance local design through introducing relevant circular design methodologies. This paper reports on qualitative, practice-based research that investigated design practice as a method of inquiry and knowledge generation. Purposive sampling was used for its appropriateness in meeting epistemological objectives. These methods align with accepted practice-based inquiry, where knowledge transfer validity is crucial. The research framework used for the study includes circular design processes, material value retention, and the analysis of design artefacts and systems by employing deductive thematic content analysis. Data from the Institute of Media, Strategy and Design (iMSD) process, the Use2Use toolkit, and the Ellen MacArthur Foundation (EMF) adaptive strategy for circular design were thematically coded in Atlas.ti. The results of this teleological study using these three design methodologies were achieved by creating design artefacts and their embodied purposive value in alignment with pedagogical principles and documented circular design outcomes. Conclusions identify the potential for unifying relevant components of these design processes to enhance designer capacity through iterative, user-centric, circular, and systems design thinking. Future research to validate the multi-modal circular design framework as a result of the study is recommended. Potential considerations include industry pilot studies, exploring innovations in materials, emerging technologies, AI tools, and comparative studies across various geographic and economic contexts. Additionally, investigating user engagement strategies, human-centred approaches, co-design, and design as strategy beyond form-giving can strengthen the adoption and impact of circular design practice.

Keywords: Adaptive strategy, circular design, design process, EMF, Use2Use, iMSD

© Copyright 2025 Design Education Forum of Southern Africa (www.defsa.org.za)

Introduction

Over the many years of practising and teaching design, I have realised that design is lifelong learning and hands-on solutions exploration. Design practice and pedagogy encompass fundamentals, technical skills, and skilful crafting. It is about developing processes and techniques that lead to the creation of contextually responsive and methodologically rigorous design solutions. This paper reports on a study that was undertaken to evaluate and explore potential enhancements to my current approach to design (Dansk Design Center 2021) through studying teleological aspects of the Use2Use design toolkit (Selvefors & Rexfelt 2021) and the Ellen MacArthur Foundation (EMF) adaptive strategy for circular design (Ellen MacArthur Foundation 2023) to determine if and how they could inform the design process at the design consultancy I work for, iMSD. The researcher created design artefacts to operationalise and test the teleological aspects of the design processes under study. Their production provided the empirical basis for reflective coding and analysis, enabling the researcher to examine how purpose and process converge within circular design frameworks.

Thematic analytical data was gathered by executing design artefacts (Figure 1), and a teleological study of the three identified design processes. The designs are available online via this link (Jogie 2025). Data was collected by capturing multiple viewpoint recordings of the researcher actively designing. These recordings were edited, captioned, transcribed, and coded using Atlas.ti. Artificial intelligence was judiciously used to sift through the large volumes of raw data that exceeded 720,000 words. Sifting through such a voluminous dataset would have been extremely difficult using traditional research protocols. This biomimetic orientation of these processes draws on biomimicry, where design strategies abstract functional principles from natural ecosystems to create regenerative and circular design. Thematic analysis was achieved through the creation and reflective documentation of design artefacts produced by the researcher.

Figure 48: A sampling of design artefacts from the study

© Copyright 2025 Design Education Forum of Southern Africa (www.defsa.org.za)

Background and motivation

In working with the Design Institute (SABS Design Institute 2013), I became engaged with their design process, which profoundly influenced my practice. This sparked further interest in international design methodologies. Whilst serving on the International Council of Design (Ico-D), I was introduced to the AIGA design process (AIGA 2016), which alongside the SABS model, the Design Staircase (Dansk Design Center 2021), and Design Research (O'Grady & O'Grady 2017, p. 9) led to the development of an amalgamated hybrid design process we use at iMSD (Figure 2).

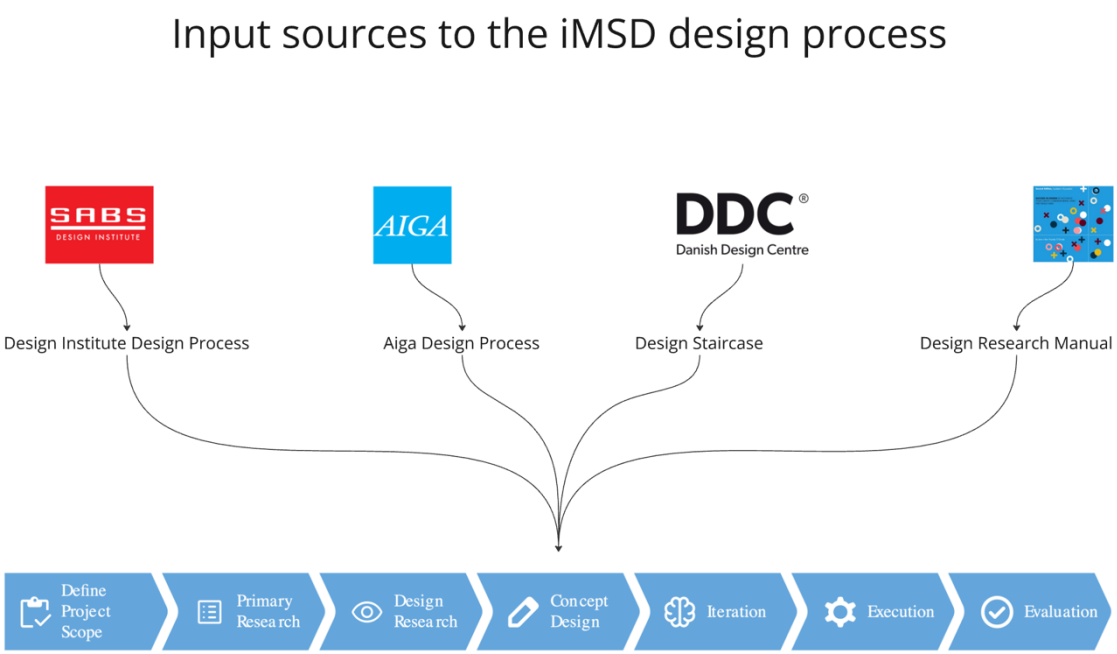

Figure 49: The seven-step IMSD design process (bottom) with its four input axiologies

The teleological analysis being reported on evaluated the purpose and outcomes of established circular design models and their sustainability-driven heuristics. There is alignment with the United Nations Sustainable Development Goals (SDGs), notably innovation (SDG9), responsible consumption (SDG12), and environmental action (SDGs 13 to 15) (United Nations 2015), which in turn complement South Africa's National Development Plan 2030 (NDP) (The Presidency National Planning Commission 2016). The research further drew on axiologies from the United Nations Conference of the Parties 2024 summit (COP29), which identified circularity as a strategic outcome (United Nations 2024). The summit resolved to prioritise regionally aligned solutions and research tailored to specific economic and environmental contexts.

