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Repurposing Discarded Materials for Sustainable Set Design Practice In Ghana

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Abstract: This study explores the potential of repurposing discarded egg crates, cartons, and polythene as sustainable alternatives to conventional materials, particularly plywood, in set design practice in Ghana. Conventional materials, while long favoured, present significant challenges including excessive weight, high costs, limited portability, and environmental degradation. Through artistic exploration, this study investigates the aesthetic, functional, and economic viability of the selected repurposed materials. The findings reveal that egg crates, cartons, and polythene offer considerable advantages: they are lightweight, artistically versatile, cost-effective, environmentally sustainable, and adaptable for dynamic stage design. Positive feedback from collaborators and participants validated the creative and practical benefits of using repurposed materials. The study concludes that integrating repurposed materials into set design practices offers a viable solution to many of the logistical, financial, and environmental limitations associated with conventional materials. It recommends that set designers and theatre practitioners continue to explore and innovate with other discarded materials, contributing to the evolving discourse on sustainability within Ghanaian theatre practice.

Keywords: *Conventional, Discarded, Repurposing, Set Design, Sustainability*.

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Introduction

Theatre production in Ghana grapples with significant challenges in set design, where creativity is often hindered by an overreliance on costly conventional materials. Set design, a cornerstone of theatrical storytelling, shapes the physical appearance, visual appeal and the emotional tone of a production. It serves as the canvas that plunges audiences' concentration in a play's setting, era, and mood, while reinforcing the director's vision through deliberate choices in colour, shapes and structural forms. Beyond aesthetics, effective set design enhances a production's narrative coherence and amplifies thematic resonance. The choice of materials in set construction is fundamental to bringing these designs to life, influencing not only the visual outcome and structural integrity but also the production's budget and its environmental footprint.

Among the conventional materials employed, plywood has been one of the most reliable and widely used for set construction. Plywood's ascent as a primary material in theatrical set construction is rooted in its strength, stability, and versatility. According to Klingelhoefer (2016), while solid wood has been used for centuries, the development and widespread availability of plywood in the early 20th century revolutionised scenic construction. Its layered structure, with wood veneers glued together with alternating grain directions, provided a significant advantage over solid lumber. This cross-graining minimised warping, shrinking, and splitting, resulting in remarkably stable and flat surfaces that were essential for creating realistic and durable scenic elements. Consequently, set designers globally, including those in Ghana, became well-versed in the properties and applications of plywood and have since relied on it extensively as a fundamental material for a wide range of scenic works.

However, the reliance on these conventional materials, including plywood, carries a significant environmental impact. The harvesting of timber, a primary component of plywood, can lead to deforestation and habitat loss if not sustainably managed. Furthermore, the production of plywood itself involves energy-intensive processes and the use of adhesives that can release harmful volatile organic compounds. While plywood offers seemingly convenient and relatively affordable solutions for creating flat, stable surfaces in set construction, its entire lifecycle contributes a considerable environmental burden, necessitating a critical re-evaluation of its prevalent use in theatre, not just in Ghana but globally.

One of the primary environmental concerns associated with plywood is its contribution to deforestation. The production process demands extensive logging, which, when unsustainable, results in the destruction of vital forest ecosystems. These forests are crucial for regulating climate by absorbing carbon dioxide, maintaining biodiversity by providing habitats for countless species, and preventing soil erosion. Unsustainable logging practices, therefore, lead to habitat loss, fragmentation, and a

reduction in the Earth's capacity to absorb greenhouse gases, directly exacerbating climate change (Bodo & Seomon 2021).

Beyond the sourcing of its raw material, the manufacturing process of plywood, according to Ningsih (n.d), is also energy-intensive. The peeling or slicing of logs into thin veneers, followed by their bonding under high pressure and heat, consumes significant energy, often derived from fossil fuels. This results in greenhouse gas emissions and contributes to air pollution.

A critical environmental aspect often overlooked is the use of adhesives in plywood production. Many conventional types utilise formaldehyde-based resins as binders. Formaldehyde is a known human carcinogen and a volatile organic compound that can be released into the air over time, both during manufacturing and from the finished product, posing health risks to workers and potentially impacting indoor air quality in spaces where plywood sets are used or stored according to the United States' National Cancer Institute (2023).

