Here is a comprehensive breakdown of everything you need to know from the files. Your specific section (**V. Conclusion and Recommendations**) has been thoroughly extracted and synthesized, followed by a highly detailed **Q&A master guide** to prepare you for any questions the panel might ask about the entire paper.

Part 1: Your Section – Conclusion & Recommendations

(This is your direct contribution to the paper. Master these points, as they represent your specific part of the presentation).

A. Summary of the Proposed Optimization Models

The primary goal of this study was to maximize daily profits at the hot food counter (Big Bite hotdogs and 7-Fresh siopaos) of the **Nora R. Fermin Convenience Store (7-Eleven)** while enforcing a strict **"zero-waste" policy** to eliminate inventory spoilage.

- **Methodology Used:** We utilized a **Mixed-Integer Linear Programming (MILP)** framework because hotdogs and siopaos are discrete physical items (we cannot sell fractions of a hotdog or siopao).
- **Operational Constraints:** The models established forecasted daily market demand (Units Per Store Day, or UPSD) as a strict upper bound to prevent overproduction, and factored in physical equipment limits (heating rollers and steaming cabinets).
- **Expanded Business Strategies:** Beyond inventory volumes, the paper introduced a **dynamic pricing optimization model** using Excel Solver to adjust prices based on price sensitivity (raising margins on high-volume budget items and discounting slow-moving premium items to boost inventory turnover). It also proposed a **mixed bundling promotional strategy** that pairs slow-moving food items with popular beverages to drive demand without lowering base prices.

B. Recommended Implementation Plan (Based on Model 1)

Transitioning the store from manual guesswork and "visual estimation" to mathematical optimization involves a phased implementation plan:

1. **Set Demand-Based Production Limits:** * **Hotdogs:** Staff must cap daily production at a target batch of **43 hotdogs**, matching local demand unit-for-unit and intentionally leaving 17 units of roller capacity idle to prevent spoilage.
    - **Siopaos:** Because cumulative demand (65.48 units) exceeds the steamer's physical capacity (40 units), staff must follow the mathematically rationalized space allocation. This means prioritizing higher-margin premium variants and eliminating lower-margin variants (like Budget Bola-Bola and Budget Vikings' Tuna Melt).
2. **Standardize Kitchen Operations:** * Conduct an all-hands staff meeting to train the 7 employees across all three rotating shifts on the optimization metrics.

    - Display a simplified, highly visual **preparation guide sheet** at the hot food station so crew members can easily load exact target batch sizes without guessing.
3. **Stakeholder Benefits:**
    - **Store Owner (Ms. Nora Fermin):** Achieves profit maximization (an optimized financial return of **₱2,093.23 per batch**) and eliminates food waste write-offs.
    - **Store Manager (Ms. Nerissa Carreon):** Receives a transparent, bias-free, data-driven operational workflow.
    - **Store Personnel (7 employees):** Eliminates shift-change guesswork during peak hours, reduces physical cleanup labor, and removes the burden of handling and discarding dried-out, expired food.

C. Contribution to the United Nations Sustainable Development Goals (SDGs)

Our optimization models directly contribute to two key UN Sustainable Development Goals:

- **SDG 8: Decent Work and Economic Growth:** By maximizing batch profit, we enhance the store's financial viability. Crucially, standardizing production limits minimizes physical fatigue and operational disruption for employees during peak hours, improving productivity and labor performance.
- **SDG 12: Responsible Consumption and Production:** Convenience store hot food counters traditionally rely on staff guesswork, resulting in dried-out, unsold food thrown out daily. By imposing demand-constrained caps, our model acts as a retail-level loss prevention mechanism that drastically reduces localized food waste and resource inefficiency.

Part 2: Master Q&A Defense Guide (For the Whole Paper)

These are highly strategic questions the professors or panel might ask during your defense, along with exact, professional, and data-backed answers.

Q1: "Why did you choose Mixed-Integer Linear Programming (MILP) instead of a regular Linear Programming (LP) model?"

- **Answer:** "We chose Mixed-Integer Linear Programming because of a critical real-world constraint: **product integrity**. Regular Linear Programming allows for continuous variables, which could result in fractional solutions—such as recommending we prepare 4.6 Creamy Cheese hotdogs or 7.3 Premium Asado siopaos. Since the store cannot manufacture, steam, or sell fractions of a hotdog or siopao, we constrained our decision variables to non-negative whole numbers (integers) to ensure a realistic, actionable, and realistic production schedule."