Research problem

This study identified the lack of evidence-based integration of global circular design frameworks, such as the Use2Use Design Toolkit and the EMF Adaptive Strategy, into contemporary South African visual communication design processes, and the impact of such omissions on local design processes' ability to articulate locally relevant circular design strategies.

© Copyright 2025 Design Education Forum of Southern Africa (www.defsa.org.za)

Research question

Which teleological aspects of the Use2Use design toolkit and the EMF adaptive strategy for circular design processes could be integrated into an established design process that could respond to the South African context?

Aims

This study aimed to investigate and analyse the teleological aspects of the Use2Use design toolkit and the EMF adaptive strategy for circular design to determine if and how these teleologies could enable and enhance the hybrid iMSD design process, thereby potentially responding to design approaches in the South African context in a considered and relevant way.

Objectives

The study's objectives were to gather qualitative data using a brief from the Student Gold Pack awards, selected by the researcher to serve as an objective, unbiased design scenario to ensure data integrity (Institute of Packaging SA 2023). Objectives of the study were:

1. To investigate the teleological aspects of the Use2Use and EMF frameworks
2. To analyse how these can be integrated into the iMSD design process
3. To determine their potential to enhance circular design practices within the South African context.

Conceptual framework

Figure 3 presents an outline of the conceptual framework used for the study, detailing the context, theoretical grounding, research methodology, and data sources used to structure and inform the research.

© Copyright 2025 Design Education Forum of Southern Africa (www.defsa.org.za)

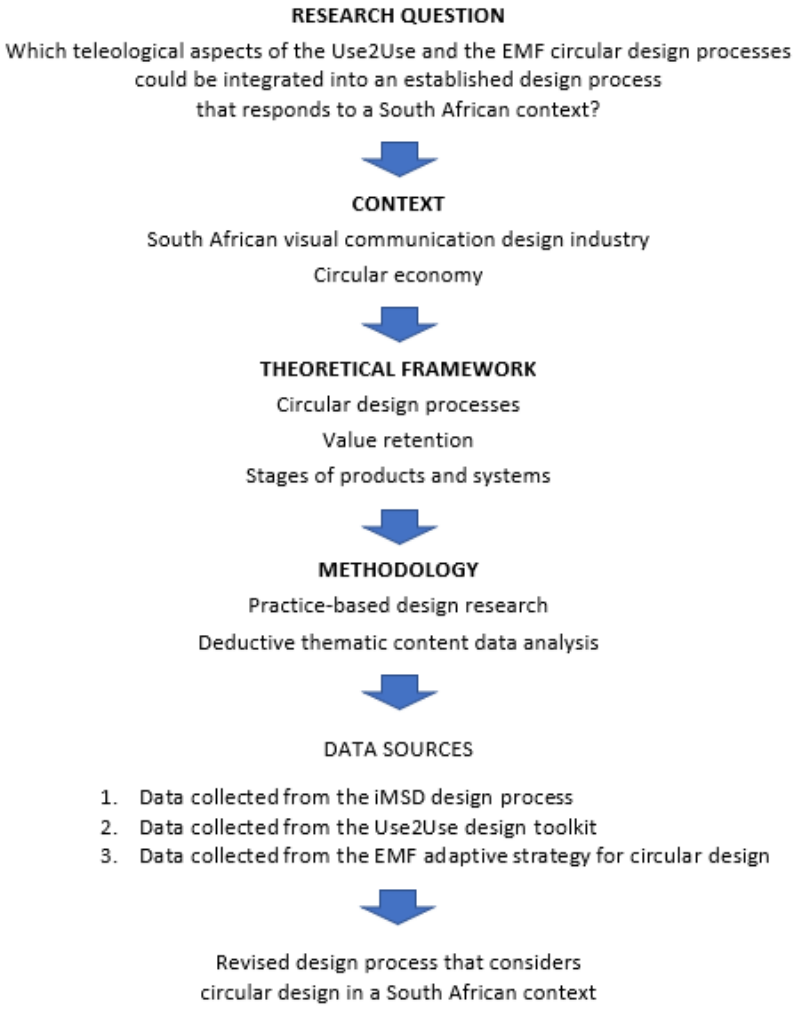

Figure 50: Conceptual framework of the study

Table 1 represents a topological mapping of the three design processes that formed part of the study. The topologies shown are of the iMSD design process alongside the two international circular design processes. The table articulates the steps for each design process.

Table 22: Topology of design processes selected for the study

	iMSD design process	USE2USE design toolkit	EMF adaptive strategy for circular design
Step 1	Define project scope	Thinking activation pack	Observe and interpret the system
Step 2	Primary research	Circular journeys exploration pack	Envision circular futures
Step 3	Design research	Multiple use-cycles exploration pack	Create conditions for collaboration
Step 4	Concept design	Circular designs ideation pack	Build circular design capabilities
Step 5	Iteration	Circular designs evaluation pack	Rewrite the rules

© Copyright 2025 Design Education Forum of Southern Africa (www.defsa.org.za)

Step 6	Execution		Develop tools to design and evaluate
Step 7	Evaluation		

Theoretical perspectives

This paper is based on theories and research on the global shift towards circular and sustainable design practices while recognising the infrastructural and socio-economic challenges experienced in the Global South, particularly in South Africa. Theoretical perspectives contribute to themes of circular processes such as value retention, lifecycle extension, resource optimisation, and systems design. Levels of process design, materials, energy, and system scales, anchored in lifecycle stages including but not limited to reuse, refurbishment, redesign, and recovery, are also presented. South Africa encounters challenges in recycling infrastructure and waste systems (Packaging SA 2017, p. 65), requiring design processes tailored to local conditions while promoting inclusion and resilience (Schiller 2013, p. 23).

