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# Supply Chain Analysis of the Blacksmithing Industry in San Nicolas, Ilocos Norte, Philippines

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**Abstract**

This study conducted a supply chain analysis of the blacksmithing industry in San Nicolas, Ilocos Norte, Philippines, using a descriptive research design. The research aimed to evaluate supply chain management (SCM) practices, identify challenges, and propose strategies for the industry. The study employed supply chain mapping to visually represent the processes of sourcing and procurement, production, distribution, and marketing. San Nicolas, renowned for its blacksmithing heritage, served as the study area, with a focus on active blacksmiths in Brgy. 9, 10, and 11 who had operated for at least one year. Initially, the study identified 15 blacksmiths, but upon verification, it revealed that three had ceased operations; four additional blacksmiths, referred by peers, were included to ensure comprehensive insights. The study employed total enumeration sampling method to cover the entire population of active blacksmiths in the area. Structured surveys collected data, using mean scores to evaluate the level of supply chain practices and the severity of supply chain problems. Findings revealed that supply chain practices were moderately implemented, and supply chain problems were generally not at all a problem. A supply chain map for bolo (buneng) production was developed, and strategies such as cultural branding and marketing, product diversification, and enhanced market access in blacksmithing were proposed to strengthen the industry.

**Keywords:** Blacksmithing Industry Supply Chain, San Nicolas Ilocos Norte, Supply Chain Management Practices

## Introduction

Filipino culture and history depended on traditional industries like blacksmithing. These artisanal methods laid the groundwork for technical advancement throughout industries. However, modernization has reduced many old traditions, endangering important cultural assets. Maintaining these old industries is important for cultural preservation and technical advancement. Thus, revitalizing and maintaining decreasing sectors like blacksmithing is crucial for preserving the Philippines' cultural identity and fostering innovation (Bañez, 2019).

Gujja (2022) claims that blacksmithing creates jobs and boosts the economy by making and maintaining agricultural equipment and other blacksmithing products. These instruments improve agricultural efficiency and speed while reducing production costs by using staff more efficiently. The San Nicolas, Ilocos Norte blacksmithing supply chain is understudied despite its importance.

A historic town in Ilocos Norte, San Nicolas contains potters, tinsmiths, and blacksmiths. Bolos (buneng) and serrated sickles (kumpay) are among the items blacksmiths make. With the Damili industry, this blacksmithing sector sustains San Nicolas' cultural tradition and pays residents (Ferlin, 2014). The San Nicolas LGU is vital to blacksmithing preservation and promotion.

Blacksmithing is an important craft in San Nicolas, Ilocos Norte, where pandays still work to craft tools from iron ore. The Spanish introduced blacksmithing as a home industry in 1617 to boost the local economy beyond just agriculture. Blacksmithing skills are passed down generationally within families, who began training and became renowned for their finely crafted blades. The various blades and tools crafted by pandays have many uses for agriculture, cooking, and mountaineering both within San Nicolas and other provinces (Cruz, 2022).

The LGU funds, trains, and educates local blacksmiths, according to San Nicolas' senior tourist officer. Since 2019, the LGU has required San Nicolas Elementary School to teach blacksmithing and allocated space at the Museo San Nicoleno to display its history.

Like many traditional industries, the San Nicolas, Ilocos Norte blacksmithing industry faces modernization, marketing restrictions, technical advances, and a labor scarcity. Kumar and Buescher (2017) discovered that labor shortages boost technology use, which raises operational costs, lowers flexibility, and hinders innovation. Management may be difficult with a less efficient supply chain. An aging population, skill mismatch, rising labor expenses, and a reduction in qualified workers also contributed to manufacturing labor shortages, according to Kabir et al. (2015). The San Nicolas, Ilocos Norte LGU and Mariano Marcos State University partnered originally. Researchers examined San Nicolas, Ilocos Norte's blacksmithing industry. The researchers discovered a severe supply chain issue during their first visit.

Supply chain analysis helps explain the business processes involved in product production, from raw material procurement to distribution (Hayes, 2023). A complete supply chain analysis could help explain these issues and provide strategic insights into industry sustainability and growth.

