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Enhancing Production and Operations Efficiency through the Integration of an Automated Parts Ordering System Using Visual Basic for Applications (VBA) in Microsoft Excel: A Case Study of the Engineering Department in a Manufacturing Company

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Abstract- ***This research focuses on integrating a Visual Basic for Applications (VBA) tool into Microsoft Excel to enhance the engineering department's productivity at an automotive wire harness manufacturing company. Traditionally, the department relied on manual, paper-based requests for ordering parts, a process that frequently led to unclear descriptions, missing information, and incorrect part specifications. To address these inefficiencies, a digital system was developed following an eight-stage methodology: problem identification, data collection, data analysis, system design, VBA encoding, testing, implementation, and conclusion.***

Index Terms- ***Manufacturing Company, Microsoft Excel, Ordering System, Visual Basic***

I. INTRODUCTION

In the automotive wire harness manufacturing industry, the engineering department plays a key role in supporting the construction, modification, and improvement of production lines (Smith & Jones, 2022). Engineers regularly requested different materials and tools needed for various engineering projects. These requests were handled by a designated office, where engineers manually wrote the required information on paper forms and submitted them for processing. This method had been practiced for many years and was considered part of the department's normal workflow. Efficient project execution in this sector depends on the engineering department's ability to accurately identify and procure the correct components for line modifications (Logistics Management Journal, 2024). However, as projects and engineering activities increased, certain challenges began to surface with the traditional paper-based ordering system. Handwritten requests sometimes led to unclear details, missing information, or incorrect item descriptions. These issues often led to misunderstandings, follow-up clarifications, and occasional delays in preparing materials and in the construction and repair of production lines. The process was also tedious, especially when multiple materials or repeated requests needed to be submitted. Over time, it became evident within the department that the existing approach was becoming difficult to sustain, particularly with growing operational demands. The shift from manual documentation to structured digital input reduces human error and ensures data integrity within industrial workflows (Galloway et al., 2021).

A Visual Basic for Applications (VBA)–based tool in Microsoft Excel was developed and introduced to automate the parts ordering process. Excel-based automation remains a vital "low-code" solution for manufacturing environments, enabling rapid deployment of customized tools without extensive IT infrastructure (Serrano & Reid, 2022). Instead of writing everything manually, engineers could now enter their requests in a structured digital format, making them clearer, more organized, and easier to manage. The system also allowed better documentation, since records were stored electronically and could be accessed when needed. A Visual Basic for Applications (VBA)–based tool in Microsoft Excel was developed and introduced to

automate the parts ordering process. Instead of writing everything manually, engineers could now enter their requests in a structured digital format, which helped make them clearer, more organized, and easier to manage (Smith & Thompson, 2022). The system also allowed better documentation, since records were stored electronically and could be accessed when needed, aligning with modern requirements for data traceability. (International Organization for Standardization, 2016).

This development reflects how practical, low-cost digital solutions can be applied in real workplace settings to improve everyday processes (Jones, 2023). The integration of a VBA-based ordering tool provided a simpler and more convenient way for engineers to request parts, helped minimize repetitive manual tasks, and supported smoother coordination within the department. This research was focused on integrating a visual basic application through Microsoft excel to enhance productivity of the engineering department in ordering parts in a manufacturing company.

II. LITERATURE REVIEW

ABC Company kept the basic planning logic and formulas while modernizing its procurement process by eliminating manual activities. This strategy is consistent with studies by (Kalwar and Khan 2020), who investigated Excel VBA automation for creating acquisition reports and purchase orders. The roughly 35-minute task (2097 seconds) was reduced to less than 10 minutes (539 seconds) by their findings, demonstrating a significant reduction in processing time. VBA is a user-friendly but highly effective programming tool from Microsoft used to automate repetitive manual operations. By using this event-driven language, users can achieve accurate results in a fraction of the time it would take to do the work by hand. (Kalwar, et.al 2024). Automation enhances speed, accuracy, and data consistency in procurement transactions. In ordering parts, research indicates that automated order systems are essential for organizations that require timeliness and accuracy in material processing (Itamaki, 2025). Integration of automation also minimize repetitive manual tasks and improving documentation reliability. (Pongsirisang, 2001).

