ENHANCING OPERATION EFFICIENCY BY REDUCING NON-UTILIZED TALENT WASTE: A CASE STUDY OF A TRAFFIC SIGN MANUFACTURING SME IN THAILAND

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ABSTRACT
Non-utilized talent waste defined as the underutilization of employees' skills, knowledge, and creativity constitutes a critical yet frequently overlooked source of inefficiency in manufacturing operations. This study investigates the manifestations of such waste within a small and medium-sized enterprise (SME) engaged in traffic sign manufacturing in Udon Thani Province, Thailand. Employing a qualitative case study methodology, data were collected through participant observation, in-depth interviews with twelve purposively selected employees, and small group discussions. The analysis incorporated flow process charts, two-handed process charts, and skill matrices to systematically identify inefficiencies across production workflows. The findings reveal several key factors contributing to non-utilized talent waste, including misalignment between task assignments and employee competencies, imbalanced distribution of manual tasks, and limited opportunities for employee participation in continuous improvement initiatives. To address these challenges, the study advocates for the implementation of Lean Human Resource Management (Lean HRM) strategies, encompassing skill-based job design, workflow optimization, and structured communication mechanisms to foster employee engagement. The results underscore that the integration of Lean HRM principles can significantly enhance operational efficiency by minimizing talent-related waste and optimizing workforce utilization within labor-intensive SME environments.
Keywords: Lean Human Resource Management, Operational Efficiency, Non-Utilized Talent Waste, Employee Engagement, Traffic Sign Manufacturing

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INTRODUCTION

Human resources constitute a critical asset in enhancing organizational performance, particularly within the manufacturing sector, where technical expertise and operational experience are essential (Birdi et al., 2008). In the context of Industry 4.0, where advanced technologies are increasingly embedded in production systems, the strategic management of human capital has emerged as a key determinant of sustained competitive advantage (Moeuf et al., 2018). Nevertheless, a significant yet frequently overlooked source of inefficiency persists: non-utilized talent waste (Sartal & Navas, 2019).

Non-utilized talent waste is characterized by the underutilization of employees' skills, creativity, and capabilities, often resulting from task misalignment, inflexible organizational structures, or limited opportunities for employee involvement (D'Antonio & Chiabert, 2018). This form of waste not only erodes individual motivation and engagement but also adversely impacts operational efficiency and diminishes organizational capacity for innovation (McKie et al., 2021). Despite its strategic relevance, the effective management of non-utilized talent remains an underexamined area of inquiry, particularly within small and medium-sized enterprises (SMEs), where informal and ad hoc management practices frequently predominate (Chung & Yuen, 2003)

In Thailand, small and medium-sized enterprises (SMEs) engaged in traffic sign manufacturing provide a representative example of this challenge (Chompu-Inwai et al., 2015). These enterprises typically rely on labor-intensive production processes and frequently operate under resource constraints with limited formal human resource management systems. (Basilio, 2025) A preliminary assessment of a traffic sign manufacturing factory situated in Udon Thani Province, Northeastern Thailand, identified widespread occurrences of non-utilized talent waste. Notable issues included misalignments between employee competencies and assigned tasks, disproportionate distribution of manual work, and a lack of effective mechanisms to facilitate employee involvement in continuous improvement initiatives.

Lean management principles, originating from the Toyota Production System have traditionally emphasized the elimination of various forms of process waste to enhance operational efficiency (Womack & Jones, 1997). In recent years, the scope of lean thinking has broadened to encompass human resource management (Subramanian et al., 2023), leading to the emergence of Lean Human Resource Management (Lean HRM). Lean HRM focuses on aligning talent deployment with organizational objectives, promoting continuous learning, and fostering employee engagement as mechanisms for driving operational excellence (Paposa et al., 2023). However, empirical research examining the role of Lean HRM in addressing non-utilized talent waste remains limited, particularly within the context of small and medium-sized enterprises (SMEs).

This study seeks to address this gap by investigating patterns of non-utilized talent waste within a traffic sign manufacturing SME and proposing targeted Lean HRM interventions to enhance workforce utilization and operational performance. By integrating qualitative insights from the field with established Lean and HRM frameworks, this research aims to advance theoretical understanding and offer practical guidelines for optimizing human resource practices in labor-intensive manufacturing environments.