The disposal of plywood presents further environmental challenges. Treated plywood, designed for durability and resistance to pests and moisture, can contain chemicals that may leach into the soil and water if improperly discarded. Even untreated plywood, despite its theoretical biodegradability, often ends up in landfills where anaerobic decomposition releases methane, a potent greenhouse gas with a significantly higher global warming potential than carbon dioxide over a shorter timeframe.

Considering these multifaceted environmental impacts, deforestation, energy consumption, toxic emissions from adhesives, and problematic disposal, the need to move away from the over-reliance on plywood in set design becomes increasingly clear. The substantial ecological costs associated with its production and disposal contribute significantly to pressing global environmental issues like climate change, biodiversity loss, and pollution.

This urgency for change is not merely an environmental imperative but also aligns with a growing global consciousness towards sustainability and the necessity for more responsible resource management across all industries, including the creative arts. This study, by exploring and implementing alternative materials and construction methods, the theatre community can actively contribute to mitigating these harmful environmental consequences and fostering a more sustainable set design practice.

Addressing these imperatives, this study investigates the potential of repurposing discarded materials, specifically egg crates, cartons, and polythene, as viable substitutes for conventional set design resources. Prototyping these materials in a live production, the research evaluates their aesthetic, functional, and economic viability, while proposing strategies to mitigate the logistical and creative limitations prevalent in Ghanaian theatre. This exploration aligns with global sustainability goals, particularly Sustainable Development Goal 12 (Responsible Consumption and Production), by repurposing waste that would otherwise contribute to environmental degradation. Diverting such materials from landfills not only reduces ecological harm but also fosters a circular economy within the arts, encouraging resourcefulness without compromising artistic integrity.

Through this intervention, the study aims to catalyse a shift in set design practices, demonstrating how eco-conscious innovation can enhance theatrical quality while alleviating financial burdens. By bridging the gap between artistic ambition and material constraints, the findings seek to empower designers with scalable, sustainable solutions, ultimately enriching Ghana's theatre landscape through creativity, affordability, and environmental stewardship.

To maintain a focused and manageable investigation within the context of Ghanaian theatre, this study limited its scope to the repurposing of only discarded egg crates and carton boxes sourced from the Efutu municipality of the Central Region of Ghana, as practically tested in the set design for the production of the play *Guilty?* by the Department of Theatre Arts, School of Creative Arts, University of Education, Winneba.

Review of Related Literature

Theoretical Framework

This study adopts upcycling theory as a central framework, challenging the traditional view of waste by emphasising the creative transformation of discarded materials into items of greater value. Sreekumar (2023) underscores the importance of a strong theoretical framework for guiding research, and upcycling, with its roots in sustainability and the circular economy, provides a solid foundation. Upcycling goes beyond simple reuse; it involves envisioning new possibilities for materials considered unusable, extending their lifecycle.

Upcycling theory is particularly relevant to theatre and set design in that, the often-temporary nature of sets leads to potential material waste, making the transformation of discarded items into valuable artistic components aligned with sustainable and visually engaging production practices. Upcycling sits at the intersection of creativity, sustainability, and environmental consciousness. In this study, the application of upcycling theory is evident in the exploration of repurposed materials, specifically discarded egg crates, demonstrating how upcycling principles can be integrated into set design to create aesthetically pleasing and functional set components from waste.

Embracing upcycling allows set designers to champion sustainability without sacrificing creativity or artistic vision. This research aims to foster a culture of sustainability and resourcefulness within the theatre community. By focusing on repurposing materials like egg crates, the study illustrates upcycling's transformative potential for achieving more sustainable set design practices. Upcycling theory serves as both an environmental necessity and a catalyst for artistic innovation, promoting a more sustainable and creatively vibrant future for theatre production. This aligns directly with the study's focus on repurposing discarded materials like egg crates, cartons, and polythene, as highlighted in the abstract and introduction, to address the challenges of cost and environmental impact in set design.

