

Managing Humanitarian Food Logistics: Efficiency Analysis of the Batch Distribution System in Rohingya Refugee Camps

Illiteracy and Poverty Alleviation Assistance Organization – IPAO

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Submitted in Partial Fulfillment of the Requirements for the Degree
Bachelor of Business Administration



Internship/Project Report Approval Form

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Internship

Organization: IPAO (Illiteracy and Poverty Alleviation Assistance Organization)

Internship /Project Report Topic: **Managing Humanitarian Food Logistics: Efficiency Analysis of the Batch Distribution System in Rohingya Refugee Camps**

• Term (Tick one): ☐ Spring 2025 ☐ Summer 2025 ☐ Fall 2025

SUPERVISOR APPROVAL

(Tick One)

☐ Approved ☐ Not Approved ☐ Partial Re-write ☐ Full Re-write

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Letter of Transmittal

19th January, 2026

Sakib Hossain

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Subject: Submission of Internship & Project Report.

Dear Sir,

With due respect, I am pleased to submit my Internship Report titled " Managing Humanitarian Food Logistics: Efficiency Analysis of the Batch Distribution System in Rohingya Refugee Camps," based on my experience at the Illiteracy and Poverty Alleviation Assistance Organization (IPAO).

This report documents my practical experience managing logistics for food distribution in Ukhiya, Cox's Bazar, and presents my research findings on improving warehouse and distribution efficiency in high-density humanitarian settings.

I have endeavored to follow the guidelines provided and have applied the theoretical knowledge acquired during my academic tenure. I hope this report meets your expectations.

Sincerely,

Salman Habib Akash

Student ID: 212011056

Bachelor of Business Administration (BBA)

Concentration: Supply Chain Management

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Acknowledgement

First and foremost, I would like to express my profound gratitude and sincere appreciation to my internship supervisor at the **Illiteracy and Poverty Alleviation Assistance Organization (IPAO)**. I am deeply thankful for the unwavering guidance, professional trust, and the significant responsibilities I was granted during the critical food distribution phases in Camps 6, 8, and 11. The opportunity to work on the front lines of the Kutupalong expansion site provided me with a unique vantage point to witness the intersection of humanitarian principles and logistical execution. Your mentorship was truly invaluable, helping me navigate the immense complexities of field logistics, from warehouse coordination to the challenges of last-mile delivery in a high-pressure environment.

I am also deeply grateful to my academic supervisor, **SAKIB HOSSAIN**, whose scholarly expertise and continuous support were instrumental throughout this journey. His constructive feedback and rigorous standards significantly shaped the intellectual structure and analytical quality of this report. I truly appreciate the time he dedicated to reviewing my findings and his ability to push me toward a more data-driven and critical analysis of humanitarian supply chains. His mentorship ensured that this internship was not just a field experience, but a profound academic learning opportunity.

Finally, I would like to extend my heartfelt thanks to the dedicated field volunteers and the broader logistics team members at IPAO. This report and the operations it analyzes would not have been possible without their tireless teamwork and shared commitment to service. Together, we managed the monumental task of distributing essential relief to over 6,000 families residing in the most congested refugee camps in the world. Their resilience in the face of logistical bottlenecks and extreme field conditions served as a constant source of inspiration. It was an honor to serve alongside such a hardworking team in the effort to ensure aid reaches those who need it most with speed and dignity.

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PART- A

Chapter One

Internship Preparation

1.1 Motivation for Internship

The decision to pursue an internship within the complex and volatile environment of the humanitarian sector was not merely a requirement for academic completion but a deliberate choice driven by a profound professional interest in the mechanics of emergency supply chains. The ongoing humanitarian crisis in Cox's Bazar, Bangladesh hosting over one million Rohingya refugees presents one of the most intellectually and operationally challenging logistical environments in the contemporary world. My primary motivation was to bridge the significant chasm that exists between the theoretical frameworks of Supply Chain Management (SCM) taught in university lecture halls and the gritty, unpredictable reality of field operations where resources are scarce, and human suffering is the cost of inefficiency.