Q2: "What is the difference between Model 1 and Model 2 in your study?"

- **Answer:** "The models serve different operational scopes:

- ○ **Model 1 (Demand-Constrained Profit Maximization Model)** is a batch-level optimization model. It isolates the most financially lucrative product mix for a *single production batch* based on equipment limits and forecasted demand, assuming a zero-waste policy.
- ○ **Model 2 (Inventory Level Optimization Model)** takes a broader, daily perspective. It focuses on maintaining sufficient stock throughout the entire 24-hour day by balancing expected daily sales against the risk of spoilage, ensuring a complete product variety is maintained on shelf while minimizing total overstock."

Q3: "In Model 1, the hotdog category has a capacity utilization of only 71.67%, leaving 17 units of roller capacity idle. Why didn't you fill the roller to 100% capacity?"

- **Answer:** "This is where mathematical optimization triumphs over traditional 'visual estimation'. The cumulative daily demand for all hotdog variants is only 43 units. While the physical roller can hold 60 units, preparing those extra 17 units just to achieve 100% capacity utilization would violate our core 'zero-waste' constraint. Because there is no local market demand for those extra units, they would inevitably dry out, expire, and result in direct financial write-offs and food waste."

Q4: "For the Siopao category, cumulative demand (65.48 units) exceeds the steamer's capacity (40 units). How does the model decide what to cut?"

- **Answer:** "When hardware capacity is a bottleneck, the model acts as a financial rationer. It systematically evaluates the profit margin of each individual variant. It prioritizes high-margin premium variants (which yield up to ₱25.93 per unit) and systematically caps or completely eliminates lower-margin budget alternatives. For example, the model completely eliminated Budget Bola-Bola (₱15.28 profit) and Budget Vikings' Tuna Melt (₱14.49 profit), and capped Budget Asado at 11 units instead of its full demand of 14, ensuring every single slot of the 40-unit steamer is occupied by the absolute highest-yielding products possible."

Q5: "How did you acquire your dataset, and how reliable is it?"

- **Answer:** "The data is highly reliable as it consists of official, system-generated primary documents. We obtained permission from management to access the store's official **Point-of-Sale (POS) sales monitoring reports**. Specifically, our primary dataset consists of the official **OR Sales Monitor reports for May and June 2026**, which provided exact monthly sales volumes, retail prices, and historical Units Per Store Day (UPSD) sales velocities."

Q6: "Your Model 2 accepts a small amount of projected spoilage for slower-moving items. Why is this acceptable?"

- **Answer:** "In a real-world retail environment, maintaining a complete product assortment is crucial for customer retention. Slower-moving products (like TJ Cheesedog or Budget

Vikings' Tuna Melt) were assigned a minimum Target Daily Stock of 5 units to ensure they remain available on the shelf. While this results in minor projected daily spoilage (0.64 to 4.00 units), this is an acceptable operational trade-off. It ensures the store preserves a full product variety for walk-in customers while preventing the massive, unmanaged overstocking that occurred prior to our study."

Q7: "How do your proposed recommendations benefit the floor-level crew members of the convenience store?"

- **Answer:** "This is a key focus of our **SDG 8** alignment. Under the current system, the 7 rotating staff members must constantly guess customer demand, leading to high-stress periods during peak hours and physical fatigue. By displaying a highly simplified, visual preparation sheet at the hot food station, we remove the cognitive burden of demand-forecasting. Additionally, by eliminating overproduction, we drastically simplify and shorten the end-of-shift cleanup process, as the staff no longer has to manually clear out, record, and dispose of large quantities of expired, dried-out food."

1. Statement of the Problem

The primary problem identified at the **Nora R. Fermin Convenience Store (7-Eleven)** centers on operational inefficiencies in managing its highly perishable hot food counter (specifically **Big Bite hotdogs** and **7-Fresh siopaos**).

Because these ready-to-eat products have strict, limited holding times in the rollers and steamers, the store struggles with a balancing act:

- **Overproduction:** Preparing excessive quantities results in unsold items drying out, leading directly to high inventory spoilage, food waste, and financial losses.
- **Underproduction:** Preparing insufficient quantities based on guesswork leads to severe stockouts during peak operational hours, causing lost sales and customer dissatisfaction.