Environmental Concerns, Repurposed Materials, and Sustainable Set Design

Given the growing global emphasis on environmental consciousness, this section examines the increasing importance of sustainability in the performing arts, with a specific focus on set design practices. Contemporary designers are increasingly challenged to incorporate eco-friendly materials and methods while maintaining the aesthetic and functional integrity of their designs. Hassall and Rowan (2019) argue for a comprehensive understanding of a set's lifecycle in a sustainable approach, while Abera (2024) highlights the practical challenges of cost and

accessibility of sustainable materials. Balancing ecological responsibility with artistic and technical efficacy is crucial (Kagan, 2014).

This leads to an investigation of repurposed materials as a strategy to address environmental concerns and creative demands. The creative reimagining of discarded resources minimises waste and environmental impact, fostering a more sustainable and resourceful future for theatrical production. This directly supports the study's exploration of repurposing discarded materials as a viable solution to the environmental concerns associated with conventional materials like plywood, as discussed in the introduction.

Vans' (2010) definition of repurposed materials as resources diverted from the waste stream for new purposes is insightful. This highlights their role in promoting sustainability by giving discarded items a second life. Kwok and Grudgings (2012) emphasise the potential for these materials to gain renewed value and lead to distinctive outcomes. Cheadle (2024) categorises repurposing into direct reuse, upcycling, and recycling, underscoring its versatility and varied environmental impacts. These definitions portray repurposed materials as more than just waste alternatives; they represent an opportunity to redefine our relationship with resources and move towards a more circular and conscientious mode of consumption, relevant to set design.

The literature, including works by Bedik (2011), Acaroglu (2012), and Banal Fernández (2016), stresses the growing recognition of sustainable set design for the theatre industry's long-term viability. Sustainable practices mitigate environmental impact, reduce operational costs, and foster creative innovation. The environmental advantages include waste reduction and resource conservation through recycled materials and sustainable options. Energy-efficient lighting and reduced energy consumption contribute to cost savings. Sustainable set design also stimulates creativity, enabling unique and innovative sets that can surpass the limitations of conventional materials, as illustrated by repurposing shipping crates. Sustainable set design aligns with social justice and equity, allowing the theatre industry to contribute to a more sustainable and equitable future. Productions like Hamilton and Matilda the Musical demonstrate the innovative use of recycled materials and sustainable practices. The growing momentum for sustainability indicates a future with more groundbreaking applications of sustainable materials and practices in set design, reflecting the industry's commitment to environmental responsibility

Discussions

Design Concept

This project was driven by a core design concept that prioritised sustainability and cost-effectiveness. This was fundamentally shaped the entire creative process. Recognising the challenges within Ghanaian theatre set design, particularly the over-reliance on expensive and often environmentally unfriendly conventional materials, I sought a solution that directly addressed these issues. The decision to repurpose discarded materials became central to this concept. It was a conscious effort to move away from traditional practices and embrace a more responsible and innovative approach to set design.

Design Process

The design process itself required careful consideration. While numerous scholars propose various steps for effective design, there's no single, universally applicable model. Therefore, I adopted a flexible approach, integrating relevant steps from different sources to create a process tailored to the specific needs of this project. This involved a thoughtful amalgamation and adaptation of existing frameworks, resulting in the seven-step cyclical chart that guided my work. This chart (Figure 1) visually represents the iterative and dynamic nature of the design process.

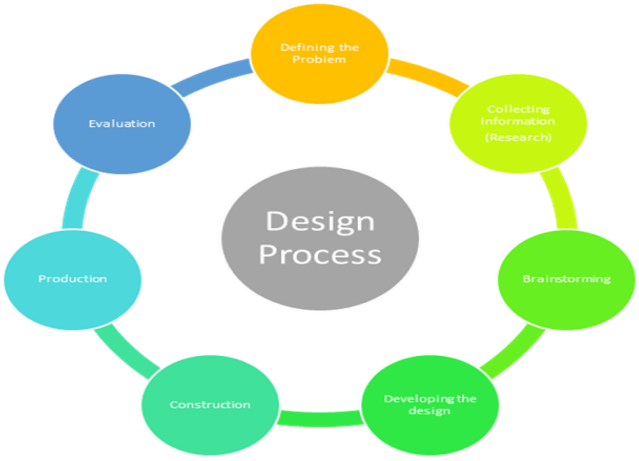

Fig. 1: A seven steps cyclical Design Process Chart
Source: Researcher's construct