LITERATURE REVIEWS

Lean Waste in Manufacturing Processes

Lean thinking, derived from the Toyota Production System (TPS), emphasizes the systematic elimination of waste to achieve optimal efficiency in manufacturing operations (Womack & Jones, 1997). Within this framework, muda, or waste, is categorized into eight types: overproduction, waiting, transportation, overprocessing, inventory, motion, defects, and non-utilized talent. While early applications of Lean primarily concentrated on eliminating physical

and process-based inefficiencies, increasing attention is now being directed toward talent-related waste, as organizations increasingly recognize the strategic value of human resources (Womack & Jones, 1997). A comprehensive understanding of these forms of waste is essential for diagnosing and addressing productivity challenges in contemporary manufacturing environments.

Non-Utilized Talent Waste

Non-utilized talent waste refers to the underuse or misalignment of employees' skills, creativity, and capabilities (Womack & Jones, 1997). It arises when organizations fail to allocate work that leverages employee competencies, neglect opportunities for active employee involvement, or maintain hierarchical structures that inhibit innovation and continuous improvement (Mehta, 2023). Such inefficiencies not only diminish organizational innovation and engagement but also contribute to employee dissatisfaction and potential burnout (Serrat, 2017). Despite growing recognition of non-utilized talent waste as a critical factor in long-term organizational performance, empirical studies remain relatively scarce-particularly within SMEs, where human resource management systems are often informal and fragmented.

Human Resource Management

Human Resource Management (HRM) encompasses strategic processes aimed at attracting, developing, and retaining talent to achieve organizational objectives (Rajagopal et al., 2022). Contemporary HRM emphasizes the alignment of organizational goals with employee capabilities, fostering psychological engagement and promoting both person-job and person-organization fit (Milhem, 2024; Pillai & Srivastava, 2024). However, many SMEs continue to face challenges in systematically managing talent, resulting in persistent gaps between employee potential and organizational utilization (Fiernaningsih et al., 2024) Addressing these gaps is essential for enhancing productivity, fostering innovation, and supporting sustainable organizational growth.

Integrating Lean Thinking with HRM (Lean HRM)

The integration of Lean principles into HRM commonly referred to as Lean Human Resource Management (Lean HRM) seeks to eliminate waste across HR processes while maximizing the value generated by employees (Womack & Jones, 1997). Lean HRM emphasizes the streamlining of recruitment, training, and performance management processes, ensuring that employees' skills are effectively leveraged to support operational excellence (Fiernaningsih et al., 2024). Moreover, Lean HRM fosters a culture of continuous employee involvement in process improvement initiatives, thereby enhancing engagement and driving innovation (Mehta, 2023). Nevertheless, empirical evidence regarding the application of Lean HRM in addressing non-utilized talent waste remains limited, particularly within labor-intensive SMEs in emerging economies.

Synthesis and Research Gap

The extant literature highlights the growing recognition of non-utilized talent waste as a significant barrier to operational efficiency and organizational performance. While Lean HRM offers promising strategies to mitigate this form of waste, its practical application within SME manufacturing contexts such as traffic sign production in Thailand remains underexplored. This study aims to address this gap by examining how Lean HRM principles can be effectively deployed to reduce non-utilized talent waste and enhance operational efficiency within a labor-intensive SME environment.

Conceptual Framework

This study adopts a conceptual framework that integrates lean management principles with Human Resource Management (HRM) to systematically address non-utilized talent waste (task mismatch and workload imbalance) in manufacturing operations. The framework is grounded in the lean HRM perspective, which emphasizes the strategic alignment of employee

competencies with task requirements and the continuous engagement of employees in process improvement (Fiernaningsih et al., 2024; Mehta, 2023).

The framework comprises three key components:

Input : Qualitative data are collected through participant observation, in-depth interviews, and focus group discussions involving employees and management at a traffic sign manufacturing SME located in Northeastern Thailand. Additional data are gathered using flow process charts, two-handed process charts, and skill matrices to map current work practices and identify inefficiencies.

Process : Analytical tools are employed to examine patterns of non-utilized talent waste, with a particular focus on task-skill mismatches, imbalanced manual task distribution, and barriers to employee participation. The analysis is guided by lean principles and HRM best practices to uncover root causes of inefficiency and identify opportunities for improvement.

Output : The study proposes targeted lean HRM interventions designed to reduce non-utilized talent waste and enhance operational efficiency. These interventions include skill-based job design, workflow optimization, and the establishment of structured communication channels to promote continuous employee engagement. Anticipated outcomes include improved workforce utilization, enhanced productivity, and increased employee satisfaction.