Defining circularity

Circularity refers to stakeholder-driven strategies that merge economic activity with ecological well-being (Murray *et al.* 2017, p. 369). The circular economy places design at its centre, requiring practitioners to rethink and recode traditional linear systems. Legacy linear systems are historically rooted in industrial mass production, and transitioning towards regenerative practices is required. Circularity offers an alternative to the traditional "take-make-dispose" approach of linear design by encouraging closed-loop design systems that maintain resource value and minimise waste (Pinheiro *et al.* 2019).

Teleological aspects of circular design

Circular design exhibits teleological heuristics aligning purpose-driven design through nature-inspired cycles. Teleology is the study of design intent and purpose, where artefacts and processes are understood through the outcomes they are designed to achieve (Salem Press Encyclopedia 2022). Sustainable design thinking looks at the retention of materials in the cycle, mimicking natural systems (Bleischwitz *et al.* 2009, p. 225). Well-articulated closed-loop design systems ensure solutions are designed for complete reuse or biodegradability, eliminating waste (Fleischmann 2020, p. 101). Design artefacts should be built for longevity, durability, reduced environmental impact, and lowered replacement frequency. Human-centred design underscores user needs by enhancing circular design adoption (Ideo.org 2020, p. 3). Additionally, biomimicry uses nature as a model for circular design strategies. By emulating nature, design is able to promote zero waste and regeneration of natural systems (Biomimicry Institute 2024).

Earley's (2017, p. 429) "circular design futures" proposition emphasises systemic thinking, material reuse, and digital-traditional integration. This positions designers as change agents and drivers of regenerative innovation that align with global sustainability goals. Designers become central to systemic transition. Fleischmann (2020, p. 103) further notes that design decisions can boost modularity, material recovery, and disassembly. Equipping designers with collaborative tools enables positive contributions to production systems and supports the broader adoption of circular design.

© Copyright 2025 Design Education Forum of Southern Africa (www.defsa.org.za)

Circular economy principles

The EMF adaptive strategy advocates for embedding circularity into design processes. It promotes iterative co-creation and responsiveness to changing material, user, and systemic contexts (Ellen MacArthur Foundation 2023). This adaptability enhances value chains in a globally dynamic economy whilst ensuring that design remains scalable and sustainable. To operationalise circularity, designers must understand material flows, lifecycle strategies, and stakeholder collaboration (Sumter *et al.* 2020, p. 5).

South Africa's circular strategy stresses renewable material use, recyclability, and lifecycle maximisation (Packaging SA 2017, p. 26). Modular design and repairability offer robust circular economic dividends, particularly in packaging. These approaches encourage long-lasting products and greater efficiency in design outcomes (van der Laan *et al.* 2019, p. 3).

The study used these guidelines to analyse and compare three design processes: iMSD, Use2Use, and EMF. These design processes were explored within South Africa's specific socio-economic context. The study paid particular attention to UN SDG goals 9 and 13, and South Africa's NDP 2030, as it sought to produce regionally relevant design knowledge that responded to international and local circular design dictates.

Research methodology

This qualitative, practice-based study explored how creative practice can serve as both a method of inquiry and knowledge generation through circular design. The study employed iterative prototyping, transcription, and thematic content analysis to investigate the three design methodologies from iMSD, Use2Use, and EMF to assess their teleological relevance in South Africa. All data were derived from the researcher's own design activities and reflective documentation, consistent with practice-based inquiry. The design research undertaken aligned with an interpretivist research approach and was selected for its situated, experiential knowledge outcomes (Samuel 2019, p. 19).

Research design

The study employed practice-based research, with design practice as both method and output of inquiry (Chun Tie *et al.* 2019, p. 1). Data was collected through iterative prototyping, screen and camera recordings, and transcriptions. These methods provided an empirical dataset for analysis. Practice-based research was selected for its responsiveness to real-world conditions and the research design's ability to produce new knowledge through creative artefacts (Carstensen *et al.* 2019, p. 100). The design outputs sought to enhance existing methodologies and evaluate the potential for improvements (Andriessen *et al.* 2022, p. 26). Design artefacts, process recordings, and transcriptions were generated solely by the researcher while engaging with the design brief.

Population and sampling

The brief titled 'The Competitive Edge' from the Student Gold Pack Awards was used solely as a neutral design brief to guide the researcher's own design exploration and ensure objectivity in data collection. No student or external participant data were used in the study (Institute of Packaging SA 2023). The brief and design models were selected for their contextual relevance to circular design. The brief was executed using the iMSD design process and then thematically analysed with detailed documentation to ensure rigour and traceability (Etikan 2016, p. 2). Purposive sampling aligned the selected project brief and the study's objectives. This sampling method was chosen for its suitability in practice-based

© Copyright 2025 Design Education Forum of Southern Africa (www.defsa.org.za)

research and for enhancing the neutrality of findings (Schön 1983, p. 166). The population sample consisted solely of the researcher's design output.

Data collection

Two parallel data streams were recorded: screen captures of the designer's computer and third-person video recordings of the designer executing design artefacts. These were transcribed and captioned, producing 100 transcripts from 142 recording sessions. The data was analysed for teleological convergence and divergence, focusing on identifying contextual adaptability for South African design. Deductive thematic analysis was applied using Atlas.ti to code and compare the design methodologies. 72 transcripts were coded against three core themes: clarifying questions, decision making, and justification. This coding approach allowed for the mapping of teleological alignment and thematic analysis across the design frameworks.

