

The Visual Catalyst: Integrating Graphic Design, Innovation and Circular Economy Principles for Sustainable Production

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Abstract. Our research addresses a critical blind spot in the circular economy (CE) transition: the gap between technical potential and public adoption. While the focus has been on technological innovation, we demonstrate that graphic design is the essential catalyst for making circular systems functional and desirable, given the need for effective communication and cultural adoption. This study positions graphic design not as a superficial layer but as a strategic catalyst for enabling circular systems by translating complex principles into tangible user experiences. Through a qualitative study involving nine graphic designers in Nigeria, this research identified key barriers, including a significant value-action gap, client hesitation, and a deficit of resources and knowledge that hinder the integration of CE practices. Despite these challenges, designers demonstrated a strong willingness to engage in training and adopt circular principles. In response to these findings, this paper introduces the Graphic Design–Innovation–Circularity (GIC) Model, a novel conceptual framework that illustrates the synergistic relationship between visual communication, design-driven innovation, and CE principles to foster sustainable production. The authors provide an actionable guide for designers, educators, and policymakers and argue that we cannot fully realise a circular economy unless design leverages its power to shape behaviour, build trust, and make sustainability visible and desirable.

Keywords: Graphic Design; Innovation; Circular Economy; Sustainable Production; Visual Communication; Behaviour Change; Conceptual Model.

INTRODUCTION

The linear 'take-make-dispose' model is a failed experiment. Its legacy climatic upheaval and resource scarcity demand not just incremental improvement, but a radical redesign of our entire production and consumption system: the depletion of finite resources, overflowing landfills, and profound environmental degradation [1]. This model, which has underpinned global industrial growth for over a century, is fundamentally flawed because it assumes infinite resources in a demonstrably finite world. In response to this crisis, the circular economy (CE) has emerged as a robust alternative framework, promising a system that is restorative and regenerative by de-

sign. The model proposes a future where designers eliminate waste, keep materials in continuous use, and regenerate natural systems [2].

However, the transition to a circular system has encountered a significant roadblock. To date, the vast majority of research, policy, and innovation has focused on the technical and industrial aspects of the CE: advanced recycling technologies, reverse logistics, and material science. While these are indispensable, this techno-centric approach overlooks a crucial element: the human factor. A circular economy cannot function solely on technology; it requires a parallel cultural and behavioural shift. People, consumers, clients, and citizens must understand, trust, and willingly participate in circular systems for them to suc-

ceed; this is where our current models fall short; we are building the engine of a circular future but failing to design its user interface.

This is the vital, yet chronically undervalued, role of graphic design. Traditionally viewed as a discipline concerned with aesthetics and visual appeal, graphic design has evolved into a strategic practice capable of shaping perceptions, guiding behaviour, and communicating complex ideas [3]. It is the discipline that translates the abstract principles of the CE into tangible, relatable experiences, from the clear recycling instructions on a package that prevent it from going to landfill, to the compelling brand story of a company like Patagonia that makes repairs seem desirable, to the intuitive interface of a product-sharing application. Graphic design is the bridge between the circular system and the people who must navigate it [4, 5].

Despite this potential, graphic design remains a marginal voice in CE discourse. Its role is often reduced to the final step of "communication" rather than being recognised as an integral component of the innovation process itself [6]. There is a critical lack of practical frameworks that equip designers with the tools to integrate CE principles and, equally, a lack of understanding among clients and businesses about the strategic value that design brings to circularity.

In this study, we seek to bridge this gap by moving beyond asking whether graphic design is essential and instead investigating how we can operationalise it within the circular economy. Through an empirical study of practising graphic designers, this research aims to:

- 1) Identify the real-world barriers preventing graphic designers from adopting circular economy principles.
- 2) Pinpoint concrete opportunities for integrating these principles into everyday design work for sustainable production.

In doing so, we introduce the Graphic Design–Innovation–Circularity (GIC) Model. This new framework positions visual communication not as a peripheral support function but as a central catalyst for the circular transition. This paper will first review the relevant literature, detail its qualitative methodology, present the field findings, and discuss the implications of the GIC model for designers, educators, and policymakers striving to build a sustainable future.

