

**JGB 1735****Simflow: An Inventory, Sales, and Ordering System for a Local Foods Producer**

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**Abstract**

*Businesses in the Philippines, whether micro, small, or medium, are now forced to expedite their integration of technology-based platforms, given their potential to reach a broader customer base. Some of the key areas on which a business should focus its IT-based services are inventory, sales, and ordering. Small to medium enterprises have started taking steps in adapting IT services as a means to promote and sell their products. However, the lack of experience creating and managing a dedicated system proves challenging as they move towards a larger market. This obstacle heavily limited their business processes and transactions through their social media platforms. In order to streamline their business process, the researchers designed and developed a web application named "Simflow" that would precisely fit their needs. The application utilized Laravel as the primary backend framework, following the Model-View-Controller (MVC) architecture to subdivide the system into its logical components.*

*On the other hand, the look and feel of the web application were designed using the Bootstrap framework. Additionally, several test cases covering functionality, validation, and security were made for each feature. Test results state that the system is 85% efficient.*

*Keywords: order and sales management, inventory system, e-commerce website, small and medium enterprise, laravel framework*

## **Introduction**

The COVID-19 pandemic caused numerous disruptions that affected living, causing small revenues and a lack of job opportunities for many minority-owned businesses (Fairlie, 2020). Hence, businesses are encouraged to remain flexible and adapt their business models to cope with the unpredictability of the situation (Doern, 2019, as cited in Priyono, 2020).

Information Technology (IT) then comes into play, which can leverage their business processes: performing tasks faster, increasing productivity, and reaching a broader market. E-Commerce, for example, emerged as one of the most practical forms of business solutions. Business owners can operate digitally despite contact restrictions and other confinement measures (OECD, 2020). Meanwhile, consumers can access a significant variety of products from the convenience and safety of their homes (Trupthi et al., 2019). Availing of these types of IT services is considered a long-term investment when managed accordingly. The recurring problem within Small and Medium-sized enterprises (SMEs) is the fear of losing money in the early phases of the investment, especially when the requirements need to be aligned with their business objectives.

One small food business that adapted well to the new normal is CheChe's Gourmet, a local food producer based in Baguio City that produces bottled gourmets and distributes them wholesale. Despite the limitations brought by the pandemic, it managed to grow its production capabilities. However, their growing business comes with the challenge of managing their

operations efficiently and effectively to maximize their capabilities, improve their operations, and increase profitability.

The small business operates on Facebook and Instagram, promoting its products and transacting with customers through direct messages. They also accept advance orders, which are orders that contain products currently unavailable. For business documents, they generate official receipts manually and use NHT invoicing. This mobile application allows them to create order invoices by entering customer details, adding their order details, and generating a pdf document, which will be sent to the customer afterward. Payment options are GCash or bank transfer, with proof required via screenshot. Shipping is through pickup/meet-up or Victory Liner's Cargo Service. As observed, having different processes and tools to manage their current processes makes it difficult for them to monitor their sales, considering that only one or two persons are equipped to do it.

Moreover, inventory management and order tracking are done manually, which can be tedious and increase the risk of inaccuracies. They usually prepare products in advance. However, they occasionally produce products on demand due to inventory exhaustion. This results in customer product delays, negatively affecting the business's opportunity to profit. An efficient and effective production heavily relies on good inventory management. However, a significant problem of the proponent is that they rely on counting products physically and do not use spreadsheets or other inventory system tools. Manual tracking is tedious and inconvenient, requiring the operator to exert much effort to record every item. Inaccuracies can occur due to human error, where staff may be tired and repeat and miss a count for a specific set of items.

Overall, with CheChe's Gourmet's current operations, using different technologies for each process and having an ambiguous approach in management can lead to inefficiencies and

difficulties in coordinating and tracking different aspects of the business. As a result, the business may need help meeting customer demands and promptly fulfilling orders.

Considering these issues, Information Technology (IT) can be used to provide a viable solution by developing a systematic, structured, and comprehensive Order, Sales, and Inventory Management system. This would enable CheChe's Gourmet to manage its operations and enhance its overall performance effectively and efficiently. Hence, the study aims to develop Simflow, a web application that would streamline the business workflow by automating key business processes. To achieve the overall goal of Simflow, the researchers laid out the following objectives:

- To define the functional requirements based on CheChe's Gourmet's processes and the data involved.
- To create the essential models necessary to explain Simflow's design.
- To develop Simflow using the appropriate technologies.
- To test Simflow's functionality and reliability.
- To deploy and turnover Simflow to its intended users.

