An Analysis of Economic Viability of Bell Metal Production in Sarthebari of Assam

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Abstract: One of the oldest traditions in Sarthebari, Assam, is the manufacturing of Kah (bell metal), which connects indigenous artisan economy with cultural legacy. From the time of ancient kings to the present day status the industry provides livelihood to lots of people in the region. This study provides a detailed economic comparison of conventional copper-tin alloy casting costs and modern industrial production processes. The study investigates the costs of raw materials, labor, energy use, and equipment investments using primary data gathered from structured interviews with regional artisans and secondary data from government records and commodities exchanges. Although industrial technologies lower unit costs through mechanization, the cultural value and market share of handcrafted products allow for higher prices, enhancing artisan livelihoods. The study also evaluates how global copper and tin price changes affect production costs, as well as the significance of regulatory interventions and sustainable tourism initiatives in supporting the traditional sector. The study concludes that a balanced strategy that sustains the artisanal skills essential to Sarthebari's Kah production while embracing selective technology is required.

Keywords: Bell Metal Industry, Production & Cost Analysis, Economic Viability.

1. Introduction

Bell metal fabrication, an ancient form of craftsmanship that has been carried up through the ages, is well-known custom in Sarthebari, a small town in Assam, India. Bell metal, an alloy composed mostly of copper (around 78–80%) and tin (20–22%), is used to make musical instruments, ceremonial artifacts, utensils, and ornaments. There is great cultural significance to these relics. However, the proliferation of modern manufacturing techniques, variations in raw material pricing, and global market forces have drastically changed the economic scenario for these crafts.

Bell metal craftsmanship in Sarthebari is more than just a craft; it signifies a community's identity and expertise that has evolved over ages. Historically, artisans used manual procedures that involved small furnaces, hand tools, and time-consuming processes. The process, which begins with alloy preparation and progresses to casting and polishing, necessitates specialized skills that are generally passed down through families or guilds. In contrast, modern industrial procedures use automated furnaces, CNC machines, and mechanized casting techniques, considerably lowering manufacturing time and cost.

The industrialization of metal items in recent years has culminated in competitive market prices. Economies of scale are advantageous for mass-produced goods, but they often compromise the

genuineness and cultural significance of handcrafted goods. As consequently, there have emerged two markets: one that prioritizes cost-effectiveness and the other that emphasizes indigenous and cultural value. The purpose of this study is to determine if conventional approaches can continue to be profitable in the face of current industrial challenges.

2. Objectives:

The main objectives of this study are:

I. To evaluate the financial aspects of industrial procedures versus traditional bell metal casting.

II. To examine the effects on overall profitability of changes in the price of raw materials, specifically copper and tin.

III. To evaluate traditional product price and market demand in relation to industrial alternatives.

IV. To explore policy interventions that could support artisans and promote sustainable tourism and export opportunities.

3. Significance of the study:

The role of artisanal crafts in local economies is crucial, and the viability of bell metal production has broader implications for cultural preservation and rural development. As government bodies advocate for heritage conservation and sustainable tourism, the findings of this paper aim to guide future efforts to safeguard this traditional industry. Moreover, understanding the economic trade-offs between traditional and mechanized production methods could serve as a model for other artisanal sectors in India and other developing economies.

4. Literature Review:

Historical and ethnographic study has extensively documented Assam's bell metal production tradition. Choudhury (2010) and Dutta (2013), among others, have shown how the craft developed in combination with regional practices. The elaborate patterns on bell metal objects reflect an apparent connection between regional customs and metalworking abilities. These studies also show that conventional techniques are getting fewer prevalent, primarily because younger generations are reluctant to work hard for a small sum of money.

The dual problem of maintaining cultural legacy and attaining financial viability is frequently covered in economic study on India's handicraft businesses. According to studies by Mehta (2018) and Banerjee and Sarkar (2016), industrialization increases production efficiency but frequently hinders from the inherent enticement of handmade goods. Research indicates that people are prepared to pay more for original bell metal products, but traditional methods are becoming more expensive, posing a challenge for profitability.

Cost comparisons between traditional and industrial manufacturing processes have been investigated in numerous industries, including textiles and pottery. The literature agrees that industrial processes can greatly reduce labor and energy costs, but at the sacrifice of product uniqueness and market distinctiveness (Rao and Singh, 2017). The study stresses the need for additional specific studies into the economic feasibility of bell metal manufacturing in Sarthebari, specifically the influence of global variations in prices on artisan profitability.

Government interventions, including raw material subsidies, skill development programs, and marketing assistance, have been the key in sustaining traditional industries. Reports from the Ministry of MSMEs and local bodies in Assam stress the importance of policy measures that balance modernization with cultural preservation. When combined with sustainable tourism

strategies, these initiatives can help create a niche market that supports the longevity of bell metal crafts.

5. Methodology and Data Collection:

This study used a combination of methods, which incorporates quantitative cost analysis with qualitative insights from personal interviews and surveys. The sources of primary and secondary data are as follows:

Primary Data:

Artisan Interviews: Structured interviews were conducted with 30 artisans from Sarthebari to gather detailed information on labor costs, production times, and challenges.

Field Surveys: A survey of 100 local craft shops and tourism outlets provided data on pricing, consumer preferences, and sales volumes.

Observational Studies: On-site visits were made to document traditional casting methods, time inputs, and resource utilization.