Defining the Problem

The initial and arguably most critical phase was defining the problem. This involved a comprehensive analysis to pinpoint the specific challenges that needed to be addressed. It wasn't enough to simply acknowledge a problem; it required a deep dive into its nature, scope, and potential impact. For this project, the problem was identified as the over-reliance on heavy, conventional materials in Ghanaian theatre set design. This wasn't just an abstract observation; it was grounded in my own extensive experience as a theatre practitioner in Ghana, spanning over a decade. This firsthand knowledge was further validated and enriched through detailed discussions with key figures in the theatre community, particularly set designers who grapple with these material challenges daily. This thorough understanding of the problem laid a solid foundation for the subsequent design stages, ensuring that the solutions developed would be targeted and effective.

Research

With the problem clearly defined, the next step was to gather comprehensive information. This involved a multi-faceted approach, including a thorough review of existing literature and an examination of current industry practices. Collaboration was also crucial at this stage. I consulted with other set designers to gain a broader perspective on the challenges they faced, which reinforced the issue of over-reliance on conventional materials. Furthermore, I initiated conversations with the playwright and directors of the production for which I intended to test my design. I presented my concept of repurposing egg crates, underscoring the potential benefits: their availability, low cost, and lightweight nature, which would allow for greater flexibility and ease of set changes. I argued that this approach would not only address practical concerns but also demonstrate a commitment to innovation and pushing the boundaries of theatrical design. These collaborative engagements provided valuable insights into the play's essence and the artistic vision guiding the production, ensuring that the set design would

effectively serve the narrative. This phase of information gathering built upon the problem definition phase and directly informed the subsequent brainstorming stage.

Brainstorming

Brainstorming, a collaborative and generative technique, played a vital role in exploring potential solutions. It's a process that encourages participants to freely contribute ideas, fostering creativity and innovation. Litchfield (2008) highlights the significance of *material brainstorming*, which focuses specifically on exploring the selection and utilisation of materials. This involves considering diverse materials, their properties, potential applications, and innovative ways to use them as replacements for less effective or unsustainable options. In this project, the brainstorming period led to the selection of discarded egg crates, cardboard boxes, and industrial polythene bags.

The decision to use egg crates was primarily driven by the need to address the weight issues associated with conventional set materials. Conventional materials like plywood can significantly increase the overall weight of a set. Their ready availability in local markets and lorry stations further solidified their appeal. These crates, often discarded after a single use, presented an opportunity to not only create art but also address environmental concerns by diverting them from the waste stream (Figure 2).

Fig. 2: Discarded egg crates after use

Source: Picture taken by researcher in Winneba lorry station (23/2/2023)

Similarly, discarded cardboard boxes, a common sight in the environment, were identified as another valuable resource for repurposing. These boxes, typically used for packaging, are frequently discarded, presenting an opportunity to reduce waste and promote sustainability.

Ultimately, the selection of egg crates, cardboard boxes, and polythene bags was driven by their prevalence, accessibility, potential for creative manipulation, and the opportunity they presented for repurposing. This repurposing effort aimed to enhance the visual appeal of the set while demonstrating a commitment to responsible production practices and environmental consciousness. The feasibility of incorporating these materials was carefully evaluated throughout the brainstorming phase, with practical considerations such as portability, stability, and ease of manipulation being paramount.

Sourcing these materials became a significant undertaking, requiring collaboration with the production team, primarily students and national service personnel from the Department of Theatre Arts, University of Education, Winneba. I initiated discussions to communicate my vision of repurposing materials, encouraging team members to contribute any discarded egg crates they had. The response was overwhelmingly positive, highlighting the abundance of this resource. Interestingly, the painting activities attracted the attention of other students and staff, further increasing the supply of egg crates and fostering a sense of community involvement. This collaborative sourcing strategy not only yielded a large quantity of materials but also cultivated a shared sense of purpose and commitment to the project. In securing a free and abundant supply of egg crates, the project eliminated the need to purchase plywood, aligning with its budget-conscious and environmentally friendly objectives.

