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Research Article

Innovative Models in Quality Management Control

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Abstract

The UV Cropping finishing service industry has a strategic role in increasing the aesthetic value and selling power of printed products. However, the high level of product defects due to technical errors, lack of employee competence, and weaknesses in quality control cause increased operational costs and decreased customer satisfaction. This study aims to develop a Human- Centered Quality Control (HCQC) Model to improve the effectiveness and efficiency of employee performance in quality control. This study uses a mixed methods method that combines qualitative and quantitative approaches. The HCQC model focuses on six main components, namely improving employee competence through training and certification, performance-based motivation and incentives, team collaboration with the Quality Control Circle (QCC), technology-based performance monitoring and evaluation, simulation and testing of quality improvement methods, and utilization of data and machine learning to optimize quality control. The results of the study indicate that the application of the HCQC model can reduce the level of product defects, increase employee involvement in quality control, and optimize operational costs by reducing waste. With a human resource-based approach, companies can be more effective in improving their quality standards and competitiveness. Therefore, this model is recommended as an innovative strategy in quality control in the finishing and manufacturing service industries.

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Introduction

The problem faced by this finishing service company is the high number of damaged products resulting in complaints and increased operational costs. The UV Cropping finishing service industry has a strategic role in increasing the aesthetic value, attractiveness, and selling power of printed products such as packaging, brochures, books and business cards. UV Cropping technology provides a more premium appearance and provides a more premium appearance and additional protection for printed products. However, in practice, the quality of production results often does not meet the expected standards, causing various problems. In the case study at this company, the main problem faced was the high level of product damage in the production process. This damage can be caused by various factors, such as technical errors in the machine, the use of raw materials that do not meet specifications, lack of employee competence in operating the machine, and weaknesses in quality control. The direct impact of this problem is the increase in defective products which ultimately affects consumer satisfaction. Increasing customer complaints not only risk reducing consumer trust, but also have an impact on the company's reputation, besides it will also have an impact on mass unemployment if consumers buy their own machines to finish their own product finishing . In addition, high

levels of damage cause waste of materials and time , so that operational costs increase due to rework or even product replacement. This situation indicates an urgent need to improve the effectiveness and efficiency of employee performance in the production department. As a solution, the implementation of quality management control is a strategic approach to identify the main causes of damage, reduce errors during the production process, and ensure that quality standards are met. With good quality control, companies can reduce the level of damage, reduce operational costs, and increase customer satisfaction. Therefore, this study aims to formulate the right strategy to support the improvement of employee performance effectiveness and efficiency through quality control in a UV Cropping finishing service company . In research (Ridwan et al., 2020) to reduce waste and minimize defective products, fishbone diagrams and 5 whys are applied and for problem analysis the 5W + 1H method and the 5S approach are used. To increase productivity by reducing waste with the VSM method, while the results of the study are activities with added value (VA) of 4% and NNVA of 10%, while activities that do not provide added value (NVA) are 86%. The cause of the high percentage of activities that do not have added value is due to delays is the result of research conducted by (Aisyah, 2020) . The next study is a recommendation for alternative quality control strategies is the implementation of GMP, SSOP and HACCP applications, by increasing employee knowledge and skills, improving supervision of raw material quality, maintenance of production machines and equipment and improving supervision is the result of research (Nurrahmah et al., 2022) . To find out the most dominant level of defects, the causes of defects, using the seven tools method with the results of the study obtained the dominant level of defects in soft products with a percentage of 42.82%, then the most frequent causes of human factors include negligence, lack of focus and fatigue. Therefore, improvements are needed to reduce the number of defect levels by providing sufficient rest time for workers and routine maintenance of the tools used are the results of research (Indranata et al., 2022) . Then according to (Gu et al., 2023) who examined the impact of human resource management practices on supply chain resilience from the perspective of ability - motivation - opportunity. Meanwhile, according to (Kovács, 2018) in production, resources including raw materials, humans, machines, equipment are always limited. It is very important for manufacturing companies to produce cost-effective end products in short lead times that can be achieved with minimized costs and higher effectiveness, therefore efficiency improvement methods are needed. Where the methods applied are simulation, lean methods and layout design. In contrast to research (Sinaga & Maryanto, 2019) which discusses that improper handling and maintenance of machines can result in losses called the six big ones. loss . The first stage in an effort to increase production efficiency in this company is to measure the effectiveness of the laminating machine using the overall equipment method. effectiveness (OEE) which is then continued by regulating the OEE six big loss to regulate the amount of efficiency lost in the six big losses . In the study (Ummah, 2019) it was stated that the effectiveness of the management system is determined by the reliability, quality and speed of decisions, the effectiveness of the cost of spending to maintain and develop management equipment will increase the utilization of production capacity, reduce production costs, change the maintenance time indicators of production machines and equipment and reduce the production area used. Another study is according to (Dhawan, 2024) who said that the full benefits of productivity improvement measures can be realized when productivity is examined from two perspectives. Operational efficiency of an individual worker or business unit and performance (Effectiveness in relation to end-user or customer satisfaction. Furthermore, research conducted by (Uluskan, 2022) shows that six sigma is a powerful methodology for reducing variation, minimizing costs, improving product and process quality in an organization and ultimately maximizing customer satisfaction. In the study (Krishnan et al., 2021) said efforts to improve quality and quality management so that Indian manufacturers can position themselves to survive in a competitive environment. Different again with research (Galli, 2018) describes the process of defining, measuring, analyzing, improving and controlling six sigma and shows how to combine lean six sigma tools and project management. In the study (Sunder, 2016) where the aim is to review the literature on lean six sigma and stakeholder management to develop a basic understanding of the important relationship between the two. The next study is (Ghasemi & Sohrabi, 2023) contains an analysis that highlights the potential to integrate these two methodologies in order to create a strategy for continuous and incremental improvement through employee involvement. Next is the research (Sony et al., 2020) which contains criticism of six sigma , including high failure rates, high initial costs, six sigma techniques on shifting, the significance of reducing variation. While the research I did was to identify problems that caused high levels of damaged products based on the effectiveness and efficiency of production employee performance with alternative solutions to the problem with quality control through a human resource-based management control model approach (Human-Centered Quality Control-HCQC).