Literature Review

The transition to a circular economy represents a profound shift from our dominant linear system. To understand the potential role of graphic design within this transition, it is essential first to explore the evolution of the circular economy concept, the expanding mandate of design in sustainability, and the specific, yet under-theorised, intersections between visual communication and circular principles.

The Evolution and Imperative of the Circular Economy. The linear "take-make-dispose" model has long been identified as a primary driver of environmental degradation, relying on readily accessible resources and energy [1]. In response, the concept of a Circular Economy (CE) has gained significant traction as a viable alternative. While its roots can be traced to schools of thought such as "cradle to cradle" [7] and industrial ecology, the Ellen MacArthur Foundation's work has been instrumental in popularising a unified framework. This framework is built on three core principles, powerfully illustrated by their "butterfly diagram": designing out waste and pollution, keeping products and materials in use, and regenerating natural systems [1].

Authors [2] helpfully define the CE as "a regenerative system in which resource input and waste, emission, and energy leakage are minimised by slowing, closing, and narrowing material and energy loops." The appeal is clear: it promises to decouple economic activity from the consumption of finite resources. However, the prevailing focus in both literature and practice has been overwhelmingly techno-centric, emphasising innovations in material science, reverse logistics, and recycling technologies [5]. While these are crucial, this focus often overlooks a critical success factor: the CE is not just an industrial model but a socio-technical one. Its success hinges on widespread cultural acceptance and behavioural change, areas where communication and perception are paramount; this creates a pivotal, yet often missed, entry point for design disciplines focused on meaning, behaviour, and communication.

The Expanding Role of Design: From Aesthetics to Agency. The field of design has undergone significant evolution, shedding its historical identity as a service profession focused primarily on aesthetics. It is now increasingly recognised as a strategic discipline capable of addressing complex, "wicked" problems [3]. This shift is particu-

larly evident in the context of sustainability. Early approaches focused on reducing harm using recycled paper or less toxic inks. While positive, critics describe this "light green" approach as incrementalist.

The authors present a more transformative approach in frameworks such as Cradle to Cradle [7], which advocate a regenerative design paradigm where designers conceive products as nutrients in continuous biological or technical cycles. Similarly, [8] argues for a fashion and design system that is inherently restorative and equitable; this aligns with the concept of "Design for Behaviour Change," which draws on insights from behavioural economics, such as the authors' [9] "nudge" theory. The premise is that design can subtly alter the choice architecture around us, making sustainable behaviours like repairing a product or correctly sorting waste easier, more desirable, or more socially normative. This repositioning of design, from creating objects to shaping behaviours and systems, is a necessary precursor to understanding its specific role in a CE.

Graphic Design as the Strategic Interface for Circularity. Within this expanded design landscape, graphic design's potential extends far beyond creating attractive visuals. It functions as the crucial interface between complex circular systems and the people who must engage with them. This strategic role manifests in several key areas:

1) Packaging and Information Design: Perhaps the most direct application, graphic design determines how a product communicates its circularity; this includes clear instructions for recycling or composting, but also extends to designs that facilitate reuse, such as the durable, branded packaging in TerraCycle's "Loop" system. Poor information design can render a recyclable product unrecyclable if users are confused, whereas effective design can guide proper end-of-life handling effortlessly [10].

2) Narrating Longevity and Trust: For product longevity, a cornerstone of the CE graphic design builds the narrative. Companies like Patagonia and Fairphone don't just sell products; they sell a philosophy of repair and care. Their branding, marketing, and most importantly, their detailed, user-friendly repair guides, are all graphic design outputs that empower users and build trust in the brand's commitment to circularity [4]. The "Don't Buy This Jacket" campaign is a classic example of visual storytelling that challenges consumption norms directly.

3) Visualising Systems and Enabling Services: The CE often involves new business models, such as product-as-a-service. Graphic designers create the user interfaces, service manuals, and system maps that make these models intelligible and accessible. They visualise the often-invisible flows of materials and energy, helping stakeholders from CEOs to consumers to understand their role within the larger system [5].

Despite these clear applications, graphic design's contribution remains peripheral in mainstream CE discourse. Industry practitioners often treat it merely as a tool for communicating sustainability rather than acknowledging its role as an active agent in implementing it; this has created a gap between the technical potential of circular systems and their social adoption.

