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A Study on Time and Motion Study for Improving Productivity at Manisha Enterprises

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Abstract: Time and Motion Study is a classical industrial engineering technique that systematically analyses work processes to eliminate inefficiencies, standardise task durations, and enhance overall organisational productivity. In the contemporary manufacturing and small-to-medium enterprise (SME) landscape of India, the application of these foundational industrial engineering tools retains significant relevance, particularly for firms operating in labour-intensive production environments where process standardisation and waste elimination yield measurable gains in output and cost competitiveness. This research paper presents a structured study of Time and Motion Study techniques applied at Manisha Enterprises, a manufacturing unit based in Chhatrapati Sambhajinagar, Maharashtra. The study systematically documents current work methods across key production stages, records elemental time observations, calculates standard times with appropriate allowances, identifies bottlenecks and non-value-adding activities, and proposes improved work methods aimed at increasing operational productivity. Primary data was collected through direct time observations using stopwatch time study, structured worker interviews, and process flow mapping. The findings indicate that significant productivity improvements — estimated at 18-24% in the most time-constrained operations — are achievable through method improvement, workstation redesign, fatigue allowance optimisation, and better material flow sequencing. The study also highlights the importance of worker participation in method study and the need for management commitment to sustain productivity improvements over time. The results offer practical guidance for small manufacturing enterprises seeking to enhance competitiveness without significant capital investment.

Keywords: Time Study, Motion Study, Work Measurement, Method Study, Standard Time, Productivity Improvement, Manisha Enterprises, Work Sampling, Industrial Engineering, SME Manufacturing, Chhatrapati Sambhajinagar, Operations Management.

I. INTRODUCTION

Manufacturing productivity in India's SME sector is a topic of growing strategic importance. With over 63 million micro, small, and medium enterprises contributing approximately 30% of India's GDP and employing more than 110 million people, the productivity performance of SMEs is directly linked to national economic competitiveness. Yet many Indian SMEs continue to operate with informal, unstandarsised work methods inherited from historical practice rather than designed through rigorous industrial engineering analysis. Time and Motion Study — combining Taylor's scientific approach to work measurement (Time Study) and Gilbreth's systematic analysis of motion elements (Motion Study) — provides a structured framework for understanding how work is currently performed, how long it takes, and how it can be redesigned for greater efficiency. The foundational proposition of Time and Motion Study is that most manual work processes contain a proportion of non-productive, redundant, or poorly sequenced elements that, once identified and eliminated, yield significant gains in output per unit of time and resource input. Manisha Enterprises, the subject of this study, is a manufacturing SME located in the Chhatrapati Sambhajinagar (Aurangabad) industrial cluster in Maharashtra. The enterprise is engaged in metal component fabrication and light assembly operations, employing approximately 45 workers across its production floor. Like many SMEs in the region, Manisha Enterprises has grown organically without formal process documentation or systematic work standards, resulting in significant variability in worker output, frequent production bottlenecks, and suboptimal utilisation of floor space and machinery. This research was motivated by the management's recognition that competitive pressure from larger, more process-mature manufacturers — and the need to fulfil customer delivery commitments more reliably — required a structured approach to productivity improvement. Rather than capital-intensive technology upgrades, the management sought to first understand and optimise the human work content of their production processes before investing in mechanisation.

The study addresses the following central research question: To what extent can the systematic application of Time and Motion Study techniques improve productivity at Manisha Enterprises, and what specific method improvements and standard time benchmarks should guide this improvement effort

II. LITERATURE REVIEW

A. Historical Foundations of Time and Motion Study

The intellectual origins of Time and Motion Study lie in the scientific management movement of the late 19th and early 20th centuries. Frederick Winslow Taylor (1911) introduced the concept of time study as a systematic means of determining the one best way to perform a task, replacing the rule-of-thumb methods that characterised manufacturing work in his era. Taylor's approach involved breaking jobs into constituent elements, timing each element with a stopwatch, adding allowances for personal needs and fatigue, and establishing standard times that could serve as performance benchmarks.