Like the proponent, MSMEs who opt for a system that fits their needs would have their business processes organized and automated, allowing them to have an easier time operating their business. Thus, it improves workflow efficiency in their daily operations and customer assistance by helping the customers set and manage their orders.

In addition, having a cloud-based system allows MSMEs to expand their customer base beyond a specific geographic area. They can reach and engage with customers in other regions or areas, increase brand visibility, and drive more sales and growth. On the end of their customers, having a system in the cloud allows them to order products anytime and from anywhere

conveniently. It provides real-time access to product information, availability, and updates to make informed purchasing decisions.

### **Review of Related Literature**

The review of related literature provides an overview of studies and theories that align with the research problems. Through examination, the researchers gained a deeper understanding of the topic's current state and identified areas for further research.

Processed foods are more challenging to manage in the food processing and distribution industry since they are perishable (Liang, 2013). This is relative to CheChe's Gourmet expanding production, as they deal with a large food inventory for processing. Processing foods involves transforming fresh foods into products (Ratini, 2022). Preservatives are also added to avoid natural spoilage, and edible parts commonly discarded during cooking are often used to reduce unnecessary wastage. Companies need a warehouse to store input foods as inventory. However, large quantities of processed foods and complexity make inventory management more effortless. Poor management can also increase the risk of spoiled processed foods (Liang, 2013).

Chaubey (2019) states that establishments experiencing inventory shortages or frequent stock-outs are common problems observed due to inaccurate inventory records and poor forecasting. It can result in customer product delays, leading to potential profit loss. Moreover, manual or absence of recording inventory can negatively impact the performance of a business as it can be inaccurate and undoubtedly inefficient, significantly if the business is expanding. According to Abisoye et al., 2013, this can be linked to errors caused by human factors, such as staff members repeating or overlooking the count of specific items.

In light of these challenges, food businesses can embrace technology, especially in this modern era (Rodprayoon & Chanasit, 2019). According to Tapado & Delluza (2015), manual

processes in the past were mainly automated to meet today's society's demands and make a business more efficient. The study conducted by Dahiru (2020) designed and implemented an inventory management system for Walid Halal Spices in India. Like CheChe's, Walid does not use any system and tracks inventory through a manual ledger where information is documented on hard copies and entered into a spreadsheet application. As observed by Dahiru, manual processes can be inconvenient, time-consuming, and a waste of paper and ink. There is also no form of security since manual ledger systems are easily manipulated and lost. Given these problems, Dahiru developed an automated inventory system using the Waterfall method and Agile. The notable application features include product management, stock management, notification, and retrieving sales reports.

In a study by Bermusa et al. 2022, they developed a dynamic online ordering and data-driven inventory management system for a winery. The business needed help managing inventory and processing orders using a manual system, particularly monitoring product lists and sales transactions. According to the authors, the traditional physical purchasing system is a conventional approach in the food and beverage industry, where all operations and tasks are carried out manually, resulting in a significant amount of paperwork that needs more reliability and accuracy.

To address the issues for the conventional approach, similar to CheChe's, a viable solution would be to develop an online ordering system that paves the way for micro, small, and medium enterprises to digitalization. Features like online ordering, inventory management systems, and SMS functionality were tested and analyzed. Based on the results from the respondent's evaluation, it is evident that the project exceeded all expectations, which satisfies the needs of small enterprises such as efficiency, reliability, monitoring, and convenience.

According to Zadeh et al. (2018), recognizing the potential of Enterprise Resource Planning (ERP) can lead to efficiency and an increase in productivity. ERP can streamline business processes, uncovering significant business value, which can pave the way for SMEs to the adaptation of technology solutions. However, its system implementation and adaptation would take much work, considering the time and cost needed to develop appropriately for the current business process. Moreover, enterprise systems can be challenging to develop and configure scalable systems that can constantly adapt to the ever-changing business environment (Markus & Cornelis, 2000).

It is essential to realize the significance of a digital system in this enterprise. Thus, the researchers intend to lay a robust groundwork by embracing digitalization. To illustrate, a comparable matter encountered in manual sales auditing was resolved by the AMA Olongapo researchers by introducing a POS system for a restaurant business, according to Dumalo et al. (2019). CheChe's Gourmet must use a different POS system due to its ordering process, customer management, and product distribution.

### **Framework**

This study aims to develop Simflow, a web application that would streamline CheChe's Gourmet workflow by automating its key processes. To achieve this objective, researchers utilized the Model-View-Controller architecture, aligning with the Laravel framework, the primary technology for this study. The entire technology stack utilized to develop the system comprises PHP, JavaScript, SASS, Bootstrap, and MySQL.