Synthesising the Gap: The Need for an Integrative Framework. The reviewed literature confirms the CE as a necessary paradigm and establishes the design's capacity to drive systemic change. However, a critical synthesis reveals a disconnection. The rich discourse on CE principles [1, 2] and the evolving theory of strategic, behavioural design [3, 4] run in parallel. Researchers have not yet developed integrative models that explicitly show how the tools and mindsets of graphic design can be operationalised to achieve core CE objectives.

This gap is not merely academic; it has practical consequences. Without a clear framework, graphic designers lack the language to advocate for their strategic role, clients fail to see the value beyond aesthetics, and educators struggle to integrate CE principles meaningfully into design curricula. Therefore, this study seeks to bridge this divide by exploring the on-the-ground realities designers face and proposing a conceptual model, the Graphic Design-Innovation-Circularity (GIC) Model, which is designed to integrate visual communication directly into the heart of circular innovation and sustainable production.

METHOD

To investigate the practical challenges and opportunities facing graphic designers in adopting circular economy principles, this study employed a qualitative research approach. The researchers selected this methodology for its ability to generate rich, detailed insights into human experiences, perceptions, and underlying motivations, thereby supporting the goal of uncovering the

"why" and "how" behind designers' practices [11].

Research Design and Context. This research adopted an exploratory, cross-sectional case study design focused on the Nigerian context. A case study approach is practical for investigating a contemporary phenomenon in its real-life context, especially when the boundaries between the phenomenon and its context are not clearly defined [12]. Nigeria, as a rapidly developing economy with a burgeoning creative industry and significant environmental challenges in waste management and consumption, presents a critical, under-explored context for this research. Focusing here allows us to understand the unique dynamics and barriers that may differ from those in well-studied Western economies.

The study specifically targeted graphic designers affiliated with academic institutions. This purposive sampling strategy was intentional, as this group operates at the nexus of education and professional practice. They are not only practitioners who face real-world client constraints but also educators who shape the next generation of designers, making their perspectives doubly valuable.

Participant Selection and Demographics. This study employs purposive and snowball sampling to recruit participants. It begins by contacting designers through professional networks and university design departments in Nigeria, then asking them to recommend additional qualified colleagues. The final sample consisted of nine graphic designers. The sample size, while small, is considered robust for a qualitative, in-depth study where the objective is to gain deep insights rather than to achieve statistical generalisability [13]. The researchers found that new data ceased to yield insights after the seventh interview, yet they included all nine interviews to enhance the comprehensiveness of the findings.

Data Collection Instrument and Procedure. The research team collected data using an online survey questionnaire that integrated quantitative and qualitative elements to capture both the extent of attitudes and the subtleties behind them.

The survey was structured into four parts:

1) Demographic Information: Collecting data for Table 1.

Table 1 – Participant Demographics

Participant ID	Years of Experience	Primary Sector	Specialisation
P01	8	Academia	Branding & Identity
P02	12	Freelance	Packaging Design
P03	5	Agency	Digital Design
P04	15	Academia	Information Design
P05	7	Freelance	Advertising & Marketing
P06	10	Agency	Publication Design
P07	6	Academia	Social Design
P08	9	Freelance	Typography
P09	11	Agency	User Experience (UX)

2) Likert-Scale Questions: A 5-point scale (1=Strongly Disagree to Agree 5=Strongly) was used to gauge attitudes toward the importance of sustainability, familiarity with CE principles, perceived challenges, and willingness to adopt new practices.

3) Open-Ended Questions: These questions prompted participants to elaborate on the "how" and "why" behind their Likert-scale responses. Example questions included: "Can you describe a specific instance where you faced a challenge trying to implement a sustainable design solution?" and "What kind of support or resources would most help you integrate circular economy principles into your work?"

4) Informed Consent: All participants were provided with an information sheet detailing the study's purpose, assuring anonymity, and explaining that participation was voluntary. Submission of the completed survey was taken as implied consent.

The survey was distributed via email and professional messaging platforms and remained open for data collection over four weeks.

Data Analysis. The data analysis process was conducted in two parallel streams, corresponding to the two types of data collected.