Currently, daily production decisions are based purely on staff intuition, experience, and visual estimation rather than mathematical metrics, resulting in highly volatile profit margins and unnecessary waste.

2. How the Models Solved the Problem

The study developed **Mixed-Integer Linear Programming (MILP)** models using Excel Solver to take the guesswork out of store operations. They solved the problem by translating physical store realities into math equations:

- **Decision Variables:** Constrained to whole non-negative integers (since the store cannot physically cook or sell fractions of a hotdog or siopao).

- **Demand Constraints:** Using Units Per Store Day (UPSD) from historical POS sales reports as a strict upper bound so the kitchen never overproduces beyond what the local market can absorb.
- **Capacity Constraints:** Incorporating the maximum hardware holding limits—60 units for the hotdog roller and 40 units for the siopao steamer.

3. Detailed Breakdown: Why Model 1 is the Optimal Solution

Model 1 (Demand-Constrained Profit Maximization Model) was selected as the absolute optimal solution because it directly targets production volumes based on hard operational data rather than volatile market assumptions.

How Model 1 Solved It In Detail:

Model 1 handles the store's two distinct product categories through strategic mathematical adjustments:

1. **The Hotdog Category (Demand-Constrained Scenario):** Cumulative demand for all hotdog variants is 43 units, which is lower than the roller's 60-unit capacity. Instead of filling the roller to 100% just for visual appeal, Model 1 caps production at exactly **43 units**, intentionally leaving 17 slots idle. This completely eliminates overproduction waste while satisfying 100% of customer demand.
2. **The Siopao Category (Capacity-Constrained Scenario):** Market demand for siopao is 65.48 units, but the steamer can only hold 40 units. Model 1 acts as a strict financial rationer. It fills all 40 slots by prioritizing the highest-margin premium items (yielding up to ₱25.93 profit per unit) and **completely eliminates slow-moving, lower-margin budget variants** (setting target batches for Budget Bola-Bola and Budget Vikings' Tuna Melt to zero).

Through this exact, data-driven product mix, Model 1 guarantees the absolute maximum possible batch profit of **₱2,093.23** under a strict zero-waste framework.

4. Why Not the Other Models? (In Detail)

The text reveals a slight misalignment in the table of contents descriptions versus the final text evaluation, but evaluates the alternative strategies explicitly as follows:

Why Not Model 2? (Focuses on Price Adjustments)

Model 2 attempts to solve the problem by dynamically shifting retail prices based on consumer price sensitivity (raising margins on fast-movers and slashing prices on slow-movers to push inventory turnover).

- **The Flaw:** Model 2 relies heavily on *assumptions* about customer purchasing behavior and price elasticity. In real-world retail, if you adjust prices improperly, you risk severe customer alienation, causing budget-conscious buyers to go to competitors and lowering total foot traffic. It does not reliably control localized daily kitchen waste if demand shifts unpredictably.

Why Not Model 3? (Focuses on Promotional Bundles / Spoilage Cost Minimization)

Model 3 seeks to solve the issue through mixed promotional bundles (pairing slow-moving food items with popular beverages to force inventory movement) or focusing strictly on eliminating cost liabilities.

- **The Flaw:** Just like Model 2, its success is highly volatile and depends entirely on customer acceptance of the promotional pairings. Furthermore, a strict focus on cost minimization or matching expected baseline demand means the store operates with **absolutely zero safety stock** and **limited flexibility**. If the store experiences a sudden surge in traffic (such as peak hours or travelers passing the intersection), Model 3 leaves the store entirely incapable of capturing that extra revenue, leading to severe stockouts.

Summary Conclusion for Your Defense

Model 1 is superior because it relies on **actual operational limits and recorded sales data** rather than unpredictable behavioral marketing assumptions. It hits the exact mathematical sweet spot: it structures floor-level production to squeeze maximum profits out of the store's existing physical constraints while completely stopping the financial bleed of food spoilage.

To ensure you are fully prepared to defend your study, here is a breakdown of potential "blind spots," methodological shortcomings, and structural discrepancies that an expert panel is highly likely to target.

By anticipating these vulnerabilities now, you can confidently address them during your defense rather than being caught off guard.

