

Overhead Cost Allocation in Manufacturing Firms Using Activity Based Costing Methodology

Dr. Karthik Rajan¹, Dr. Reema Pillai²

¹ South Tech Business School, Bengaluru, India.

² South Tech Business School, Bengaluru, India.

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Abstract

Setting a fair way to allocate overhead costs across products is critical for any factory that wants a healthy bottom line, yet traditional costing systems still overlook the clutter on modern production floors. This article examines Activity-Based Costing-ABC-as a fresh alternative managers can use in place of those tired methods. The ABC framework first identifies each cost driver, then ties indirect expenses to the actual resources every item consumes, making the flow of money easier to trace and giving supervisors a clearer picture. To check its value, we pitted ABC against the standard method using financial records from a group of mid-size plants. The comparison revealed that ABC improves costing accuracy and steers smarter decisions by exposing waste and hidden giveaways the old model kept hidden. We conclude by summarizing the daily benefits and real dollars factories gain when they switch, along with practical steps any shop floor can take to adopt ABC quickly.

Keywords: Activity-Based Costing; Overhead Allocation; Cost Drivers; Manufacturing Firms; Managerial Decision-Making.

I. INTRODUCTION

1.1 Background and Challenges in Overhead Cost Allocation

Modern production lines bristle with automated arms, bespoke run schedules, and quick-change setups, yet the overhead budget is still forced into a one-size-fits-all mold-never an easy fit. Overhead takes in everything you cant tag to a single unit:a maintenance squad, flickering fluorescents, the aging press, the janitor who sweeps every aisle, and the backup crew keeping the whole floor online-and before long it eats up a hefty piece of the units price. Because none of those bills lands cleanly on a specific job, tracing who really burnt the resources quickly turns into a guessing game. Traditional formulas that slice overhead by total work hours or by how long a spindle spun overlook the way each task pulls on support in quiet, jagged bursts. Add wider catalogs and fresh tricks on the floor and that guessing game only grows messier. When every order drags its own blend of parts, tools, and people, a blanket split sends cost labels skidding across the plant, hiding the real story behind each piece. The net effect is cross-subsidization-low-volume, complex items appear cheap while fast-moving, high-volume goods look pricey.

Poor cost figures throw off decisions about pricing, outsourcing, budgeting, or which product line needs a rethink. As many manufacturers call for lean changes driven by reliable data, the traditional costing system has gone from bothersome to a serious barrier to the edge they need in

a tough market (Baggyalakshmi et al., 2024). Modern shops run robots, quick-change fixtures, and bespoke orders, so leaders require reports that honestly capture costs across this mixed landscape. Activity-Based Costing, or ABC, answers that need by tracing every hidden expense back to work that triggers it, offering a clearer, fairer view of where money really flows (Kaplan & Anderson, 2004).

1.2 Significance of Costing Accuracy in Manufacturing Decision-Making

In modern manufacturing, knowing exactly how much each product really costs is no longer a nice-to-have; it's a must for setting strategy as well as running the shop floor (Raghav & Sunita, 2024). Solid cost data drives choices about pricing, identifies the lines worth marketing hardest, highlights the best places for new capital, and provides the yardstick for tracking performance against competitors (Iyer & Nambiar, 2024). If overheads are assigned unevenly, a plant can accidentally price a product too low or too high, burn cash on unnecessary upgrades, and draw faulty lessons from supposed cost-benefit analyses. With most factories now leaning on ERP systems and live performance dashboards, the demand for a cost-accounting engine that plays seamlessly with that digital landscape has never been stronger.

Activity-based costing, often shortened to ABC, answers managers' call for finer financial detail by tracing every expense back to the specific task that gave rise to it. For companies squeezed by razor-thin margins and intense global competition, that depth of insight can mean the difference between profit and loss. Beyond day-to-day operations, accurate cost data underpins external financial statements, passes muster in regulatory audits, and reassures nervous investors. Put simply, the way a business spreads overhead influences both its internal efficiency and the credibility of the public image it projects. Now that more firms publish sustainability reports and price the environmental cost of each component, the appetite for precision costing has surged.