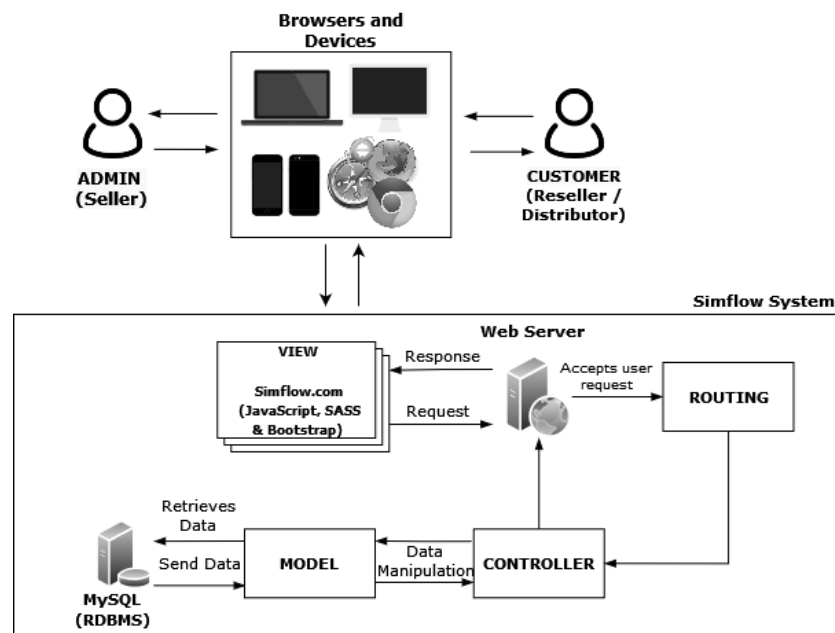
**Figure 1***System Architecture*

Figure 1 shows the system architecture. The process starts when a user interacts with the website through a browser, which may be a computer, tablet, or mobile phone. A request is sent to the "Server," and the "Router" directs the request to the appropriate controller. The "Controller" then manipulates the model, the data accessed and retrieved from the database. After which, the "Controller" sends the processed data to the "View." The view is responsible for rendering the information to be displayed back to the user.

### Methodology

Initially, the project originated from reverse pitching activity where the proponent signified their need for a system, but the design was further analyzed and designed in that it would be configurable to cater to any medium-scale enterprise. The researchers used Agile as the software development methodology, an iterative approach that allows constant communication with the stakeholder and provides flexibility to adapt to changes in requirements at any stage



(Al-Saqqa et al., 2020). It comprises six phases that repeatedly iterate until completion: planning, design, development, testing, review, and launch. For the project, different activities were done in each phase. The planning phase involves collecting data and identifying the scope and key requirements. Activities include interviewing stakeholders and analyzing their current workflow through flowcharts. Information retrieved is then used in the design phase, where the system architecture is designed, technologies used are identified, and essential system diagrams are created; in this phase, the system processes are visualized through flowcharts and prototypes. After refining outputs from the previous phase, the system architecture was implemented in the development phase, which involves coding the system's features. These are then tested regularly to identify and address any issues and later on review. When issues in the features or system design are identified during the review phase, the researchers iterate back to the previous phases, analyze the requirements, and make the necessary changes in the design. Changes are then implemented, tested, and reviewed until the application is ready to be in the launch phase. In this phase, the application underwent final testing and quality assurance and was later deployed to the cloud for use by the proponent.

### **Discussion of Results**

This chapter presents the results after implementing the methodology following the study's objectives.

#### **Data Collection**

The researchers conducted a scheduled online interview with the owner of CheChe's Gourmet on the Zoom platform due to the health and safety protocols given at that time. They prepared an interview guide, and the meeting's agenda revolved around CheChe's Gourmet and its current business processes and operations. This includes the business' basic information, such

