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Process Improvement in Restaurants' Commissary Through Pro Model Simulation

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Abstract

In highly competitive food industries, operational efficiency and customer satisfaction are important for sustainable business growth. This paper focuses on identifying the bottlenecks in the workflow, assessing the unnecessary or redundant processes, and developing practical, low-cost technological and layout-based interventions in the restaurant's commissary. The goal of this study is to enhance both efficiency and effectiveness, ensuring that customer satisfaction is achieved not only by the product quality but also the time efficiency and consistent service using Pro Model Simulation. The simulation modeled both the current and proposed workflows, focusing on producing fresh wings. Results revealed that by implementing a redesigned layout and redistributing tasks among workers, processing time for 88 crates of chicken wings was reduced from 12 hours to 5 hours 58.33% improvement. These findings underscore the value of simulation tools in optimizing food production systems by improving efficiency, reducing labor costs, and enhancing overall productivity. The proposed layout and process standardization are practical, low-cost solutions that can be readily adopted by the commissary to support its growth and customer satisfaction goals. The study recommends investing in a first-in, first-out (FIFO) rack system to optimize inventory management, ensure constant product movement, prevent spoilage, and maximize overhead freezer space. This should facilitate efficient dispatching and reduce the need for cumbersome crate stacking. Future works should include a holistic analysis of the other processes involved in the facility, such as chicken breast processes, ergonomics of the facility, and cost-benefit analysis of the changes to evaluate return of investment.

Keywords
Process Optimization, Layout Analysis, ProModel Simulation, Time and Motion Study, Food Processing

1. Introduction
In today's highly competitive food industry, operational efficiency and customer satisfaction are important for sustainable business growth. The company recognizes customer satisfaction as the guiding principle behind its long-term success. To continue this commitment to satisfy customers, the company prioritizes continuous improvement through innovation, development, and technological advancement.

The study aims to identify the bottlenecks in the workflow, assess the unnecessary or redundant processes, and develop practical, low-cost technological and layout-based interventions. By redesigning the workstation layout, automating repetitive manual tasks, and pre-positioning essential materials, this study seeks to reduce process time and increase productivity. Ultimately, the goal of this study is to enhance both efficiency and effectiveness, ensuring that customer satisfaction is achieved not only by the product quality but also by the time efficiency and consistent service. By implementing the suggested improvements of this study, the company will envision a smarter, leaner production environment that will strengthen its core values of safety, quality, and responsiveness to customer needs.

Food businesses, particularly those engaged in high-volume production, frequently encounter operational efficiency challenges that impact productivity and product quality. These challenges often stem from inconsistent production processes, labor inefficiencies, poor facility layout, and inadequate standardization—all of which can result in production delays, increased costs, and customer dissatisfaction. These operational gaps become more pronounced in fast-paced food environments such as wing production, where demand fluctuates and consistency is critical.A range of inefficiencies currently hinders the company under study's production of wings. Notable issues include frequent production errors due to non-standardized procedures, inconsistent output, and rework. Additionally, overlapping workforce assignments, idle time, and workplace congestion disrupt the flow of operations and reduce overall productivity. These inefficiencies are symptomatic of broader industry challenges. However, they are particularly pressing given the competitive nature of the food sector and the increasing demand for consistency and speed.

1.1 Objectives

The existing production facility layout fails to optimally use the available space, resulting in disorganized workflows, bottlenecks, and wasted movement. This spatial inefficiency contributes to delays and prevents the maximization of production output per cycle.

To address these problems, the production process must be optimized and standardized. This includes developing consistent operating procedures to reduce errors, reorganizing workforce assignments to prevent overlap and idle time, and redesigning the production layout to fully utilize the given area. These improvements are essential to enhancing the company's internal operations and remaining competitive in an industry where operational excellence is a key determinant of long-term success..

1.1.1 General objectives

To lessen the overlapping of manpower schedules and increase the efficiency of wings production by the company by implementing a new floor layout and providing a standard operating procedure.

Specific objectives:

1. To reduce process lead time of the drumette and wing production
2. To lessen the overlapping of workforce, eliminate idle time, and workplace congestion.
3. To optimize and standardize the production of drumettes and wings to eliminate errors.

2. Literature Review

2.1 Related Literature

Process improvement is a crucial approach utilized in various industries to increase efficiency, eliminate waste, and maintain quality (Garcia et al. 2021). One important part of this is the facility layout problem (FLP), which involves the ideal design of physical areas, equipment, and workflows to minimize movement, alleviate bottlenecks, and increase production. Addressing FLP is particularly important in food processing and commissary kitchen environments, where spatial organization has a substantial impact on safety, consistency, and operational flow (Cabusas et al. 2023).

