Automation of Order Management and Inventory Management in Fashion E-Commerce using Low Code Automation Tool

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Abstract— This study addresses inefficiencies in manual order and inventory management in fashion e-commerce. The literature revealed various automation tools used such as Generative AI, process automation, RPA and low code automation tool. For an SME with low product variants a low code automation tool seemed more apt to be deployed due to reduced complexity and low cost of implementation and technical knowledge. A detailed study on the existing processes of order and inventory management was explored to identify to the areas and flow of automation. The automation for developed for a limited scope and use case. Utilizing low-code automation tools like Shopify, Airtable, and QuickBooks, the streamlined workflows for order confirmation, inventory tracking, and supplier management was designed. The automation was tested and was successfully deployed for the test SME created with several test orders. Findings reveal significant improvements in efficiency and error reduction. The adoption of low-code automation offers transformative solutions for enhancing productivity and customer satisfaction in e-commerce. Continued exploration of automation strategies promises sustained growth and competitiveness in the evolving landscape.

Index Terms- Automation, Inventory Management, Order Management, Low Code Software

I. INTRODUCTION

Order management and inventory management are critical components of the fashion e-commerce sector. In the highly competitive online retail environment, efficient management of orders and inventory can significantly impact a company's productivity, cost-effectiveness, and overall success. Meeting customer demands and achieving operational excellence necessitate the optimization of these processes, particularly through automation.

Currently, fashion e-commerce businesses face several challenges due to the reliance on manual processes in order and inventory management. Order details must be manually collected from e-commerce platforms such as Shopify and entered spreadsheets like Google Sheets. This manual approach is time-consuming, prone to errors, and inefficient, often resulting in delayed order fulfillment and increased processing costs. Similarly, inventory management requires manual updates to inventory status, packaging, shipment tracking, and stock replenishment based on physical checks, leading to inaccuracies and operational delays.

The inefficiencies of manual order and inventory management processes have significant repercussions. E-commerce businesses often experience delays in order fulfillment due to inaccurate inventory records, leading to potential revenue losses of up to 10.2%. Additionally, the reliance on manual processing increases overall costs by 30% compared to automated methods, while inefficiencies persist in updating systems and forecasting inventory needs. These challenges underscore the critical need for automation to enhance operational efficiency.

Low-code automation offers a transformative solution to these issues. By leveraging Integrated Platform as a Service (iPaaS) solutions such as MAKE, businesses can automate repetitive tasks, streamline operations, enhance data accuracy, and reduce overall costs. Automation can seamlessly integrate various systems and automate tasks such as data entry, invoice generation, and order confirmation. This not only increases operational efficiency but also minimizes

errors, enables real-time inventory tracking, and supports scalable business growth.

The aim of this study is to explore the potential of low-code automation in transforming traditionally manual processes in the fashion e-commerce sector. By focusing on the automation of order management and inventory management, the study seeks to provide insights into how fashion e-commerce businesses can automate business operations. Specifically, the study firstly aims to automate the order management process by implementing automatic order confirmation and invoice generation. Secondly to automate the inventory management process with live order tracking, optimized replenishment cycles, and automated supplier order placement.

This research highlights the potential of low-code automation tools in addressing the inefficiencies and inaccuracies inherent in manual processes, ultimately driving operational excellence and competitive advantage in the fashion e-commerce sector.