Microsoft Excel and VBA are widely recognized as powerful yet low-cost automation tools in industrial and business operations, moreover, demonstrates that VBA reduces manual workload and enhances reporting efficiency. (Kalwar, et.al 2021). Manufacturing environments benefit significantly from digital systems that support material planning and inventory management. Research highlights the importance of computerized monitoring in ensuring availability of materials and supporting production continuity. (Chukwulozie, 2014). Through integration of VBA, it provides significant operational efficiencies, specifically through time conservation and enhanced data accuracy. While applicable across various Microsoft platforms, VBA's utility is most prominent in Excel. Given Excel's status as the global industrial benchmark for data analysis, VBA is an effortless yet complex component for extensive spreadsheet features. (Khan, 2021).

III. METHODOLOGY

The description of the techniques used to carry out research is known as research methodology. Under this section, there was a thorough discussion of data collecting, data analysis, report automation tools, and calculating methods, as listed below.

Figure 1: Research stages

1. *Identification of Problems*. At the initial stage, the researcher identifies and formulates the problem to be solved regarding the manual ordering of parts which includes errors in parts specification, wrong parts, or efficiency in inventory management.
2. *Collection of Data.* At this stage, researcher will collect data related to the inventory information system using observation, interview, and literature study techniques.

3. *Analysis of Data*. At this stage, the researcher analyzes and selects the data collected for use in the system to be built.
4. *Design of the System*. At this stage, the researcher plans and designs the automation tool.
5. *Encoding through VBA*. At this stage, the core logic is programmed using VBA language to facilitate automation.
6. *Testing of the system*. At this stage, the researcher rigorously checks the system for errors or bugs.
7. *Implementation of the system*. At this stage, the researcher the automation tool is used by the engineering department.
8. *Conclusion*. At this stage, the assessment is made of the automation affecting the performance of the manufacturing department's parts ordering.

IV. RESULTS AND DISCUSSION

The results of the implementation of the VBA in the engineering department of a manufacturing company is listed below.

Table 1: Processing time comparison

Activity	Manual system	VBA System	Improvement
Creating parts request	12 min	4 min	66.7%
Verifying parts detail	8 min	2 min	75%
Recording request logs	5 min	0 min (automatic)	100%
Total processing time	25 min	6 min	76%

Integration of VBA in parts ordering reduced repetitive manual work, as shown in Table 1. Creating parts requests was reduced from 12 min to 4 min, achieving 66.7% improvement, while verification time decreased from 8 minutes to 2 minutes (75% improvement) due to structured inputs and validation features. Recording request logs, which previously took 5 minutes, was fully automated, resulting in a 100% reduction in time. Overall, the processing time was reduced from 25 minutes to 6 minutes, resulting in a 76% improvement.

These results indicate that the VBA system significantly enhanced efficiency, reduced manual workload, and improved process reliability in the parts ordering workflow.

Table 2: User satisfaction / Employee Feedback

Statement	Mean
System is easy to use	4.6
Faster than manual process	4.8
Improved accuracy	4.5
Reduced workload	4.4

Table 2 presents user satisfaction results from a Likert-scale survey (1-5). It shows the evaluation of the VBA-based automated parts ordering system by the engineering personnel. The results revealed high user acceptance, with all indicators receiving mean scores of 4.4-4.8, interpreted as “Strongly Agree.” The statement “Faster than manual process” obtained the highest mean of 4.8, indicating that the system significantly improved the speed of preparing and processing parts requests. “System is easy to use,” with a mean of 4.6, indicating that users found the system convenient and user-friendly. Meanwhile, “Improved accuracy” and “Reduced workload” received mean scores of 4.5 and 4.4, respectively, suggesting that the system helped minimize errors and lessen manual tasks. Overall, the findings indicate that the VBA system improved efficiency, accuracy, and productivity in the engineering department.

V. CONCLUSION

The study conducted in the manufacturing industry’s engineering department shows that a computerized parts ordering system is far superior to manual methods because it digitizes all data and prevents incorrect part specifications. By moving away from manual operations, the system serves as a central hub for ordering and managing parts and materials, including detailed part-time information and supplier information. This shift directly addresses common issues like entering the wrong part numbers or

incorrect specifications. Ultimately, the automated system boosts productivity and reduces costs and effort by providing fast, error-free data whenever needed.

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