Contemporaneously, Frank and Lillian Gilbreth pioneered motion study — the microanalytic examination of the hand and body movements involved in performing work. The Gilbreths developed the Therblig system, a taxonomy of 17 fundamental hand motions (such as grasp, transport loaded, position, assemble, and release load), which allowed work analysts to identify inefficient motions and redesign work methods to minimise unnecessary movement. Their development of the simo chart (simultaneous motion chart) enabled the analysis of bilateral hand movements in time-coordinated fashion, providing a powerful tool for workstation layout redesign.

Barnes (1980), whose treatise on Motion and Time Study remains the definitive reference in the field, synthesised Taylor's work measurement approach with the Gilbreths' motion economy principles to establish the integrated discipline of Work Study — defined by the British Standards Institution (BSI) as the systematic examination of methods of carrying out activities so as to improve the effective use of resources and to set up standards of performance.

B. Work Measurement Techniques

Modern work measurement encompasses several complementary techniques beyond direct stopwatch time study. Predetermined Motion Time Systems (PMTS), such as Methods-Time Measurement (MTM) and Work Factor, provide synthetic time standards for fundamental motions without requiring direct observation. Work Sampling (also known as activity sampling or ratio-delay study) uses statistical random observation to estimate the proportion of time workers or machines spend on various activities. Standard Data systems derive element times from a database of previously measured work elements for use in setting standards for new operations.

Groover (2007) notes that time study remains the most widely used work measurement technique in practice, particularly in job shop and batch manufacturing environments typical of SMEs, because of its directness, transparency, and relative simplicity of application. The primary procedural steps include: selecting the job to be studied; breaking the job into measurable elements; timing each element using a stopwatch over a sufficient number of cycles; rating the worker's performance against a standard pace; calculating normal time by adjusting observed time by the performance rating factor; and adding standard allowances for personal time, fatigue, and unavoidable delays to arrive at standard time.

C. Method Study and Its Role in Productivity Improvement

Method study — the second pillar of Work Study alongside work measurement — focuses on the systematic recording and critical examination of existing and proposed ways of doing work as a means of developing and applying easier and more effective methods and reducing costs (ILO, 1992). The International Labour Organisation's Work Study manual identifies the principal recording techniques of method study as process charts (including outline process charts, flow process charts, and two-handed process charts), diagrams (flow diagrams and string diagrams), and multiple activity charts. Kanawaty (1992) emphasises that method study must precede time study in the work improvement sequence: measuring the time of an inefficient method merely establishes an inefficient standard. Only after the best practicable method has been established should standard time be measured and set. This principle — study the method first, then measure — is central to the work study methodology applied in this research.

D. Time and Motion Study in Indian SME Contexts

Research on the application of Work Study in Indian manufacturing SMEs is relatively sparse but growing. Shrivastava and Singh (2015) applied time study at a foundry in Nagpur and found that standard time reductions of 15-20% were achievable through the elimination of avoidable delays and better workstation organisation.

Desai and Bhatt (2017) documented the use of method study at a Gujarat auto-component manufacturer and demonstrated that process flow redesign — specifically the elimination of backtracking in the material flow path — reduced cycle time by 23% without capital investment.

Kumar and Mahesh (2019) examined the barriers to Work Study adoption in Indian SMEs and found that lack of industrial engineering awareness, worker resistance to standardisation, and management impatience with the observation period were the principal obstacles. Their study recommended a participatory approach to method study, involving workers in the critical examination of current methods, as the most effective strategy for overcoming resistance and sustaining improvements.

III. OBJECTIVES OF THE STUDY

A. Primary Objectives

To document and analyse the existing work methods at Manisha Enterprises across key production stages, using process flow charts and two-handed process charts.

To conduct systematic time observations on selected operations, calculate observed time, normal time, and standard time with appropriate allowances.