II. LITERATURE REVIEW

Patil, Omkar & Kulkarni (2024) address the challenge of enhancing inventory management through a Real-Time Inventory Management System employing a Generative User Interface methodology. This innovative approach facilitates real-time adaptation to user interactions, significantly enhancing system efficiency and user experience. The study focuses on real time monitoring and inventory control, exploring methodologies for tracking inventory levels instantly to support decision-making processes. The application of the generative user interface enhances adaptability to diverse user inputs and system states. Key findings highlight the system's ability to process inputs instantly, optimize inventory levels, and dynamically respond to user interactions. Ultimately, the paper underscores the significance of real-time responsiveness and adaptability in inventory management systems, emphasizing the potential for improved efficiency and user satisfaction [1]. Skórnóg, Damian, and Mariusz Kmiecik (2024) explored the implementation of OpenAI's ChatGPT in optimizing and streamlining inventory management processes within manufacturing firms. The methodology section outlines the integration process of ChatGPT into existing inventory systems, aiming to automate tasks like inventory tracking, stock prediction, and generating restock alerts. This integration aims to enhance inventory control speed and accuracy, mitigating risks of stockouts or overstocking while improving resource allocation efficiency. Key terms such as "ChatGPT" signify the AI model used, "inventory management" highlights the core focus, "manufacturing" denotes the industry context, and "automation" emphasizes the paper's thrust on leveraging technology for operational enhancement [2].The research paper by A Garg and D. Sharma (2023) introduces a cutting-edge generative AI model aimed at enhancing software testing, particularly for ERP software, critical in businesses. The model utilizes advanced machine learning to predict vulnerabilities, improving testing efficiency by anticipating issues. Key concepts include Generative AI, Software Test Modelling, ERP Software, Machine Learning, and Vulnerability Prediction. The methodology involves training the AI on ERP software patterns and nuances to predict vulnerabilities. The outcomes highlight enhanced testing efficiency and preemptive issue identification, reducing potential software risks [3]. Von Garrel, J., Jahn, C (2023) introduce a robust methodology centered on a design framework tailored for small and medium-sized manufacturing enterprises aiming to adopt AI-based business models. The methodology intricately details the integration process, offering insights into effectively incorporating AI into existing business models. It underscores the transformative impact of AI in reshaping business strategies, with key terms like 'AI-based business models', 'manufacturing enterprises', and 'design framework' serving as focal points. 'AI-based business models' denote strategies integrating AI for enhanced efficiency, while 'manufacturing enterprises' refers to businesses involved in goods production. The 'design framework' serves as a structured guide for AI implementation. Notably, the methodology targets small and medium-sized enterprises, emphasizing the untapped potential of AI integration and scalability benefits, highlighting its applicability across diverse business scales[4]. Wilson's (2020) work offers a thought-provoking prediction about the future of order management, arguing for a shift towards fully automated systems. His predictions are grounded in a thorough analysis of market trends, technological advancements, and

industry needs. Wilson provides a solid foundation for his arguments about the inevitable move towards automation in order management, which he believes is a necessary and beneficial evolution for businesses to remain competitive and efficient in the modern marketplace. He further discusses the implications of this shift on industry-wide practices and the potential obstacles that might hinder this transition [5]. Roberts' (2020) work delivers a fresh perspective on the potential of blockchain technology in order management. The paper delves into the ways blockchain can revolutionize order management, from enhancing transparency to improving efficiency. Roberts' work is a valuable resource for those interested in the application of blockchain technology beyond its typical use in cryptocurrency. By exploring the potential of blockchain technology in a new context, the paper provides a novel viewpoint on the technology and its diverse applications. The paper further discusses potential challenges and solutions related to the implementation of blockchain in order management [6]. Davis and Taylor's (2019) work is a thorough meta-analysis that sheds light on the rapidly evolving landscape of process automation. Their study compiles a wealth of research from various sources, providing a multifaceted perspective on the current state of process automation, as well as the potential future directions the field could take. By integrating and synthesizing numerous studies, the authors offer a broad, nuanced understanding of process automation practices and trends. The work serves as a valuable reference for understanding the broader context of automation, making it a valuable resource for both academia and industry. The authors also hint at the potential breakthroughs we might expect soon [7]. Williams' (2019) research presents a thorough review of the literature on process automation, order management, and inventory management. The paper provides a broad overview, capturing the state of the field and offering insights into areas of future research. Williams' work is a valuable resource for anyone interested in the current state of these fields and their potential trajectories. His comprehensive review serves as an excellent starting point for those wishing to delve deeper into these topics. The paper concludes with recommendations for future research, providing readers with actionable suggestions to continue exploring these fields [8]. Brown and Green's (2019) insightful paper tackles the unique challenges inherent in implementing process automation within traditional industries. They offer a nuanced discussion, highlighting the potential hurdles industries may face during the transition to automation. The authors suggest practical solutions to streamline the process, making their work particularly useful for traditional businesses navigating the shift towards automation. Their discussion provides a balanced view of the opportunities and challenges of automation, making it a must-read for industry leaders looking to modernize their operations [9]. The paper by Liu and Zhao (2018) underscores the potential of the Internet of Things (IoT) in inventory management. They detail how IoT can revolutionize real-time tracking, leading to increased efficiency and accuracy in inventory control. The authors argue that IoT has the potential to significantly reduce inventory errors and streamline the overall process. They make a compelling case for this promising technology, suggesting it could be a game-changer in the field of inventory management. They further discuss the implications of IoT on other aspects of business operations, creating a comprehensive picture of its transformative potential [10]. Kim's (2018) study takes a deep dive into the impact of automation on worker satisfaction in inventory management. The findings highlight the importance of considering worker satisfaction when implementing new technologies. Kim suggests that careful consideration must be given to how automation affects employees, as their satisfaction can significantly influence the success of the technology's implementation. The paper underscores the human aspect of technological change, reminding readers that worker satisfaction is a crucial factor in successful implementation. The study concludes with a discussion on strategies for maintaining worker satisfaction during technological transitions [11]. Turner's (2017) research provides an insightful exploration of the usage of an automated order management system within a small business setting. The study delivers a detailed examination of how such systems can drastically enhance small business operations and profitability. Turner's research serves as a prime example of how automation can benefit even smaller scale businesses, not just large corporations. The findings suggest that with appropriate implementation, automation can significantly improve efficiency and profitability across different business scales. The paper concludes