Trustworthiness was maintained through purposive sampling, academic rigour, and accepted coding practices. Peer-reviewed literature supported the analytical approach (Nowell *et al.* 2017, p. 3), and an interpretivist approach documented the researcher's influence on meaning construction (Samuel 2019, p. 19).

Ethical concerns

No human participants were involved. The study relied solely on the researcher's own design activities and publicly available data, adhering to ethical guidelines (Marais *et al.* 2004, p. 2).

Limitations and delimitations

The study was limited to design outputs and did not address broader socio-economic aspects of the circular economy. Artefacts were context-specific and not intended as universal models. The study was delimited by using only publicly available and relevant resources to maintain sampling relevance and trustworthiness. In honouring the DEFSA word count limitations, this submission did not include certain ancillary aspects of the research. The full research paper and associated research instruments may be obtained directly from the author upon request.

Analysis

Deductive thematic analysis of the clarifying questions, decision making, and justifications coded by the designer-researcher whilst designing and analysing against the iMSD, Use2Use, and EMF design processes highlighted distinct yet complementary approaches to design outcomes. This interconnected matrix is represented as a design process tree in Figure 4. It is worth noting that the iMSD process integrates design artefact creation within structured design thinking frameworks, the Use2Use toolkit focuses on user-centred circularity, and the EMF strategy supports change through systems design and stakeholder collaboration. Together, these processes offer designers options to explore strategic, sustainable, and circular design solutions, underscoring the value of circular design thinking.

© Copyright 2025 Design Education Forum of Southern Africa (www.defsa.org.za)

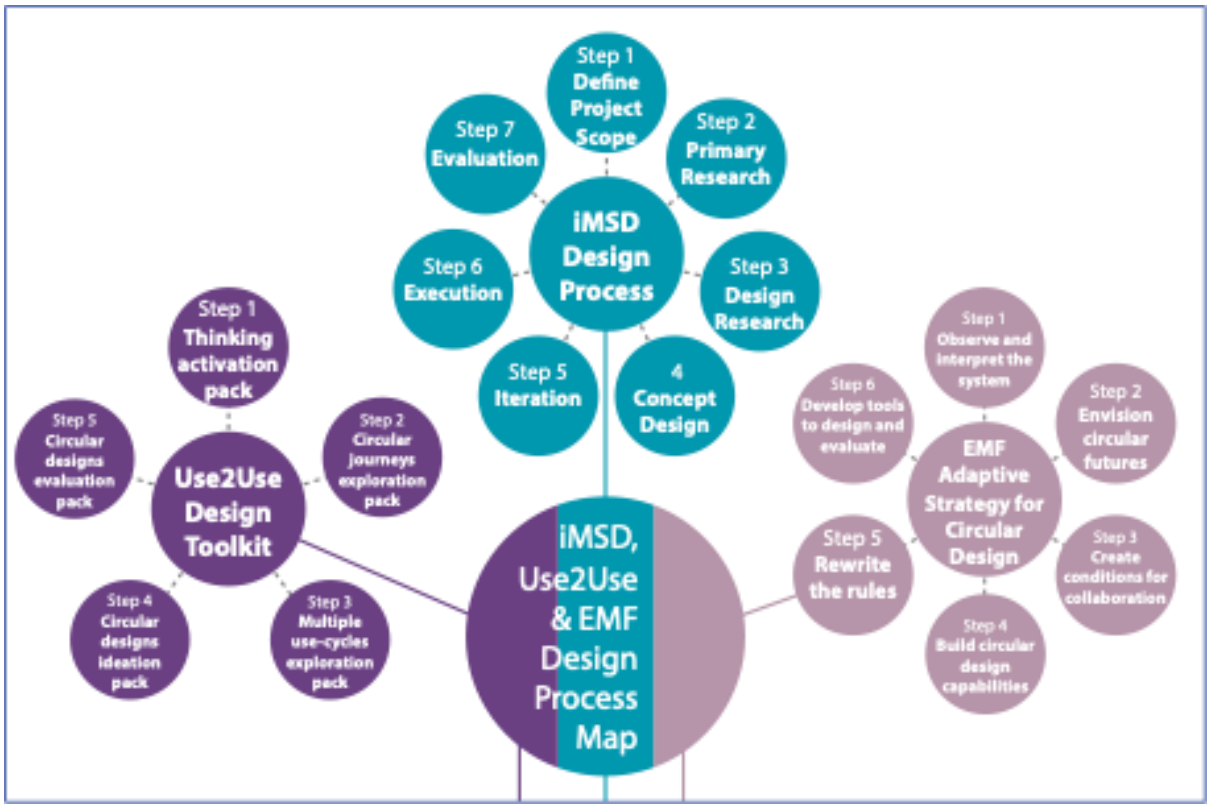

Figure 51: Design process tree situating the three design processes

Decision making was guided by the research question and identifying teleological aspects of the Use2Use and EMF processes, whilst identifying integration pathways into existing iMSD design processes and circular design more broadly in South Africa. Use2Use emphasised user-centricity, adaptability, and lifecycle extension. EMF offered systems-level thinking, stakeholder enablement, and evaluation tools as potential value propositions to the iMSD design process, presenting enhancement potential for sustainability, usability, and scalability within local design frameworks.

Results of teleological observations

A teleological analysis of the coding across the iMSD, Use2Use, and EMF design processes revealed their interconnected roles in promoting circular design outcomes. The iMSD process was guided by strategic decisions informed by research, contextual relevance, iteration, and balancing creativity with construct. The Use2Use toolkit emphasised user-centric design, scenario exploration, and resource-efficient strategies, encouraging sustainable consumption behaviours. The EMF strategy leveraged systems thinking, stakeholder collaboration, impact assessment, and sustainability metrics to embed circular principles within broader organisational frameworks.

Each approach used circular teleologies to refine design solutions. Figure 5 presents a mapping of the teleological steps of the three design processes. Complementary teleologies are coloured green, partially aligned teleologies are yellow, unique teleologies are white, and steps with no associated teleologies are grey. This mapping illustrates the considered actions taken at each design stage.