Developing the Design

A key part of this stage was designing the individual flats, the foundational components of the set. Ensuring the precise design and construction of these flats, incorporating the egg crates, was crucial for the efficiency and success of the set assembly process. The difference in dimensions between standard stage flats (4' x 8') and the smaller egg crates presented a design challenge. This required careful planning to integrate the egg crates effectively within the larger flat frames. The variability in egg crate sizes, with some being smaller or partially damaged, further complicated the design process. To address this, the number of toggles within the flat frames was increased to provide a secure base for holding the crates. While adding toggles, the weight of the flats was carefully considered, with adjustments made to toggle size and arrangement to minimise weight while maintaining functionality.

Construction

We transformed the various concepts to physical reality. I produced the detailed drawings that specified every aspect of the final design. These drawings were crucial for the construction team to understand how to bring the set to life. I collaborated with carpenters, and painters, to construct the various set units according to the design. The major activities under this phase were the construction of the flats, paintings and the construction of the set.

Construction of the flats

Flats, the foundational elements of set design, are often the first components constructed due to their role as the building blocks for walls, doors, and other vertical structures on stage. While adhering to the standard 4' x 8' dimensions for the flats, we introduced additional toggles to accommodate the varying sizes of the egg crates and ensure a secure fit. Additionally, we reduced the size of framing components like the rails, stiles, and toggles without compromising the overall structural integrity of the flats. This modification not only maintained the quality of the frames but also enhanced their strength.

Another notable variation in the construction process was the use of fastening tools and materials. Instead of using nails and hammers, which require a certain level of expertise or supervision, we opted for a staple gun to secure the crates to the frames. This streamlined approach allowed for quicker and more efficient construction with minimal specialised knowledge or oversight.

Painting

Typically, painting occurs after the flats are fully built, but due to our innovative approach, painting was done concurrently with frame construction. This was necessary because painting the

individual crates once they were affixed to the frames would have been impractical. Therefore, we strategically painted each crate individually and allowed them to dry before attaching them to the frames. The painting process did not require any special techniques or tools; we simply used readily available brushes and enlisted the help of numerous volunteers. The vibrant colours of the painted crates attracted even more people who were intrigued by the project and eager to contribute. Although the initial task of painting a large quantity of crates seemed daunting, the enthusiastic participation of volunteers made it an enjoyable and collaborative experience. Interestingly, the project's visibility even led to additional egg crate donations from community members.

Fig. 3: volunteers assisting with the painting

Source: Project pictures (2023)

Fig. 4: Painted egg crates being dried

Source: Project Pictures (2023)

Building the Set

In this phase, the individual flats are assembled to create the distinct locations identified in the play script. This stage demands proficiency in stage carpentry, as it involves intricate joinery and precise measurements to ensure accurate execution. The assembly process is meticulously guided by the floor plan and other theatre graphics, such as elevation drawings, which must be skilfully interpreted and implemented by the construction team. Drawing upon my expertise in stage carpentry, I collaborated with other qualified individuals who shared similar experience. This collaborative effort ensured a smooth and efficient assembly process, with minimal disruptions or challenges. The pictures below document the entire set building journey, starting from the bare stage and progressing through the various stages until the set takes its final shape.

Fig. 5: Crew members during the set construction

Source: Project Picture (2023)

Fig. 6: The Set gradually taking shape during the construction

Source: Project Picture (2023)

Fig. 7: Section of the constructed set

Source: Project Picture (2023)

Production

The production phase, the penultimate stage of the design process, brings the set to life. Upon completion of the set, I led rehearsals to ensure its functionality and safety. Technical rehearsals were carried out to rigorously test scene changes, as their seamless execution is vital. This phase involves a comprehensive assessment of the set's practicality, including the evaluation of entrances, exits, and its compatibility with lighting. Any necessary corrections or adjustments are made to optimise the set's performance and integration with all technical elements. After confirming the set's readiness, we stepped back to observe the play unfold within it. We remained on standby, prepared to address any unforeseen issues. The following images showcase the set design in action, depicting the four distinct locations of the play. The

sequence begins in a living room, an interrogation room, a court room then a prison yard.