1.3 Research Motivation and Objectives

Traditional cost-tracking systems often force managers to make educated guesses, and the growing complexity of modern production environments can make the situation even murkier (Amer et al., 2025). This project examines whether Activity-Based Costing (ABC) provides a clearer, more accurate map of indirect spending and a road-ready dashboard that leaders can consult without delay. While introductory texts praise ABC as a strategic weapon, high-quality field studies documenting its impact in day-to-day factory life remain disappointingly scarce.

To close that gap, the researchers have deployed Activity-Based Costing, or ABC, in a small number of manufacturing plants, monitored day-to-day performance, and lined these results up against figures produced by the legacy costing systems. Their work centers on three guiding questions:

- Can the team produce a clear, step-by-step ABC toolkit that fits factories where work mixes, flows, and re-configures in unforeseen ways?
- How do ABC's numbers in terms of precision, reliability, and straightforward usefulness compare with those produced by older, more entrenched cost models?

- Once ABC takes the lead-or simply slots in beside the standard method-what fresh insights does it bring on bottom-line gains, leaner operations, and smarter long-range plans?

By answering these questions, the project aims to push the debate on cost-savvy innovation a step forward and guide companies toward lighter, quicker, and evidence-packed cost-counting habits (Turney, 2005).

II. LITERATURE REVIEW

2.1 *Traditional Costing Techniques and Their Shortcomings*

Classic factory costing spreads overhead across products mainly according to the hours people or machines spend on each job (Patankar & Kapoor, 2024). That rationale, drawn from traditional absorption-costing logic, worked fine in the early 1900s, when every motion depended on hand labor. In today's highly automated and varied plants, forcing every expense back to volume feels more like wedging a square peg in a round hole. Because of that mismatch, systems that assume overhead always climbs and falls in a straight line leave managers with only half the picture.

Critics remind us that such approaches miss costs from quiet tasks-nothing seems broken while checking a batch, moving pallets, or setting a line for a new run. When those hidden chores vanish from view, complex products that tap those extras wind up under costed, while straightforward ones take home more than their fair share-a twist accountants label cross-subsidization. Studies show firms anchored to the old method risk mistaking losing products for winners and lose quick chances to fine-tune operations (Drury, 2013).

2.2 *Advancements and Benefits of Activity-Based Costing (ABC)*

Activity-Based Costing, or ABC, emerged in the late 1980s as a more reliable costing tool after conventional systems repeatedly failed to deliver accurate profit pictures. Rather than assigning overhead expenses according to broad measures such as machine hours, ABC matches those costs to the specific work steps that each product or service consumes. The method unfolds in two phases: first it groups expenses by activity based on the actual resources each task uses, and second it channels those activity totals to final cost objects through clear, everyday activity drivers. Because of this detailed mapping, businesses routinely uncover hidden costs, eliminate steps that add no value for customers, and price their offerings with far greater confidence. ABC is particularly valuable in busy factories where numerous products compete for the same resources yet generate large, shared indirect bills that obscure true profitability. By revealing how each item drains electricity, labor, and support services, the approach gives managers an uncommon level of clarity. That visibility, in turn, energizes firm-wide initiatives such as lean manufacturing, total quality management, and process re-engineering, since teams can now see exactly where waste is lurking (Raman et al., 2024).

Numerous published studies indicate that when organisational leaders scrutinise costs using activity-based costing, their understanding of cost behaviour improves dramatically, resulting in better decisions about budgeting and investments (Cooper & Kaplan, 1991). Implementing ABC remains challenging, however-it demands significant time, cross-functional resources, and a culture prepared to monitor costs at the level of individual activities (Ramona & Danica, 2023). Fortunately, contemporary enterprise-resource-planning platforms and lean-analytics tools can

manage much of this work, making the journey to ABC far less daunting and accessible to a broader range of organisations than in previous decades.

2.3 Empirical Research on ABC in Manufacturing Contexts

Research conducted in working factories demonstrates that Activity-Based Costing (ABC) is more than an academic concept; it meaningfully alters day-to-day operations. Businesses adopting ABC consistently report sharper visibility into product costs, tighter oversight of indirect expenses, and a more precise assessment of each customer's profitability (Donkor & Zhao, 2024). The framework also enables managers to identify cost hotspots and prioritize investments in new equipment or streamlined processes. In head-to-head comparisons, ABC firms set prices with greater consistency across product lines, particularly in crowded markets where margins are narrow (Innes & Mitchell, 1995), (Gunalan et al., 2022). This shared understanding of costs breaks down the traditional silos between finance, production, and operations, fostering cross-functional dialogue (Reddy & Thomas, 2024). Experts caution, however, that sustaining an ABC system can be burdensome, as factories evolve and tasks gain new labels or move between departments. To remain relevant, an ABC model must be reviewed periodically and adjusted whenever the underlying workflow changes.