Materials and Methods

This study uses qualitative and quantitative approaches (mixed methods) to obtain comprehensive results. This approach allows researchers to analyze data in depth

while obtaining relevant generalizations. The flow chart in this study is as shown in the following figure:

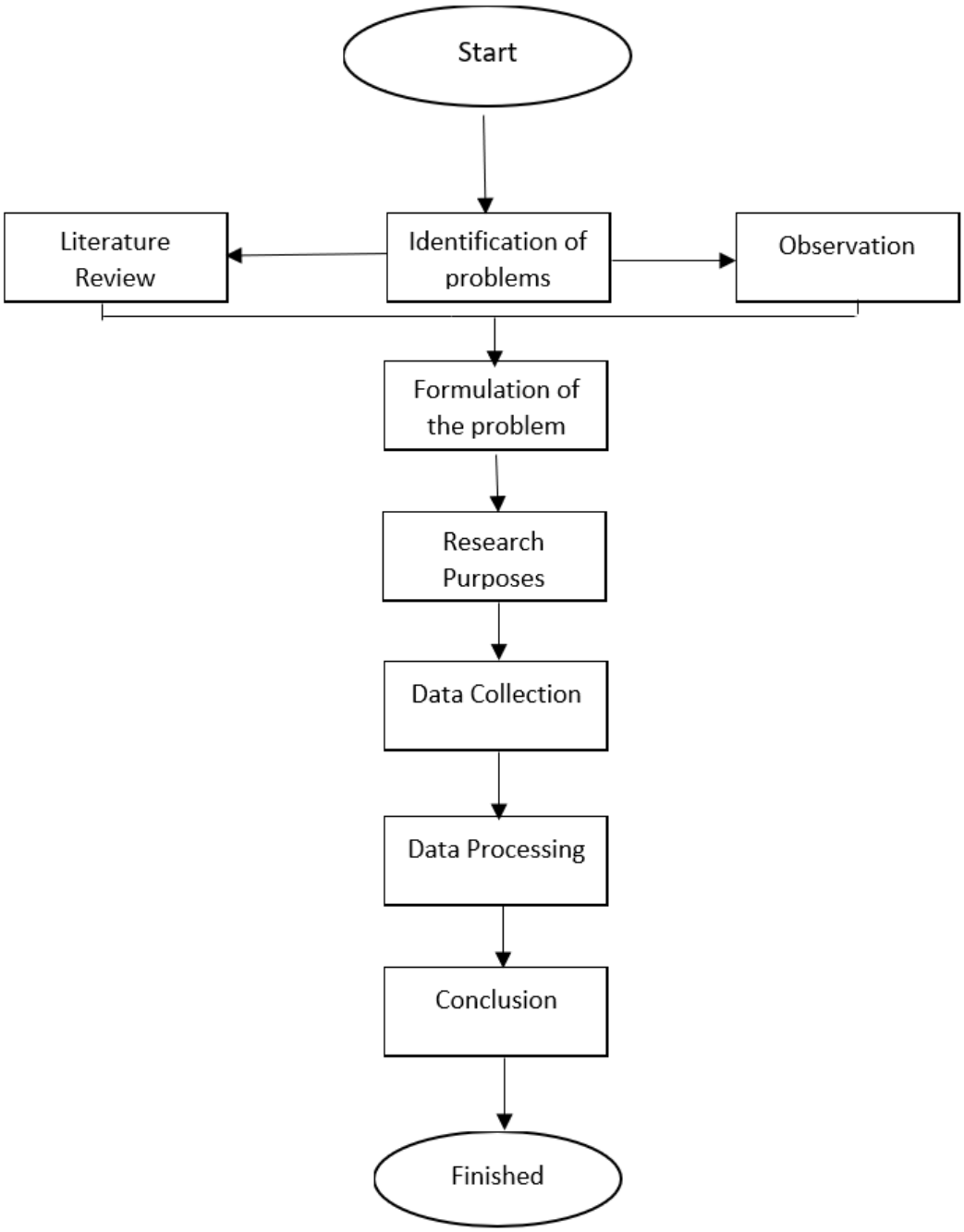

Figure 1. Flow chart of research methodology

In this study, we start by identifying the problem supported by literature studies and observations in the company, then determine the formulation of the problem, determine the objectives, collect data, process data and discuss it, then end by drawing conclusions.

Results and Discussion

This Human-Centered Quality Control (HCQC) Model.

Model Components:

1. Employee Competency Improvement:
   - Specific needs-based training (Skill-Based Training).
   - Internal certification to ensure competency standards.

2. Motivation and Incentives:
   - team quality performance based reward system
   - Quality Innovation Recognition Program.
3. Team Collaboration:
   - teamwork methodologies such as Quality Control Circle (QCC).
   - Digital platform for collaboration and sharing ideas.
4. Performance Monitoring and Evaluation:
   - team quality performance .
   - Utilization of technology such as data-based monitoring applications (Digital Dashboard).
5. Simulation and Testing (Testing Ground):
   - Internal laboratory to test quality improvement methods.
6. Use of Data for Optimization:
   - Analyze employee error data to identify patterns that cause failures.
   - Leveraging machine learning to provide personnel training recommendations.

Basic Assumptions of HCQMT:

1. The central role of HR:
   Product quality is greatly influenced by the performance and competence of individuals and teams in the production process.
2. Continuous Competency Improvement:
   Focused and ongoing training is key to reducing work errors and improving product quality.
3. Motivation to Improve Performance:
   A fair reward and recognition system encourages employee productivity and concern for quality.
4. Collaboration Strengthens Quality;
   teamwork accelerates the identification and collective resolution of quality problems .