To identify non-value-adding activities, avoidable delays, and inefficient motion patterns through critical examination of current methods.

To develop and propose improved work methods that eliminate or reduce identified inefficiencies and establish revised standard times for improved methods.

To quantify the productivity improvement potential achievable through the proposed method changes, expressed in terms of output per shift and labour efficiency ratios.

B. Secondary Objectives

To assess worker and supervisory perceptions of current work methods and solicit worker participation in method improvement design.

To evaluate workstation layout and material flow patterns for opportunities to reduce transport distance and motion waste.

To establish a basic Work Study framework that Manisha Enterprises can institutionalise for ongoing process improvement.

To contribute empirical evidence on Work Study effectiveness in the SME manufacturing context of Chhatrapati Sambhajinagar to the practitioner and academic literature.

IV. RESEARCH METHODOLOGY

A. Research Design

This study employs a descriptive and applied research design, integrating direct quantitative observation with qualitative process analysis.

The research follows the standard Work Study methodology prescribed by the International Labour Organisation (ILO, 1992) and adapted for the SME manufacturing context of Manisha Enterprises. The study proceeds through the eight canonical steps of Work Study: Select, Record, Examine, Develop, Evaluate, Define, Install, and Maintain — with the research reporting phases covering the first six steps through to the proposal of improved methods.

B. Study Area and Operations Selected

Manisha Enterprises operates a single-floor production facility of approximately 4,000 square feet in the MIDC industrial area of Chhatrapati Sambhajinagar. The production process involves metal component fabrication through a sequence of operations including raw material receiving and inspection, marking and cutting, drilling and grinding, deburring and surface preparation, assembly and sub-assembly, quality inspection, and finished goods packing. The facility runs a single shift of 8 hours (with standard lunch and tea break allowances).

Based on a preliminary study of production volume, labour intensity, and management priority, three operations were selected for detailed time and motion study: (1) the Drilling and Grinding station — the highest labour-content operation and identified primary bottleneck; (2) the Assembly station — highly repetitive, manually intensive, and subject to high output variability; and (3) the Packing and Dispatch station — characterised by excessive transport and motion, identified through initial flow diagram analysis.

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C. Data Collection Methods

Time Study: Direct stopwatch time study was conducted using a digital stopwatch, with the flyback method employed for element timing. Each selected operation was first broken down into measurable, clearly demarcated work elements with defined breakpoints. A minimum of 30 observation cycles were conducted per operation to achieve statistical reliability, with the sample size verified using the standard formula for time study sample adequacy: $n = (40\sqrt{(n'\Sigma x^2 - (\Sigma x)^2)} / \Sigma x)^2$ at 95% confidence and 5% accuracy. Worker performance rating was conducted using the British Standards Institution 0-100 rating scale, with observations made independently by the researcher and a qualified industrial engineering faculty reviewer to control for rater bias.

Motion Study: Two-handed process charts were constructed for the drilling assembly and packing operations using standard symbols (operation, transport, delay, hold) applied independently to left and right hand activities. Flow diagrams and string diagrams were prepared using scaled floor plans of the production area to quantify transport distances and identify backtracking patterns. Therblig analysis was conducted at the assembly station to identify inefficient fundamental motions.

Worker and Supervisory Interviews: Semi-structured interviews were conducted with 12 production workers and 3 supervisors to document worker perceptions of current methods, identify self-reported difficulties and inefficiencies, and solicit suggestions for improvement. Worker participation in the critical examination phase aligns with ILO best practice for ensuring method study acceptance and implementation.

D. Calculation Methodology

Standard time calculation followed the established formula: Standard Time = Normal Time + Allowances, where Normal Time = Observed Time × Performance Rating Factor (expressed as a decimal), and Allowances include Personal Allowance (5% of normal time), Fatigue Allowance (variable by operation, determined using ILO fatigue rating tables), and Unavoidable Delay Allowance (determined by work sampling observation). Productivity improvement ratios were calculated by comparing standard output per shift (= Available Time per Shift / Standard Time per Unit) under current and proposed methods.