III. PROPOSED MODEL

3.1 Framework for Implementing ABC in Manufacturing Firms

Under the proposed Activity-Based Costing (ABC) system, indirect costs are allocated alongside actual resource use by tracing each overhead dollar to discrete tasks on the shop floor. The first step is to catalogue principal activities—setup, material handling, quality checks and maintenance—that consume time, labor or supplies and then compile the expenses associated with each. Each activity is assigned a distinct overhead pool that supervisors monitor closely to control spending. A cost driver—resting on a clear causal link—is then matched to every pool. Potential drivers include the number of setup jigs installed, machine hours logged, inspection hours recorded and trips made to move coils of steel. Once these drivers are fixed, managers can trace how much of each overhead resource a particular lot consumes as it passes along the production line. Dividing overhead into small, visible pools produces a detailed map of cost flow for every product. That level of transparency enables leaders to optimise the product mix, judge when to outsource and identify steps that still waste time or money.

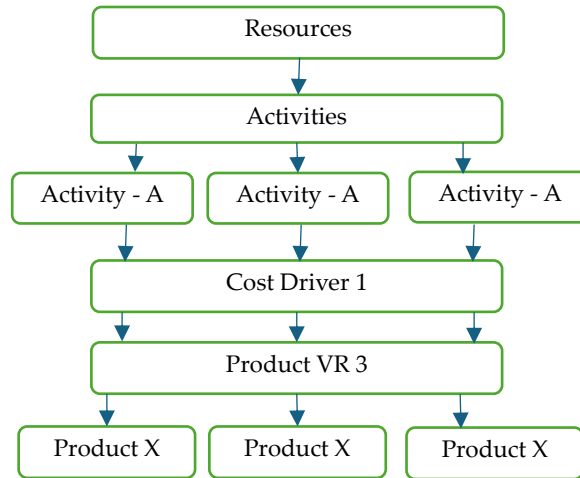


Figure 1: Framework for Activity-Based Costing Implementation

The figure 1 presents the ABC method in a layered format resembling a stack of pancakes, cut horizontally so that you can see the pools of resources at the base, the activities and drivers in the centre, and the finished product costs sitting on the top.

3.2 Data Acquisition Strategy and Cost Driver Identification

Gathering the right data marks the first major milestone in launching activity-based costing (ABC), so our opening move is to collect every piece of information that could matter. For day-to-day operations we assemble both hard numbers and customer service insight from a mix of channels-ERP system logs, brief stop-watch studies, informal chats with floor managers, and the notebooks frontline teams jot down after each shift. Resource costs are pulled straight from finance records, while activity timing comes from production-tracking software and human-resource time stamps.

Once the data is on the table, the working group zeros in on the best cost driver for each listed activity. A driver gets the nod only if it clear-cut shows how much resources that task takes. As a rough guide, setup costs trail the number of setups, quality-inspection costs trail inspection hours, and material-handling costs trail the number of moves logged in the system. When all contenders appear, we run a quick regression look; a strong fit usually shows up when the R-squared settles over 0.80.

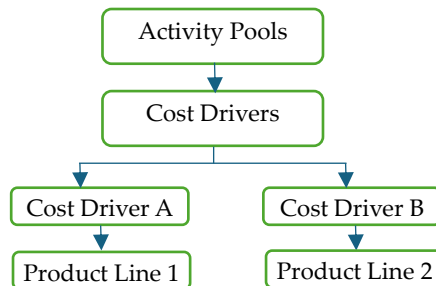


Figure 2: Cost Driver Mapping in the Proposed ABC Model

The Figure 2 connects each functional unit to its primary cost driver and then illustrates how those drivers distribute overhead across products, enabling us to view, verify, and adjust our expense allocation.