This study analyzes the San Nicolas, Ilocos Norte blacksmithing supply chain to fill this gap. This study maps sourcing & procurement, production, and distribution & marketing. Researchers suggest ways to improve and sustain blacksmithing. This research benefits the Local Government Unit of San Nicolas, the Ilocos Norte blacksmithing business, and the community they serve.

**Objectives of the Study**

This study conducted a supply chain analysis of the blacksmithing industry in San Nicolas, Ilocos Norte. Specifically, to:

1. determine the supply chain management practices of the blacksmithing industry;
2. identify the problems encountered in the supply chain of the blacksmithing industry;
3. create a supply chain map of the blacksmithing industry; and
4. develop strategies that can be proposed to improve the supply chain of the blacksmithing industry?

**Conceptual Framework**

The conceptual framework outlines the supply chain process consisting of three primary stages: sourcing & procurement, production, and distribution &marketing. Sourcing & procurement aim to establish dependable access to premium raw materials and tools from nearby suppliers while efficiently overseeing their inventory to prevent stockouts. Distribution and marketing emphasize effectively reaching a wide

range of customers through robust sales channels, supported by adequate transportation and logistics infrastructure, and using pricing strategies that reflect the value and craftsmanship of their products. Production looks into incorporating modern tools and technologies for efficiency, prioritizing waste management to minimize environmental impact, and having skilled apprentices and assistants readily available to support activities. The arrows in the framework represent the transfer of goods and information throughout the supply chain, and these flows are crucial for identifying areas of concern or opportunities for enhancement. Analyzing the sourcing & procurement, production, and distribution & Marketing will provide valuable insights that can guide crafting supply chain map within the blacksmithing sector of San Nicolas, Ilocos Norte.

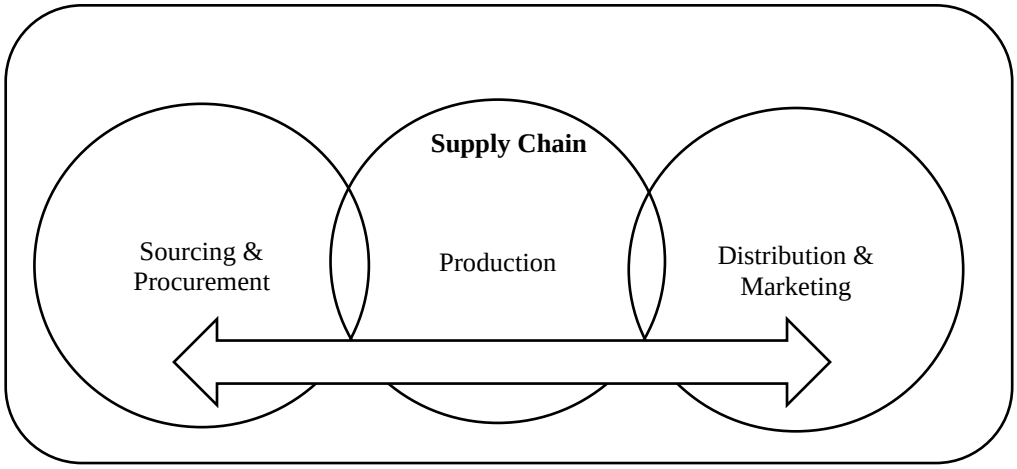


**Figure 1. Research paradigm**

## Methodology

### Research Design

A descriptive research design was used in this study. The study was conducted to analyze the supply chain management practices, problems encountered, create a supply chain map and strategies to improve the supply chain of the blacksmithing industry. The supply chain mapping is the visual representation of the industry supply chain. This determines sourcing & procurement, production, and distribution & marketing within the supply chain.

### Locale of the Study

San Nicolas, Ilocos Norte, Philippines has identified blacksmithing as part of its culture and heritage. The town is known for its diligent blacksmiths who craft various types of blacksmith products. The study was conducted particularly in Brgy. 9, 10, and 11, with a specific focus on active blacksmiths who had been managing their operations for at least one (1) year in the blacksmithing industry. These blacksmiths served as the respondents, providing comprehensive insights into the industry's practices and challenges.

