UE22CS320A–Capstone Project Approval

Project Title : Cost estimation tool for manufacturing units
Project ID : 160
Project Guide : Dr Sandesh B.J

Project Team : Aditiyaa Naag: PES2UG22CS433
Rayaan Sattar:PES2UG22CS437
Samyak Singhal:PES2UG22CS498
Shreevardhan rao:PES2UG22CS530

OUTLINE

- Importance of cost estimation in manufacturing
- Vastness of input parameters
- Existing methodology
- Problems addressed
- Objectives
- Feasibility study
- Literature survey
- Gantt chart

PROBLEM STATEMENT

IMPORTANCE OF COST ESTIMATION IN MANUFACTURING

The Request for Quotation (RFQ) is the initial interaction with a potential customer. Providing precise cost estimates in response to an RFQ sets a professional tone and can influence the customer's decision to proceed.

A higher bidding conversion rate means more successful bids and projects. Accurate cost estimation improves the quality of bids, directly affecting the conversion rate.

Knowing exact costs helps in negotiating better terms with suppliers and subcontractors. Effective negotiations can reduce expenses and improve overall project profitability

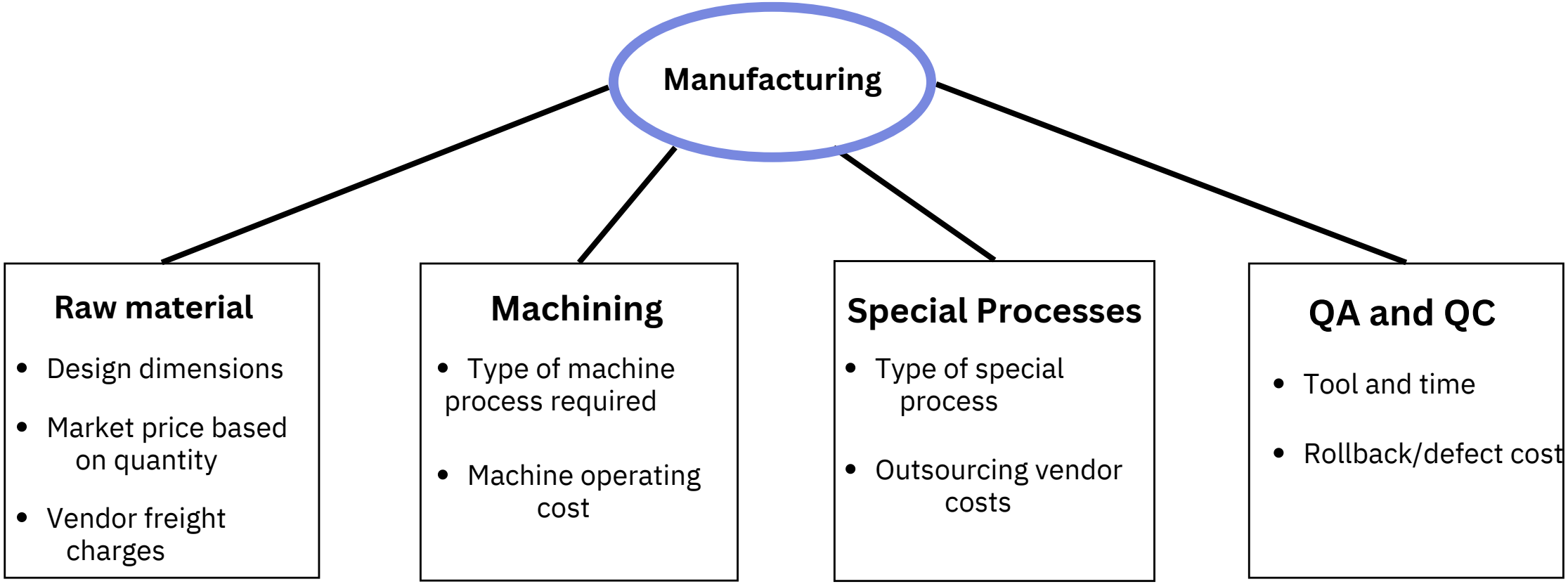
Analyzing customer specifications thoroughly ensures that all cost factors are considered. Accurate unit cost preparation prevents unforeseen expenses, protecting profit margins.