Academic literature on humanitarian logistics emphasizes that unlike commercial supply chains, which are driven by profit maximization and cost reduction, humanitarian chains are driven by the imperative to minimize loss of life and alleviate suffering under conditions of high uncertainty. I was motivated to witness firsthand how these theoretical distinctions manifest on the ground. Specifically, I sought to understand the last-mile delivery challenge, the final leg of the supply chain where aid is transferred to beneficiaries. In the refugee camps of Ukhiya and Teknaf, this last mile is complicated by a lack of paved infrastructure, extreme population density, and the constant threat of natural hazards like monsoons and landslides. By immersing myself in this context, I aimed to acquire the crisis management skills and adaptability that are prerequisites for a career in global development operations.

1.2 Internship Search and Placement Process

The process of securing a meaningful internship that would allow for substantial operational involvement rather than mere observation was rigorous. I began by mapping the landscape of Non-Governmental Organizations (NGOs) active in the Cox's Bazar district. The region is saturated with aid agencies, but many restrict interns to administrative roles in head offices. My objective was to find an organization with a lean operational structure that would permit a higher degree of responsibility and field access.

I identified the Illiteracy and Poverty Alleviation Assistance Organization (IPAO) as a prime target. Established in 1996, IPAO has a long-standing reputation for integrating community engagement with sustainable development goals (SDGs). Unlike international giants where interns might be siloed, IPAO's localized approach and diverse project portfolio-ranging from

food security to Smart Agri and WASH (Water, Sanitation, and Family)-offered a holistic view of humanitarian operations.

The application process involved a detailed submission of my Curriculum Vitae and a tailored cover letter that explicitly linked my academic coursework in operations management specifically inventory control and logistics planning to the practical needs of relief distribution. This was followed by a challenging interview process where I was tested on my ability to handle hypothetical field crises, such as vehicle breakdowns or sudden stock outs during distribution. I emphasized my technical proficiency in data management and my willingness to work in austere conditions. My selection for the position of Logistics Intern was a result of this demonstrated alignment between my skills and the organization's immediate operational needs for the September 2025 distribution cycle.

1.3 Organization Overview: Illiteracy and Poverty Alleviation Assistance Organization (IPAO)

The Illiteracy and Poverty Alleviation Assistance Organization (IPAO) is a registered non-profit development organization that has been at the forefront of social development in Bangladesh for nearly three decades. Since its inception in 1996, IPAO has aligned its strategic objectives with the United Nations Sustainable Development Goals (SDGs), focusing on poverty reduction, quality education, and zero hunger through innovative, people-centered solutions.

Mission

The mission of IPAO is to alleviate human suffering and empower individuals to reach their full potential. The organization is dedicated to improving the well-being of all people, striving to change lives through service that is inclusive of every race, religion, and gender. By focusing on human dignity and providing a strong support system, IPAO helps the most vulnerable populations overcome hardship and build a better future.

Vision

IPAO envisions a world where a helping hand is always available to those in need and where poverty is replaced by community empowerment. The organization strives for a future where every person regardless of their background has access to clean water, nutritious food, and sustainable livelihoods. IPAO aims to build communities that are self-reliant, climate-resilient, and capable of protecting their environment for generations to come.

Objectives

IPAO's strategic objectives are divided into six key pillars of development:

- **WASH (Water, Sanitation, and Hygiene):** Providing safe water through solar pumps and tube wells, alongside Family education to improve public health.

- Food Aid & Nutrition: Distributing emergency food during crises and developing sustainable systems to reduce long-term hunger.
- Smart Agriculture & Livelihoods: Promoting climate-resilient farming techniques and organic pest control to increase productivity and income for smallholders.
- Disability Inclusion: Ensuring all infrastructure, such as toilets and ramps, is accessible to persons with disabilities to foster community well-being.
- Education and Awareness: Providing life skills training and informal education to empower youth and marginalized groups.
- Innovation & Sustainability: Integrating renewable energy, like solar power, and eco-friendly practices into all development projects.

1.4 Operational Scope and Strategic Pillars:

IPAO operates with a philosophy that integrates immediate relief with long-term resilience. In the context of the Rohingya response in Cox's Bazar, their operations are multifaceted and critical:

Food and Emergency Response: This is a cornerstone of their intervention. IPAO manages the end-to-end logistics of distributing dry food rations and cooked meals to thousands of displaced families. The organization navigates the complexities of the World Food Programme's (WFP) voucher system and ration cuts to ensure food security for the most vulnerable demographics in Camps 6, 8, and 11.8

Water, Sanitation, and Hygiene (WASH): Recognizing that waterborne diseases are a lethal threat in congested camps, IPAO is heavily involved in WASH infrastructure. This includes the installation of deep tube wells, the construction of sanitary latrines, and the implementation of solar-powered water treatment networks to ensure access to potable water.

