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Descriptive Study of Reverse Logistics Activities and Ceramic Waste Innovation at PT. Lucky Indah Keramik

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Abstract
This study aims to analyze the implementation of reverse logistics in handling ceramic tableware products at PT. Lucky Indah Keramik, from end users back to the company. This activity provides benefits such as waste reduction, product cycle optimization, resource utilization, and improved customer satisfaction. The research method uses a descriptive approach, analyzing five dimensions: What, How, Who, Where, and Why and Why Not to evaluate the company's reverse logistics practices. The results indicate that PT. Lucky Indah Keramik has established clear return procedures, covering inspection flow, reverse logistics design, stakeholders, locations, motivations, obstacles, and corrective actions. The company also strives to optimize reverse logistics through reuse, repair, remanufacturing, and recycling to create an efficient and eco-friendly industry. Unusable ceramic waste is repurposed as aggregate material or handicrafts, minimizing environmental impact. The study concludes that PT. Lucky Indah Keramik's reverse logistics system operates systematically, supporting operational efficiency and environmental sustainability.
Keywords: *dimension descriptive study, environmental sustainability, pt. lucky indah keramik, reverse logistics*

Abstrak
Penelitian ini bertujuan untuk menganalisis implementasi *reverse logistics* dalam penanganan produk *tableware* keramik di PT. Lucky Indah Keramik, dari *end user* kembali ke perusahaan. Aktivitas ini memberikan manfaat seperti pengurangan *waste*, optimalisasi siklus produk, pemanfaatan sumber daya, serta peningkatan kepuasan pelanggan. Metode penelitian menggunakan pendekatan deskriptif dengan analisis lima dimensi: *What, How, Who, Where, dan Why and Why Not* untuk mengevaluasi praktik *reverse logistics* perusahaan. Hasil penelitian menunjukkan bahwa PT. Lucky Indah Keramik telah memiliki prosedur yang jelas dalam pengembalian produk, mencakup alur inspeksi, desain *reverse logistics*, pelaku, lokasi, motivasi, kendala, dan tindakan perbaikan. Perusahaan juga berupaya mengoptimalkan proses *reverse logistics* melalui praktik *reuse, repair, remanufacturing, dan recycle* guna menciptakan industri yang efektif dan ramah lingkungan. Limbah keramik yang tidak layak pakai dimanfaatkan sebagai bahan agregat atau kerajinan, mengurangi dampak lingkungan. Penelitian ini menyimpulkan bahwa implementasi *reverse logistics* di PT. Lucky Indah Keramik telah berjalan sistematis, mendukung efisiensi operasional dan keberlanjutan lingkungan.
Kata Kunci: *dimensi studi deskriptif, keberlanjutan lingkungan, pt. lucky indah keramik, reverse logistics*

1. Introduction
In the globalization era, increased industrial activities have led to significant growth in waste generation. One developed solution to address waste problems is the implementation of Reverse Logistics (RL), which aims to manage product returns and waste from consumers back to manufacturers for reuse, recycling, or more environmentally friendly disposal [1]. The RL concept has been applied in various industries, including pharmaceuticals, where expired drug returns present major challenges in pharmaceutical waste management [2]. A study at PT Surya Dermato Medica Laboratories demonstrated that RL implementation in the pharmaceutical industry plays a crucial role in reducing waste and improving efficiency in managing returned drug logistics [2, 3].

Beyond pharmaceuticals, RL has been implemented in mining. For instance, RL systems in iron ore mining allow the reuse of mining waste, thereby reducing negative environmental [4]. Similar models have been applied in e-waste management, where Life Cycle Assessment (LCA) approaches have been used to evaluate the environmental impact of RL systems for e-waste processing in Brazil [5]. In construction, waste materials like concrete and ceramics can be reprocessed through RL to create new products. Studies on RL in construction show that implementing this system can significantly reduce environmental impact while improving resource use efficiency [5, 6].

The ceramic industry faces similar waste management challenges. A study on green supply chains in India's ceramic industry revealed that regulatory and market pressures are key factors driving companies to adopt RL concepts to improve operational efficiency and sustainability [7, 8]. Various innovations have been developed for ceramic waste utilization. Research has proven that ceramic waste can be used as aggregate in paving blocks and concrete, improving mechanical properties like compressive strength and wear resistance [6, 8]. Additionally, using ceramic waste as a concrete mixture additive shows positive results in increasing compressive strength up to a certain percentage, beyond which strength decreases due to excessive waste content [9]. In creative industries, ceramic waste can be repurposed as raw material for handicrafts. A study in Bayat demonstrated that well-managed ceramic waste can be transformed into various economically valuable products like accessories and souvenirs [10].