with recommendations for small businesses considering the integration of such systems[12]. Patel and Singh's (2017) work provides a comprehensive overview of the current trends in process automation. Their paper delivers valuable insights for both practitioners and researchers, helping to guide future work in the field. Their work offers a thorough investigation into trends and developments, providing a solid foundation for future research and practice. The review serves as a vital resource for those interested in the field, offering a detailed snapshot of current practices and potential future directions. The authors also discuss potential challenges and opportunities in the field, enriching the paper's value to the reader [13]. Samaranayake, P. (2009) explores business process integration, automation, and optimization within Enterprise Resource Planning (ERP) systems, emphasizing an integrated approach to create a seamless, efficient, and effective ERP environment. Central to this approach is the use of enhanced process models, which provide a detailed depiction of business processes, capturing the complexity and interconnectivity of various organizational tasks and functions. The methodology involves systematically identifying, analyzing, and enhancing individual process models to accurately reflect business operations before integrating them into the ERP system. This ensures that each process is not only optimized but also effectively represented. The aim is to automate manual tasks, thereby improving efficiency, and to optimize processes to enhance the overall effectiveness of the ERP system. This integrated approach leads to improved operational performance and potentially better business outcomes by reducing time and resource expenditure [14]. The literature review provides a comprehensive overview of recent advancements and research directions in inventory management, automation, and technology integration within various industries. From real-time inventory systems to AI-driven solutions and blockchain applications, these studies underscore the transformative potential of innovative technologies in enhancing operational efficiency, decision-making processes, and overall business performance.

III. EXISTING MANUAL PROCESSES

3.1 Existing Manual Process of Order Management

The existing order management process in fashion e-commerce is depicted and involves several manual steps:

1. Receive Order from E-commerce Website: Customers browse the product catalog, select items, and complete the checkout process. The e-commerce platform generates an order notification, which is received by the staff responsible for order fulfillment.
2. Manual Entry of Order Details into a Book or Excel Sheet: Staff manually transcribe order details into a designated book or Excel spreadsheet, recording information such as product names, quantities, customer shipping address, contact details, and order timestamps.
3. Inventory Management Process: Staff manually cross-reference inventory records to verify the availability of each ordered item, involving physical stock counts or consulting inventory management systems.
4. Receive Order Confirmation: After confirming inventory availability and processing the order, an order confirmation is received through the e-commerce platform's order management system or via email.
5. Update Order Status on Excel and Update Shipping Details: The order status is manually updated in the Excel sheet, reflecting its progress through the fulfillment process. Shipping details such as courier company name, tracking number, and expected delivery date are also manually entered.
6. Packaging of Order: Staff manually pick the ordered items from inventory, inspect, package, and label them with the customer's shipping address and other relevant information.
7. Arrange Pickup/Delivery: Packaged orders are scheduled for pickup by the courier service or dropped off at designated shipping locations.
8. Track Shipment and Update Final Status: Staff manually track the shipment's progress using the courier service's tracking system, recording updates such as "out for delivery" and "delivered" in the Excel sheet.
9. Close Order and Document: Upon successful delivery, staff update the final status of the order in