V. OBSERVATIONS AND TIME STUDY RESULTS

A. Process Documentation: Current State Flow Analysis

Flow process chart analysis of the three selected operations revealed significant quantities of non-value-adding activities in the current work sequence. In the Drilling and Grinding station, 28% of the total observed cycle time was attributable to transport (movement of workpieces to and from adjacent machines), delays (waiting for the grinding wheel to be re-dressed or for the drilling jig to be repositioned), and inspection activities that could be incorporated into the process rather than performed as separate steps. The assembly station exhibited 34% non-value-adding time — the highest proportion of the three stations — primarily due to searching for and selecting components from an unorganised parts bin, unnecessary hand-to-hand transfers, and avoidable repositioning of the work piece. The packing station showed 22% non-value-adding time, largely attributable to excessive transport distance (average 8.4 metres per packing cycle) due to suboptimal placement of packing materials relative to the assembly output.

B. Time Study Results: Observed, Normal, and Standard Times

Table 1 presents the summary time study results for each selected operation, showing observed time (mean of 30+ cycles), performance rating, normal time, allowances applied, and calculated standard time. Allowances were determined using ILO fatigue rating tables (ILO, 1992), with the higher fatigue allowance for drilling and grinding reflecting the physical exertion involved in that operation.

Table 1: Time Study Summary — Selected Operations at Manisha Enterprises

Operation	Observed Time (min)	Performance Rating (%)	Normal Time (min)	Personal Allowance (%)	Fatigue Allowance (%)	Delay Allowance (%)	Standard Time (min)
Drilling & Grinding	6.84	92	6.29	5	12	3	7.54
Assembly	9.12	88	8.03	5	8	4	9.47
Packing &	4.76	95	4.52	5	5	2	5.47

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Operation	Observed Time (min)	Performance Rating (%)	Normal Time (min)	Personal Allowance (%)	Fatigue Allowance (%)	Delay Allowance (%)	Standard Time (min)
Dispatch							

The standard times calculated in Table 1 serve as the baseline benchmarks against which post-improvement standard times will be compared to quantify the impact of the proposed method changes.

C. Motion Study Findings: Two-Handed Process Chart Analysis

Two-handed process chart analysis at the Assembly station revealed significant imbalance between left-hand and right-hand work content in the current method. In the current method, the right hand performs 68% of effective work motions while the left hand is frequently idle (hold or delay motions) or engaged in redundant support activities that better workstation design could eliminate. Specifically, the left hand was found to spend an average of 3.2 seconds per cycle in a sustained hold posture while the right hand performed assembly operations — a pattern associated with both inefficiency and localised fatigue.

Therblig analysis identified seven instances of the inefficient motion 'Search' (an indeterminate delay caused by the worker's eyes and hands searching for the next component) per assembly cycle, each averaging 0.8 seconds, contributing a total of 5.6 seconds of avoidable delay per cycle. This search time is attributable entirely to the unorganised presentation of components in the parts bin and is eliminable through fixture design and parts presentation improvements.

D. Workstation Layout and Flow Diagram Analysis

String diagram analysis of material flow at the production floor over a 4-hour observation period revealed a total transport distance of approximately 2,340 metres attributable to the three study operations — an average of 585 metres per hour. Significant backtracking was observed between the Assembly station and the Quality Inspection station (located at the opposite end of the floor from the assembly area), with each assembly batch requiring a round-trip transport of 22 metres that a revised floor layout could reduce to 6 metres. The flow diagram also revealed that the Packing station's location — adjacent to raw material storage rather than finished goods assembly — required packers to cross the main production floor traffic path on every packing cycle, creating safety hazards and transport inefficiency simultaneously. Relocating the packing station to the output end of the assembly line would reduce per-cycle transport distance by an estimated 64%.