Fig. 8: Actors playing within the constructed set

Source: Project Picture (2023)

Fig. 9: Actors in the interrogation room

Source: Project Picture (2023)

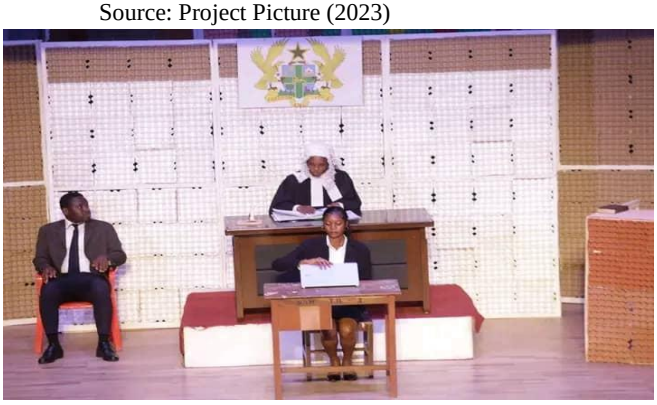

Fig. 10: A section of the courtroom

Source: Project Picture (2023)

Fig. 11: Prisoners playing in the prison yard

Source: Project Picture (2023)

Striking and Filing

A crucial activity within the production phase is the striking and filing process, encompassing the dismantling and storage of the set. Here, the advantages of repurposing materials became evident. Compared to traditional methods, striking and filing proved remarkably quicker and more efficient. The lightweight nature of the materials allowed a single person to easily carry a flat without assistance, streamlining the entire process. This approach, combined with the use of repurposed materials, significantly simplified striking and filing, underscoring the practical benefits of sustainable set construction.

Reflections

This section evaluates the practicality and suitability of discarded egg crates, cardboard boxes, and industrial polythene as sustainable alternatives to conventional set design and construction materials. The reflections are premised on portability, artistic viability, aesthetic appeal, cost-effectiveness, sustainability, and challenges. These parameters were chosen based on a literature review, practical considerations, and the project's goals, ensuring each parameter serves a specific purpose in the evaluation.

Portability

Portability, defined here as the ease with which objects can be moved and reconfigured, was a central consideration. The assessment of portability included the weight of the repurposed materials and modularity, evaluated through direct observation and feedback from participants.

Personal observation during the construction process revealed several advantages of the repurposed materials. The lightweight nature of these materials significantly expedited the construction of flats, as a single person could easily move and handle them, accelerating the overall pace. This streamlined construction reduced physical strain and saved valuable time.

Unlike conventional construction, which often demands a larger workforce or specialised skills, the repurposed materials simplified the process. A smaller construction crew could efficiently handle and manipulate the materials with minimal guidance. For example, attaching egg crates to flat frames was simpler than working with plywood, requiring only basic tools like knives and scissors instead of saws, hammers, and planes.

The inherent qualities of the materials facilitated easy manipulation. The interlocking grid structure of egg crates allowed for creating larger surfaces with minimal effort and simple glue joining, eliminating the complex carpentry techniques often needed with plywood.

Feedback from crew members corroborated these observations. One crew member initially expressed skepticism about using egg crates, associating them with fragility. However, their doubts were dispelled upon working with the materials. They noted that the egg crates were easy to arrange and fix onto frames, simplifying the construction process and allowing for faster, independent work. They also highlighted the ease of lifting and carrying completed flats, underscoring the materials' portability.

This experience highlights the portable potential of repurposed materials, challenging preconceived notions about their fragility. The ease with which a student with minimal construction experience adapted to these materials demonstrates their user-friendliness in set construction.

Artistic Viability

Evaluating the artistic viability of the repurposed materials involved testing their ability to withstand artistic processes and their compatibility with various artistic treatments, such as painting techniques and construction methods. The egg crates and cardboard demonstrated exceptional versatility, readily accommodating a wide range of painting techniques to achieve diverse visual effects. Both materials accepted paints well, allowing for techniques like flat wash and crosshatching. The egg crates' inherent textured surface added dimension to the flats.

While the repetitive pattern of the egg crates initially seemed limiting, their adaptability proved impressive. The successful application of various painting techniques with different paint colours was particularly rewarding. For instance, blending the crates' original brown colour with white for the courtroom flats created a harmonious effect, revealing the artistic potential within these repurposed materials.

Evaluating artistic viability also required considering the materials' strength under various construction methods. Their durability during construction is essential to their artistic potential. Key construction activities, such as sawing, fastening, and building, were examined.