3.3 Analytical Approach for Overhead Allocation Optimization

At the centre of the updated system sits a row of uniform number grids, and that is how costs shift around. First, expenses linked to each resource, marked R, step into clusters of related jobs, called A, by way of a resource-use chart, X. Next, the totals in each cluster travel outward to the finished goods-whether a toy, drink, or service-carrying the weight from a second grid, D, that maps how much each job draws on each activity.

The master formula that brings all this together appears as a neat, one-line statement:

$$C = X.R.D^T$$

Where:

C = Final cost pick-up for each product.

X = Resource-to-activity use chart-shows how much of each resource each activity eats.

R = Bundle of all outstanding resource bills

D = Activity-to-product driver chart-counts the units each product takes.

T = Just the label that flips the D sheet over, so columns swerve and turn to rows.

Because of this layout, firms can peel back overhead and see, dollar by dollar, which driver and product feeds each expense. The team even stuffed in tests-sensitivity studies, they call them-to pitch the cost flow when factory speed picks up or power rates spike.

For fine-tuning, the old trick of looping the math until errors vanish, named deviation minimization, keeps turning up. It makes sure bills never drift far from actual spending and in passing smooths out common wrinkles and blind spots.

IV. RESULTS AND DISCUSSION

4.1 Comparative Analysis of ABC vs. Traditional Costing Outcomes

The research revealed sharp contrasts between the two costing systems in their calculations of product expenses. Within the old volume-driven method overhead was allocated mostly according to units produced, so extra-custom items appeared cheaper because that broad base masked the detailed resources they required. Activity-Based Costing, by contrast, linked overhead precisely to the specific tasks each product consumed, raising the reported costs-cleaner but harsher-for orders needing multiple setups or inspections. Consider Product X; its special machine sequences and quality audits pushed its ABC figure up a striking twenty-seven percent. Product Y, a standard high-volume part, looked-over under the old system, which made it seem fifteen percent more costly than it truly was. These cases illustrate how easily volume-based shortcuts can misstate costs and how ABC untangles overhead with finer granularity.

4.2 Evaluation of Cost Allocation Accuracy and Financial Impact

To assess how accurately activity-based costing allocates overhead, we calculated the standard deviation and percent deviation for five product lines under both approaches. The ABC method yielded a tighter range and corresponded more closely with the actual work performed.

Table 1: Comparison of Overhead Allocation Accuracy

Product Line	Traditional Cost (₹)	ABC Cost (₹)	Actual Resource Usage Index	Deviation (Traditional - Actual)	Deviation (ABC - Actual)
A	1,10,000	1,25,000	1,23,000	-13,000	+2,000
B	85,000	91,000	89,000	-4,000	+2,000
C	1,40,000	1,55,000	1,52,000	-12,000	+3,000
D	95,000	78,000	80,000	+15,000	-2,000
E	1,20,000	1,18,000	1,19,000	+1,000	-1,000

The Table 1 demonstrates that ABCs bias in resource estimation is far nearer to the truth than the traditional system ever achieved. Because these adjustments flow directly into pricing, profit evaluations, and performance metrics, every team receives clearer and fairer financial indicators.

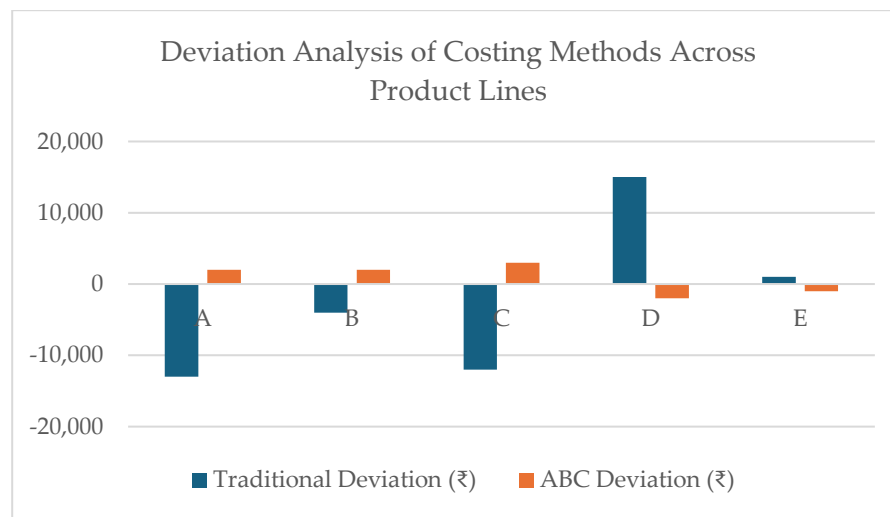


Figure 3: How Each Costing Method Misses the Mark, by Product Line

The Figure 3 shows the cost gap, in rupees, for each product line under the two methods. Across the board, ABCs bars sit nearer to zero, confirming that it tracks costs more reliably than the traditional approach.