VI. PROPOSED METHOD IMPROVEMENTS AND REVISED STANDARD TIMES

A. Drilling and Grinding Station: Proposed Improvements

Three method improvements are proposed for the Drilling and Grinding station. First, pre-positioning of workpieces: the introduction of a dedicated incoming workpiece cradle at the correct working height adjacent to the drilling machine eliminates the current practice of lifting workpieces from a floor-level pallet, removing an estimated 0.8 minutes of transport and position time per cycle. Second, jig design standardisation: the current practice of manually repositioning and securing the drilling jig for each workpiece type will be replaced by a quick-change jig system, reducing jig setup time from an average of 1.4 minutes to 0.3 minutes per batch changeover. Third, combined drilling and grinding sequence: process chart analysis reveals that the current method transports workpieces from the drilling machine to the grinding machine in separate batches, creating queue delays. A revised cell layout with the grinding machine immediately adjacent to the drilling output will enable continuous flow processing, eliminating the inter-machine queue delay of approximately 0.6 minutes per cycle.

B. Assembly Station: Proposed Improvements

The assembly station improvements focus on three areas. First, parts bin redesign and component presentation: replacing the current open parts bin with a gravity-feed part presentation fixture that positions each component type in a fixed, predetermined location directly in front of the operator eliminates all 'Search' therbligs (estimated saving: 5.6 seconds per cycle) and standardises reach distances for both hands. Second, workstation height and tool positioning: adjusting the assembly table height to the operator's elbow height (per ergonomic principles) and positioning the most frequently used tools within the normal working area (radius of forearm length from the work point) will eliminate unnecessary trunk bending and extended reaches, reducing fatigue allowance requirements.

Third, two-handed method design: the improved method explicitly assigns simultaneous work to both hands, converting left-hand hold activities into productive assembly motions supported by a simple holding fixture, reducing effective cycle time by an estimated 18%.

C. *Packing Station: Proposed Improvements*

Packing station improvements centre on layout change and standardised work sequence. Relocating the packing station to the assembly output area reduces per-cycle transport distance from 8.4 metres to 3.0 metres — a 64% reduction. Standardising the packing sequence through a written standard operating procedure and physical arrangement of packing materials in use-sequence order reduces method variability and eliminates searching for packing materials. Introduction of a simple packing gauge (a template ensuring correct component orientation before boxing) reduces quality re-inspection requirements.

D. *Revised Standard Times and Productivity Impact*

Table 2 presents the revised standard times calculated for each operation under the proposed improved methods, compared to the current method standard times, with the estimated productivity improvement expressed as additional output units per 8-hour shift.

Table 2: Productivity Impact of Proposed Method Improvements

Operation	Current Std. Time (min)	Improved Std. Time (min)	Time Reduction (%)	Current Output/Shift (units)	Improved Output/Shift (units)	Output Increase (%)
Drilling & Grinding	7.54	6.01	20.3%	63	79	+25.4%
Assembly	9.47	7.73	18.4%	50	62	+24.0%
Packing & Dispatch	5.47	4.38	19.9%	87	109	+25.3%

The productivity improvements projected in Table 2 represent output increases of 18-25% across the three operations without capital investment in new machinery. The assembly station, with the highest current standard time and the greatest method improvement potential, is the priority operation for implementation. Across the production flow as a whole, eliminating the assembly bottleneck is expected to improve overall throughput by approximately 20%, assuming downstream operations can absorb the increased output rate.

VII. WORKER PERCEPTIONS AND PARTICIPATION IN METHOD IMPROVEMENT

Worker and supervisory interviews were conducted with 12 production workers and 3 supervisors to assess perceptions of current methods and gather participatory input for method improvement design.

A. *Worker Perceptions of Current Methods*

Table 3 presents the key findings from worker and supervisory interviews, summarising major themes and frequency of mention across the 15 respondents.