Sawing, a major activity in set construction, involves splitting large materials for proper joining and fitting. In this project, while the selected materials were not as large as conventional ones, they still required sawing. For instance, egg crates and cardboard needed to be sawed to fit into flat frames, and polythene needed splitting. However, unlike conventional materials that require sophisticated saws, basic tools like scissors were sufficient, making the process faster and requiring less effort and labour.

Fastening, joining materials together, was another key activity. Instead of nailing, stapling was used, offering several advantages. Stapling required less physical effort than hammering, reducing strain on the crew and needing less manpower and expertise. Its ease of use sped up the construction process. Stapling was also well-suited to the materials, securely fastening egg crates and cardboard without damage.

Building the set, assembling individual flats to create the play's locales, was another major activity. This stage utilised the sawing and fastening techniques on a larger scale. Ensuring seamless fitting and stability required careful measurement and alignment. Despite the complexity, the materials proved robust and adaptable, allowing for adjustments. Their lightweight nature eased handling, and their flexibility enabled quick rectification of construction challenges. In the end, the materials withstood the construction process without major defects.

Aesthetic Appeal

The materials' compatibility and integration with other visual elements, such as lighting, costumes, and props, were tested, and their overall appeal to the production team and audience was assessed. The lighting designer found that the materials responded well to both warm and cool lighting schemes, enabling subtle shifts in mood and atmosphere. The egg crates and cardboard worked effectively with the lighting. However, washing the egg crates' surface with high-intensity par can light was avoided to preserve their distinctive texture. Warm-coloured lighting with controlled intensity was used instead. In the interrogation room, LEDs were used to avoid unwanted reflections from the black polythene under par cans. A lighting technician noted that the project introduced new materials and techniques and that the materials performed admirably. The set's neutral tones and subtle patterns complemented the actors' costumes. For example, in the courtroom scene, the black and white attire of the lawyers and judge contrasted beautifully with the set's warm brown and white hues, highlighting the egg crate surfaces' textures and accentuating the scene's formality and drama. The overall effect was visually balanced.

Fig. 12: Judge and clerks costume harmonising well with the set

Source: Project Picture (2023)

The creative reuse of egg crates extended beyond the set itself. We ingeniously repurposed them to construct major some of the stage properties (props), such as the witness box, further unifying the production's visual language. The witness box, a focal point of the courtroom scenes, stood as an artistic potential of these materials, demonstrating that even discarded objects can play a significant role in artistic expression.

Fig. 13: A witness in the witness box

Source: Project Picture (2023)

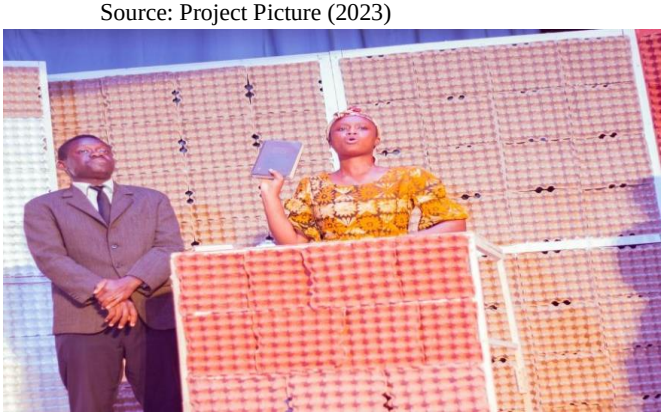

Fig. 14: Another witness in the witness box
Source: Project Picture (2023)

On the Aesthetic Appeal evaluation, generally the repurposed materials presented no challenges in terms of harmonising with other visual elements. Their versatility allowed for well integration with lighting, costumes, and props, demonstrating their potential to complement a wide range of aesthetic choices. This successful integration demonstrated the materials' compatibility with the aesthetical elements.

Cost-Effectiveness

One other key parameter in assessing the suitability of the repurposed materials was the cost-effectiveness of the selected materials. A comprehensive cost analysis was conducted, comparing the financial implications of using repurposed materials to those of conventional set-building materials. This analysis encompassed the expenses associated with acquiring, processing, and modifying the materials. To illustrate this comparison, I developed a budget for constructing a single flat using both repurposed and conventional materials. The budget specifically focused on the cost of materials for the flat itself, excluding other elements like paints. I then extrapolated these figures to determine the total cost of building the entire set required for the production of *Guilty*. The analysis aimed to isolate the financial impact of material choices in set construction.