Accurate cost estimation aids in effective budgeting and resource allocation. It enhances production planning, leading to efficient operations and cost savings

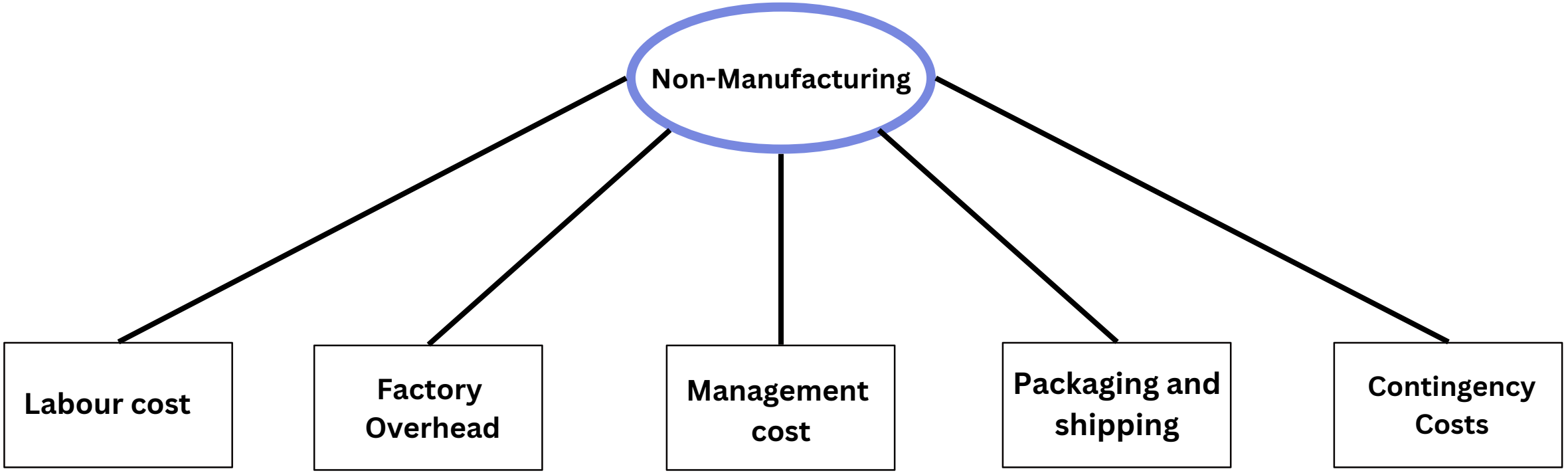
In competitive markets, quick and precise cost estimates are essential to participate effectively in bidding processes. Speed and accuracy in costing increase the chances of winning contracts.

Precise cost estimates ensure pricing covers all expenses while remaining competitive. This balance is essential for maintaining healthy profit margins.

VASTNESS OF INPUT PARAMETERS



PROBLEM STATEMENT



EXISTING METHODOLOGY

1. The customer sends a Request for Quotation (RFQ) along with design files and detailed specifications.

2. The design documents are reviewed to extract key information, such as material requirements, dimensions, and product features.

3. Necessary manufacturing processes are identified, such as cutting, milling, welding, heat treatment, or surface coating.

4. A final Bill Of Material(BOM) is made.

EXISTING METHODOLOGY

5 Historical data from the SAP system is used as a baseline for costs and processes.

6

- Raw Material: Cost includes input dimensions, price per kilogram, and freight charges
- Machining: Machine hourly rates account for setup time, labor, and operation costs
- Special Process: Includes costs for heat treatment, surface finishing, and coating
- Non-Manufacturing Expenses: Covers indirect costs
- Profit Margins: Aligned with market conditions and company policy
- Intuition: Team refines estimates using insights from past projects

PROBLEMS ADDRESSED

Complete lack of automation

The current process is manual, leading to inefficiencies, longer response times, and a higher risk of human error, affecting the speed and accuracy of cost estimations.