The conceptual framework presented in Figure 1 provides a structured approach for analyzing the interplay between human resource management practices and lean manufacturing principles. By systematically addressing non-utilized talent waste, the framework offers both theoretical insights and practical guidance for enhancing operational efficiency and workforce utilization in labor-intensive SME contexts.

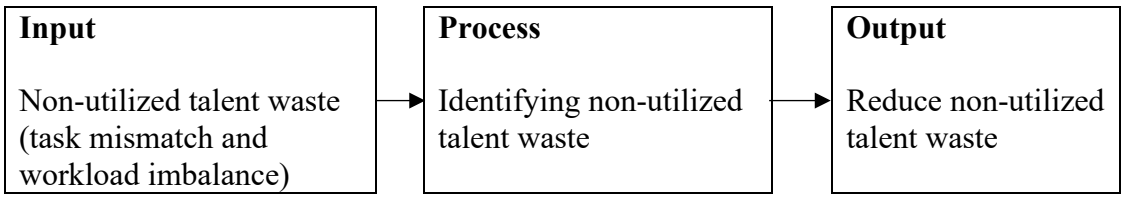

Figure 1 Conceptual Framework

RESEARCH METHODOLOGY

This study adopts a qualitative case study design to explore the patterns of non-utilized talent waste and to examine the potential application of Lean Human Resource Management (Lean HRM) interventions within a labor-intensive small and medium-sized enterprise (SME) in Northeastern Thailand. A qualitative approach was deemed appropriate given the complex and context-specific nature of talent utilization and organizational processes, which are not easily captured through quantitative survey methods (Chou & Cerna, 2019). The case study methodology enables an in-depth investigation of employee experiences, organizational practices, and production dynamics within their real-world setting. To ensure methodological rigor, data were collected through multiple sources, including participant observation, in-depth interviews, and focus group discussions, supplemented by structured process analysis using established industrial engineering tools. The integration of qualitative insights with systematic process mapping provides a comprehensive understanding of how non-utilized talent waste emerges and how targeted Lean HRM interventions may be designed to address it.

Data Collection

Data were collected through three primary qualitative methods: participant observation, in-depth interviews, and focus group discussions. Participant observation enabled the researcher to develop a contextual understanding of work processes and employee interactions within the manufacturing environment. In-depth interviews were conducted with twelve purposively selected employees from three skill levels-entry, mid, and advanced-based on experience

criteria: at least six months for entry-level, one to three years for mid-level, and more than three years for advanced-level employees. All participants were actively working in production-line operations during the study period. There by ensuring a diverse range of perspectives regarding skill utilization and operational practices. In addition, focus group discussions were employed to elicit shared experiences and generate collaborative insights concerning opportunities for process improvement.

To complement the qualitative inquiry, several analytical tools were utilized to systematically examine work processes. Flow process charts were employed to map the sequence and timing of manufacturing activities; two-handed process charts were used to analyze the distribution and balance of manual tasks; and skill matrices were developed to assess the alignment between employee competencies and task requirements. Collectively, these tools provided a structured basis for identifying inefficiencies and instances of non-utilized talent waste within the production workflow (Sabilah & Daonil, 2024)

Data Analysis

Data analysis was conducted through an iterative process involving thematic coding of interview and focus group transcripts, triangulation of observational data, and cross-referencing with the outputs derived from process charts. Particular emphasis was placed on identifying patterns of task-skill mismatches, imbalances in manual task distribution, and organizational barriers to employee engagement. The emergent findings were subsequently synthesized to inform the design of targeted Lean HRM interventions aimed at reducing talent-related waste and enhancing operational efficiency.

By integrating qualitative insights with structured process analysis, this methodological approach provides a comprehensive understanding of how non-utilized talent waste manifests within a labor-intensive SME context. Moreover, it establishes a robust foundation for the development of practical Lean HRM strategies tailored to the specific challenges and operational realities of the target organization.