Time and Motion Study (TMS) is a well-established quantitative method used to evaluate the duration and efficiency of task performance. By systematically observing and recording the time and movements involved in completing a task, these studies help determine the standard time a skilled individual requires to carry out work at a specified quality level (Kalne 2022). Typically conducted by external observers, TMS not only measures how tasks are performed but also provides a foundation for identifying inefficiencies and enhancing productivity (Das 2024). This approach has proven effective in a variety of contexts. For example, a stopwatch-based TMS conducted in Galogandang village on pottery production enabled the determination of standard task durations, which led to refined production targets and improved output (Aryani & Linda 2023). The value of TMS becomes especially apparent in environments like cold commissary kitchens, where operations must be carried out under stringent temperature requirements. These settings involve repetitive tasks and demand high precision, making them prime candidates for workflow optimization through TMS analysis (Langford & Poypurow 2023).

The integrated kitchen that prepares, organizes, gathers, and keeps in the chill or on pre-prepared food products is the function of cold commissaries before disseminating to the several outlets. The standard enhances the efficiency, maintaining the product consistency and food safety specifications. Yangyang et al. (2024) mentioned that the capacity of a central kitchen can operate and promote collaborations among related departments, consequently enhancing production efficiency and advancing the growth of food development. Van et al. (2022) reviewed that a central kitchen standard is used for school feeding programs in the Philippines. As the model concentrated on systematized ensuring food safety and consistency, highlighting the variability for flexible food operations in industry and government.

A systematic optimization in food processing according to Wang (2022), uses an intelligent optimization algorithm and machine learning techniques to improve the efficiency of the food processing operations and suitability. These tools are not just innovative but essential, and anticipatory knowledge and faster decision making that is crucial in a lively food industry. The factor of a supply chain management model optimizes the development of programming models, as mentioned by Savsar and Ben Salamah (2022). The model resulted in a notable depletion in operational costs as the capacity extensions, schedule of distributions, and optimal locations were determined. The model shows the operational efficiency and not just about internal processes, it also played a key role in cost decrease and flexibility.

Bagum et al. (2025) proposed a conceptual model that showed relationships of supply chain cost and difficulty in sales to customer gratification, and the quality of the food processing. The study also highlighted the importance of optimizing inventory management to enhance the system's performance. The supply chain complexity with consumer satisfaction reinforces the ideas of the unseen logistics that considerably impact consumer experience. Effective inventory and revenue planning are not just operational concerns, as they impact the reputation and revenue.

Based on recent developments, an improvement in effectiveness and product quality is important to maximizing food processing efficiency. Attaining a faster convergence and better process outcomes is the presented optimization approach to enhanced particle swarm optimization for the control of vacuum drying parameters for jujube slices, as said by Shang (2024). These ensure the quality and consistency in processing food, where even a small change can affect the taste and safety.The diverse applications of ProModel simulation software across other domains, such as the manufacturing and healthcare industries. Its role as a powerful decision-support and optimization tool is highlighted by Abad et al. (2023), who showcased how ProModel significantly enhances productivity in a tin can and metal sheet fabrication company by identifying and addressing process inefficiencies. In the healthcare sector, Camur et al. (2023) demonstrated how simulation using ProModel-based frameworks can guide capacity planning during health crises like pandemics.

Different works have emphasized the value of process optimization within the food processing industry in various countries, although there is a lack of studies validating its use through ProModel simulations, especially within the food processing industry in the Philippines. To address the research gap, the study focuses on integrating the use of ProModel and Time and Motion Studies to create a detailed analysis of bottlenecks, unoptimized processes, and workflows. Ultimately, the study aims to improve productivity within the food industry in the Philippines by integrating ProModel simulations to validate identified improvements in facility layouts, techniques, and processes.

3. Methods

3.1 Research Design

This study employed mixed research methodology, which is composed of qualitative and quantitative methods. According to Lim (2024), qualitative research is an exploratory approach aimed at comprehending and observing human experiences, behaviors, and social events. The time spent on productive tasks was analyzed using a quantitative method (McElwee 2018). To further investigate the findings, a Time and Motion Study (TMS) was used. The researchers recorded detailed data on the time and motion needed to complete a task, followed by an analysis aimed at increasing productivity (Wittaya Manawanitjarern 2022). Promodel was also used to test methods to optimize the production process and formulate a new facility design layout for the organization (Cabusas et al. 2023). To improve operational capabilities and minimize errors in any process, the researchers used the define, measure, analyze, improve, control (DMAIC) method (Mittal et al. 2023).