the Excel sheet, maintaining comprehensive documentation of the entire order fulfillment process.

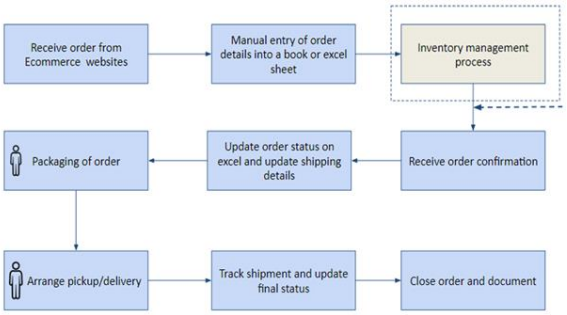

Figure: Existing Order Management Process

3.2 Existing Manual Process of Inventory Management

The existing inventory management process is depicted and involves the following manual steps:

1. Receive Order Updates: The process begins with receiving updates on orders from the order management system or e-commerce platform, including notifications of new orders, cancellations, backorders, and changes to existing orders.
2. Manual Checking of Stock: Staff manually check current stock levels of each product, involving physical counts or referencing inventory records.
3. Confirmation of Order and Update Inventory Details: After verifying stock levels, staff confirm orders and update inventory records, adjusting quantities to reflect allocated items.
4. Further Investigation with Customer: Staff may need to contact customers to clarify order details, resolve inventory discrepancies, or address concerns.
5. Trigger - Inventory Replenishment: Staff monitor stock levels and manually initiate inventory replenishment when levels fall below predetermined thresholds, placing orders with suppliers or manufacturers.
6. Backorder: Out-of-stock items are placed on backorder, manually tracked and managed, with customers updated on their status.

   Order Cancellation: Orders that cannot be fulfilled due to stock unavailability or other reasons are manually canceled. This involves contacting customers, processing refunds if necessary, and updating inventory records.

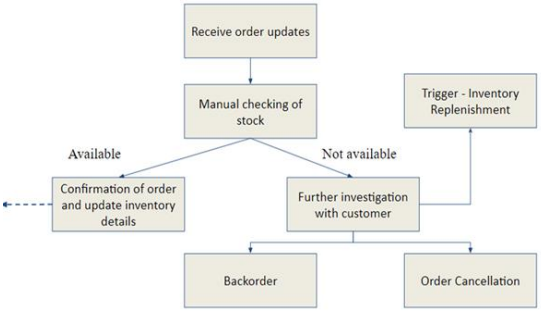

Figure: Existing Inventory Management Process

These manual processes are not only time-consuming but also prone to errors, leading to inefficiencies and increased operational costs. Automating these processes using low-code automation tools can significantly improve accuracy, reduce costs, and enhance overall operational efficiency.

IV. METHODOLOGY

1. Defining Project Scope and Objectives: The project scope is established by delineating the specific areas of order management and inventory management targeted for automation.
2. Conducting Process Analysis on Current Order and Inventory Management: A comprehensive analysis of existing manual processes for order and inventory management is conducted to identify pain points, inefficiencies, and areas for improvement.
3. Selecting Suitable Automation Tools: Various low-code automation platforms and tools available in the market are evaluated based on criteria such as ease of use, scalability, integration capabilities, and cost-effectiveness. The most suitable automation tools are selected to support the automation of both order management and inventory management workflows.
4. Designing Automation Workflow: Automated workflows for order and inventory management processes are designed using the selected automation tools. The sequence of tasks, decision points, and data flows within each workflow is mapped out, considering aspects such as order data collection and storage, order confirmation generation, inventory tracking, and supplier order placement.