Data Verification

To ensure the credibility and trustworthiness of the qualitative findings, several verification strategies were employed throughout the research process. Data were triangulated across multiple sources participant observation, in-depth interviews, focus group discussions, and process chart analyses. This multi-method approach enhanced the robustness of the findings by cross-validating emerging patterns from different perspectives. (Lemon & Hayes, 2020)

RESEARCH RESULTS

This section presents the key findings of the study concerning patterns of non-utilized talent waste within the target traffic sign manufacturing SME. Drawing upon qualitative data and structured process analysis, the results reveal three primary categories of waste: task-skill mismatches, imbalanced distribution of manual tasks, and process inefficiencies associated with waiting and motion. Comparative analyses of two production teams (Team A and Team B) further elucidate differences in operational practices and workforce utilization.

Patterns of Non-Utilized Talent Waste

The flow process chart analysis identified eleven primary steps within the traffic sign manufacturing process, spanning from order receipt to final product storage (Table 1). Of these steps, five were classified as value-adding activities (VA) namely, receive production order (Step 1), cutting aluminum sheets / sign frame (Step 5), applying base coat (Step 6), applying reflective background film (Step 8) and applying text sticker (Step 9). The remaining steps were categorized as either necessary but non-value-adding (NNVA) or non-value-adding (NVA), with prolonged waiting periods and unnecessary motion observed particularly during material transfer (Step 3), paint drying (Step 7), and product handling (Step 11).

The presence of non-value-adding stages particularly the extensive idle time during the drying process contributed significantly to non-utilized talent waste. Furthermore, task-skill mismatches were evident in several process stages, where employee competencies were underutilized during repetitive manual tasks or prolonged waiting periods.

Table 1 Overview of Manufacturing Process Activities

Step No.	Activity	Type of Activity	Time (seconds)	Value Analysis
1	Receive production order	Operation	60	VA
2	Print symbol or text design	Operation	300	NNVA
3	Transfer printed design to production	Transportation	120	NVA
4	Inspect raw materials	Inspection	120	NNVA
5	Cut aluminum sheets / sign frame	Operation	900	VA
6	Apply base coat (spray painting)	Operation	180	VA
7	Wait for paint to dry	Delay	2,700	NVA
8	Apply reflective background film	Operation	180	VA
9	Apply text sticker	Operation	300	VA
10	Conduct quality inspection	Inspection	90	NNVA
11	Transport finished product to warehouse	Transportation	60	NVA

Note: VA = Value-adding; NNVA = Necessary but Non-Value-Adding; NVA = Non-Value-Adding.

Task-Skill Mismatches and Imbalanced Manual Task Distribution

A prominent source of non-utilized talent waste was identified in the mismatch between employee skills and assigned tasks. For instance, during the design printing stage, operators' left hands remained inactive throughout the process, while the right hands performed repetitive digital inputs resulting in a partial underutilization of available manual capacity. Similarly, in the material inspection stage, manual tasks were unevenly distributed, leading to suboptimal utilization of operator capabilities.

Analysis of the two-handed process charts further substantiated these imbalances in manual task distribution. In Team A, right-hand activity exceeded left-hand activity by approximately 29% (Table 2), whereas Team B exhibited a more balanced distribution, with a difference of 10.5% between right- and left-hand activities (Table 3). These findings indicate that Team B's workflow achieved greater ergonomic balance and more effective utilization of manual capacity. However, both teams exhibited significant inefficiencies related to waiting periods particularly during the drying process for painted components which contributed substantially to idle time across the production flow.

Table 2 Two-Handed Process Chart -Team A (Before Improvement)

Activity Type	Left Hand (count)	Right (count)
Operation	6	11
Transportation	5	4
Inspection	0	2
Delay	5	4
Storage	1	1
Total	17	22

Table 3 Two-Handed Process Chart-Team B (Before Improvement)

Activity Type	Left Hand (count)	Right (count)
Operation	6	10
Transportation	5	2
Inspection	0	2
Delay	6	5
Storage	1	1
Total	18	20

These findings underscore the presence of substantial non-utilized talent waste within both production teams, stemming from task-skill mismatches and imbalances in manual task allocation. Furthermore, the drying process emerged as a significant contributor to idle time and overall operational inefficiency. These insights provide a critical foundation for the development of targeted Lean Human Resource Management (Lean HRM) interventions, which are discussed in the subsequent section.

Comparative Insights: Team A vs. Team B

The production flow of Team A exhibited more pronounced instances of unbalanced manual task allocation and longer cumulative idle periods. Notably, the waiting time associated with the drying process-measured at 2,700 seconds-constituted a major source of overall process inefficiency. This inefficiency was further exacerbated by limited employee engagement during this stage, resulting in prolonged periods of non-productive activity.