3.2 Sources of Data

The primary sources of data for this study were direct observation and video recording of the operations within the cold commissary. Instead of relying on real-time measurements, this study strategically recorded the workers' activities during regular work shifts. These recordings served as the foundation for a detailed time and motion study, which allowed the researchers to carefully review the footage, observe workflow patterns, and accurately measure the duration of each task and movement. This approach ensured data collection precision, providing the ability to pause, rewind, and analyze specific actions without disrupting the work environment.

3.3 Case Methodology

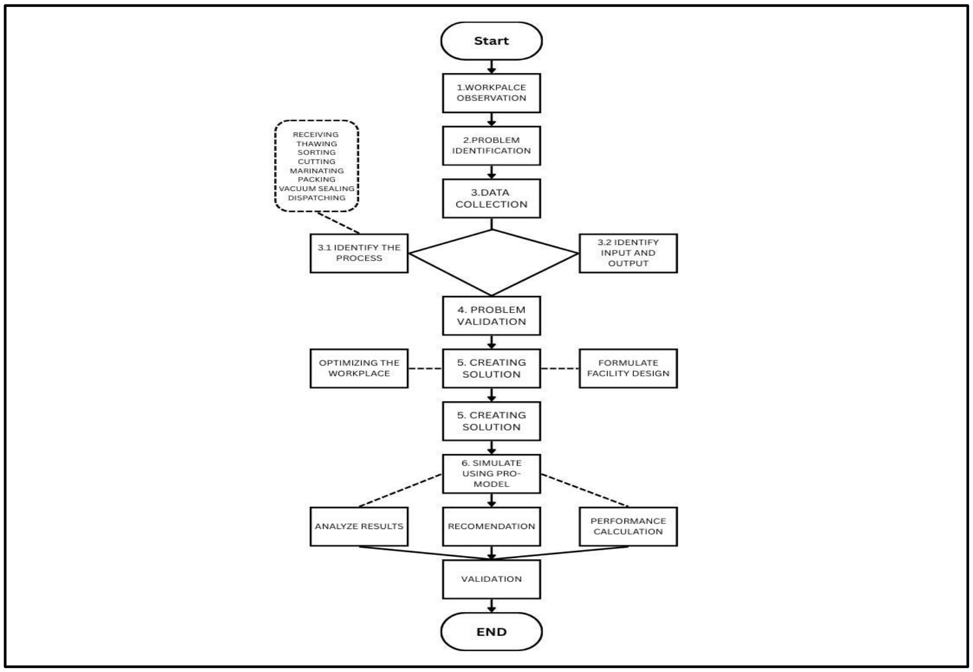

Figure 1. Case methodology utilizing Pro Model in Food Processing Company

The study begins with workplace observation, which serves as the foundation for understanding existing operations and identifying inefficiencies or areas for improvement. This involves direct observation of workflows, employee interactions, equipment usage, and material flow. Following this, the problem identification stage focuses on defining specific issues within the system that hinder performance, such as bottlenecks, delays, or resource underutilization. Once a problem is identified, the next step is data collection, where relevant operational data is gathered to support the analysis. This includes time studies, resource allocation data, and process flow information.

The collected data leads to a dual-path analysis: identifying the process and defining inputs and outputs. In identifying the process, the study focuses on specific operational areas such as receiving, storing, cutting, machining, moulding, vacuum sealing, and dispatching, allowing for targeted analysis. Simultaneously, understanding the inputs (e.g., raw materials, labor, and energy) and outputs (e.g., finished goods, scrap, or by-products) of each stage ensures a comprehensive grasp of the system's flow and resource consumption.With a clear understanding of the process and supporting data, the study proceeds to problem validation, where the identified issues are confirmed and their impact quantified. Once validated, the focus shifts to creating solutions aimed at resolving the issues. These solutions may include workflow optimization strategies or facility layout redesigns to enhance process efficiency and reduce waste.

To evaluate the effectiveness of proposed solutions, the study utilizes Pro-Model simulation software, enabling virtual modeling of the process changes before real-world implementation. This simulation step is crucial for assessing system behavior under different scenarios without disrupting actual operations. The output of this simulation is then subjected to thorough analysis, including performance calculations and the generation of actionable recommendations based on key performance indicators such as throughput, cycle time, and resource utilization.

Finally, the results and recommendations are subjected to a validation step, ensuring that the proposed changes are not only theoretically sound but also practical and aligned with organizational goals. Once validated, the study concludes, providing a clear, data-driven roadmap for process improvement and operational efficiency.

3.4 Observations

Table 1 shows the elements identified during the study, including defrosting, sorting, cutting, marinating, packing, vacuum sealing, and dispatching. Among these elements, cutting was observed to take the longest time to finish, taking 1,936.91 seconds. Inversely, dispatching took the least amount of time to finish at 573.97 seconds.