Smart Agriculture and Livelihoods: In response to the space constraints within the camps, IPAO has pioneered Smart Agri initiatives. These projects utilize hydroponics and vertical gardening techniques to allow refugees to cultivate vegetables in micro-spaces, thereby supplementing their nutrition and providing a sense of agency and mental well-being.

Education and Healthcare: Beyond physical survival, IPAO invests in human capital through learning centers for children and healthcare services that focus on maternal health and vaccination campaigns, addressing the severe shortage of medical facilities in the camps.

The organization's structure is designed for agility. It relies on a core team of project managers supported by a vast network of community volunteers. This model allows IPAO to maintain low overheads while scaling up rapidly during emergencies, a critical capability in the volatile context of the Rohingya crisis.

Chapter Two

About The Internship

2.1 Position and Work Environment

As a Project Intern, my role was positioned at the intersection of strategic planning and tactical execution. I was based primarily out of the field office in Ukhiya, which served as the logistical command center for the relief operations. However, the nature of the work demanded extensive mobility, and I spent a significant portion of my internship within the refugee camps themselves, specifically Camps 6, 8, and 11.

The work environment was characterized by high intensity and constant flux. The physical conditions were demanding; the camps are located on hilly terrain with limited infrastructure, often turning into mud-slicked pathways during the monsoon rains common in September. This environmental reality posed continuous challenges to logistics, requiring real-time problem solving. The office environment was equally dynamic, serving as a hub for coordination between donors, the warehouse team, and field volunteers. I reported directly to the Project Manager, Shah Poran, and worked closely with the warehouse staff to synchronize inventory movements with beneficiary needs. The atmosphere was one of disciplined urgency, driven by the knowledge that any delay in the supply chain directly impacted the welfare of thousands of families.

2.2 Duties and Responsibilities

The scope of my internship was expansive, covering four distinct but interconnected operational domains. My daily routine involved a rotation through these domains, ensuring a comprehensive engagement with the project lifecycle.

2.2.1 Project Documentation and Volunteer Management

In the humanitarian sector, accountability is paramount. Donors require precise documentation of how resources including human resources are utilized. I was tasked with the administration of the "Master Roll," a critical ledger tracking the attendance, deployment, and remuneration of the volunteer workforce.

Attendance Tracking: I maintained the daily attendance logs for a team of 35 personnel, comprising volunteers, project interns, and drivers. This required rigorous verification of presence at the designated distribution sites. Utilizing the data from the project's attendance sheet, I tracked the engagement of key volunteers. For instance, Tanvirul Hoque Sifat and Hasanul Banna were recorded for 13 days of active duty, while other dedicated members like Aziz contributed an impressive 27 days of service. This tracking was not merely administrative; it was essential for operational planning, ensuring that adequate manpower was allocated to high-traffic distribution points each day.

Payroll Administration: I assisted in the complex calculation of volunteer stipends. The payment structure was multi-tiered, involving transport allowances and daily subsistence rates distributed across multiple tranches (Payment 1, 2, 3, etc.). For example, I processed the ledger for Mustafizur Rahman, calculating a total payment of BDT 11,500 based on his 19 days of attendance and specific transport allocations. Ensuring accuracy here was vital for maintaining morale among the volunteer corps, who are the backbone of the operation.

Resource and Equipment Allocation: I managed the inventory of non-food items essential for the team's operation. This included the procurement and distribution of high-visibility vests and ID cards. The expense logs from September 9th indicate the procurement of 35 ID cards at a unit cost of 36 BDT. I ensured that every team member was properly identified, a mandatory security requirement for entering the highly regulated military checkpoints surrounding the Rohingya camps.

2.2.2 Financial Verification and Expense Auditing

Operating on a donor-funded budget requires strict financial discipline. My role involved the preliminary audit of field expenses before they were submitted to the central finance department for reimbursement. This first line of defense against financial leakage is crucial for NGO sustainability.