5. Data-Driven Making:

Using data to understand error patterns and provide specific intervention recommendations improves the effectiveness of quality control.

The Mathematical Model:

1. Main Variables
   - Competence: Employee competency level, measured by training or work experience evaluation scores.
   - Motivation: Motivation level, calculated from the employee motivation index which includes intrinsic and extrinsic aspects.
   - Collaboration: The level of collaboration between employees, measured by the level of participation in the team and the effectiveness of communication.
   - Quality: The level of product quality, measured by the percentage of defect-free products.
   - Cost of Operations: Operational costs, including labor costs, inspections, and product damage.

This study proposes an innovative model in human resource-based quality management control, called Human-Centered Quality Control (HCQC) . This model emphasizes the importance of employee involvement in maintaining production quality through increasing competence, motivation, collaboration, and the use of data for process optimization.

Some of the key findings in this study are:

1. Employee Competency Improvement : Through specific needs-based training and internal certification, it is expected that employees will have better skills in operating machines and avoiding production errors.
2. Motivation and Incentives : Individual and team quality performance-based reward systems can increase employee awareness of the quality standards that must be met.
3. Team Collaboration : By implementing the Quality Control Circle (QCC) methodology and a digital platform for sharing ideas, quality problem solving can be done collectively.
4. Performance Monitoring and Evaluation : Using data-based applications for performance monitoring can provide faster and more accurate feedback.
5. Simulation and Testing : Internal laboratories are used to test quality improvement methods before they are implemented in full-scale production.
6. Data Utilization : Error analysis using machine learning helps identify patterns that cause failures, so that training and interventions can be carried out more effectively.