Table 1. Cycle Time

Elements	1	2	3	4	5	6	7	8	9	10	Total Observed Time (Seconds)
E1. Defrosting	132.84	133:32	134:84	135:37	133:90	135:65	134:08	133:05	134:74	133:64	1,341.69
E2. Sorting	130.39	174.95	392.26	284.75	196.43	148.05	221.87	316.64	290.21	235.94	2,391.49
E3. Cutting	1,766.4	1,790.4	1,746.4	1,761.9	1,751.3	1,752.1	1,792.1	1,789.1	1,771.2	1,761.4	17,682.3
E4. Marinating	194.34	194.76	194.11	194.08	193.57	194.28	195.85	195.99	194.64	195.29	1,936.91
E5. Packing	238.54	238.92	239.17	236.82	238.61	239.28	237.95	238.47	239.04	236.73	2,373.53
E6. Vacuum Sealing	185.38	192.41	183.51	189.06	187.42	195.12	189.48	191.24	184.76	186.77	1,835.15
E7. Dispatching	52.74	46.46	32.00	68.97	75.21	35.60	44.35	58.63	52.04	107.97	573.97

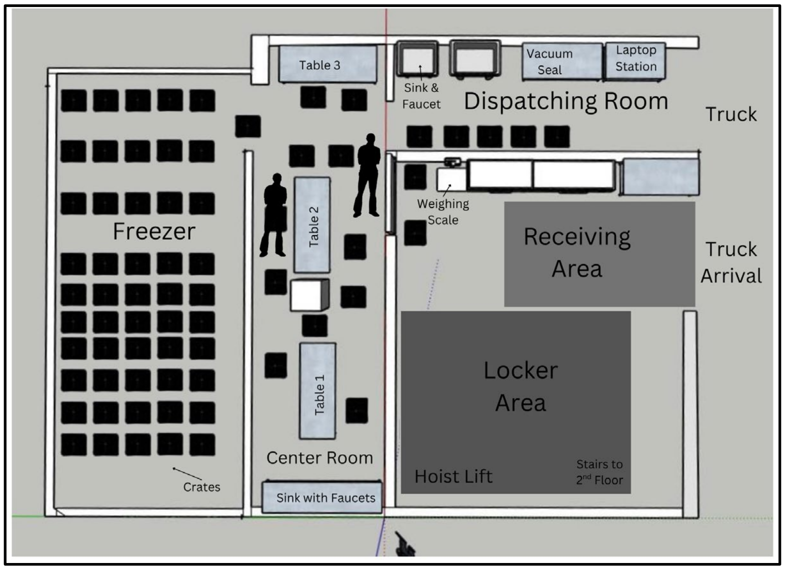

Figure 2. General Layout

The general layout is designed to reflect the various stages of the handling of a product, starting from the stage of receiving up to dispatch. The goods enter from the Truck Arrival area into the Receiving Area, which is equipped with a weighing scale for the initial weighment. The Center Room implements processing tables (Tables 1 and 2) and a sink with faucets to support any cleaning functions. Processed items are then sent to Freezer storage, which consists of several crates, where the packing of these crates interferes with the flow of work due to the limited available space and lack of clear circulation. The Dispatching Room has weighing scales, sinks, vacuum sealers, and a laptop station for documentation and packaging prior to loading for dispatch.