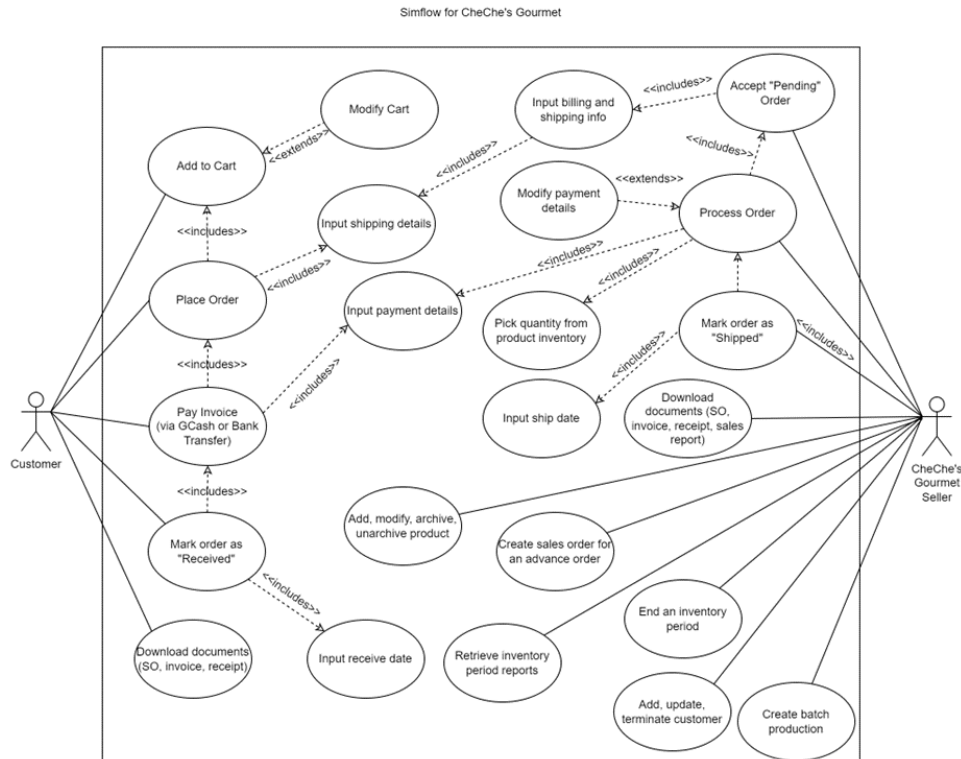
as its business model, products, history, vision, and mission. Operations discussed were the ordering and delivery process, production and storage, and inventory. Aside from scheduled meetings, the group communicated with the stakeholder through Messenger to request documents needed for analysis and raise any clarification and inquiries regarding their processes. Moreover, additional information regarding the business was obtained through the business's Instagram account, Facebook page, and Canva page. The stakeholder permitted the group to obtain proprietary assets from their respective accounts and pages, such as product images and texts.

### **System Design**

The functional requirements were subdivided into the main processes of the system, specifically placing an Order, Managing Sales Orders, Managing Advance Orders, Product Management and Batch Production, Product Losses, and Customer Management. Afterward, the Use Case diagram was created, as shown in Figure 2, which includes the two main actors of the system. The first actor is the reseller or distributor, which includes the following interactions in the system: adding to the cart, placing orders, paying invoices, marking an order as "Received," and downloading documents. The second factor is the proponent, which allows administrative functionalities such as processing orders and advance orders, creating batch productions and records for product losses, downloading documents, and CRUD operations for products and customers.

Moreover, the researchers also created the Entity-Relationship diagram (ERD) as a basis for the design of the system's relational database. They could visualize the entities, data, and relationships between entities in the system and determine entities involved in each functional requirement.

**Figure 2**  
*Use Case Diagram*



**System Implementation**

The researchers proceeded to implement the system design by developing the main processes or features of the application, which are discussed below. They first created a sitemap to visualize the application's taxonomy. After that, they visualized the backend logic for each feature using BPMN flowcharts and created the related prototypes in each functionality using Figma to analyze how users interact. These diagrams and illustrations allowed the researchers to consult with stakeholders and revise or address any logic or UI design issues immediately before the development.

## **Business Processes**

The business processes in the system involve the customer's steps in creating and managing orders and the seller's steps in processing them. On the side, the customers can first browse products and add these to their cart. They can edit and delete a product and its shipping address from their cart. After which, they can place their order, and the system will generate and present a sales order document for the customer to review. Once they confirm, the order is stored in their profile, and the seller is notified. The seller can accept the pending order in the system by creating an invoice and specifying the billing and shipping information needed. Upon confirmation, the system will generate and present the order invoice for the seller to review. If there are no changes, the customer is notified of the order's new status. They can pay by selecting their chosen payment method, following the instructions, and entering the payment details, including the proof of payment. After the seller is notified of the payment, they can prepare the order. This includes selecting the quantity from the physical inventory for each ordered product, packaging, printing, and issuing the official receipt. Once the order is ready for shipping, the seller can set it in the system, and the customer will be notified. Upon receiving the order, the customer can mark the order as received, and the seller will be notified.

## **Advance Order Process**

The advance order process allows the customer to place orders with unavailable products and be processed by the seller. Placing an advance order is similar to the transaction process discussed previously. The difference is that an advance order document is presented rather than a sales order document upon placing the order. For the seller to handle the advance order, they can update the product inventory after production and process the advance order by creating a sales order. The customer is then notified, which proceeds to the discussed transaction process earlier.