Regarding supply chain efficiency, research on risk management in the ceramic industry highlights the importance of effective logistics management to reduce outsourcing risks and enhance industrial competitiveness [3]. Despite RL's well-documented benefits across industrial sectors, implementation still faces challenges including technical barriers, costs, and infrastructure limitations [11]. Therefore, more comprehensive approaches are needed to address these challenges and improve RL effectiveness across industries.

PT. Lucky Indah Keramik is a ceramic tableware manufacturer producing plates, bowls, and other dinnerware items used by households, restaurants, and food vendors, with various designs, sizes, shapes, and types. Product returns at PT. Lucky Indah Keramik include Common Collection, Emboss Collection, and Elegant Collection items. With increasing production, PT. Lucky Indah Keramik faces challenges in managing production waste and defective products. Improper handling of this waste could negatively impact the environment and the company's operational efficiency. Product returns occur due to shipping errors and damage during distribution to retailers and consumers. Products categorized for reverse logistics may result from several factors including rejects, transport or material handling damage, packaging issues, government/company return policies, or product obsolescence. Additionally, growing consumer awareness of sustainable business practices demands more environmentally friendly strategies from companies [12].

Reverse Logistics activities can be described using a descriptive study framework based on 4W+1H dimensions (What, How, Who, Where, Why and Why Not) [13, 14]. This approach explains return efforts, risks, and barriers in RL based on company occurrences and internal documents like records, forms, customer questionnaires, and company policies. This research will examine RL activities at PT. Lucky Indah Keramik where products returned from consumers or retailers travel back through distributors to the company for reuse, repair, and recycling. The reprocessed products are then resold, with ceramic waste being innovatively repurposed for optimal efficiency.

The study aims to analyze and describe RL activities in the ceramic industry while examining innovations in ceramic waste utilization. Theoretically, it will contribute to RL literature in the ceramic sector and waste repurposing. Practically, it can guide ceramic industries in implementing more effective RL strategies to improve operational efficiency and reduce environmental impact from waste generation.

2. Material and Methods

Location and Time Research

This study was conducted in December 2024 at PT. Lucky Indah Keramik, a leading Indonesian manufacturer of ceramic tableware (plates, bowls, and cups in various designs and dimensions). The company is headquartered in Tangerang, Indonesia. The research utilized four months of historical product return data (August-November 2024), providing a representative sample of reverse logistics (RL) activities during peak operational periods.

Research Design and Framework

The study employs a descriptive research design using the 4W1H framework (What, How, Who, Where, Why and Why Not) to systematically examine reverse logistics processes. Reverse logistics in this context refers to the process of planning, implementing, and controlling the efficient, cost-effective flow of finished goods and related information from end users, retailers, and distributors back to the manufacturing facility. Primary data was collected through semi-structured interviews with supply chain personnel and direct observations of return handling procedures. Secondary data sources included internal company documents (return forms, inspection reports) and academic literature on reverse logistics in manufacturing sectors.

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Flow Chart

The research was conducted through a series of structured stages. The initial stage involved a preliminary study encompassing literature review, field study, and problem formulation to establish a clear research direction. Subsequently, data collection was carried out using both primary and secondary sources. Primary data were obtained through brainstorming sessions and interviews with relevant stakeholders, while secondary data consisted of scientific publications and quantitative data. The data processing phase began with designing the reverse logistics flow and mapping the inspection process for returned products, followed by a comprehensive 4W1H analysis (What, How, Who, Where, Why, and Why Not) to examine variables related to reverse logistics, defined as the process of planning, implementing, and controlling the efficient flow of returned goods. Finally, conclusions and recommendations were drawn based on the findings from the previous stages of the research. It is shown in **Figure 1** below.