© Copyright 2025 Design Education Forum of Southern Africa (www.defsa.org.za)

Figure 52: Teleological step mapping across design processes

Results of teleological analysis

A comparison of the three codes across the processes presents potential complementary teleologies pertaining to circular design and stakeholder engagement. Figure 6 is a procedural process map of the shared, supplementary, and unique teleologies across the three processes, illustrating how they could potentially support robust design solutions that are innovative and practical. The teleological mapping of iterative design through the iMSD process, user-centric circularity through the Use2Use toolkit, and systems design through the EMF strategy show how identified teleologies could enhance the design experience. It is worth noting that the mapping does not occur in a linear progression.

© Copyright 2025 Design Education Forum of Southern Africa (www.defsa.org.za)

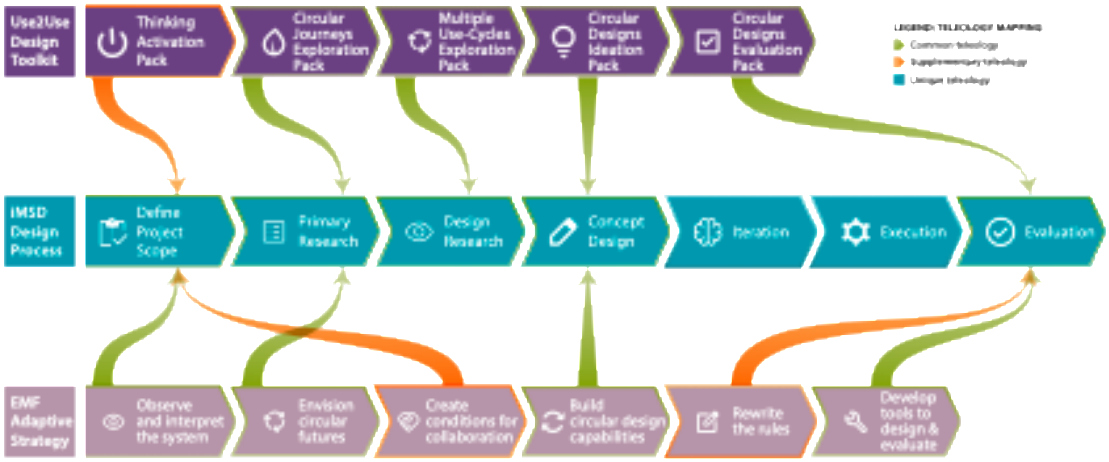

Figure 53: Teleological mapping of the design processes

Findings and results

The empirical data collected and analysed show the teleological outcomes embedded within the three design processes, and documented teleologies of international and South African design-driven processes, and their alignment within user-centric circular economy principles through iterative design processes prompted by a neutral design brief through the iterative design of artefacts.

Identified design process teleologies

The identified design teleologies were derived from the researcher's reflective practice and autoethnographic analysis of the design artefacts created during the study. The iMSD design process followed a structured seven-step approach. Step 1, Define Project Scope: established foundational tenets of the design brief by clarifying objectives aligned with project goals. Step 2, Primary Research: gathered essential data, prioritising stakeholder engagement, and identified context-specific insights. Step 3, Design Research: investigated materials, technologies, and global trends, bridging theory with actionable strategies. Step 4, Concept Design: translated research insights into practical design solutions that sought to balance design and functionality. Step 5, Iteration: allowed for continuous evaluation and refinement to maintain relevant and practical designs. Step 6, Execution: transformed concepts into tangible design artefacts. Step 7, Evaluation: rigorously assessed designs against an established design assessment matrix (Elmansy 2015).

The Use2Use toolkit consists of five interconnected "packs", each designed to enhance circular design problem solving (Rexfelt & Selvefors 2021). Step 1, Thinking Activation Pack: offered behavioural insights by mapping user decisions during the obtainment, use, and disposal phases of a user journey. Step 2, Circular Journeys Exploration Pack: visualised user interactions across lifecycles, highlighting pain points and opportunities for improvement. Step 3, Multiple Use-Cycles Exploration Pack: focused on empathy and value retention via extended product lifecycles, prioritising user needs. Step 4, Circular Designs Ideation Pack: synthesised insights into practical circular solutions grounded in sustainable practices. Step 5, Circular Design Evaluation Pack: assessments were carried out, enabling the designer to evaluate the environmental, user, and organisational benefits of design solutions.

The EMF strategy is a structured framework with six key 'levers' or steps that facilitate the transition to circular design. Step 1, Observe and Interpret the System: focused on understanding existing systems and identifying interventions through contextual insight. Step 2, Envision Circular Futures: harnessed creativity and strategy to develop innovative solutions. Step 3, Create the Conditions for

© Copyright 2025 Design Education Forum of Southern Africa (www.defsa.org.za)

Collaboration: demonstrated building trust and partnerships by promoting interdisciplinary alignment and overcoming barriers through shared goals. Step 4, Build Circular Design Capabilities: explored how to equip teams with the necessary skills and tools for circular practices. Step 5, Rewrite the Rules: targeted redundant policies, including potential regulatory changes to support systemic transformation. Step 6, Develop Tools to Design and Evaluate: presented circular solutions that ensured measurable outcomes.

Findings

The steps across the three design processes include teleologies that have alignment potentiality for theoretical principles with actionable strategies in driving innovation through circular design. By addressing specific goals through each step, these approaches produce design outcomes that demonstrably integrate ecological regeneration, material value retention, and socially inclusive principles relevant to South African design practice. The teleological underpinnings of these design processes provide a foundational scaffolding for circular design by offering pathways to pursue circular-centric design solutions through thoughtful design practice.

Conclusion and implications

This study concludes that the considered thematic integration of key components of the Use2Use toolkit and the EMF strategy into the iMSD process offers teleological opportunities for enhanced user-centric, circular, and systemic design (Table 2). The thematic analysis employed by the study revealed unique contributions across user engagement, lifecycles, adaptability, and strategic foresight. The iMSD process is iterative, Use2Use is user-centric, and EMF offers holistic systems design opportunities.