### Population and Sampling

The study covered the entire population of the blacksmithing industry in San Nicolas, Ilocos Norte, provided by the Local Government Unit. Initially, a list of fifteen (15) blacksmiths and their addresses was obtained. However, subsequent verification revealed that three (3) blacksmiths had discontinued their operations. To gain a comprehensive understanding of the operational landscape of the blacksmithing

industry, the researchers decided to interview an additional four (4) active blacksmiths who were not originally included in the list but were referred by their fellow blacksmiths. These additional participants met the criteria of having managed their operations in the blacksmithing industry for at least one (1) year. The sampling technique used in this study was total enumeration. This method is a type of purposive sampling where the researcher selects the entire population with specific characteristics for examination (Canonizado, 2021).

**Research Instrument**

The structured survey questionnaire was the primary tool used in this study to collect data along information regarding the respondents' supply chain practices of the blacksmithing industry on sourcing & procurement, production, distribution & marketing. Likewise, questionnaire was to determine the problems encountered in the supply chain. And an interview guide that consisted of questions about the supply chain to exactly map sourcing & procurement, production, and distribution & marketing within the supply chain in San Nicolas, Ilocos Norte.

**Data Gathering Procedure**

The researchers followed a specific procedure to obtain Ethical Clearance from the University Research Ethics Review Board (URERB) for their study. Participants were given survey questionnaires, informed of the study's objectives, and assured of confidentiality. Interviews were conducted to gather data for a supply chain map. The study took four months, and the collected data was stored in a Google Sheet for unauthorized access. The data will be deleted one (1) year after the completion of the study.

**Statistical Treatment of Data**

Mean was used to determine the level of supply chain management practices also used to determine the seriousness of problems in the blacksmithing industry in San Nicolas, Ilocos Norte. The supply chain analysis was conducted via supply chain mapping. Supply chain mapping is a graphical depiction of the industrial supply chain. It plots sourcing and procurement, production, and distribution & marketing processes, facilitating the development of a supply chain map for the blacksmithing industry in San Nicolas, Ilocos Norte.

**Ethical consideration**

Ethical considerations were taken into account during the study, ensuring participants' informed consent was obtained voluntarily. Participants were given full disclosure and the option to participate or decline. The study objectives and expected tasks were explained to participants, and the data was kept confidential. Researchers took precautions to prevent data tampering and ensure accurate results. The study aimed to avoid malpractices such as data fabrication or inflating conclusions. All themes from the transcripts were discussed with participants, and any modifications were made if necessary.

**Results and Discussion**

**1. Supply Chain Management Practices of the Blacksmithing Industry in San Nicolas, Ilocos Norte**

The results offer a supply chain analysis of the blacksmithing industry in San Nicolas, Ilocos Norte and look into three main areas of the supply chain - sourcing & procurement, production, and distribution & marketing. With a composite mean of 3.26 for all areas, the industry appears to operate at a moderately

practiced degree of supply chain management, indicating both notable strengths and room for improvement.

Along with sourcing & procurement, the industry relies on direct material procurement (3.94) and long-term supplier relationships (3.69), interpreted as "Highly Practiced." This indicates a foundation of stability and trust within its supply networks. It interprets the measured use of bulk purchase (3.19), collaborative sourcing (3.38), and conventional intermediaries (2.69) as "Moderately Practiced." Thus, it suggests inefficiencies and lost cost savings and resource-sharing opportunities. The industry values relationships above innovation for buying goods. This may restrict flexibility and increase costs owing to intermediaries.

With production, the industry has "Moderately Practiced" compliance with standardized workflows (3.31) and some process innovation (3.13), indicating a fundamental commitment to quality control. However, low flexibility in adjusting production volume and mix (2.81) and inadequate production monitoring (2.63) demonstrate responsiveness and operational supervision inefficiencies. The make-to-order strategy (3.19) prioritizes customization above scalability, which may hinder the industry's ability to respond to sudden demand surges. Results show that production methods remain artisanal and manual, with little automation or real-time monitoring technologies.