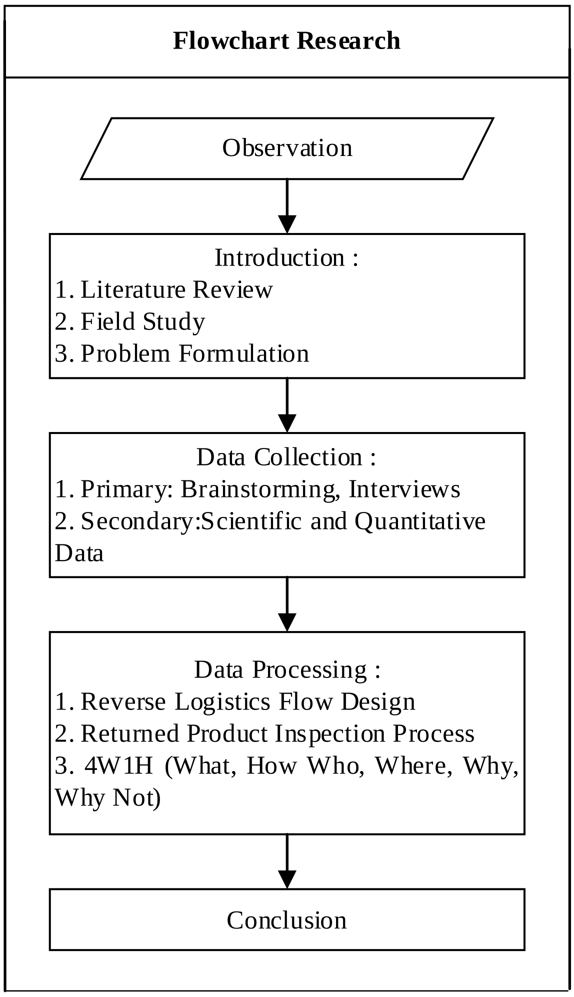

Fig. 1: Flow Chart
Source: Researcher (2025)

3. Results and Discussion

Reverse Logistics Concepts

Reverse Logistics (RL) is a strategic management concept that involves the process of retrieving products from consumers or downstream supply chain partners back to manufacturers to recover remaining value [15]. This approach serves three key purposes: minimizing natural resource consumption through the utilization of secondary materials, reducing waste-related challenges, and complying with environmental regulations at international, regional, and national levels [16]. Products enter reverse logistics systems for various reasons including manufacturing defects, transportation damage, packaging issues, regulatory requirements such as product recalls, or when reaching their end-of-life stage [17]. It should be noted that returned products do not necessarily go back to the original manufacturer but may be processed at authorized service centers for repair or value recovery [18].

The reverse supply chain encompasses a series of integrated activities involving product returns from end-users or repair processes [19, 20]. Current research identifies four critical components of this system: product recall management, material replacement protocols, reverse material flows for returns processing, and value recovery operations including repair, remanufacturing and recycling [21]. This framework highlights that reverse supply chains must address three fundamental challenges: handling defective products, managing material replacement logistics, and coordinating complex recovery processes that involve returns authorization, quality inspection, reconditioning and material reprocessing [22]. The system requires careful management to optimize value recovery while meeting both economic and environmental objectives.

Framework/Desain Reverse Logistics

The reverse logistics framework represents an integral component of sustainable supply chain management by facilitating the backward flow of goods from end consumers back to the point of origin. In traditional forward logistics, products move linearly from the manufacturer (company) to the distributor, then to retailers, and ultimately to consumer [15]. However, reverse logistics emphasizes the retrieval of used, defective, or surplus products from consumers and their reintegration into the supply chain. This reverse flow includes activities such as product returns, repairs, remanufacturing, recycling, and proper disposal [19]. The diagram underscores the multidirectional nature of logistics: while forward logistics delivers products to the market, reverse logistics enables the recovery of value and the reduction of environmental impact. By implementing an effective reverse logistics system, companies can improve operational efficiency, enhance customer satisfaction, and contribute to circular economy principles.

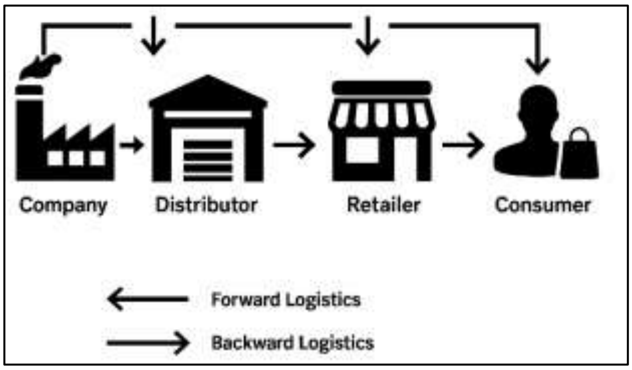

Fig. 2: Framework Design of PT. Lucky Indah Keramik
Source: Analysis Result (2025)

The production process of ceramic

The production process of ceramic tableware utilizes raw materials such as clay, silica sand, and feldspar, which are then processed through a series of complex stages including forming, cooling, firing, glazing, and quality control. These processes are carried out in accordance with ISO 9001:2015 Quality Management Certification and Indonesian National Standards (SNI) [23]. Ceramics are high-value artistic products created by artisans either manually or with the aid of forming tools. The final evaluation of a ceramic piece can only be conducted after the firing process. It is common for ceramic products to crack or break, which is often caused by improper production techniques, insufficient drying stages, or damage during transportation and manual handling.