Table 23: Thematic analysis of iMSD, Use2Use, and EMF design processes

Theme/Steps	iMSD	Use2Use	EMF
User-centred design	Stakeholder-driven research	Behaviour mapping	Collaborative user engagement
Circularity and its impact	Implicit circularity focus	Lifecycle value retention	Sustainability lifecycle embedded
Resource selection and lifecycle considerations	Circular material selection	Durable, adaptable products	Material flow innovations
Design innovation and iterative processes	Continuous iterative refinement	Reflective, iterative ideation	Adaptive strategic foresight
Contextual adaptability	South African relevance	Inclusive community focus	Systemic regulatory adaptation
Frameworks for triangulation and validation	Rigorous design evaluation	Comprehensive impact assessment	Sustainability benchmark validation
Lifelong learning and capacity building	Learning via systematic inquiry	Iterative educational tools	Circular team empowerment
Teleological and systemic integration	Theory meets practical strategy	Behavioural and systemic insight	Integrated sustainability focus

Through thematic analysis, a reimagined multi-modal design process concept is proposed, inspired by the biomimetic structure of a living cell (Figure 7). The model provides for foundational project scoping and execution, enhanced circular user journeys, lifecycle thinking, and systemic circular design

© Copyright 2025 Design Education Forum of Southern Africa (www.defsa.org.za)

strategies. Arrows and interconnected loops indicate the fluidity between phases, allowing designers to approach projects non-linearly, selecting and reconfiguring components based on specific design needs.

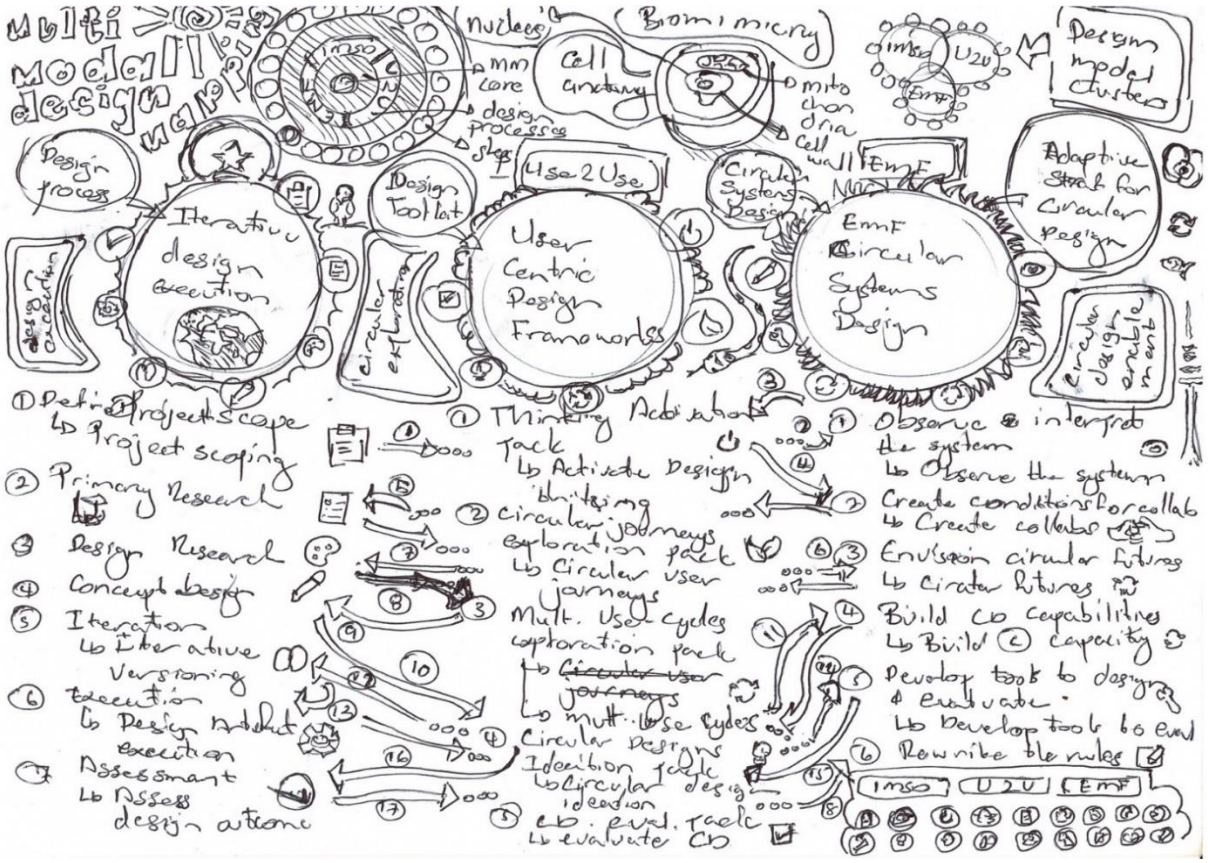

Figure 54: Conceptual exploration of a multi-modal circular design process

The finalised multi-modal design model (MMDM) (Figure 8) is a refined design execution that captures the core design process flows of the conceptualisation (Figure 7), and should be understood as a conceptual explorative stepping stone to the MMDM presented in Figure 8, rather than a procedural design outcome. The design model presented is flexible, allowing designers to determine necessary steps based on project specifics, allowing for continuous iteration and adaptability. Mimicking a living cell, the outer design steps are a metaphoric reference to a cell wall, permitting engagement at any point guided by the context of the project brief, rather than a linear stepped sequence of design endeavour. The MMDM operates like a self-sustaining cell, where the multi-modal core acts as a nucleus, while iterative, user-centric, and systems design teleologies serve as mitochondria powering design execution. This flexibility should allow for the inclusion or exclusion of any of the 19 steps (Figure 8). Central to this multi-modal design process are the three design processes that were studied.