1) Quantitative Data (Likert Scale): The responses to the Likert-scale questions were analysed using descriptive statistics. We calculated the mean (M) and standard deviation (SD) for each item to determine the central tendency and the

degree of consensus or divergence among participants.

2) Qualitative Data (Open-Ended Responses): We subjected the qualitative responses to a rigorous Thematic Analysis. This process began with deep familiarisation, immersing ourselves in the designers' words before systematically coding the data and iteratively refining the codes into the central themes reported below.

Familiarisation: Immersing ourselves in the data by reading and re-reading all responses.

Generating Initial Codes: Systematically coding interesting features across the entire dataset.

Searching for Themes: Collating codes into potential themes, gathering all data relevant to each potential theme.

Reviewing Themes: Checking whether the themes align with the coded extracts and the entire dataset to generate a thematic map.

Defining and Naming Themes: Refining the specifics of each theme and generating clear definitions and names for them (as presented in the Findings section).

Producing the Report: Weaving the analytic narrative together with vivid, compelling data extracts.

This mixed-methods approach within a qualitative framework enabled a robust analysis in which the quantitative data highlighted what designers thought, and the qualitative data powerfully explained why they thought it, providing a comprehensive understanding of the research problem.

RESULTS AND DISCUSSION

The analysis of the survey data revealed a complex picture of attitudes, practices, and barriers. The results are organised around four central themes that emerged from the thematic analysis of the open-ended responses, supported by the descriptive statistics from the Likert-scale questions.

Theme 1: The Value-Action Gap in Sustainable Practice. The quantitative data clearly showed that designers value sustainability in theory. The statement "How important is sustainability in your graphic design work?" received a high mean score ($M=4.2$, $SD=0.8$). However, this value did not consistently translate into practice. The

statement "How often do you consider environmental impact when making design decisions?" received a significantly lower mean score ($M=3.2$, $SD=1.1$), indicating inconsistency.

The qualitative data provides the crucial "why" behind this gap. Designers expressed a strong personal ethic but felt constrained by external pressures.

P02 (Packaging Designer): "In my heart, I know it's the right thing to do. I want to specify recycled materials for every project. But then the client's budget comes in, and sustainability becomes the first line item to be cut."

P05 (Freelance, Advertising): "There's a constant internal conflict. You're trying to be ethically responsible, but you also have a business to run and rent to pay. When a client refuses the eco-option, you can't just walk away from the job every time."

This tension between personal values and commercial reality was the most dominant narrative, highlighting that intention alone is insufficient without structural support.

Theme 2: The Knowledge and Resource Deficit. Designers reported only moderate familiarity with formal Circular Economy principles ($M=2.9$, $SD=1.0$). Survey respondents rated the challenge of finding sustainable resources and materials as the most significant barrier ($M=4.1$, $SD=0.9$).

The open-ended responses revealed that this is not just a lack of awareness, but a lack of accessible, credible, and affordable local infrastructure.

P07 (Academic, Social Design): "I know what Cradle to Cradle means, but trying to find a local printer who uses non-toxic, plant-based inks or a reliable supplier of FSC-certified paper is a nightmare. The information isn't centralised, and it's often too expensive for the projects we do here."

P03 (Agency, Digital Design): "My sustainability knowledge is mostly self-taught from online articles. Our design education never covered this. We learned about colour theory and typography, not lifecycle assessments or material flows."

This theme underscores that the barrier is not merely conceptual but deeply practical, rooted in local supply chains and educational gaps. The model addresses the 'knowledge deficit' by formally integrating CE Principles as a foundational element.

Theme 3: Client Hesitation as the Primary External Barrier. The perceived level of client support was notably low (M=2.8, SD=1.2). Stakeholders repeatedly cited this as the most significant external obstacle, using it to veto sustainable ideas.

The designers' accounts pointed to a fundamental disconnect in how value is perceived.

P04 (Academic, Information Design): "Clients see sustainable design as a cost, not an investment. They'll pay extra for a fancy foil stamp, but not for a biodegradable substrate. We have to become better at selling the business case, not just the environmental one."