Intuition-driven decisions rather than data-driven

There is a shift towards making decisions based on data and analytics, which ensures more accurate and reliable cost estimates compared to relying solely on experience or gut feelings.

Requirement of fast and accurate quotations

In a competitive market, manufacturers need to quickly generate precise quotes to secure contracts. Any delay or inaccuracies can lead to lost business opportunities.

Extensive amount of variables that fluctuate

Factors like raw material prices, machine costs, and vendor charges are constantly changing, making it difficult to maintain consistent and accurate cost estimations without real-time data.

Lack of end-to-end solutions

There is no comprehensive system that covers every phase from RFQ to final quotation, resulting in fragmented processes that slow down overall efficiency and increase the complexity of project management

OBJECTIVES

Develop an end to end cost estimation tool that covers all the phases and cost influencers.

Utilize a machine learning model to analyze historical data and trends, improving cost prediction accuracy by identifying patterns from past projects

Create an intuitive application interface that integrates seamlessly with familiar tools like SAP and Excel.

Implement real-time updates to cost predictions based on fluctuating variables like material prices and production capacity for enhanced accuracy.

FEASIBILITY STUDY

Dataset Creation: Developing a robust and accurate dataset is essential to provide a foundation for analysis, decision-making, and cost estimation. It must include historical data, process parameters, and cost drivers to ensure relevant insights.

Integration with Existing Tools: The solution must seamlessly integrate with current systems such as ERP, SAP, or CRM, ensuring that no data is lost, workflows remain consistent, and teams can operate within familiar environments.

Post-Project Maintainability: Ongoing support and updates are crucial for the long-term success of any system. Ensuring that the solution is easy to maintain helps in adapting to future changes without requiring a complete overhaul.

Complexity and Number of Features: A system with too many features may overwhelm users, while too few may not meet project needs. Balancing complexity with usability is critical for effective system performance and user adoption.

FEASIBILITY STUDY

Real-Time Updating of Changes: The system must allow real-time updates to reflect changes in variables such as raw material costs or process requirements, ensuring that decisions are based on the most current data.

Usability: The system needs to be user-friendly with intuitive interfaces, minimizing the learning curve for teams and maximizing productivity from day one.

Extensive Testing for Genuine Value Addition: Rigorous testing is necessary to validate that the system or solution adds real value, ensuring accuracy, efficiency, and the elimination of errors before full-scale deployment.

LITERATURE SURVEY

1. Material and Cost estimation of a Customized Product based on the Customer's description, Kevin Baboolal and Patrick Hosein , 2021 (IDSTA).

A Machine Learning approach to automate product customization by analyzing customer-provided descriptions with Natural Language Processing. Extracted details are fed into a Deep Neural Network to predict required components and quantities, aiding cost and price estimation. The approach is demonstrated with data from an electrical distribution board manufacturer, where precise component estimation is crucial for pricing and production efficiency

2.Cost-Based Decision Support System: A Dynamic Cost Estimation of Key Performance Indicators in Manufacturing, Foivos Psarommatis and Morad Danishvar, 2024(IEEE)

This study introduces a real-time cost function for batch manufacturing by translating five key performance indicators (KPIs) related to resource use, efficiency, quality, environmental impact, and inventory into financial metrics. The approach bridges engineering and financial data, creating a unified language for decision-making across engineering, management, and finance teams. Verified through case studies in Tungsten metallurgy and electronic circuit manufacturing, this cost model supports dynamic, KPI-driven cost predictions and decision-making.