Product Inspection Activities

The return data collected at PT. Lucky Indah Keramik is analyzed to understand the inspection activities carried out for returned products. As illustrated in **Figure 3**, products returned from retail stores or end users undergo an initial visual inspection to determine the type and extent of damage, as well as the appropriate course of action. If the product is found to be broken or has structural defects, such as cracks or dimensional inconsistencies, it is directed to the recycling stage to be processed into raw materials. These recycled materials are later used for remanufacturing new products. Conversely, if the defect lies in the glaze layer or surface appearance, the product is routed for repairing and restoration processes.

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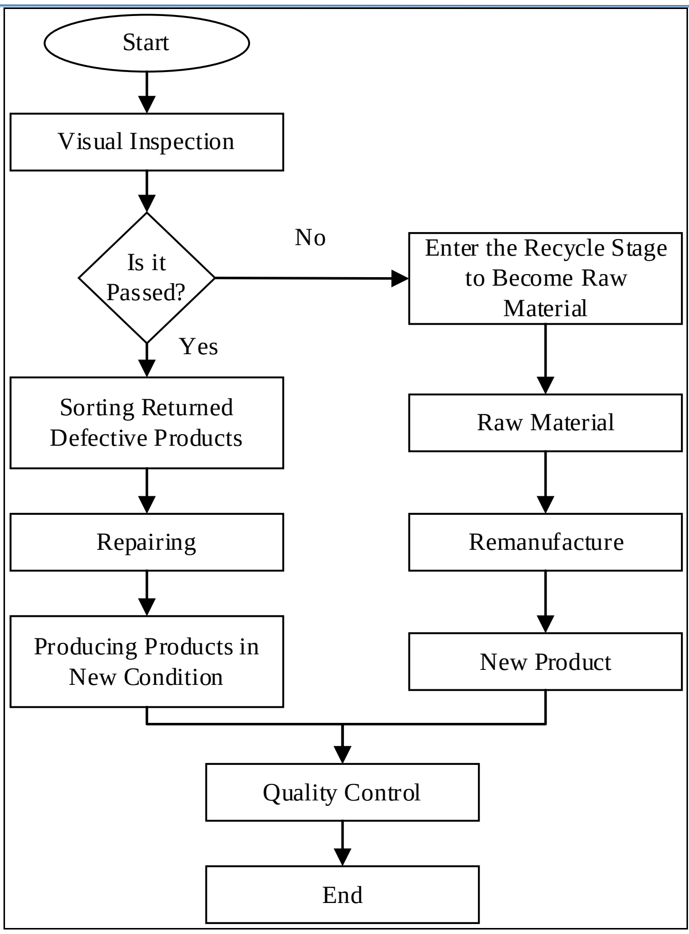

Fig. 3: Diagram Flow of Product Inspection Activities
Source: Analysis Result (2025)

Descriptive Study of the "What" Dimension (Product)

Below is **Table 1** which shows a list of defective products returned to the company.

Table 1. List of Returned Products Defects

Period	Production Volume (pcs)	Defective Product		
		C (%)	BP (%)	EBS (%)
August	12.500	5,09	5,57	3,77
September	12.500	4,78	3,79	3,45
October	12.500	4,07	3,68	4,14
November	12.500	2,38	1,33	0,77
Sum	50.000	16,32	14,37	12,13

Source: PT. Lucky Indah Keramik (2024)

PT. Lucky Indah Keramik is a ceramic tableware manufacturer engaged in a reverse logistics system that facilitates the return and reprocessing of certain defective products. These activities are designed to optimize the product cycle from manufacturer to end user and back. The quantity of returned products from August to November 2024 is shown in Table 1, where defect rates are categorized into three types: C (cracks), BP (base glaze peeling), and EBS (edge breakage or sticking during kiln firing).

Despite the company implementing rigorous production and quality control measures based on ISO 9001:2015 and Indonesian National Standards (SNI), post-distribution product damage still occurs. These defects are commonly caused by factors such as transportation issues, environmental conditions, or human error. Therefore, the company endeavors to address these challenges by adopting corrective measures through repair, reuse, and recycling of the defective products returned via reverse logistics mechanisms.