P08 (Freelance, Typography): "I presented a design for reusable packaging, and the client's first question was, 'But how will we make money if customers don't come back to buy a new box?' They are stuck in a linear business model and can't see the alternative." This theme identifies the client-designer relationship as a critical leverage point. If clients do not buy in, they effectively neutralise the designer's knowledge and intent. Graphic Design and Innovation actively overcome 'client hesitation' by creating tangible value that designers can communicate.

Theme 4: A Strong Appetite for Capacity Building and Systemic Support. Despite the challenges, the data reveal a robust and optimistic finding: a strong willingness to participate in training (M=4.0, SD=0.7) and adopt CE principles (M=3.7, SD=0.9). Designers are not resistant; they are eager to upskill and receive systemic support.

Their suggestions for support were practical and pointed towards clear solutions.

P01 (Academic, Branding): "We need ready-to-use resources, a Nigerian database of sustainable material suppliers, templates for environmental impact reports that we can show clients, and case studies from this region, not just Europe."

P06 (Agency, Publication Design): "Workshops would be fantastic, especially if they were targeted at both designers and clients. We need to educate the entire ecosystem, not just one part of it."

This theme confirms the motivation to change. The failure is not one of will but of infrastructure, a lack of accessible education, resources, and collaborative frameworks. The model channels the 'appetite for capacity building' into a structured pathway for professional development."

Table 2 – Summary of Survey Results

Statement	Mean	Standard Deviation	Interpretation
Importance of Sustainability in Work	4.2	0.8	High Importance
Frequency of Considering Environmental Impact	3.2	1.1	Inconsistent Practice
Confidence in Designing Sustainable Graphics	3.5	1.0	Moderate
Familiarity with CE Principles	2.9	1.0	Low Familiarity
Willingness to Adopt CE Principles	3.7	0.9	High Willingness
Perceived Client Support	2.8	1.2	Low Support
Challenge of Finding Sustainable Resources	4.1	0.9	High Challenge
Willingness to Participate in Training	4.0	0.7	High Willingness

Notes: Likert Scale: 1=Strongly Disagree to Agree 5=Strongly

The Graphic Design–Innovation–Circularity (GIC) Model. The GIC Model, depicted in the figure below, is a dynamic framework for visualising and operationalising the integration of graphic design into the core of circular economy strategies.

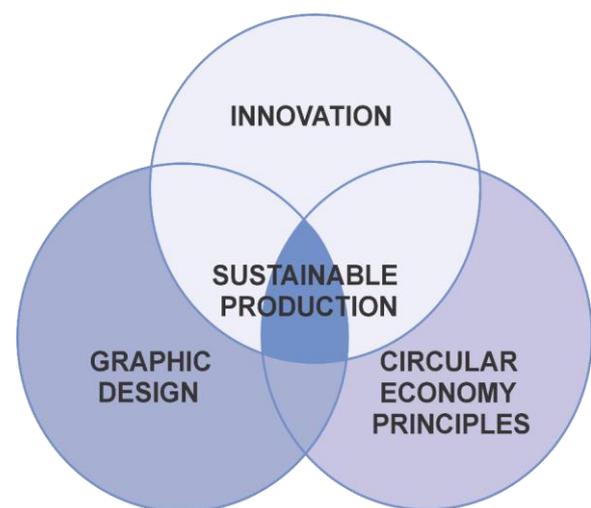


Figure 1 – The Graphic Design–Innovation–Circularity (GIC) Model for Sustainable Production [14]

It moves beyond a linear process and presents a synergistic system in which each component

continuously influences and reinforces the others.

Model Components and Dynamics

1) Circular Economy Principles

Role: This is the outer ring that encapsulates the entire system, representing the non-negotiable principles and goals of a circular economy [1]. These include designing out waste and pollution, keeping products and materials in use, and regenerating natural systems.

Function: It sets the "rules of the game." Every action within the model, every design choice and every innovation is evaluated against these principles. The approach ensures that designers always align the pursuit of innovation and aesthetic communication with the ultimate goal of ecological and economic sustainability.

2) Graphic Design & Innovation (Design-Driven)

Relationship: At the heart of the model is a dynamic, bidirectional relationship between Graphic Design and Innovation, which serves as the system's active "engine".