**Table 1. Supply chain management practices of the blacksmithing industry in San Nicolas, Ilocos Norte. (n=16)**

| | Items | Mean | Descriptive Interpretation |
|---|---|---|---|
| **Sourcing & Procurement** | | | |
| 1 | Blacksmithing industry procures materials from suppliers. | 3.94 | HP |
| 2 | Blacksmithing industry relies on traditional intermediaries or middlemen for material procurement | 2.69 | MP |
| 3 | Blacksmithing industry engages in collaborating sourcing or group purchasing with other blacksmiths. | 3.38 | MP |
| 4 | Blacksmithing industry maintains supplier relationships through long-term contracts. | 3.69 | HP |
| 5 | Blacksmithing industry uses bulk purchasing and inventory management to negotiate better prices and secure supplies. | 3.19 | MP |
| | ***Composite Mean*** | **3.38** | **MP** |
| **Production** | | | |
| 1 | Blacksmithing industry produces goods only according to the demand. | 3.19 | MP |
| 2 | Blacksmithing industry follows standardized workflow and procedures and quality control. | 3.31 | MP |
| 3 | Blacksmithing industry can adjust to changes in volume and mix of products quickly with their processes. | 2.81 | MP |
| 4 | Blacksmithing industry monitors and tracks its production orders. | 2.63 | MP |
| 5 | Blacksmithing industry innovates and optimizes production processes. | 3.13 | MP |

| | | | |
|---|---|---|---|
| | ***Composite Mean*** | **3.01** | **MP** |
| **Distribution & Marketing** | | | |
| 1 | Blacksmithing industry offers highly reliable products | 3.94 | HP |
| 2 | Blacksmithing industry has an accessible place to market and distribute products. | 3.88 | HP |
| 3 | Blacksmithing industry delivers product orders on time. | 3.50 | HP |
| 4 | Blacksmithing industry offers competitive prices. | 3.75 | HP |
| 5 | Blacksmithing industry uses promotional platforms such as Facebook, Instagram etc. to market the product. | 1.94 | SP |
| | ***Composite Mean*** | **3.40** | **MP** |
| | ***Overall Mean*** | **3.26** | **MP** |

| ***Legend:*** | ***Range of Mean Values*** | ***Interpretations*** |
|---|---|---|
| | *3.51 - 4.00* | *Highly Practiced (HP)* |
| | *2.51 - 3.50* | *Moderately Practiced (MP)* |
| | *1.51 - 2.50* | *Slightly Practiced (SP)* |
| | *1.00 – 1.50* | *Not Practiced (NP* |

With distribution & marketing, the industry does well in product reliability (3.94), market accessibility (3.88), and on-time delivery (3.50) as indicated by the "Highly Practiced" rating. This implies that the industry has a strong distribution capability. Also, the pricing (3.75) is indicated by the "Highly Practiced" rating. This suggests a strong ability to manage costs effectively through artisanal production methods. However, there is underutilization of digital marketing (1.94) as indicated by a "Slightly Practiced" rating. This suggests a reliance on traditional markets, limiting the industry's capacity for market development. Furthermore, this indicates that the industry relies heavily on their reputation and word-of-mouth promotion rather than utilizing digital platforms to reach a broader market.

## 2. Seriousness of Problem in the Supply Chain of the Blacksmithing Industry in San Nicolas, Ilocos Norte

The findings show the challenges of the blacksmithing industry in San Nicolas, Ilocos Norte across their supply chain along sourcing & procurement, production, and distribution & marketing. With an overall mean of 1.48, the industry perceives these issues as "Not at all a Problem." However, as the low scores could reflect a lack of awareness or prioritization of these issues rather than their absence, this interpretation may mask underlying inefficiencies.