In contrast to linear models, this circular multi-modal framework proposes dynamic design thinking, enabling designers to revisit, combine, and reorder steps per their project and stakeholder needs. The shift to an adaptive circular system opens significant opportunities for designers, educators, and stakeholders through flexible iteration and adaptation. The biomimetic approach integrates circularity throughout the process rather than as a secondary consideration. Adjusting steps based on real-world needs and feedback encourages collaborative, user-driven innovation. Mapping the Use2Use toolkit and the EMF strategy onto the iMSD design process presents a more nuanced approach to visual

© Copyright 2025 Design Education Forum of Southern Africa (www.defsa.org.za)

communication design. This approach centres on design thinking as a combined strategy to enhance practice and design education.

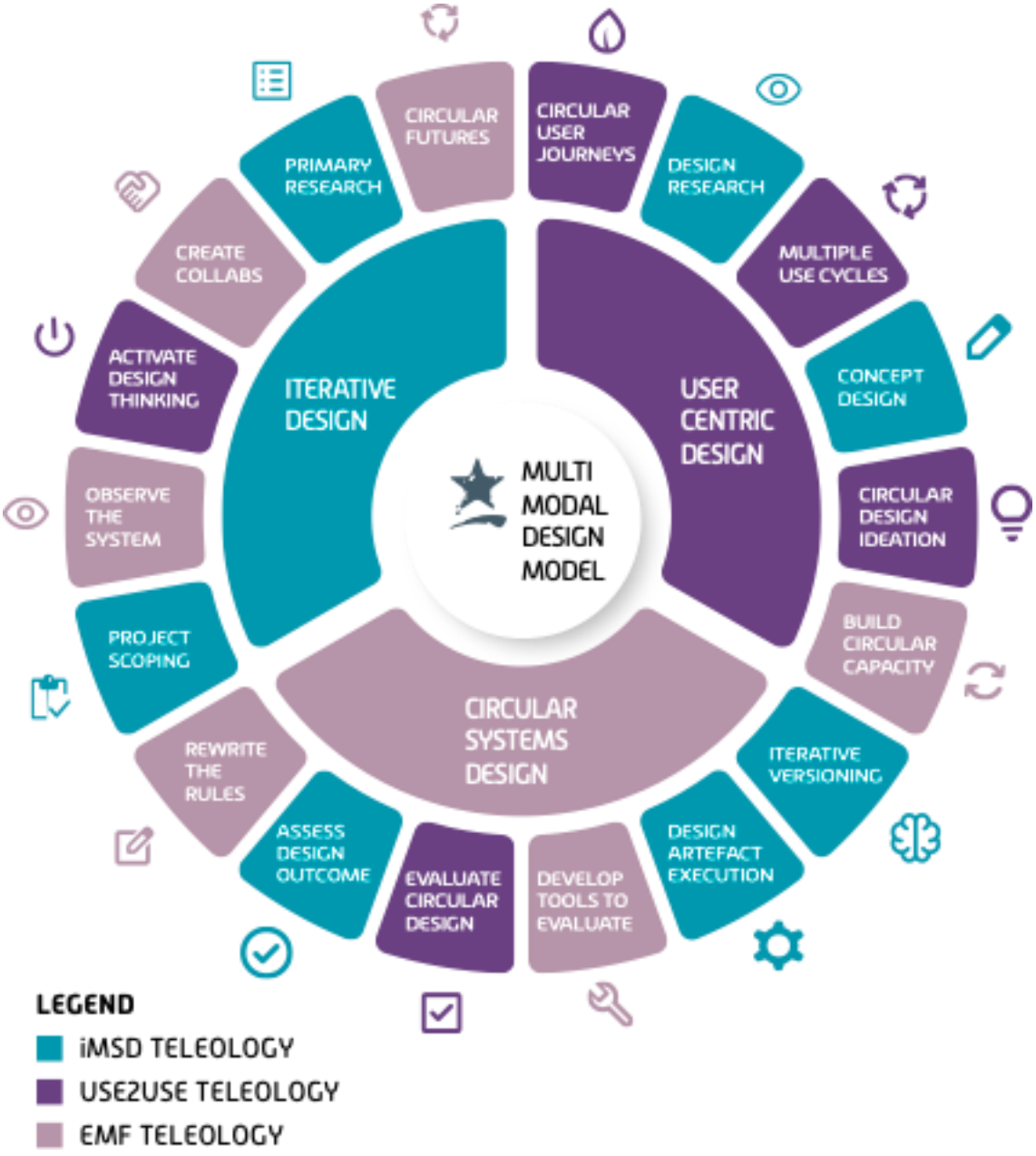

Figure 55: Multi-modal model of a reimagined design process from the study

Multi-modal design model implementation strategies

The transition to a multi-modal circular design model offers a modular approach to design, allowing designers to engage flexibly based on project needs (Figure 8). This adaptability permits the selection, exclusion, and reordering of the MMDM process steps to better align with specific design objectives, enhancing fluidity and ensuring circular principles are integrated throughout the design process.

For instance, whilst having a product design bias, the Use2Use toolkit's circular user journeys pack provides a user-centred focus that could be useful in visual communication design. Conversely, some elements of the EMF adaptive strategy may play a role in agile visual communication contexts depending on the designer's needs.

© Copyright 2025 Design Education Forum of Southern Africa (www.defsa.org.za)

The MMDM distinguishes itself from linear design models by catering for continuous feedback and refinement. Prototyping and iterative loops enable design decisions to evolve into real-time insights, enhancing usability and material efficiency. To support MMDM adoption, synthesised evaluation tools offer real-time tracking of design outcomes. Insights collected from simulations help with decision-making, providing measurable data on design efficacy and embedded circularity in design artefacts.

While the MMDM has not yet undergone empirical testing, it has been designed to serve as a conceptual framework for further study, including potential pilot applications in design education and practice to assess its adaptability and functional value.

Finally, the MMDM encourages stakeholder collaboration by combining insights from designers, businesses, policymakers, and consumers to support a cooperative approach to design-led solutions, supported by user-driven and systemic circular design considerations.

References

AIGA 2016, Design process define the problem | learn | generate ideas | design development | implementation, AIGA, Minnesota.