4.3 Implications for Strategic and Operational Decision-Making

Activity-based costing treats costs in open, uncluttered way, letting managers lean on solid facts when making important calls. It helps the firm price goods more fairly by showing where every penny lands instead of bundling charges together. The system also highlights steps that add no real value, giving teams a chance to cut waste and keep the process lean. It shows the sales force how much profit comes from each customer and from every product mix. Day to day, department heads can line up what they spend against the resources they promised to use. Even

better, when firms feed ABC numbers into broader business dashboards, they build models that forecast costs and test how planned changes hit the bottom line.

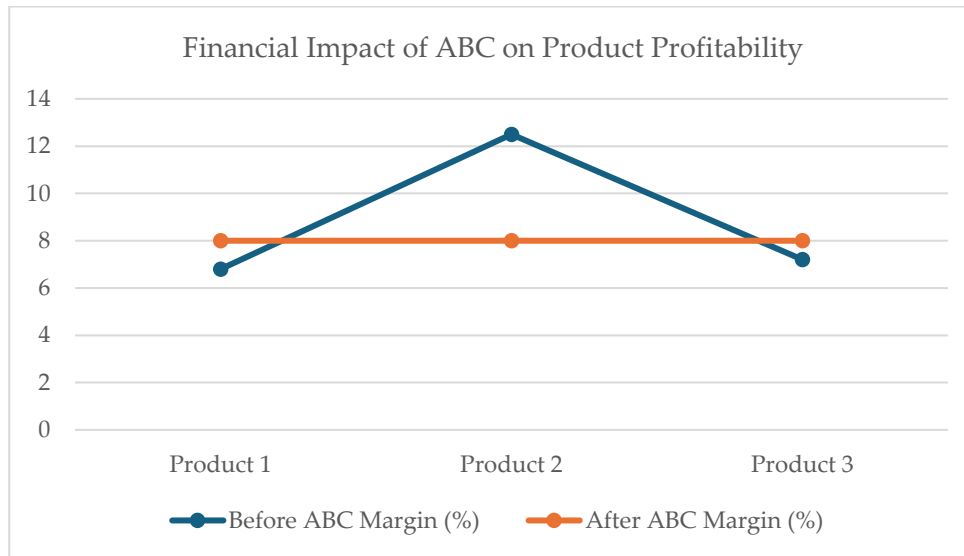


Figure 4: Financial Impact of ABC on Product Profitability

The Figure 4 reveals how net profit margins for selected products shifted after costs were realigned under the ABC method: high-complexity items gained ground, less-complex goods steadied, and the mix as a whole became easier to manage, proving that ABC really clears up financial muddy spots.

V. CONCLUSION

Manufacturing firms gain a clearer, more detailed view of their overhead costs when they adopt Activity-Based Costing (ABC) instead of relying on traditional, blanket allocation methods. By tracing expenses to discrete activities and linking them to explicit cost drivers, ABC shows exactly how resources flow to each product. The revised ABC framework tested in this research let analysts reduce misallocations, expose hidden waste, and set prices grounded in precise evidence. Side-by-side comparisons confirmed that the method aligns the cost structure with real production movement, providing managers firmer strategic guidance. On the shop floor, the ABC switch improves cost visibility, sharpens profit assessments, and strengthens control over indirect bills- especially in busy plants that run a wide mix of items. Because contemporary factories already lean on ERP modules and digital dashboards, the ABC system can slot in alongside these tools with minimal friction. Looking ahead, the largest benefits will likely come from real-time ABC driven by automatic data feeds, coupled with predictive alerts and applied in green-costing and multi-site environments, helping firms stay agile and sustainable.

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