The results of the implementation of the HCQC model show that this approach can reduce the level of product defects, increase the effectiveness and efficiency of employee work, and reduce operational costs due to rework and material waste**.**

Conclusion

The HCQC model is effective in improving production quality by placing human resources as the main factor in quality control. Improving employee competency through internal training and certification has been proven to reduce errors in the production process. Performance-based motivation and incentive systems increase employee involvement and responsibility for product quality. Team collaboration through Quality Control Circles (QCC) and the use of digital technology accelerates the identification and resolution of quality issues. Utilizing data in decision making helps companies optimize quality control strategies in a more objective and measurable manner. This human resource-based approach also contributes to operational efficiency , as it reduces waste and increases work productivity.

Thus, the application of the HCQC model is recommended for UV Cropping finishing service companies and similar industries that experience problems in quality control and production efficiency.

References

Aisyah, S. (2020). Lean Manufacturing Planning to Reduce Waste Using the VSM Method at PT Y Indonesia. Journal of Industrial Engineering Optimization (JOTI) , 2 (2), 56. https://doi.org/10.30998/joti.v2i2.4096

Dhawan, A.P. (2024). Productivity improvement tools used in the Industry-An Overview. International Journal of Scientific Research in Engineering and Management , 08 (05), 1–5. https://doi.org/10.55041/ijsrem35225

Galli, B. J. (2018). Can project management help improve lean six sigma? IEEE Engineering Management Review , 46 (2), 55–64. https://doi.org/10.1109/EMR.2018.2810146

Ghasemi, H., & Sohrabi, N. (2023). The Role of Continuous Improvement in Engineering Management: A Review of Kaizen and Six Sigma Practices. Management Strategies and Engineering Sciences , 5 (2), 1–10. https://msesj.com/index.php/mses/article/view/32

Gu, M., Zhang, Y., Li, D., & Huo, B. (2023). The effect of high-involvement human resource management practices on supply chain resilience and operational performance. Journal of Management Science and Engineering , 8 (2), 176–190. https://doi.org/10.1016/j.jmse.2022.12.001

Indranata, MD, Andesta, D., & Hidayat. (2022). Quality Control of Onion Cracker Products Using the Seven Tools Method (Case Study: Dinda Cracker UMKM). Serambi Engineering , VII (2), 3120–3128.

Kovács, G. (2018). Methods for Efficiency Improvement of Production and Logistic Processes. Research Papers Faculty of Materials Science and Technology Slovak University of Technology , 26 (42), 55–61. https://doi.org/10.2478/rput-2018-0006

Krishnan, S., Mathiyazhagan, K., & Sreedharan, V.R. (2021). Developing a hybrid approach for lean six sigma project management: A case application in the reamer manufacturing industry. IEEE Transactions on Engineering Management , 69 (6), 2897–2914. https://doi.org/10.1109/TEM.2020.3013695

Nurrahmah, A., Hartini, S., & Santosa, PPP (2022). Analysis of Bread Product Quality Control Using Good Manufacturing Practices (GMP) and Hazard Analysis Critical Control Point (HACCP) Methods at Ahnaf Bakery SMEs. Journal of Technology and Management , 20 (2), 119–132. https://doi.org/10.52330/jtm.v20i2.61

Ridwan, A., Arina, F., & Permana, A. (2020). Improving quality and efficiency in the dunnage production process using the lean six sigma method (Case study at PT. XYZ). Teknika: Jurnal Sains Dan Teknologi , 16 (2), 186. https://doi.org/10.36055/tjst.v16i2.9618

Sinaga, Z., & Maryanto, T. (2019). Analysis of Total Productive Maintenance on Laminating Machine I with Overall Equipment Effectiveness Method. JIEMS (Journal of Industrial Engineering and Management Systems) , 12 (1). https://doi.org/10.30813/jiems.v12i1.1533

Sony, M., Antony, J., Park, S., & Mutingi, M. (2020). Key Criticisms of Six Sigma: A Systematic Literature Review. IEEE Transactions on Engineering Management , 67 (3), 950–962. https://doi.org/10.1109/TEM.2018.2889517

Sunder, V. M. (2016). Lean six sigma project management - A stakeholder management perspective. TQM Journal , 28 (1), 132–150. https://doi.org/10.1108/TQM-09-2014-0070

Uluskan, M. (2022). Enhancing Six Sigma Understanding: Insights into Various Dimensions and Aspects of Six Sigma. EMJ - Engineering Management Journal , 34 (1), 99–128. https://doi.org/10.1080/10429247.2020.1852806