Secondary Data:

Commodity Prices: Price data for copper and tin were obtained from the London Metal Exchange (LME) and the Multi Commodity Exchange (MCX) in India.

Government Reports: Data from the Assam Handicrafts Board and the Ministry of MSMEs provided context on production volumes and exports.

Academic Journals: Previous research on artisanal production and economic studies in rural India was reviewed to provide a theoretical framework.

Data Analysis Techniques:

The study employed cost-benefit analysis and comparative modeling to assess the economic viability of traditional versus industrial methods. Specific techniques included:

Cost Breakdown Analysis: Categorizing production costs into raw materials, labor, energy, and equipment.

Sensitivity Analysis: Assessing how raw material price fluctuations affect overall production costs.

Comparative Tables: Comparing traditional and industrial costs, production times, and profitability.

Qualitative Content Analysis: Thematic coding of interview responses to identify recurring challenges and opportunities.

Assumptions and Limitations:

The analysis is based on several assumptions:

Stable Exchange Rates: Exchange rate variations were assumed to be minimal for converting international prices.

Representative Sampling: The artisans and shops surveyed were assumed to be representative of the wider Sarthebari community.

Time Constraints: Data reflects conditions during the study period and may not fully represent long-term economic trends.

The study has limitations, including potential biases in self-reported data and the difficulty in isolating the effects of modernization from broader economic variables. Despite these limitations, the mixed-methods approach offers a solid framework for understanding the economic dynamics involved.

6. Data Analysis and Findings:

Raw Material Costs: Copper and Tin

Bell metal's composition relies on a steady supply of copper and tin. Over the past five years, both metals have seen price fluctuations due to global demand, mining output, and geopolitical

factors. Copper prices have risen by about 53%, while tin prices have increased by 32%, significantly affecting production costs, particularly for tin.

Production Cost Breakdown

The study analyzed four main cost components:

a) Raw Material Cost
b) Labor Cost
c) Energy/Fuel Cost
d) Equipment and Overhead Cost

Table 1: Cost Structures (Per Unit)

Component	Traditional (₹)	Industrial (₹)
Raw Materials	650	620
Labor	250	80
Energy/Fuel	50	120
Equipment/Overhead	50	200
Total Cost	**1,000**	**1,020**

Source: authors' estimation

Traditional Production Costs

Traditional casting methods, requiring skilled labor and manual processes, result in higher labor costs but lower capital investment.

Industrial Production Costs

Industrial methods, with significant investments in technology and machinery, reduce labor costs but incur higher upfront capital costs.

Market Pricing and Revenue Analysis

Traditional products are priced between ₹1,200 and ₹1,500 per unit, while industrial products are priced around ₹1,000. Traditional items generate higher profit margins due to consumers' willingness to pay more for authenticity, despite higher production costs.

Artisan Income and Economic Impact

Master craftsmen earn approximately ₹40,000 per month, skilled workers earn about ₹25,000 and helpers make around ₹12,000 monthly, highlighting the economic viability of traditional crafts despite rising raw material prices and competition from industrial production.

Sensitivity Analysis: Impact of Raw Material Price Fluctuations

A 10% increase in raw material prices would raise the cost of traditional production from ₹900 to ₹950 per unit, while industrial production costs would rise from ₹830 to ₹878 per unit. This suggests industrial methods are slightly less sensitive to price fluctuations.

Interpreting the Cost Dynamics

Industrial production offers cost savings mainly through mechanization and bulk purchasing but sacrifices product uniqueness. Traditional methods, while more expensive per unit, carry cultural value that appeals to certain consumer segments.

Market Differentiation and Consumer Preferences

A significant portion of consumers values the authenticity of handcrafted products, even at a premium price. Mass-market buyers prioritize cost, but both production methods can coexist if targeted at distinct markets.

7. Policy Implications and Strategic Recommendations:

Critical policy measures include:

- Raw material subsidies for traditional artisans.
- Skill enhancement programs to integrate modern tools without compromising traditional quality.
- Promotion of bell metal as a cultural heritage product through sustainable tourism.

- Financial support, such as microcredit schemes, to help artisans upgrade equipment.

Limitations and Future Research Directions:
Future research could explore hybrid models of production, combining traditional and modern methods to maintain cultural integrity while improving efficiency.

8. Conclusion:

The economic viability of bell metal production in Sarthebari relies on balancing traditional craftsmanship with modern production techniques. Industrial methods offer lower unit costs, but traditional products still command a premium due to their cultural and artisanal value. Key findings suggest that with the right policy support, traditional production can remain competitive, offering a sustainable path forward for the craft.

9. Recommendations:

The following recommendations are proposed:
1. Implement Raw Material Subsidies: To ease the impact of volatile raw material prices.
2. Promote Skill Development and Hybrid Production: Through training programs that combine traditional techniques with selective modernization.
3. Enhance Market Access Through Sustainable Tourism: By promoting the cultural significance of bell metal products.
4. Facilitate Financial Support: Providing access to loans and credit for equipment upgrades.
5. Monitor and Regulate Raw Material Markets: To stabilize industry conditions.
6. Encourage Collaborative Research: To study the integration of technology with traditional production.

By implementing these recommendations, stakeholders can help ensure the preservation of Sarthebari's bell metal craft for future generations.

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