Andriessen, D, van Beest, W, Boon, W, Pol, H, Van Der Veen, G & Moors, E 2022, 'A research pathway model for evaluating the implementation of practice-based research: The case of self-management health innovations', *Research Evaluation*, vol. 31, no. 1, pp. 24–48, https://doi.org/10.1093/reseval/rvab023.

Biomimicry Institute 2024, The Biomimicry Institute: It's time for solutions that get us back in sync with nature, viewed 4 December 2024, https://biomimicry.org/.

Bleischwitz, R, Bahn-Walkowiak, B, Bringezu, S, Lucas, R, Steger, S, Wilts, H, Onischka, M & Röder, O 2009, *Outline of a resource policy and its economic dimension*, viewed 9 November 2024, www.ressourcenproduktivitaet.de.

Carstensen, AK & Bernhard, J 2019, 'Design science research–a powerful tool for improving methods in engineering education research', *European Journal of Engineering Education*, vol. 44, nos 1–2, pp. 85–102, https://doi.org/10.1080/03043797.2018.1498459.

Chun Tie, Y, Birks, M & Francis, K 2019, 'Grounded theory research: A design framework for novice researchers', *SAGE Open Medicine*, vol. 7, https://doi.org/10.1177/2050312118822927.

Dansk Design Center 2021, The design ladder: Four steps of design use by Dansk Design Center, viewed 9 November 2024, https://issuu.com/dansk_design_center/docs/design-ladder_en.

Earley, R 2017, 'Circular design futures', *Design Journal*, vol. 20, no. 4, pp. 421–434, https://doi.org/10.1080/14606925.2017.1328164.

Ellen MacArthur Foundation 2023, Adaptive strategy for circular design, viewed 28 June 2023, https://ellenmacarthurfoundation.org/news/the-six-levers-designers-can-use-to-unlock-the-potential-of-circular-design.

Elmansy, R 2015, How to evaluate design ideas – Designorate, viewed 7 July 2023, https://www.designorate.com/how-to-evaluate-design-ideas/.

Etikan, I 2016, 'Comparison of convenience sampling and purposive sampling', *American Journal of Theoretical and Applied Statistics*, vol. 5, no. 1, p. 1, https://doi.org/10.11648/j.ajtas.20160501.11.

Fleischmann, K 2020, 'Designers as change agents in the circular economy', *Journal of Design for Social Change, Sustainable Innovation and Entrepreneurship*, vol. 1, pp. 99–118.

Ideo.org 2020, The field guide to human-centered design, viewed 7 July 2023, http://journal.um-surabaya.ac.id/index.php/JKM/article/view/2203.

© Copyright 2025 Design Education Forum of Southern Africa (www.defsa.org.za)

Institute of Packaging SA 2023, Student gold pack: Project brief 3, viewed 8 January 2024, https://www.studentgoldpack.org.za/?page=46.

Jogie, M 2025, *iMSD design process study*, viewed 23 March 2025, https://indd.adobe.com/view/939d35d3-8143-4dbe-af08-0998830d93d2.

Marais, P, Lourens, A & Albertse, E 2004, *TUT guidelines for the preparation of dissertations and theses*, TUT.

Murray, A, Skene, K & Haynes, K 2017, 'The circular economy: An interdisciplinary exploration of the concept and application in a global context', *Journal of Business Ethics*, vol. 140, no. 3, pp. 369–380, https://doi.org/10.1007/s10551-015-2693-2.

Nowell, LS, Norris, JM, White, DE & Moules, NJ 2017, 'Thematic analysis: Striving to meet the trustworthiness criteria', *International Journal of Qualitative Methods*, vol. 16, no. 1, pp. 1–13, https://doi.org/10.1177/1609406917733847.

O'Grady, JV & O'Grady, KV 2017, *A designer's research manual*, 2nd edn, Quarto Publishing Group, Beverly.

Packaging SA 2017, *Design for recycling for packaging and paper in South Africa*, Packaging SA, Johannesburg.

Pinheiro, M, Seles, B, De Camargo Fiorini, P, Jugend, D, Lopes de Sousa Jabbour, A, da Silva, H & Latan, H 2019, 'The role of new product development in underpinning the circular economy: A systematic review and integrative framework', *Management Decision*, vol. 57, no. 4, pp. 840–862, https://doi.org/10.1108/MD-07-2018-0782.

Rexfelt, O & Selvefors, A 2021, 'The Use2Use design toolkit—tools for user-centred circular design', *Sustainability*, vol. 13, no. 10, p. 5397, https://doi.org/10.3390/su13105397.

SABS Design Institute 2013, 'Design process', https://doi.org/10.11606/gtp.v14i2.137709.

Salem Press Encyclopedia 2022, 'Teleology (philosophy)', viewed 7 July 2023, http://www.sparknotes.com/philosophy/aristotle/themes.html.

Samuel, MA 2019, *The research wheel*, University of KwaZulu-Natal, Durban.

Schiller, S 2013, *The acquisition of essential characteristics required for a contemporary graphic design career*, PhD thesis, University of Pretoria.

Schön, D 1983, *The reflective practitioner: How professionals think in action*, Basic Books, New York.

Selvefors, A & Rexfelt, O 2021, The Use2Use design toolkit, viewed 4 January 2022, https://www.use2use.se/.

Sumter, D, de Koning, J, Bakker, C & Balkenende, R 2020, 'Circular economy competencies for design', *Sustainability (Switzerland)*, vol. 12, no. 4, https://doi.org/10.3390/su12041561.

The Presidency National Planning Commission 2016, *National development plan 2030: Executive summary*, Government of South Africa, Pretoria.

United Nations 2015, United Nations sustainable development goals, viewed 24 November 2024, https://sdgs.un.org/goals.

United Nations 2024, *Summary of global climate action at COP 29*, Baku.

van der Laan, AZ & Aurisicchio, M 2019, 'Designing product-service systems to close resource loops: Circular design guidelines', in *Procedia CIRP*, Elsevier B.V., pp. 631–636, https://doi.org/10.1016/j.procir.2019.01.079.

© Copyright 2025 Design Education Forum of Southern Africa (www.defsa.org.za)