Transportation Cost Analysis: I verified the legitimacy of transport claims, which represent a significant portion of the operational budget. This involved scrutinizing bills such as the BDT 6,000 Bus Ticket expense on September 4th for moving the core team from Dhaka/Chittagong to the operational base, as well as local Cox to Ukhiya transit costs. I cross-referenced these claims with movement logs to ensure that vehicles billed were actually used for project purposes.

Operational Sustenance Tracking: I tracked the expenses related to feeding the volunteer force during long shifts. For instance, on September 6th, the ledger recorded a lunch expense of BDT 1,040 for 8 personnel. I was responsible for ensuring that these costs remained within the per-diem limits set by the project guidelines.

Discrepancy Resolution: I monitored the Billed, Not Passed ledger, flagging items that lacked sufficient documentation. For example, a claim for "Book/Pen" amounting to BDT 210 was held back for further justification. This experience provided deep insights into the internal control mechanisms necessary to prevent fraud and ensure donor compliance in the NGO sector.

2.2.3 Field Visits and Distribution Logistics (Camps 6, 8, and 11)

The most operationally intensive aspect of the internship was the management of the food distribution itself. This involved executing a push logistics strategy to move commodities from the central warehouse to the Camp Distribution Points (CDPs).

Batch Distribution Coordination: To manage the immense crowds and ensure security, we employed a batching system. I was responsible for coordinating the release of goods in specific, numbered batches. For example, during the distribution in Camp 6 on September 15th, I oversaw the dispatch of 7 distinct batches. The batch sizes varied significantly, ranging from 100 to 300 Family Boxes. My role was to release these batches in coordination with the camp focal points to ensure that the arrival of trucks coincided with the readiness of the beneficiaries, thereby minimizing wait times and potential unrest.

Inventory Reconciliation and Stock Control: At the end of each operational day, I conducted a physical stock count to reconcile the Quantity Distributed with the Quantity Left. On September 16th, the ledger showed a critical closing balance of only 36 units remaining from an initial stock of 6,200. This near-zero inventory level highlighted the extreme efficiency of the turnover but also underscored the precarious nature of the supply chain; a single delayed inbound shipment would have resulted in a stockout.

2.2.4 Water Infrastructure and Hydroponics Monitoring

In addition to food logistics, I was tasked with monitoring IPAO's technical projects related to WASH and sustainable agriculture. This provided exposure to the engineering and developmental aspects of humanitarian aid.

Water Infrastructure Monitoring: I conducted field inspections of tube wells and water storage tanks using standardized safety checklists. My monitoring focused on ensuring the physical integrity of the infrastructure, verifying that open wells are equipped with locked covers to prevent accidents and contamination, and checking that drainage canals around the wells were not blocked. In Camps 6 and 8, where water scarcity is acute during the dry season, I verified the functionality of solar-powered pump systems. This monitoring is critical because recontamination of water during transport and storage is a major health risk in the camps; ensuring the source is secure is the first step in the safe water chain.

Hydroponics and Vertical Gardening Oversight: I monitored the "Smart Agri" projects where refugees are trained to grow vegetables using vertical bamboo frames and recycled containers. Given the lack of arable land, these hydroponic-style micro-gardens are essential for nutritional supplementation. I inspected the gardens to ensure beneficiaries were correctly applying the training on nutrient management and pest control. I documented the usage of distributed grow bags and assessed the health of crops like gourds and spinach. This project is vital not just for food security but also for providing psychosocial support, as gardening offers a semblance of normalcy and agency to the refugees.

2.3 Contributions to the Company

My contributions extended beyond executing assigned tasks; I actively sought to improve operational workflows.

Warehouse Optimization: I reorganized the staging area in the Ukhiya warehouse to facilitate the simultaneous loading of Rice and Family Box trucks. This reduced the idle time for vehicles by approximately 15% during peak morning hours.

Data Integrity: By meticulously maintaining the digital ledgers in Excel, I corrected several data entry errors in the volunteer payroll before payments were processed, preventing financial discrepancies.

Operational Continuity: During a period of heavy rain that threatened to halt distribution, I successfully coordinated with local drivers to find alternative routes to Camp 11, ensuring that the daily distribution target was met despite the weather disruption.

2.4 Relating Educational Learning with Internship Roles

The internship served as a rigorous laboratory for testing the SCM theories learned in my academic program.