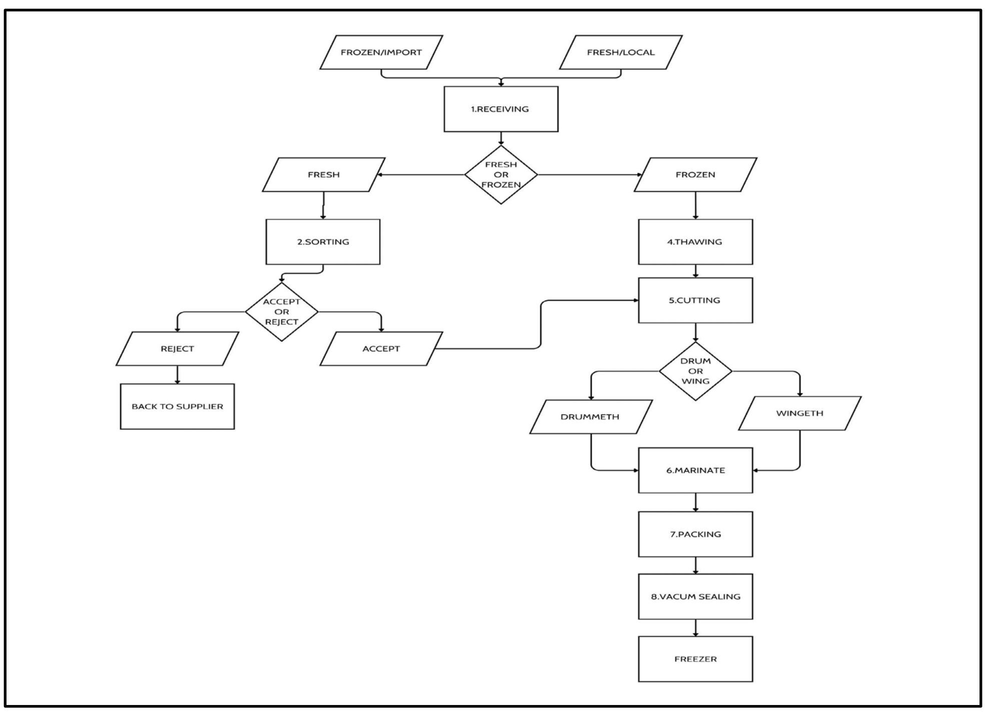

Figure 3**.** Process Flow Chart for Cold Commissary

Figure 3 shows the flow chart for Cold Commisarry. According to VanZandt (2023), flowcharts are highly effective at taking a complex series of steps and organizing them into a visually digestible format. In this case, the flowchart illustrates the production process of handling poultry, from the beginning to the end product. The process begins with the reception of raw chicken, which may either be frozen/imported or fresh/local. Upon arrival, the produce is first identified as either fresh or frozen. If the poultry is fresh, it proceeds to sorting, where quality control checks are conducted. Based on the inspection, the poultry is either accepted or rejected. Rejected items are sent back to the supplier, while accepted items move forward in the process.On the other hand, if the poultry is frozen, it undergoes thawing. Once thawed, the next step is cutting, wherein the poultry is divided into specific parts, then segregated between drumette and wingette portions. Both types follow the same subsequent steps: they are marinated, packed, and then proceed to vacuum sealing. Finally, the vacuum-sealed products are placed into the freezer for storage and distribution.

4. Results and Discussion

4.1 Numerical Results

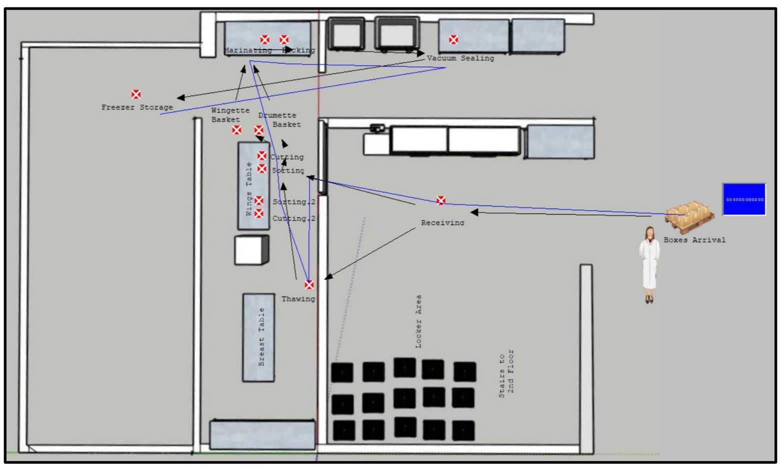

Figure 4. Frozen and Fresh Drumette and Wingette Process Routing

Figure 4 displays the routing flow of processes, from the arrival of the drumettes and wings, to the thawing process, to the sorting and cutting, then the marinating of both cuts, then to the packing, and then vacuum sealing, lastly to the freezer storage.

Name	Total Exits	Average Time In System (Min)	Average Time In Operation (Min)	Average Cost
Frozen Pack	88.00	506.55	500.01	0.00
Fresh Pack	46.00	211.66	0.42	0.00
Frozen Wings	0.00	0.00	0.00	0.00
Fresh Wings	435.00	362.63	0.03	0.00
Frozen Wingette	0.00	0.00	0.00	0.00
Frozen Drumette	0.00	0.00	0.00	0.00
Fresh Wingette	430.00	2.58	0.00	0.00
Fresh Drumette	431.00	2.62	0.00	0.00

Figure 5. Frozen and Fresh Drumette and Wingette Process Key Performance Indicators

Figure 5 illustrates the average time in the system and operation for both the frozen and fresh processes. The figure shows that the fresh wingette has the highest amount of total exits (n=435), with the second highest average time in the system (t=362.63), and one of the lowest average times in operation (t=0.03). The item with the highest amount of average time in the system is the frozen pack (t=506.55), simultaneously it also has the highest average time in operation (t=500.01). It has one of the lowest total exits among the items (n=88).