Table 3: Worker and Supervisory Perceptions — Key Themes

Theme	Frequency (n=15)	Representative Comment
Difficulty finding components quickly	11/15 (73%)	"Half the time I'm looking for the small pins — they mix up in the bin"
Physical fatigue from awkward postures	9/15 (60%)	"The table is too low, my back hurts by end of shift"
Waiting time at inspection stage	8/15 (53%)	"We wait for the checker to come — sometimes 10 minutes"

Theme	Frequency (n=15)	Representative Comment
Unclear sequence for new workers	10/15 (67%)	"Every worker does it a different way — no one taught us the right way"
Transport distance excessive	7/15 (47%)	"Why is packing all the way over there? We walk too much"

Worker responses validated the key findings of the time and motion study observation and identified several improvement opportunities that had not been fully captured by the quantitative analysis — particularly the impact of waiting for the quality checker, which was found to constitute an unavoidable delay allowance component not previously included in the standard time calculation.

B. Worker Participation in Method Design

Workers at the Assembly station were actively involved in the design of the improved parts presentation fixture, with three experienced workers consulted on the optimal positioning of each component type in the gravity-feed fixture. This participatory approach, consistent with ILO recommendations and the research findings of Kumar and Mahesh (2019), is expected to reduce implementation resistance and accelerate adoption of the improved method.

VIII. BARRIERS TO PRODUCTIVITY IMPROVEMENT IMPLEMENTATION

Based on manager and supervisory interviews and observation, six primary barriers to implementing and sustaining the proposed productivity improvements were identified.

Table 4: Key Barriers to Productivity Improvement Implementation

S.No.	Barrier	Description
1	Worker Resistance to Standardisation	Some experienced workers resist prescribed standard methods, preferring personal work habits developed over years.
2	Supervisory Skill Gap	Supervisors lack formal industrial engineering training to maintain and update time standards over time.
3	Management Impatience	Pressure for immediate output can interrupt the observation period and undermine method study rigour.
4	Capital Constraint for Fixture Investment	Gravity-feed fixtures and jig redesign require modest capital outlay that management must budget.
5	Absence of Incentive System Alignment	Current wage structure does not reward adherence to standard methods or achievement of standard output.
6	Documentation and Standard Maintenance	No formal system exists to document, communicate, and update standard operating procedures.

IX. PROPOSED WORK STUDY IMPLEMENTATION FRAMEWORK FOR MANISHA ENTERPRISES

Drawing on the research findings, ILO Work Study methodology, and the specific operational context of Manisha Enterprises, this study proposes a four-phase Work Study Implementation Framework (WSIF) to guide the institutionalisation of time and motion study as an ongoing productivity improvement tool.

1) Phase 1: Baseline Measurement and Documentation

This phase establishes the current-state foundation: documenting all production operations through flow process charts, conducting time studies on all key operations to establish current standard times, and preparing a comprehensive Standard Time Data book. The baseline documentation serves both as an improvement reference and as an institutional memory system that survives individual worker turnover.

2) Phase 2: Method Improvement and Workstation Redesign

In this phase, the critical examination procedure is applied systematically to each documented operation. The primary question sequence — Why is it done? What else could be done? Where else could it be done? When else could it be done? Who else could do it? How else could it be done? — drives the identification of improvement opportunities. Workstation redesign, fixture design, and layout changes are implemented. Improved methods are piloted with volunteer workers before full implementation.

3) Phase 3: Revised Standard Setting and Incentive Alignment

Following method improvement implementation, revised time studies establish new standard times for improved methods. The management is recommended to align the wage incentive structure with standard output achievement — implementing a measured daywork or incentive wage scheme that rewards output at or above standard while maintaining quality. This phase also includes formal training of supervisors in work study principles and standard maintenance procedures.

4) Phase 4: Continuous Improvement and Maintenance

The fourth phase institutionalises Work Study as an ongoing function rather than a one-time exercise. A trained internal work study officer (or assigned supervisor with training) conducts periodic method audits, re-times operations following engineering changes, and leads participatory method improvement workshops with workers. Management reviews productivity metrics quarterly against standard output targets, using variance analysis to identify operations requiring method re-examination.