Table 1: Budget for constructing one flat using plywood

Items	Quantity	Unit price	Cost
Wawa board for the frame	2	75	150
Plywood	1	75	150
2/4 Hardwood for braces	2	50	100
Nails	3″ (2 pounds)	15	30
	$1^{1/2''}$ (2 pounds)	15	30
Total			460

Source: Researcher construct

Budget for constructing one flat using discarded egg crates card boxes and polythene

Table 2: Budget for constructing one flat using discarded egg crates card boxes and polythene

Items	Quantity	Unit price	Cost
Wawa board for the frame	2	75	150
Discarded materials	Free	Free	N/A
2/4 Hardwood for braces	N/A	N/A	N/A
Nails	3″ (2 pounds)	15	30
	$1^{1/2''}$ (2 pounds)	N/A	N/A
Staple pins	1 box	20	20
Total			200

Source: Researcher construct

Extrapolation

Based on the tables, the cost of constructing one flat using conventional materials (plywood) is 460, while the cost using discarded materials is 200. This shows a significant cost reduction of 260 per flat when using discarded materials.

For the construction of 10 flats, the cost would be:

Conventional materials: 460 * 10 = 4600

Discarded materials: 200 * 10 = 2000

This demonstrates a substantial cost saving of 2600 when using discarded materials for 10 flats. All figures (amounts) quoted were prevalent as of May 2023 when the practical project was undertaken. While prices may have fluctuated since then, the fundamental conclusion remains unchanged: repurposing discarded materials for set construction is significantly more cost-effective than using conventional materials. A detailed comparison is presented in the table below.

Sustainability

In alignment with the United Nations' Sustainable Development Goal 12, which emphasises responsible consumption and production, this project aligns with eco-conscious alternatives to conventional set design practices prevalent in Ghanaian theatre practice. Conventional approaches often rely on materials and methods that contribute to environmental issues, such as resource depletion and waste generation. Therefore, in repurposing discarded egg crates, cartons, and polythene, this project explored a sustainable solution within the context of set design.

First, the project' focus on extending the life cycle of repurposed materials and diverting them from waste streams directly contributes to waste management and promotes a circular economy model. This alignment perfectly supports the theoretical framework for this thesis. Also, because conventional set materials often require the extraction and processing of natural resources, leading to environmental degradation. Repurposing discarded materials minimises the demand for new resources, thus conserving natural capital and reducing the overall environmental footprint of the production. Then, discarded egg crates, cartons,

and polythene can contribute to pollution and resource depletion when not properly managed.

Conclusion

This study has demonstrated the significant potential of repurposing discarded egg crates, cartons, and polythene as sustainable alternatives to conventional materials like plywood in set design practices in Ghana. The findings underscore the multifaceted benefits of these repurposed materials, including their lightweight nature, artistic versatility, cost-effectiveness, and environmental sustainability. By integrating these materials into set construction, the study not only addresses the logistical and financial challenges faced by theatre practitioners but also contributes to global sustainability efforts. The sustainability aspect of this approach cannot be overstated. As egg consumption continues globally, the supply of discarded egg crates remains abundant, providing a steady stream of raw materials for set design. This creates a circular economy where waste is transformed into valuable resources, reducing the environmental burden associated with landfill accumulation. By diverting these materials from waste streams, the theatre industry can play a pivotal role in promoting responsible consumption and production, aligning with Sustainable Development Goal 12. Moreover, the continued use of repurposed materials like egg crates alleviates the pressure on conventional materials such as plywood, which has well-documented environmental drawbacks. Plywood production contributes to deforestation, habitat loss, and pollution due to energy-intensive manufacturing processes and harmful adhesives. By adopting this novel approach, set designers can significantly reduce the demand for plywood, thereby mitigating its adverse environmental impacts. This shift not only preserves natural resources but also fosters a culture of innovation and environmental stewardship within the creative arts. The success of this project serves as a compelling call to action for set designers and theatre practitioners to embrace repurposed materials as a standard practice. By doing so, they can lead the way in sustainable theatre production, setting an example for other industries to follow. The artistic and practical viability of these materials has been proven, and their adoption can pave the way for a more sustainable and economically viable future in set design.

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