## **Inventory Management**

Inventory management is periodic. It includes a product inventory page that lists the inventory details for each product along with their reserved quantity, available quantity, and total quantity. It also allows the creation of new batches, which involves selecting the production date, products, and yield for each. Upon confirmation, the system updates the product inventory and returns it to the admin.

Moreover, the seller can also view inventory records for each product. This includes the product's information, such as its description, price, and restock level, shelf life, and the log table for the current accounting period. Each record in the table includes the type of activity, the batch number related to the activity, the quantity produced and sold, and the balance. The balance is computed by adding the products produced and subtracting the products sold starting from the beginning inventory. When ending an inventory period, they can select the date and choose whether to make adjustments. If there are no adjustments, the system will set the next accounting period's beginning inventory using the current period's ending inventory. If adjustments are to be made, the admin can select the necessary products, the type of adjustment for each, whether it is a loss or an excess, and the quantity. After confirming the details, the system will compute the total ending balance. It will then present the updated product inventory with the beginning inventory of the new accounting period based on the computed total ending balance.

## **Product Management & Customer Management**

The admin's product management feature allows the admin to create, modify, and archive a product. Meanwhile, customer management in the system includes adding, viewing, editing, and terminating a customer. When registering a customer into the system, they are notified via

email with their login credentials. Customers are terminated whenever they are inactive for two months or more.

### Report Generation

Reports can be generated and printed in the system. The admin can retrieve daily, monthly, or yearly sales reports. They can select a specific date, month, or year, and the system will retrieve the respective data and output it in a pdf document. They can also generate order invoices and official receipts, which their customers can access in the order details.

### System Testing

The researchers performed black box testing and unit testing, using a PHP unit, during the development of each process to validate whether the system produces the expected output when the user interacts with it. They created test cases for each module, considering all possible scenarios, conditions, and errors. Out of 90 test cases, 75 have passed the system testing, meaning that 85% of the system components are working as intended.

**Table 1**

*Test case results*

Functional Requirements	Tests	Passed
Placing An Order	9/9	7/9
Managing Sales Order	9/9	7/9
Advance Order	3/3	3/3
Inventory Management	3/3	1/3
Product Management	4/4	4/4
Customer Management	10/10	7/10
Routes (Web pages)	52/52	46/52

## **Deployment**

After completing the development and testing phase, the researchers presented the system to the proponent, who accepted the project. Although the application was designed for production purposes, it was initially deployed for testing to allow the proponent to identify any issues or bugs that must be addressed before full implementation. This approach ensured that the system was thoroughly tested and ready for use. Once the application is ready for public use, the proponent can avail of a hosting service and purchase a domain.

## **Conclusions**

In conclusion, this study explored CheChe's Gourmet operations on their sales & inventory. Through an in-depth analysis, the researchers identified the challenges faced by the business that were common to MSMEs and emphasized the significance of an integrated system.

As observed, CheChe's Gourmet uses several platforms separately to perform their business operations - Facebook and Instagram for marketing and transactions, NHT invoicing for invoice generation, and GCash and Bank Transfer for payments. The combination of these platforms makes it difficult for the proponent to perform all its business processes due to using different technologies for each process. In addition, inventory management is done manually, which can be inconvenient and potentially lead to inaccuracies.

The developers created Simflow to address the problems mentioned. The developers created the system architecture, functional requirements, and models using the proponent's existing process. The initial prototype made the presentation of the proposed processes to the proponent easier, and accordingly, comments and suggestions were made. These feedbacks were critical in designing the final views and functions of the system. Overall, Simflow was able to streamline CheChe's Gourmet's business process by providing a platform where both the

customer and seller can transact. It also provides the seller with management of their sales, inventory, and customers. Furthermore, the researchers went for a modern minimalistic design. The user interface was designed to quickly familiarize users with it by making fonts and elements consistent and using contrasting colors.

### **Limitations and Recommendations for Future Research**

Several improvements or add-on features can be made to Simflow. Simflow's functionality for paying invoices is limited to entering payment details. For future studies, the researchers recommend integrating services of external applications for handling payments, such as mobile wallets or online banking. Moreover, Simflow's inventory management is limited to counting. Applying data analytic methodologies such as forecasting may be added to improve production capabilities, given that there is sufficient historical data for use. The inventory feature also focuses primarily on finished products, limiting the views of the entire business operation. Therefore, the addition of managing raw materials and suppliers is recommended.

Furthermore, sales reports are limited to counting and visualizing data. Business analytics can be added to provide further insights to improve their operations. Lastly, Simflow only caters to customers nationwide. Future researchers may consider managing international orders as well.

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