The "How" Dimension (Activities and Processes)

This dimension outlines the core activities within the reverse logistics process, including return collection and product recovery actions at PT. Lucky Indah Keramik. The "how" component focuses on capturing value from returned goods and ensuring their proper disposition. As shown in **Table 2**, the return process typically begins with a product return request, followed by inspection and classification to determine the appropriate action—reuse, repair, or recycle. Returns due to miss delivery are redirected to the finished goods inventory after passing inspection, while returns due to physical defects (e.g., cracks, base peeling, or edge breakage) are handled differently.

Table 2. Reasons and Actions for Returning Goods from PT Lucky Indah Keramik

No	Cause of Return of Goods	Company Actions
1	Return due to wrong delivery	Return to finished product warehouse stock (if QC inspection results meet specifications)
2	Returns due to damaged goods	Collected by the retailer and repacked (if the QC inspection results meet the specifications, if not then the reuse, repair or recycle process will be carried out)

Source: Analysis Result (2025)

Retailers play a crucial role by collecting and repacking the defective items before sending them to distributors. These are then forwarded to the manufacturer for thorough inspection and subsequent handling based on the product's condition. The aim is to reintroduce viable goods into the supply chain or extract value from damaged products through proper recycling.

The "Who" Dimension (Actors and Stakeholders)

This dimension identifies the key actors involved in the reverse logistics ecosystem, including suppliers, product owners, users, collectors, processors, customers, and initiators. Each actor assumes distinct roles, ranging from management to operational execution of reverse logistics activities. The flow of returned goods at PT. Lucky Indah Keramik is depicted in **Figure 4.**

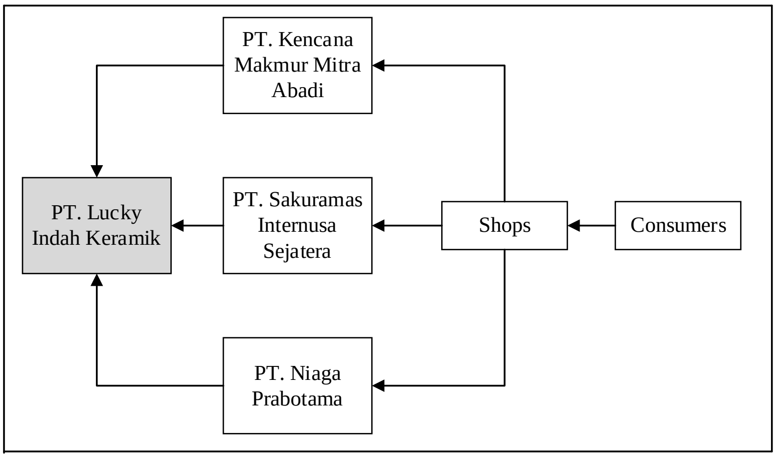

Fig. 4: Diagram Flow of Product Inspection Activities
Source: PT. Lucky Indah Keramik (2024)

Consumers may return defective products to retailers, who aggregate them for redistribution. Defective items can originate from either consumers or during transit from distributors to retailers. Once collected, the products are redistributed by three designated distributors such as PT. Kencana Makmur Mitra Abadi, PT. Sakuramas Internusa Sejatera, and PT. Niaga Prabotama back to the manufacturer for repair, reuse, or recycling processes. This integrated flow ensures accountability and traceability across the reverse logistics chain.

The "Where" Dimension (Physical Network Structure)

The physical structure of the reverse logistics network is critical for the effective coordination of returned product flows. This dimension involves retailers, distributors, and processing facilities where returned goods are evaluated and handled. **Table 3** presents the geographical and operational structure of PT. Lucky Indah Keramik’s reverse logistics network, where retailers, distributors, and processing units are spatially distributed.

Table 3. Location of Reverse Logistics Activity Actors at PT. Lucky Indah Keramik

Who's	Actors	Location
Company	PT. Lucky Indah Keramik	Tangerang
Distributors	PT. Kencana Makmur Mitra Abadi PT. Sakuramas Internusa Sejatera PT. Niaga Prabotama	West Jakarta Tangerang South Tangerang
Retailers	Glassware Shop Kitchen Equipment Shop Mall	Spread All Around Indonesia
End User	Consumen	Spread All Around City in Indonesia

Source: PT. Lucky Indah Keramik (2024)

The returned goods typically ceramic finished products are collected by retailers and transported through designated distributors to the manufacturer for inspection and potential reuse. The locations and roles of these actors directly influence the efficiency of return logistics, including transportation time, cost, and environmental impact. An optimized network ensures seamless integration of forward and reverse logistics systems.