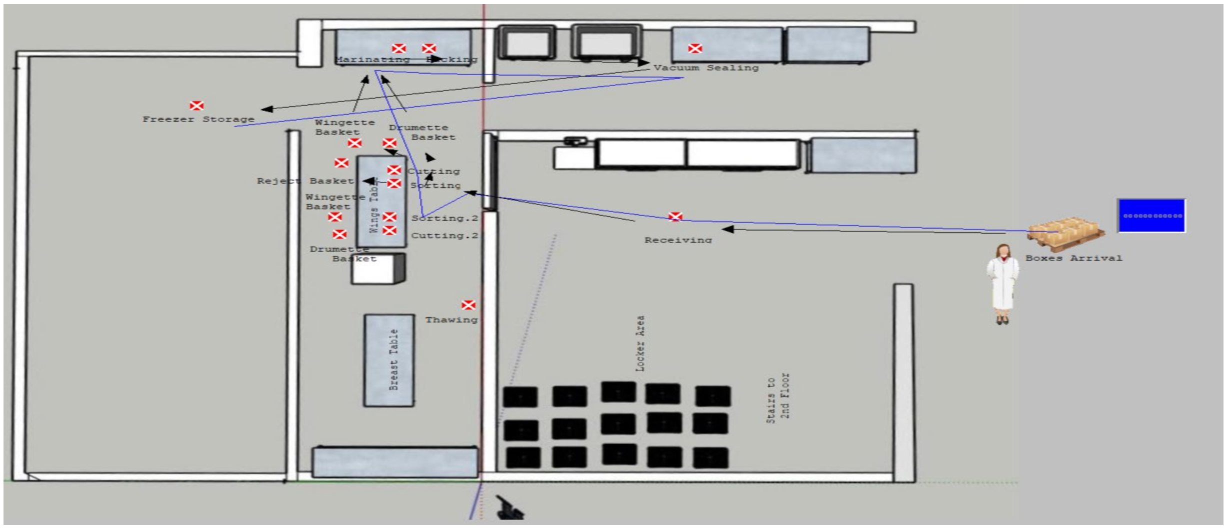

Figure 6. Current Process Routing for Fresh Drumette and Wingette

Figure 6 represents the process solely for the fresh chicken cuts. Compared to the previous process (see Figure 4), the fresh process skips the thawing process entirely.

Name	Total Exits	Average Time In System (Min)	Average Time In Operation (Min)	Average Cost
Fresh Pack	88.00	74.51	0.42	0.00
Fresh Wings	8,363.00	521.48	0.00	0.00
Fresh Wingette	8,280.00	3.66	0.00	0.00
Fresh Drumette	8,400.00	4.85	0.00	0.00
Fresh Packed	276.00	23.11	0.02	0.00
Wingette Group	0.00	0.00	0.00	0.00
Drumette Group	276.00	10.22	0.00	0.00
Rejected Wings	437.00	124.02	0.00	0.00

Figure 7. Current Key Performance Indicators in Fresh Process for Drumette and Wingette

Figure 7 provides baseline performance metrics from the system, showing that the Fresh Wings product had the most significant number of exits overall, which totaled 8,363 units, with the longest average time in the system at 521.48 minutes. Oddly enough, while it was being processed at a high throughput, its time in operation had practically been negligibly low (0.00 minutes), which indicates that there must be a huge layover other than processing, most likely due to waiting or movement. In like manner, the Fresh Drumette and the Fresh Wingette had comparatively high exits (8,400 and 8,280, respectively), showing far reduced system times (4.85 and 3.66 minutes), equating to fast handling or least bottlenecks. Fresh Pack held in the system much longer (74.51 minutes) than its output (88 units), implying a slow or inefficient process for this product. Rejected Wings, after 437 exits and 124.02 minutes in the system, could be bottlenecking due to quality control or rework. Combined items like Drumette Group and Wingette Group showed a zero or very minimal throughput, with Drumette Group spending a small 10.22 minutes in the system. These parameters highlight potential inefficiencies, especially for Fresh Wings and Rejected Wings, and the need to investigate further.