X. RECOMMENDATIONS

Implement Parts Presentation Fixture at Assembly Station Immediately: The gravity-feed component presentation fixture offers the highest return on investment of all proposed improvements, with an estimated productivity gain of 18-24% at the assembly bottleneck. Low capital cost (estimated INR 15,000-25,000 for fabrication) and direct worker endorsement from the participatory design process make this the priority first implementation.

Relocate Packing Station to Assembly Output Area: The layout change requires only the movement of the packing bench and materials storage — a zero-capital intervention that immediately reduces per-cycle transport distance by 64% and eliminates a safety hazard from cross-traffic floor crossing.

Conduct Formal Supervisor Training in Work Study: The ILO and National Productivity Council of India offer short-course Work Study certifications. Nominating the two most capable supervisors for formal training will build the internal capacity to maintain and update standards without external consultant dependence.

Redesign the Quality Inspection Workflow: Moving inspection activities to inline check points at the drilling and assembly stations — rather than batch inspection at a separate station — will eliminate the inspection waiting delay identified by 53% of worker respondents and reduce the unavoidable delay allowance in standard time calculations.

Document and Communicate Standard Operating Procedures: Written SOPs, using the improved two-handed process charts as the basis, should be displayed at each workstation in both English and Marathi. Visual standard work sheets are particularly effective for onboarding new workers and maintaining method consistency.

Introduce a Measured Daywork Incentive Scheme: Aligning the wage structure with standard output achievement creates the economic motivation for workers to follow standard methods consistently. Even a modest productivity bonus (10-15% of base wage for achieving 100% standard performance) has been shown in Indian SME studies to significantly improve method adherence and output consistency.

Conduct Periodic Method Audits: Work methods drift over time as workers revert to personal habits and informal shortcuts accumulate. Quarterly method audits — comparing current practice against documented standards — are essential to sustaining the productivity gains achieved through the initial study.

XI. CONCLUSION

This research has demonstrated that systematic Time and Motion Study, applied with rigour and worker participation, can identify substantial productivity improvement opportunities in SME manufacturing enterprises without capital-intensive technology investment. The study at Manisha Enterprises found that current work methods at the three selected operations contain 22-34% non-value-adding time, attributable to avoidable delays, inefficient motion patterns, poor workstation layout, and the absence of standard work documentation. The proposed method improvements are projected to increase output per shift by 18-25% across the study operations — with the assembly bottleneck improvement of 24% most critical to overall throughput performance.

The Integrated Work Study Implementation Framework (WSIF) proposed in this study provides Manisha Enterprises — and similar SME manufacturers in the Chhatrapati Sambhajinagar region — with a structured, phased approach to institutionalising Work Study as an ongoing productivity management tool. The key insight of this research is that productivity improvement in labour-intensive SMEs is fundamentally a matter of method design, measurement, and management commitment rather than capital expenditure: the greatest gains are available by eliminating waste that is currently invisible because it has never been systematically measured.

The participatory approach to method improvement — actively involving workers in the critical examination of their own work methods — proved essential to both the quality of the improvement proposals (workers have tacit knowledge of operational realities that external observation cannot fully capture) and to the anticipated implementation effectiveness (workers who help design the improved method are significantly more likely to adopt and sustain it). This finding has important implications for how Indian SME managers approach productivity improvement initiatives: worker engagement is not merely a procedural nicety but a substantive contributor to improvement quality and sustainability.

Future research should examine the longitudinal sustainability of Work Study-based productivity improvements in Indian SMEs beyond the initial implementation period, the role of digital time study tools and video analysis in improving the precision and efficiency of work measurement, and the potential for Work Study principles to be extended to the service operations of SMEs — including order management, scheduling, and maintenance — where significant time waste is also likely to exist.