3.Consideration of Manufacturing Data to Apply Machine Learning Methods for Predictive Manufacturing,Ji-Hyeong Han;Su-Young Chi 2016 Eighth International Conference on Ubiquitous and Future Networks (ICUFN)

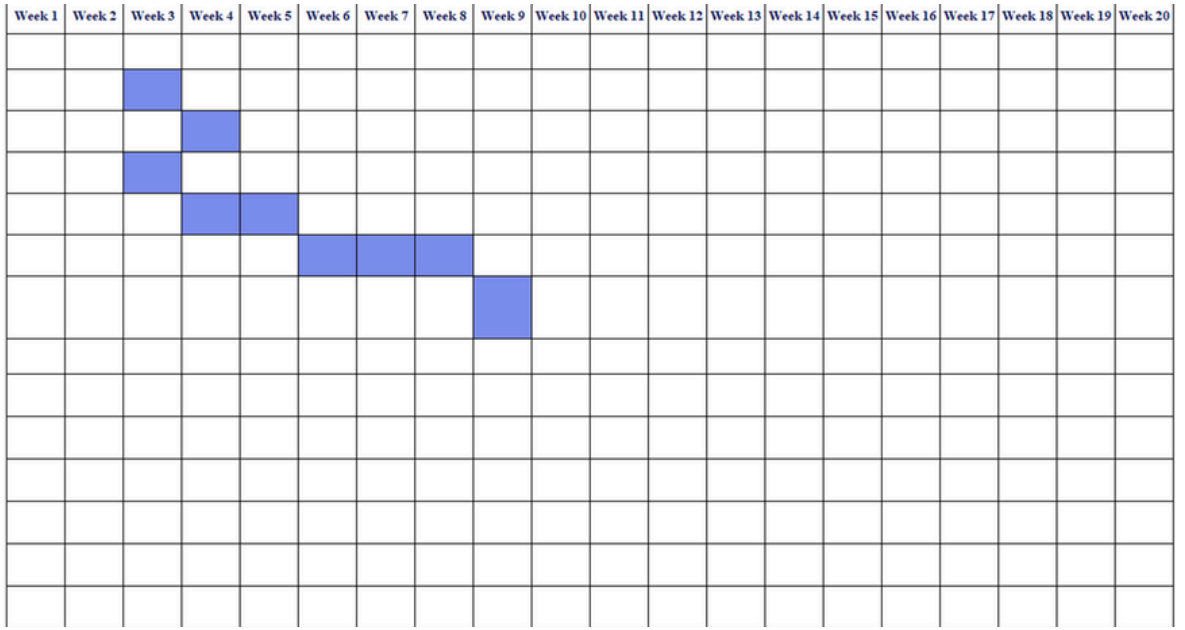
This paper addresses predictive manufacturing by focusing on CNC tool wear compensation using machine learning. It explores data characteristics in manufacturing and evaluates various machine learning methods to identify the most effective approach for predicting tool wear. This work aims to streamline predictive tasks, reduce costs, and contribute to the development of smart factory systems.

4. Early Product Cost Estimation by Intelligent Machine Learning Algorithms Richard Lackes;Julian Sengewald 2023 International Conference on Artificial Intelligence in Information and Communication (ICAIIC)

This paper introduces a two-stage machine learning model for early-stage material cost estimation, aiding businesses in selecting cost-effective product designs without relying on supplier quotes. By enhancing neural networks with modularity, the approach improves the accuracy of total manufacturing cost predictions during the product design phase

GANTT CHART

Milestone description	Progress	Start Date	Weeks
Phase 1			
Define Problem Statement	100%	22-08-2024	1
Define Project Objectives	100%	29-08-2024	1
Determine Scope	100%	05-09-2024	1
Feasibility Study	100%	12-09-2024	2
Literature Survey	100%	26-09-2024	3
Combined Overall Project Plan & Detailed Project Plan for Phase II	100%	17-10-2024	1
Phase 2			
Project Requirement Specifications			1
High-Level Design Document (HLD)			1
Low-Level Design Document (LLD)			1
Design Philosophy (UI, Backend, Algorithms)			2
Dataset Preprocessing			2
Baseline Model Exploration/Implementation			2



Thank You