**Table 2. Seriousness of problem in the supply chain of the blacksmithing industry in San Nicolas, Ilocos Norte. (n=16)**

| | **Items** | **Mean** | **Descriptive Interpretation** |
|---|---|---|---|
| **Sourcing & Procurement** | | | |
| 1 | Availability of Materials Needed for Production. | 1.63 | MIP |
| 2 | Prices of Materials | 1.63 | MIP |

| | | | |
|---|---|---|---|
| 3 | Quality of Materials | 1.38 | NP |
| 4 | Geographical Location of Suppliers | 1.00 | NP |
| 5 | Supplier Dependencies | 1.00 | NP |
| | ***Composite Mean*** | **1.33** | **NP** |
| **Production** | | | |
| 1 | Designing quality into the product | 1.06 | NP |
| 2 | Process improvement or modification of the process | 1.63 | MIP |
| 3 | Finding and retaining skilled apprentices or assistants to support production. | 1.56 | MIP |
| 4 | Quantity of orders | 1.50 | NP |
| 5 | Number of machinery and equipment for production | 1.75 | MIP |
| | ***Composite Mean*** | **1.50** | **NP** |
| **Distribution & Marketing** | | | |
| 1 | Market Knowledge | 1.13 | NP |
| 2 | Quality of offered products | 1.06 | NP |
| 3 | Advertising and promoting the product | 3.75 | SP |
| 4 | The setting of competitive prices | 1.00 | NP |
| 5 | Delivery Dependability | 1.06 | NP |
| | ***Composite Mean*** | **1.60** | **MIP** |
| | ***Overall mean*** | **1.48** | **NP** |

| ***Legend:*** | ***Range of Mean Values*** | ***Interpretations*** |
|---|---|---|
| | *3.51 - 4.00* | *Serious Problem (SP)* |
| | *2.51 - 3.50* | *Moderate Problem (MOP)* |
| | *1.51 - 2.50* | *Minor Problem (MIP)* |
| | *1.00 – 1.50* | *Not at all a Problem (NP)* |

The supply chain composite mean is 1.33 and interpreted as "Not at all a Problem" with regard to sourcing & procurement. Materials availability (1.63) and pricing (1.63) are considered "Minor Problem," indicating difficulties obtaining economical inputs. However, material quality (1.38), supplier location (1.00), and supplier dependencies (1.00) are "Not at all a Problem." This could mean the industry relies on a few local suppliers, limiting its capacity to negotiate better costs or ensure quality. The disregard for supplier interdependence and location suggests a localized, weak supply chain susceptible to disruptions. Lack of benchmarking against best practices or inability to uncover procurement process inefficiencies may also explain these low ratings.

In production, the industry composite mean of 1.50 shows that production concerns are also "Not at all a Problem." Process improvement (1.63), maintaining qualified apprentices (1.56), and machinery availability (1.75) are Minor Problems, suggesting operational constraints. However, designing quality into the product (1.06) and order quantity (1.50) are "Not at all a Problem", suggesting a lack of creativity or scalability. The industry may be small and not prioritize process optimization or advanced machinery. Losing skilled apprentices may indicate a generational gap or a lack of training, affecting the industry's future. No concern for product design or order quantity shows a concentration on artisanal rather than scalable production methods.

Industry composite mean 1.60 in Distribution & Marketing implies slightly more perceived issues than other categories. Advertising and promoting the goods (3.75) is the sole "Serious Problem" indicating a marketing gap. Market expertise (1.13), product quality (1.06), competitive price (1.00), and delivery reliability (1.06) are "Not at all a Problem," suggesting complacency or a lack of competition. The industry likely relies on conventional or word-of-mouth marketing and invests little in digital or larger promotional techniques. Lack of concern about market knowledge, pricing, and delivery shows a localized consumer base with little competitive pressure. Low scores may also indicate a lack of awareness of modern marketing technologies or an inability to analyze current techniques.

### 3. Supply Chain Map of Bolo (*Buneng*) of the blacksmithing industry in San Nicolas, Ilocos Norte

#### Standard Process of Making a Bolo (*Buneng*)

This analysis provides a detailed breakdown of the blacksmithing process for bolo (*buneng*) production. It outlines each step from acquiring raw materials to delivering the finished product to the customer. The process has three stages: sourcing & procurement, production, and distribution & marketing.