Graphic Design's Role: This component represents the practical application of visual communication to make circularity functional and compelling. It includes:

Information Design: Creating clear repair manuals, recycling instructions, and lifecycle labels.

Behavioural Nudges: Using visual cues to encourage reuse and proper disposal.

Storytelling & Branding: Building narratives around longevity, repair, and shared use (for example: Patagonia's "Worn Wear" campaign).

Material & Production Choices: Specifying recycled, recyclable, or biodegradable substrates and low-impact printing techniques.

Innovation's Role: This component, rooted in design-driven innovation [6] and design thinking [15], provides the methods and novel concepts. It includes:

Generating New Meanings: Reimagining products as services (for example, subscription models).

Developing New Business Models: Creating systems for take-back, refurbishment, and sharing.

Human-Centred Problem Solving: Using empathy and prototyping to ensure circular solutions are user-friendly and desirable.

The Interaction: Graphic design makes innovation understandable and accessible (for example, the visual identity and user interface for a new product-sharing service). Conversely, innovation creates new opportunities and challenges for graphic design (for example, designing for durable, reusable packaging in the Loop system). They fuel each other.

3) Sustainable Production

Role: This is the central goal that the system produces. It represents a production model that is:

Environmentally Regenerative: Minimising waste and ecological impact.

Economically Viable: Creating value through new circular business models.

Socially Equitable: Fostering fair labour practices and community well-being.

Culturally Resonant: Aligned with user values and behaviours, making sustainable choices the default.

This study set out to investigate the real-world barriers and opportunities for integrating circular economy (CE) principles into graphic design practice. The findings show that the profession struggles to balance a strong ethical compass with a commercial reality that has yet to align with sustainability goals. The discussion that follows interprets these findings within the broader academic discourse, elucidates the GIC model's contribution, and explores the practical implications for various stakeholders.

The Chasm between Intention and Action. The most pronounced finding of this study is the stark value-action gap among designers. While they overwhelmingly affirmed the importance of sustainability (M=4.2), their practical implementation was inconsistent (M=3.2). This dissonance is not simply a personal failing but a symptom of a systemic problem. It reflects what [16] describes as the challenge of transitioning from a "diffuse willingness" to change towards "effective, concrete action." Our findings suggest that structural barriers currently block this transition.

The qualitative data powerfully frame this not as a lack of will, but as a conflict between personal ethics and professional survival. As P02 noted, sustainability is often "the first line item to be cut." This aligns with critiques of neoliberal creative economies, in which ethical choices become individual responsibilities rather than collectively supported obligations [8]. The designers in our

study are, in effect, being asked to single-handedly absorb the financial and logistical costs of a systemic transition, a burden that proves unsustainable in practice; this moves the conversation beyond simply urging designers to "do better" and instead forces a focus on re-engineering the systems in which they operate.

The Central Role of the Client-Designer. Our study identifies the client-designer relationship as the critical, and often broken, link in the chain. The low perceived client support (M=2.8) was the most frequently cited external barrier. This finding critically extends the work of scholars like [17], who emphasise the need for new business models for the CE. Stakeholders must first bridge a fundamental communication and value-alignment gap before implementing new models.

Clients who view sustainable design as a cost rather than an investment (as per P04) are operating within a linear economic logic in which value is measured in terms of immediate, low-cost production. The designers are attempting to introduce circular reasoning, in which value is calculated based on longevity, brand trust, and reduced environmental impact [4]. This is not merely a disagreement over budget, but a clash of paradigms. Therefore, empowering designers requires not only upskilling them but also equipping them with tools, such as compelling case studies and cost-benefit analyses from the Global South, to effectively articulate the business value of circularity to their clients.

Positioning the GIC Model within the Academic and Practical Discourse. The Graphic Design-Innovation-Circularity (GIC) Model, developed from our findings, is the paper's primary theoretical contribution. It directly addresses the identified gaps by providing an integrative framework.

Bridging Disciplinary Silos: The model actively resists the techno-centrism of early CE literature by placing Graphic Design and Innovation in a dynamic feedback loop at the heart of the system. It visually asserts that you cannot have a circular economy without a circular culture, and you cannot have a circular culture without deliberate communication; this synthesises the technical focus of CE scholars [2] with the cultural and behavioural focus of design theorists [3, 4].