By comparison, Team B demonstrated relatively better balance in manual operations and more consistent employee engagement across various process steps. However, task-skill mismatches and underutilization of talent remained evident, particularly in digitally intensive tasks and manual inspection activities, where employee competencies were not fully leveraged.

Overall, the results indicate that non-utilized talent waste within the studied SME arises from both structural aspects of process design and prevailing workforce management practices. Task assignments frequently fail to optimize employee competencies, manual operations exhibit imbalances, and specific stages of the production flow generate excessive idle time. These findings highlight the critical need for targeted Lean Human Resource Management (Lean HRM) interventions aimed at improving workforce utilization and enhancing operational efficiency across the production system.

DISCUSSION & CONCLUSION

This study offers valuable insights into the ways in which non-utilized talent waste manifests within a labor-intensive SME manufacturing context and demonstrates how Lean Human Resource Management (Lean HRM) principles can be effectively leveraged to mitigate such inefficiencies (Chiyangkabut & Sangchai, 2016).

The findings indicate that task-skill mismatches and imbalanced manual operations are key contributors to non-utilized talent waste. This is consistent with the observations of (Womack & Jones, 1997), who argue that assigning tasks misaligned with employee competencies not only undermines operational efficiency but also adversely affects employee engagement and motivation. Furthermore, the significant idle time observed during the drying process highlights the impact of poorly designed workflows on workforce utilization, corroborating Thatphet and Ruangchoengchum's (2024) characterization of time-based process waste as a critical source of inefficiency.

The comparative analysis between Team A and Team B further underscores the influence of task distribution and employee engagement practices on operational outcomes. Although Team B demonstrated a more balanced distribution of manual tasks, both teams exhibited persistent instances of talent underutilization, particularly in digitally intensive and inspection-related

activities. These patterns suggest the necessity of adopting comprehensive Lean HRM interventions that address not only technical process improvements but also the broader dimensions of workforce management and organizational culture.

This study contributes to the growing body of research on Lean HRM by providing empirical evidence from an SME context-an area that remains underrepresented in the extant literature (Rajagopal et al., 2022; Mehta, 2023). While much of the existing knowledge on Lean HRM has been derived from large enterprise environments, the present findings demonstrate that Lean HRM principles are equally applicable and advantageous within smaller, resource-constrained organizations. Moreover, this research highlights the value of integrating qualitative insights with structured process analysis-a methodological approach that facilitates a more nuanced understanding of human resource-related waste and its operational implications.

From a practical standpoint, the proposed Lean HRM interventions-including skill-based job design, workflow optimization, and the establishment of enhanced communication channels-offer actionable strategies for improving workforce utilization and operational efficiency. These interventions align with Lean HRM's core emphasis on fostering a culture of continuous improvement and employee engagement (Subramanian, 2024).

In sum, this study advances both academic and practical discourse by bridging Lean Management and HRM frameworks within the context of SME manufacturing. It underscores the pivotal role of human-centered approaches in driving operational excellence and provides a foundation for future research on talent waste reduction in similar organizational settings.

Based on the findings of this study, several practical implications and directions for future research are proposed.

Suggestions for Practice

Practitioners operating within SME manufacturing environments are encouraged to implement Lean Human Resource Management (Lean HRM) interventions as a means of enhancing workforce utilization and reducing non-utilized talent waste. In particular, the adoption of skill-based job design can promote a stronger alignment between employee competencies and task requirements, thereby improving both operational efficiency and employee engagement. Additionally, workflow optimization-guided by systematic process analysis tools such as flow process charts and two-handed process charts-can help balance manual operations and reduce idle time across production processes. Furthermore, the establishment of structured communication channels, including regular feedback sessions and employee suggestion mechanisms, can foster a culture of continuous improvement and active employee participation.

Suggestions for Future Research

Future research should investigate the potential integration of digital technologies with Lean HRM practices to further enhance workforce agility and adaptability. For example, the application of digital tools for real-time skill tracking and dynamic task allocation may present new opportunities for optimizing talent utilization in manufacturing settings. In addition, comparative studies across organizations of varying sizes and industrial sectors would provide valuable insights into the generalizability and scalability of Lean HRM interventions. Finally, testing these approaches in diverse cultural and operational contexts would contribute to the development of more robust and adaptable Lean HRM frameworks applicable across a wide range of manufacturing environments

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