The supply chain map starts with material acquisition. Materials are sourced from junk shops within the province or nearby areas. Suppliers use their private vehicles or public transportation for delivering the material procured. The materials will undergo a thorough inspection to ensure compliance with quality standards. This include decision point regards whether materials are on standard or not. This decision, determined by a "yes" or "no" answer, affects whether materials are accepted or rejected. Any materials that fail to meet these standards are promptly rejected.

Once materials are acquired, they move to the production stage. The first step involves preparing the material, followed by heating the metal to make it malleable. Next, the metal is cut to its desired shape and the metal is hammered to shape it further and grinded to eliminate any rough edges or imperfections. The handle is formed and attached to create the final product.

The final product is then sorted, and the supply chain map branches into two paths depending on whether the product will be delivered or picked up. If the product is picked up by customers, the orders are prepared for pick-up at the blacksmith's shop, ending the process there. If the product is to be delivered, there is a decision point determining whether it will be delivered to retailers or directly to customers with made-to-order requests. The final products are then prepared for delivery to retailers and direct customers. The flowchart concludes with receiving payment for delivered products or for the order itself.

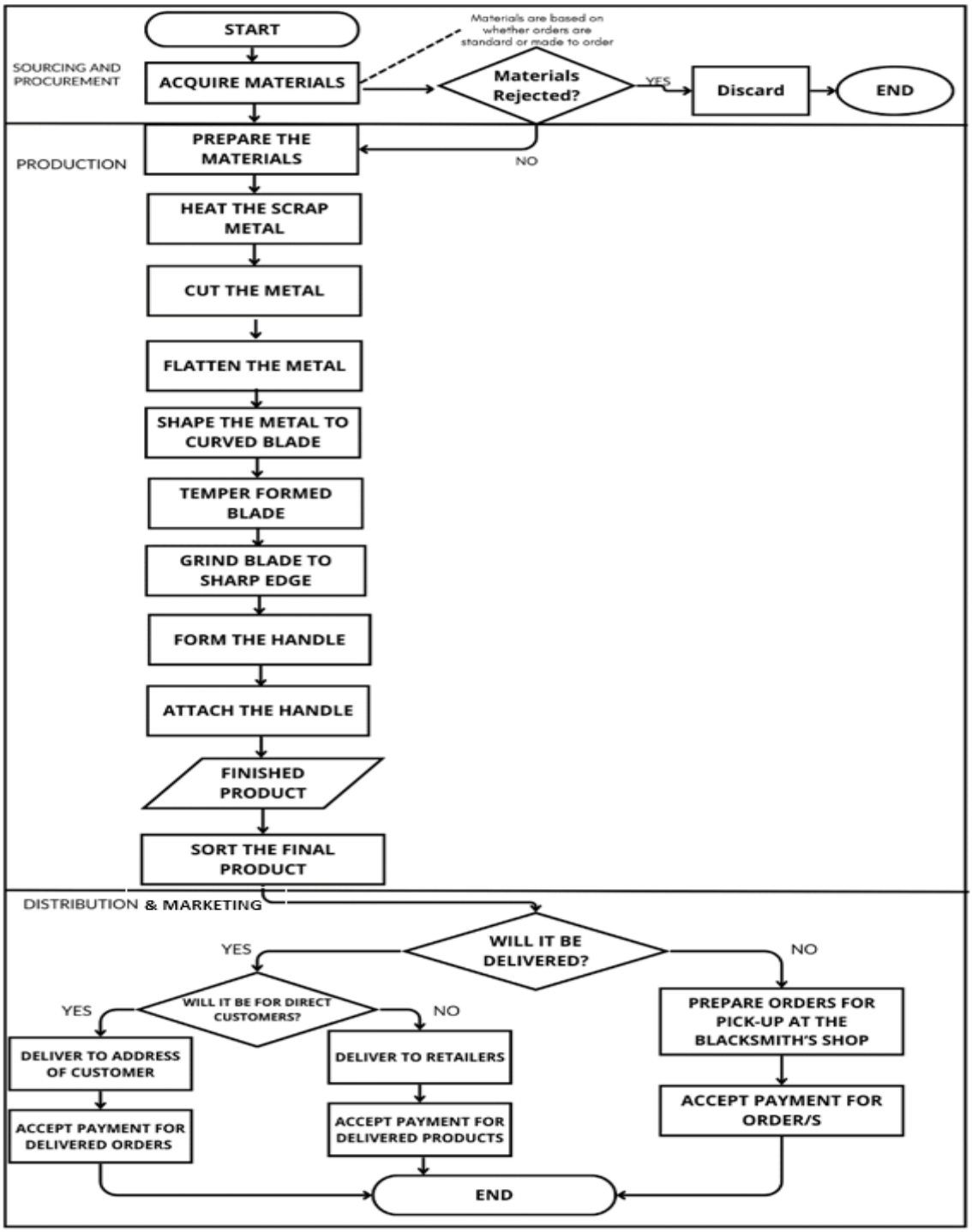


**Figure 2. Supply Chain Map of Bolo**

The standard process of creating bolo (buneng) highlights two critical aspects: material sourcing and quality control during production. Firstly, the acquiring the right materials is crucial for successful production. Delays or issues in sourcing materials can slow down the process. Secondly, it is essential to implement rigorous quality control measures during the process of material acquisition. A thorough inspection is essential to confirm that materials adhere to quality standards, as the utilization of subpar materials can adversely impact the final product. This highlights the necessity of meticulous material selection and stringent quality control during every stage of the bolo-making process.

## 4. Proposed Strategies for the Supply Chain of the Blacksmithing Industry in San Nicolas, Ilocos Norte

Recognized for its rich cultural heritage and skilled craftsmanship, the blacksmithing sector in Ilocos Norte, similar to other industries in the region, encounters challenges including restricted market access, dependence on traditional techniques, inefficiencies in the supply chain, and competition from mass-produced items. A comprehensive strategy is crucial for tackling these challenges while maintaining cultural identity and craftsmanship.