A Tool for Advocacy and Education: For practitioners, the GIC model is more than a theory; it is a tool for advocacy. It gives designers a visual language to demonstrate their strategic value,

moving them from being perceived as executors of client briefs to being essential partners in sustainability strategy. The curriculum map guides educators by clearly outlining the interconnected knowledge areas—from material science and systems thinking to behavioural psychology and business strategy—that they must integrate into modern design education.

From Barrier to Leverage Point: The model reframes the identified barriers. The "Knowledge Deficit" (Theme 2) is addressed by the model's foundation in CE Principles and its call for continuous learning. "Client Hesitation" (Theme 3) is mitigated by positioning graphic design as the engine of innovation that creates new market value. The "Appetite for Training" (Theme 4) is channelled into the model's core, suggesting that capacity building is the fuel for the entire system.

Implications for Stakeholders. The findings and the proposed model lead to concrete implications:

For Designers: The imperative is to evolve from service providers to strategic consultants; this requires proactively building literacy in CE principles and business strategy to articulate the value of sustainable design choices to clients in a compelling way.

For Educators: A radical curriculum overhaul is needed. Teaching sustainability must move from a single, peripheral module to a foundational principle integrated into every studio project, teaching not just how to design, but what to create for and why.

For Policymakers and Industry Bodies: Support must extend beyond R&D for recycling technologies. Grants, tax incentives, and recognition programs are needed for businesses that adopt circular communication strategies. Furthermore, creating standardised, localised databases of sustainable material suppliers would directly address the resource deficit identified by our participants.

Limitations and Avenues for Future Research. This study has limitations, which also provide directions for future work. The focus on the Nigerian context, while a strength in its specificity, limits the generalizability of the findings. The small sample size, though adequate for qualitative depth, means the quantitative data are indicative rather than definitive.

Future research should include:

Quantitative Validation: A large-scale survey to statistically test the relationships proposed in the GIC model across different geographic regions.

Action Research: Partnering with design studios and their clients in longitudinal case studies to apply the GIC model and document the process, challenges, and outcomes in real time.

Cross-Cultural Comparison: Comparing the barriers and opportunities for designers in emerging versus developed economies to identify context-specific versus universal challenges.

CONCLUSIONS

The journey toward a circular economy is one of the most critical undertakings of our time. This research has argued that this journey requires more than just new machines and materials; it demands new ways of seeing, thinking, and communicating. Our investigation into the world of graphic design reveals a community at the forefront of this challenge, yet one that is currently hampered by a system not designed for circularity.

The findings are clear: graphic designers see the value in sustainability and are eager to be agents of change. However, they are trapped in a value-action gap, caught between their personal ethics and a commercial reality defined by client hesitation, a deficit of accessible resources, and an educational system that has been slow to adapt. These are not isolated complaints but symptoms of a systemic failure to integrate communication and culture into the core of the circular economy agenda.

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In response, this paper's primary contribution is the Graphic Design–Innovation–Circularity (GIC) Model. This framework provides a much-needed map for a previously uncharted territory. It visually asserts that graphic design and innovation are not separate from circular principles but are in a constant, dynamic dialogue with them. The model positions design as the essential interface that makes circularity legible, desirable, and actionable for all. It is a tool for designers to advocate for their strategic role, for educators to structure a future-facing curriculum, and for businesses to visualise a new path to value creation.

The way forward is collaborative. Empowering designers requires concerted action on multiple fronts: educators must embed CE principles into the heart of design pedagogy; industry bodies must develop localised resources and platforms for knowledge sharing; and policymakers must create incentives that recognise the value of sustainable communication. Most importantly, the conversation must expand to include clients and business leaders, demystifying circular design and demonstrating its power as a driver of brand loyalty, innovation, and long-term resilience.

In the end, the products and systems of a circular future will not succeed based solely on their technical specs. They will succeed if people understand them, trust them, and want to use them. Graphic design is the discipline that builds that understanding, fosters that trust, and inspires that desire. By unlocking its full potential, we do not just make the circular economy look better; we make it work.

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