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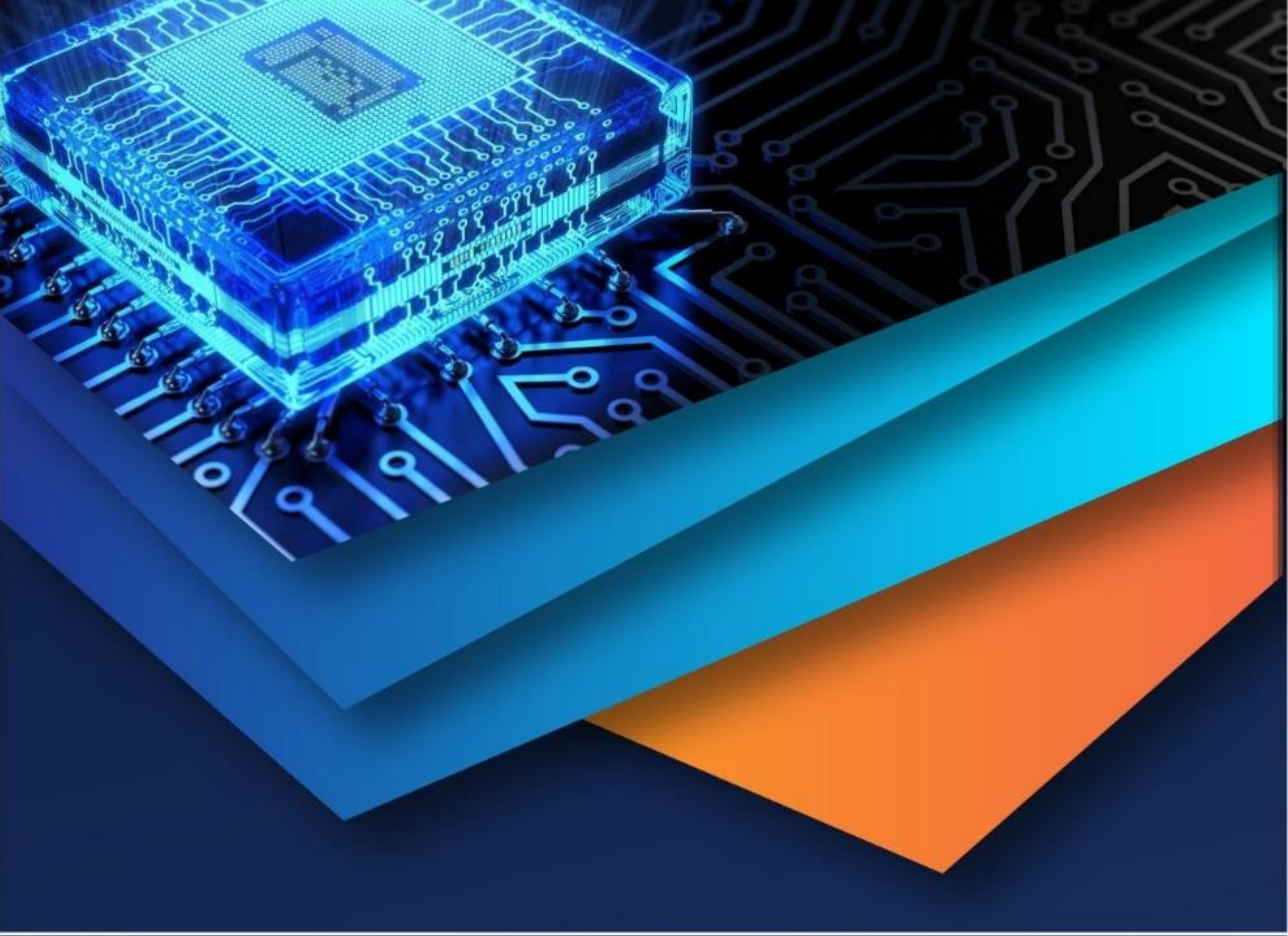

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