First, by integrating blacksmithing into Ilocos Norte's tourism initiatives, cultural branding and marketing could be prioritized. Heritage tours and live forging demonstrations could be held at sites such as Paoay Church and other tourism destinations. Participating in cultural festivals such as the Pamulinawen Festival, Damili Festival, Farmers Festival, and other tourism festivals in the province is also an option. Digital storytelling through social media campaigns—showcasing artisan stories, traditional techniques, and culturally significant products like balisong knives—can amplify visibility, with collaborations from local influencers and historians enhancing reach.

Skill development programs to modernize production are essential, in partnership with TESDA or local universities such as MMSU can bridge traditional craftsmanship with modern metallurgy and CNC machining, ensuring younger generations are equipped with hybrid skills to encourage more young artisans to engage with the industry. Introducing basic machinery, such as electric hammers, alongside CAD software for custom designs, would reduce labor intensity while maintaining artisanal quality and cultural importance. It is critical to expanding market appeal through product diversification. To shift from utilitarian tools (such as buneng) to decorative items (wrought iron lamps) and collaborating with designers for fusion products (modern furniture with traditional motifs) can attract urban and international buyers. Targeting niche markets, such as supplying custom pieces for decorative architecture or engineering, or eco-friendly kitchenware for the *"slow living"* trend, adds further opportunities.

Improvements in supply chain efficiency could involve collaborations with mining cooperatives or scrap recyclers and government incentives for bulk local material purchases. Logistics partnerships with local couriers can speed up nationwide delivery. With DTI or NCCA subsidies, artisan cooperatives and PPPs might collaborate on collective bargaining, marketing, and cultural hubs like San Nicolas' "Blacksmithing Village." Solar-powered forges and recycling metal scraps into keychains and garden ornaments would lessen environmental effects and appeal to eco-conscious urban and international customers.

Finally, it could improve market access by using e-commerce platforms (Shopee, Lazada) with Ilocano-language branding and participating in DTI's Go Lokal! These initiatives have the potential to grow not just within the country but also in other countries. Ilocos Norte's blacksmithing sector could ensure its legacy, attract young people, and achieve sustainable economic growth by combining cultural preservation with strategic modernization. This could position the industry as a beacon of innovation driven by heritage.