5. Calculating Inventory Metrics and Finding Inventory Policies: Key inventory metrics such as demand rate, lead time, safety stock, and economic order quantity (EOQ) are calculated to optimize inventory management practices. These metrics help in determining the optimal order quantities and safety stock levels, ensuring efficient inventory replenishment and minimizing stockouts and overstocking.
6. Testing Automation Workflow: Prototypes or test environments are developed to validate the designed automation workflows. Thorough testing is conducted to ensure that the automated workflows accurately capture and process order data, manage inventory levels effectively, and meet the project objectives.
7. Iterating and Refining Workflow: Feedback from stakeholders, including end-users and managers, is gathered to evaluate the performance and usability of the automated workflows.
8. Deploying Automation Tool: Once the automated workflows have been thoroughly tested and refined, the automation tool is deployed in the production environment. Processes for monitoring, maintenance, and optimization of the automated workflows are established to ensure their continued effectiveness and alignment with project objectives.

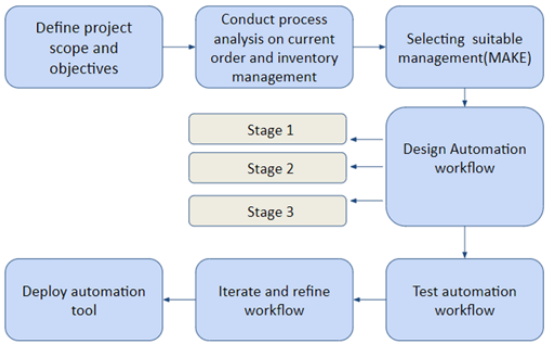

Figure: Methodology

V. IMPLEMENTATION

The tools that are used in the study to automate the identified scope are:

1. Shopify: Acts as the primary platform for e-commerce orders, offering integration capabilities for seamless information flow.
2. MAKE Software: Automates order and inventory management tasks, integrating with Shopify to reduce manual intervention and errors.
3. Airtable: Tracks inventory with a flexible interface, enabling real-time updates and accurate stock monitoring.
4. QuickBooks: Manages financial aspects like invoicing and purchase orders, ensuring accurate financial data integration.
5. Google Sheets: Tracks order details and transactions, facilitating easy sharing and collaboration.
6. Gmail: Sends automated order confirmations and updates, ensuring timely communication with customers.

The implementation of the software can be mainly categorized into 3 stages involving the backend automation of the business processes.

Stage 1: Integration and Workflow Setup

1. Create MAKE Scenario with Shopify and Iterator Modules: Log into MAKE account, establish a new scenario, and integrate Shopify "Search for products" module to process all product variants.
2. Connect to Airtable and Add a Router: Incorporate Airtable "Search Records" module to find existing products using Inventory Item ID. Add a Router to manage new product addition or updates.
3. Route for New Products Addition to Airtable: Use Filter to identify products without Record ID (product not found), then add Airtable "Create a Record" module to map product details from Shopify.
4. Route for Existing Products Update in Airtable: Employ Filter to identify products with existing Record ID, then use Airtable "Update a Record" module to update product details.
5. Execute and Schedule the Scenario: Run the scenario to add/update products from Shopify to Airtable, save it, and schedule automatic execution at desired intervals.

Stage 2: Automated Product Creation in QuickBooks from Airtable

1. Add Airtable Search Records Module: Use Airtable module to find items without QuickBooks Item ID.
2. Incorporate QuickBooks Create an Item Module: Add QuickBooks module and map relevant

product details from Airtable data.

3. Utilize Airtable Update a Record Module: Update corresponding Airtable records with newly assigned QuickBooks Item IDs.
4. Implement Filter for Error Prevention: Introduce Filter to prevent errors if no records are found.
5. Test Scenario and Schedule Automation: Execute scenario, validate its success, and schedule automatic runs to synchronize Airtable and QuickBooks.