The "Why and Why Not" Dimension (Drivers, Return Reasons, and Barriers)

This dimension explores the driving forces behind a company or individual's involvement in reverse logistics, along with the challenges experienced by PT. Lucky Indah Keramik. The decision to engage in reverse logistics is influenced by several key factors: economic, corporate policy, environmental concerns, and operational obstacles.

a. Economic Factors

Economic motivations are among the most prominent drivers of reverse logistics implementation. **Table 4** shows the cost of product loss based on the number of defects recorded between August and November 2024. During this period, the company incurred a total loss of Rp. 65,312,000, with an average return cost of Rp. 16,328,000. These figures highlight the significance of reverse logistics as a cost-control strategy. By sorting defective products for recycling or repair, PT. Lucky Indah Keramik can recover value from damaged goods, thus minimizing financial losses associated with production and distribution inefficiencies.

Table 4. Product Loss Cost Based on Number of Defects

Period	Total Defect	Cost/Product
August	636	Rp. 20.352.000
September	598	Rp. 19.136.000
October	509	Rp. 16.288.000
November	298	Rp. 9.536.000
Total Return Fee Period August-November		Rp. 65.312.000
Average Return Value Period August-November		Rp. 16.328.000

Source: Analysis Result (2025)

b. Corporate Policy Factors

PT. Lucky Indah Keramik is committed to a set of core values that prioritize accountability and high-quality manufacturing practices. The company's policy of producing goods that meet strict market and specification standards encourages a proactive stance in managing product returns. Consumer demand for flawless and high-quality products necessitates serious attention to reverse logistics operations. Through consistent monitoring and handling of returns, the company aims to maintain customer satisfaction, uphold brand reputation, and ensure that only high-quality products remain within the distribution channels. Reverse logistics, therefore, becomes a strategic tool to support continuous quality improvement and customer-centric service.

c. Environment Factors

Environmental sustainability also serves as a significant motivator for reverse logistics. The reuse and recycling of returned products and production waste allow the company to reduce its environmental impact. Solid ceramic waste, for instance, can be reprocessed into raw materials for new ceramic production, offering both ecological benefits and added value to the company. This approach aligns with the principles of circular economy and contributes to sustainable manufacturing practices.

d. Barrier to Implementation

Despite its benefits, PT. Lucky Indah Keramik faces several obstacles in implementing an effective reverse logistics system. The barrier contains of the need for dedicated storage facilities for returned products poses logistical challenges, a lack of alternative reverse logistics process designs limits the company's ability to assess and optimize efficiency and high operational costs which driven by transportation, storage, and managerial expenses—create financial constraints that hinder seamless implementation.

Ceramic Waste Innovation

PT. Lucky Indah Keramik is also exploring innovative uses for ceramic waste. Solid ceramic scraps, often generated as off-cuts during production, can be repurposed into concrete mixtures, which traditionally consist of fine aggregate (sand), coarse aggregate (gravel/crushed stone), cement, water, and, if necessary, admixtures. These ceramic fragments can serve as substitutes for coarse aggregates in paving block production, creating a sustainable and cost-effective construction material. Moreover, ceramic waste can be transformed into handicrafts by local artisans, promoting community-based industries and contributing to environmental conservation efforts. Examples of such craftwork are illustrated in the accompanying of **Figure 5**.

Fig. 5: Innovation Ceramic Waste to Craftwork
Source: Astuti (2008)

4. Conclusion

In conclusion, this study highlights that reverse logistics provides significant benefits, including waste reduction, product optimization, efficient resource utilization, and enhanced customer satisfaction and trust. PT. Lucky Indah Keramik has made notable efforts to implement reverse logistics activities in pursuit of a more efficient and environmentally friendly industrial ecosystem. The findings indicate that the company has established a clear and structured return process within its reverse logistics operations. The reverse logistics design flow at PT. Lucky Indah Keramik reflects both forward and backward distribution channels, demonstrating a reciprocal flow of goods. Furthermore, innovations in ceramic waste management show promising potential, as solid ceramic waste can be repurposed as aggregate material for the production of new products such as concrete, paving blocks, or handcrafted items, offering additional economic and environmental value.

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