## Conclusions

The results provide a supply chain analysis along sourcing & procurement, production, and distribution & marketing of the blacksmithing industry in San Nicolas, Ilocos Norte. With an overall mean of 3.26 across all areas, the industry operates at a moderately practiced supply chain. For the industry, sourcing & procurement relies on direct material procurement and long-term supplier relationships. The industry practices bulk purchases, collaborative sourcing, and conventional intermediaries. In terms of production, it adheres to standardized workflows and incorporates innovative processes. However, faces problems in

adjusting production volume and mix due to low flexibility and production monitoring inadequacy. Above scalability the make-to-order strategy prioritizes customization. With distribution & marketing, the industry does well in product reliability, market accessibility, and on-time delivery; also, the pricing. However, digital marketing is underutilized.

The findings highlight the challenges across the supply chain of the blacksmith industry in San Nicolas, Ilocos Norte along sourcing & procurement, production, and distribution & marketing with an overall mean of 1.48 perceives these issues as "Not at all a Problem." With a composite mean is 1.33, the industry's sourcing and procurement, with materials availability and pricing being a minor problem. However, material quality, supplier location, and dependencies are not, suggesting a weak supply chain and lack of benchmarking against best practices. With a composite mean of 1.50 indicates production concerns are not a problem. Process improvement, qualified apprentices, and machinery availability being minor issues in the industry. However, designing quality into products and order quantity are not, indicating a focus on artisanal production methods. The industry's distribution & marketing composite mean is 1.60, with advertising and promotion being the only "Serious Problem" signifying a marketing gap. Market expertise, product quality, competitive price, and delivery reliability are not a problem, suggesting complacency of the industry or lack of competition.

The standard process detailed breakdown of the blacksmithing process for bolo (buneng) production. It outlines each step from acquiring raw materials to delivering the finished product to the customer. The supply chain map starts with material acquisition. Once materials are acquired, they move to the production and operations stage. The final product is then sorted, and the supply chain map branches into two paths: whether the product will be delivered or picked up. The final products are then prepared for delivery to retailers and direct customers. The flowchart concludes with receiving payment for delivered products or for the order itself.

The blacksmithing industry in Ilocos Norte, known for its cultural heritage and craftsmanship likewise faces challenges. Problems such as limited market reach, reliance on traditional methods, supply chain inefficiencies, and competition from mass-produced goods. To address these issues, a multi-pronged approach is needed, including integrating blacksmithing into tourism initiatives, skill development programs, product diversification, supply chain efficiency improvements, and e-commerce platforms. Cultural branding and marketing, as well as collaborations with mining cooperatives and scrap recyclers, can help preserve the industry's heritage while attracting young people and achieving sustainable economic growth. Additionally, incorporating solar-powered forges and recycling metal scraps can appeal to eco-conscious urban and international customers. This approach could position the blacksmithing sector as a beacon of innovation driven by heritage.

**Recommendations**

Considering the findings and conclusions drawn, the following are hereby recommended.

- Blacksmiths may take into account adopting the proposed strategies for the supply chain of the blacksmithing industry in San Nicolas, Ilocos Norte
- The Local Government Unit (LGU) might consider partnering with the Department of Science and Technology to create cutting-edge tools for the Blacksmithing Industry. This would inspire younger generations to safeguard San Nicolas' cultural heritage and cultivate skilled professionals. This could also serve as a valuable asset for tourism initiatives.

- Academe might consider to explore and create tailored educational initiatives for the blacksmithing sector's supply chain, emphasizing production efficiency, sustainable sourcing, and market dynamics, while working alongside industry partners to enhance practical training and skill enhancement.
- Entrepreneurs and business owners in the blacksmithing industry might consider working together to broaden their supplier base, improve customer satisfaction, and promote sustainable success in the blacksmithing sector.
- Suppliers of blacksmithing materials might consider delivering high-quality products, exceptional customer service, competitive pricing, and sustainable practices, which boosts their attractiveness and promotes customer satisfaction through collaborative partnerships.
- Future research might consider looking into how fluctuations in raw material costs affect financial stability, supplier diversification, talent attraction, technological advancements, market demand, climate change, and economic variations within the blacksmithing industry, with the goal of strengthening resilience and improving supply chain management.

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