1. Hard-Hitting Panel Questions Regarding Blind Spots & Shortcomings

Focus Area A: The "Static" Nature of the Data

Panel Question: *"Your optimization model relies heavily on historical POS data from May and June 2026 to generate the UPSD (Units Per Store Day) demand caps. How does your model account for intense seasonal demand shifts—such as the rainy season, the school calendar year, or holiday surges?"*

- **The Vulnerability:** Your model is currently a **static snapshot**. A production cap calculated using summer/dry season data (May/June) may result in severe stockouts during colder rainy months when hot food demand naturally spikes, or during school holidays when foot traffic drops.

- **How to Defend:** *"That is an excellent point. Our current model acts as a foundational framework using a specific two-month operational baseline. To overcome this limitation in practice, the store manager would update the Excel Solver model dynamically on a rolling monthly or seasonal basis, adjusting the UPSD parameters to reflect real-time seasonal demand shifts."*

Focus Area B: The Practical Reality of Batch Cooking vs. Daily Demand

Panel Question: *"Model 1 optimizes a single 'production batch' to maximize a profit of ₱2,093.23. However, hotdogs and siopaos cannot sit on a roller or steamer for a full 24-hour day without spoiling. How many times a day must the staff replicate this optimized 'batch', and how does the model prevent waste between shift changes?"*

- **The Vulnerability:** The paper mathematically treats the daily demand cap and the physical batch capacity almost interchangeably in Model 1. In reality, a hotdog has a holding time of only 4 to 6 hours before it becomes unsellable. You cannot just load 43 hotdogs once at 8:00 AM and expect them to last until midnight.
- **How to Defend:** *"We acknowledge that physical holding limits require multi-batch preparation. Model 1 provides the absolute ceiling for a highly controlled cycle. In actual operations, the 43 daily required hotdog units should be distributed across the three rotating shifts based on historical peak hours (e.g., breakfast, lunch, and late-night drunk hours), ensuring that the roller never exceeds the demand capacity at any single point in time."*

Focus Area B2: Complete Elimination of Products

Panel Question: *"Model 1 completely eliminates the Budget Bola-Bola and Budget Vikings' Tuna Melt siopaos because of low profit margins. If a loyal customer walks in specifically looking for those budget items and finds an empty shelf, they may walk out entirely. Did your model account for the cost of lost customer goodwill and cross-category sales?"*

- **The Vulnerability:** Pure mathematical optimization lacks marketing empathy. Dropping products entirely just because their margins are lower can damage the store's reputation as a "fully stocked one-stop shop," driving customers to competing convenience stores.
- **How to Defend:** *"From a purely mathematical standpoint, eliminating lower-margin variants maximizes space efficiency under strict physical capacity bottlenecks. However, to preserve customer goodwill, management can implement a trial period. If total category foot traffic drops due to the absence of budget variants, management can easily introduce a minor lower-bound constraint in Excel Solver—forcing the model to produce a minimum safety stock (e.g., 2 units) of those items, accepting a tiny reduction in maximum profit to maintain customer variety."*

2. Internal Discrepancies Within Your Paper

The panel will scan your text for logical contradictions. You must be aware of this specific internal discrepancy:

The "Model 2 and Model 3" Concept Shift

- **The Discrepancy:** In early conceptual sections of the paper, Model 2 is introduced as a **Dynamic Pricing Model** (adjusting prices based on elasticity), and Model 3 is introduced as a **Promotional Bundling Model**. However, in later technical evaluations, the analytical text transitions into discussing Model 2 as an **Inventory Level Optimization Model** that balances expected daily sales against minor projected spoilage to preserve product assortment.
- **How to Defend if Pointed Out:** Do not panic or try to deny it. Address it cleanly: *"During our research, we approached the problem from two distinct strategic angles: **marketing-driven models** (pricing adjustments and promotional bundling) and **inventory-driven operational models** (batch limits and baseline shelf assortment survival). Model 1 proved to be the most viable operational strategy because it structures production around hard, unmanipulated sales data rather than highly unpredictable consumer behavioral shifts."*

3. A Single Relevant Follow-Up Question to Guide Your Preparation

To help fine-tune your defense strategy, consider this: **Which specific operational constraint—such as the maximum holding time of the food items on the rollers or the exact shift schedule of the 7 employees—do you feel most vulnerable explaining if the panel pushes for a real-world implementation timeline?**

To ensure your defense team is absolutely bulletproof, here is a second wave of critical, highly targeted questions. These focus on **methodological rigor, mathematical assumptions, and real-world business viability**—the exact angles seasoned business and quantitative panelists love to probe.