4.2 Proposed Improvements

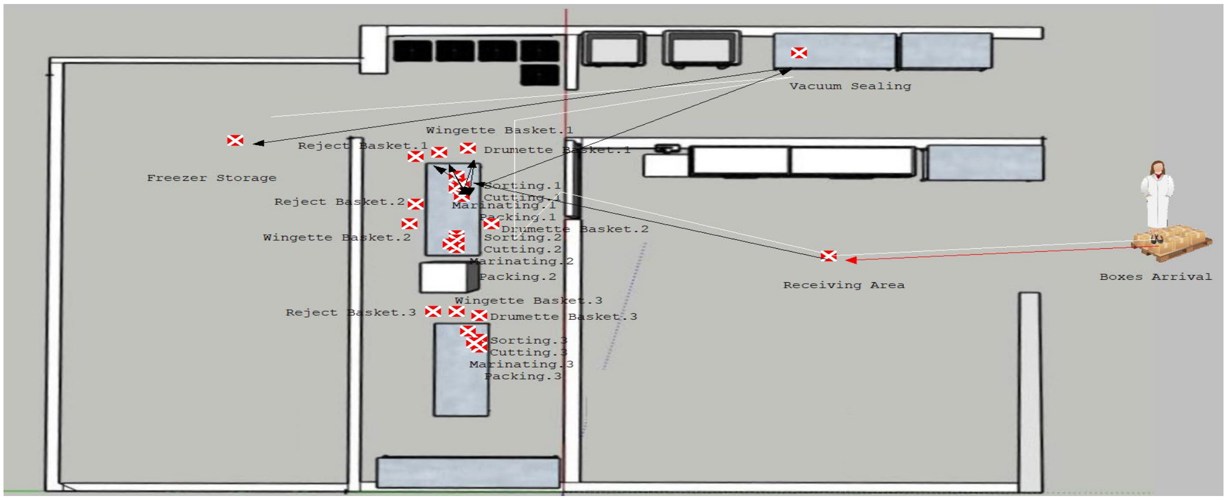

Figure 8. Proposed Improvements for Fresh Drumette and Wingette Process Routing

In Figure 8, adjustments to the fresh-cut process are proposed for a more organized arrangement of workstations and material flow. The reception area is the primary starting point, with unpacking of boxes and sorting into baskets for wingettes, drumettes, and rejects. The processing steps of sorting, cutting, marinating, and packing are clearly sectioned in three parallel workstations to eliminate obstructive workflow. The proposed changes aim to eliminate traffic, promoting uniformity of handling before the products are transported to vacuum sealing and freezer storage.

Name	Total Exits	Average Time In System (Min)	Average Time In Operation (Min)	Average Cost
Fresh Pack	88.00	12.99	0.42	0.00
Fresh Wings	8,363.00	211.51	0.03	0.00
Fresh Drumette	8,370.00	0.05	0.00	0.00
Fresh Wingette	8,280.00	0.05	0.00	0.00
Fresh Packed	276.00	8.84	0.02	0.00
Drumette Group	276.00	0.11	0.00	0.00
Wingette Group	0.00	0.00	0.00	0.00
Rejected Wings	437.00	27.78	0.01	0.00

Figure 9**.** Proposed Key Performance Indicators in Fresh Process for Drumette and Wingette

The modified case demonstrated in Figure 9 yields significantly better system performance. In the case of Fresh Pack, the average time in the system went down significantly from 74.51 to 12.99 minutes, which is a great symbol of the benefit of intervention measures. The momentous change was that Fresh Wings dramatically reduced the time in the system, from 521.48 to 211.51 minutes. Now it has remained the longest of all items. Fresh Drumette and Fresh Wingette had only recorded scant time (0.05 minutes), which suggests there is minimal delay, and it shows an efficient flow. These changes show that the bottling problem, especially in the Fresh Wings process, was partly resolved. Rejected Wings, for instance, were able to enjoy favorable conditions with an average time in the system reduced to 27.78 minutes from an average of 124.02 minutes. Gains would be associated with some changes that have been made towards the elimination of previous delays. Most of all, this figure illustrates a strong improvement in efficiency among most of the products in the system.

5. Conclusion

According to Mebrat et al. (2020), layout planning is one of the main factors that play a significant role in operational effectiveness. In line with this, the study identified bottlenecks in the food processing commissary workflow and developed practical, low-cost, layout-based solutions. ProModel simulations demonstrated that layout design and appropriate resource allocation significantly influence operational efficiency. The original layout exhibited various forms of waste, including extended processing times due to delays and bottlenecks, underutilized spaces, and increased labor costs driven by night shifts and overtime. Although the simulation covered only a single day with 88 boxes processed, findings highlighted the commissary's complexity and the need to adapt to fluctuating supply and demand. Through observation, simulation, and 5 Whys analysis, the study revealed several wastes that could be eliminated to improve productivity. The implementation of an improved layout, combined with better resource allocation, reduced processing time from 12 hours to 5 hours—a 58.33% improvement, leaving more room for extra production of wings. These findings also indicate that the overlapping of workforce, workplace congestion, and idle time was reduced. Additionally, the process was streamlined to optimize and standardize the production of drumettes and wings, reducing potential errors and reducing lead time (see Figures 8 & 9). Supporting this, Burduk et al. (2021) emphasized that simulation modeling allowed the identification and analysis of the most important problems in a company, particularly standardizing batch amounts in the production flow and improving resource utilization rates, thereby reinforcing the value of simulation in optimizing production efficiency.