Stage 3: Automated Supplier Creation in QuickBooks from Airtable

1. Retrieve Items Meeting Inventory Criteria: Utilize Airtable module to find items meeting rotation frequency and inventory status criteria.
2. Aggregate Vendor IDs: Group vendor IDs for processing using Array Aggregator module.
3. Add Filters for Error Handling: Implement filters to halt processing if no records are found, ensuring error prevention.
4. Iterate Data to Remove Duplicates: Use Iterator module to process each unique vendor ID and deduplicate.
5. Match Vendors to Items: Fetch items for ordering using Airtable Search Records module with vendor ID.
6. Create Purchase Order and Aggregate Items: Consolidate items into one order per vendor with Array Aggregator and QuickBooks Create Purchase Order structure.
7. Download and Email Purchase Orders: Download purchase order PDF, retrieve vendor email, and email PDF using Gmail Send Email module.
8. Update "Ordered" Field in Airtable: Mark ordered items as "Ordered" in Airtable inventory table using Airtable Search Records module.
9. Test the Scenario: Adjust item quantities, run scenario, and verify accuracy of received purchase order emails.

VI. RESULTS

The results of the study majorly led to the outcome of live inventory tracking and showcasing the picture of dynamic updates on Airtable with every order placed. The figure depicted shows that the inventory change and when connected to the chain of automation it automatically triggers an order placement email to the supplier as drafted.

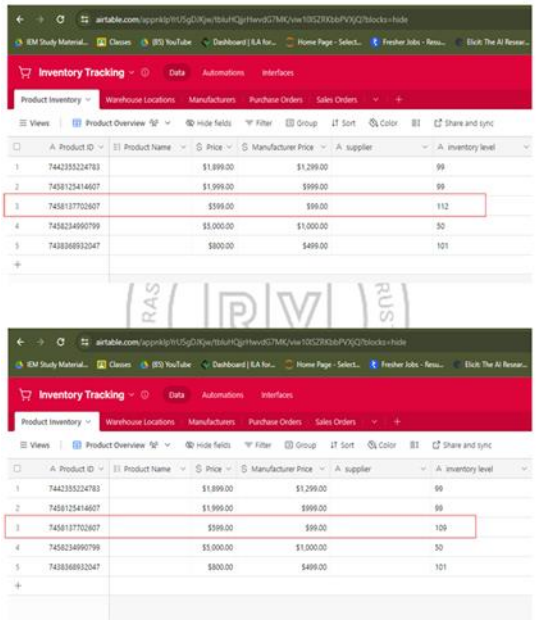

Figure: Dynamic change in inventory levels

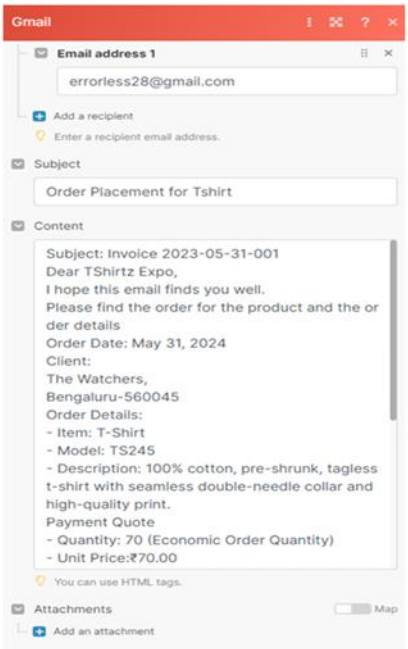

Figure: Automated Supplier Order Placement via Email

CONCLUSION

In this study, we examined the application of low-code automation tools to streamline order and inventory management processes within the fashion e-commerce

sector. By integrating platforms like Shopify, Airtable, QuickBooks, and MAKE software, our project aimed to enhance operational efficiency and reduce manual workload.

The adoption of low-code automation showcased promising results in terms of process optimization and resource utilization. By automating repetitive tasks and synchronizing data across platforms, businesses can mitigate errors and accelerate order processing. Moreover, the seamless integration of tools facilitated smoother communication and enhanced collaboration among stakeholders.

The successful implementation of automation tools underscores their potential to revolutionize traditional e-commerce operations. By freeing up valuable time and resources, businesses can focus on strategic initiatives and customer-centric activities, thereby fostering growth and competitiveness in the market.

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