1. Methodology & Mathematical Rigor

Q1: "Demand is inherently stochastic (probabilistic and unpredictable), but your MILP model is completely deterministic (static). Why didn't you use a simulation model like Monte Carlo, and how does your model handle a sudden rush of customers?"

- **The Trap:** Panelists with strong quantitative backgrounds will point out that treating daily demand (UPSD) as a fixed, constant number is a massive oversimplification of real-world retail.
- **Your Defense:**
  "While we recognize that customer demand behaves stochastically in real life, a deterministic MILP model was selected to establish a concrete operational baseline for the store. Dealing with average daily demand allows the business to transition smoothly

from pure visual guesswork to structured parameters. To handle demand spikes, the store can utilize Model 2's logic—incorporating a mathematically calculated safety stock buffer to absorb unexpected daily surges without systematically overproducing."

Q2: "You used Excel Solver for these models. What happens when the store owner, Ms. Nora Fermin, wants to change the menu, or when wholesale costs from 7-Eleven corporate shift? Who updates the model?"

- **The Trap:** They are testing the long-term viability and usability of your project. If the model is too complex for a non-technical store owner to use, its real-world value is zero.
- **Your Defense:**
  "This is why we built our optimization templates using Microsoft Excel rather than specialized coding languages. As part of our handover and implementation plan, we designed a simplified, user-friendly Excel dashboard. The store owner or manager only needs to input the new wholesale costs or retail prices in clearly labeled cells, and click 'Solve'. No programming knowledge is required, ensuring the tool remains sustainable long after our study concludes."

2. Business Operations & Human Resources

Q3: "You mentioned standardizing operations for 7 employees across three rotating shifts. Convenience stores typically suffer from extremely high employee turnover. How do you ensure new hires adhere to these strict target batches?"

- **The Trap:** They want to see if you understand the operational reality of running a retail business where the staff changes constantly.
- **Your Defense:**
  "To address employee turnover, we designed our operational recommendations to be completely independent of individual staff memory. Instead of relying on complex mathematical explanations, we translated the Excel results into a visual, color-coded **Preparation Guide Sheet** posted directly next to the steamers and rollers. This visual standard operating procedure (SOP) ensures that any new hire, even on their first day, can immediately look at the chart and prepare the exact target quantities for their shift."

Q4: "If you prioritize only high-margin items to maximize profits under strict capacity limits, won't you damage your relationship with 7-Eleven corporate, which might mandate that you carry a complete product line?"

- **The Trap:** 7-Eleven is a franchise. Franchisees often have strict contractual agreements regarding product variety and menu compliance.
- **Your Defense:**
  "Franchise agreements do require stores to maintain baseline product assortments. Our

model serves as a decision-support tool to show the *financial cost* of those mandates. If corporate strictly requires the store to carry Budget Bola-Bola, we can simply adjust the 'lower bound' constraint in our model to a minimum of, say, 2 units. This allows the store to remain contractually compliant while still mathematically optimizing the remaining 38 slots in the steamer."

3. Financial & Data Integrity

Q5: "Your data was collected during May and June 2026. How do you know that these two months are representative of the store's annual sales performance?"

- **The Trap:** They are questioning the reliability and validity of your primary data source.
- **Your Defense:**
  "May and June are highly strategic operational baselines. They capture the transition period between the hot dry season (high beverage and snack traffic) and the onset of the rainy season, when hot food demand traditionally begins to climb. While a full 12-month historical dataset would capture complete seasonality, this two-month POS dataset provided clean, unskewed transactional data to validate our model's mathematical logic. The model is designed so that the manager can input new POS data monthly to keep the baseline continuously updated."

Summary Advice for Your Presentation:

1. **Own the Constraints:** Never pretend your model is perfect. If the panel points out a limitation (e.g., "What about electricity costs?"), say: *"That is an excellent variable. While it was outside the scope of our primary optimization model, it represents a valuable area for future research."*
2. **Refer Back to the POS Data:** Whenever they challenge your demand assumptions, remind them that your numbers are not made up—they are backed directly by the store's official **OR Sales Monitor reports**.