Future work should include a holistic analysis of the other processes involved in the facility, such as chicken breast processes, the ergonomics of the facility, and cost-benefit analysis of the changes to evaluate the return on investment.

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Biographies

Jose Marie Carrillo is a third-year industrial engineering student at the Technological Institute of the Philippines - Quezon City (T.I.P. - Q.C.) who is currently pursuing the course IE-E2 573, Risk Management as one of his courses. He is dedicated to applying the knowledge gained from previous leadership experiences, such as being a student mentee of the Supreme Council and Industrial Engineering Department Student Council (IE DSC)of T.I.P., Q.C. from 2022-2023, Vice Mayor of the IE DSC (T.I.P. Q.C.) to lead a team that will be capable of solving the various risks that may be discovered within companies.

Carlos Nathaniel F. Dee is currently a third-year student at the Technological Institute of the Philippines – Quezon City, pursuing a Bachelor of Science in Industrial Engineering. He currently serves as the Department Student Council (DSC) Supreme Student Council (SSC) Representative, he also served as the League of Recognized Student Organizations (LORSO) Representative and was appointed in a core position of the LORSO as the auditor.

John Lester B. Dela Paz is currently a third-year student at the Technological Institute of the Philippines – Quezon City, pursuing a Bachelor of Science in Industrial Engineering. He is also serving as the Treasurer of the Department Student Council, responsible for managing the funds and the financial operations of the organization.

Frederick Norman Raei A. Dimaano is currently a third-year student at the Technological Institute of the Philippines – Quezon City, pursuing a Bachelor of Science in Industrial Engineering. He served as a Library Student Assistant, assisting with managing library materials and with the students' academic needs.

Ezekiel Richardson S. Dipasupil is a third-year Industrial Engineering student at the Technological Institute of the Philippines. He is passionate about learning how to improve processes and increase efficiency in various industries, especially in areas like logistics and production. Ezekiel is still exploring different areas of industrial engineering but is particularly interested in supply chain management and data analysis. While he is focused on her studies, he is also eager to gain practical experience and is looking for internship opportunities to better understand how theoretical concepts are applied in real-world settings.

Sarah Mae L. Galit is currently a third-year student at the Technological Institute of the Philippines – Quezon City, pursuing a Bachelor of Science in Industrial Engineering. She is a Cadet Chief Girl Scout of the Girl Scouts of the Philippines (GSP) Rizal Council, where she serves as a member of the Council Board and the Vice Chairperson of one of its key committees, and a Young Adult Representative for Triennium 2024-2027. As a youth leader, she continues to lead the next generation of girl scouts and make an impact in various communities, showcasing strong leadership skills, discipline, a sense of responsibility, and genuine concern for the community.

Bianca Angeline Catherina Mae S. Gedaria is a 3rd-year BS Industrial Engineering student at the Technological Institute of the Philippines (T.I.P.), a DOST scholar, and a consistent academic lister. She has experience as a campus journalist, cartoonist, and TV script writer/reporter. Certified in Lean Six Sigma White Belt and Project Management Essentials, she actively leads in ORIENTS as Auditor (formerly P.R.O.), serves as Vice President of the Payongpitik Society (PEER), and is a member of the Political Science Society. Her past affiliations include BYP and ACE-Q. With a keen interest in the airline and marine industries, she aims to drive innovation and impact in these sectors.

Danica Angel S. Maquilan is currently a third-year student at the Technological Institute of the Philippines – Quezon City, pursuing a Bachelor of Science in Industrial Engineering. She is currently the Secretary of the Organization of Industrial Engineering Students (ORIENTS), managing the documents of the organization.

Edrian T. Untalan is a BS Industrial Engineering student at T.I.P. Quezon City, combining academic excellence with active leadership. He serves as Secretary of the IE Department Student Council and Director for Archives and Documentation of the T.I.P. Association of DOST Scholars for the A.Y. 2024-2025, ensuring efficient documentation and organizational flow. Formerly involved in campus journalism as an Editorial Writer and Column Editor, he values responsibility, growth, and lifelong learning, viewing every task as a chance to improve and achieve.

Maricar M. Navarro is an ASEAN Engineer (AE) and Professional Industrial Engineer (PIE), accredited by AFEO and PIIE. She is a professor at the T.I.P Quezon City, teaching both undergraduate and graduate programs, with over 18 years of experience in industry, academia, and research. Her expertise includes production optimization, facility layout, warehouse operations, and service delivery. Her current research centers on financial optimization and operations decision-making. A Ph.D in Industrial Engineering and master's graduate from MAPUA University, she is also an associate member of the NRCP and a member of PIIE, actively contributing to research and professional advancement in Industrial Engineering.