Just-In-Time (JIT) Logistics: The lack of extensive warehousing space in Ukhiya forced us to adopt a JIT approach. I applied JIT principles to coordinate truck arrivals exactly when warehouse space became available from outgoing shipments.

Inventory Management: While textbooks emphasize Economic Order Quantity (EOQ) to minimize costs, the field reality taught me that in humanitarian logistics, the cost of a stockout is human suffering. Thus, the focus shifted from financial optimization to **service level maximization and responsiveness**.

Bottleneck Analysis: I applied the Theory of Constraints to identify that the manual token verification process at the camp entrance was the primary bottleneck slowing down distribution. This observation aligns with literature suggesting that last mile inefficiencies often stem from administrative rather than physical constraints.

Chapter Three

Self Reflection

3.1 Observations and Experiences

My tenure at IPAO was a defining professional and personal experience. I was deeply struck by the resilience of the field team and the beneficiaries. Despite the chaotic environment characterized by sweltering heat, mud, and the emotional weight of the refugee crisis the volunteers maintained a high level of discipline. The "Batch Distribution System," while effective in controlling crowds, often led to long wait times for refugees if a truck was delayed due to traffic congestion on the single main road serving the camps. I observed that the reliance on paper-based tokens and manual ledger entry (Excel was updated end-of-day, not real-time) created information lags. If a truck was diverted, the receiving team often didn't know until it failed to arrive, causing anxiety among the waiting crowd.

3.2 Skill Development and Areas for Improvement

Strengths:

I discovered a natural aptitude for operational coordination and crisis management. My ability to visualize the flow of goods helped in rearranging the warehouse layout for efficiency. I also excelled in data reconciliation, identifying discrepancies in the volunteer payment logs that saved the organization funds. My adaptability was tested and proven; I learned to remain calm and decisive even when operational plans disintegrated due to external factors like weather or security alerts.

Weaknesses:

Initially, I struggled with the language barrier in the camps, as the Rohingya dialect differs significantly from standard Bangla. This hampered my direct communication with beneficiaries and forced me to rely on interpreters. Additionally, I found it emotionally difficult to witness the extent of the deprivation, which occasionally affected my objectivity in the first few days. I also realized that while my Excel skills were adequate, they were insufficient for handling the complex, large-scale datasets required for real-time logistics tracking.

3.3 Recommendations for the Organization

To utilize interns better and improve operations, IPAO could implement the following:

Digital Onboarding: Create a digital onboarding module that covers basic Rohingya dialect phrases and cultural sensitivities to prepare interns before field deployment.

Digitization of Logistics: Move away from paper logs to mobile-based data collection tools like **KoboToolbox** or **ODK**. This would allow for real-time inventory tracking and reduce the information lag between the warehouse and the camps.

Rotation System: The internship program would benefit from a structured rotation system, allowing interns to spend time in Procurement and Finance to understand the upstream processes that dictate the field logistics I managed.

Chapter Four

Personal Development Plan

4.1 Career Plan and Next Course of Action

This internship has solidified my resolve to build a career in Humanitarian Supply Chain Management. The experience has demonstrated that logistics is the backbone of effective aid. My immediate goal is to complete my Bachelor of Business Administration (BBA) and utilize the insights gathered during this internship. Post-graduation, I intend to seek a Junior Logistics Officer position with an international NGO (such as WFP, UNHCR, or IOM) to gain exposure to large-scale, cross-border supply chains.

4.2 Skills Development Strategy

To achieve these goals, I have outlined a targeted skills development strategy:

Technical Proficiency: I plan to master advanced data visualization tools like **Tableau** and **Power BI**. The ability to turn raw logistics data into actionable visual insights is highly valued in the sector. I will also pursue an EMBA degree in Humanitarian Logistics to formalize my field knowledge.

Soft Skills: I aim to improve my negotiation and conflict resolution skills, which are vital when dealing with local vendors, transporters, and navigating the complex stakeholder environment of a refugee camp. I will also take courses in Crisis Communication to better handle the high-stress interactions inherent in this sector.

PART B

Managing Humanitarian Food Logistics: Efficiency Analysis of the Batch Distribution System in Rohingya Refugee Camps

Focus: Camp 6, 8 & Camp 11 (Ukhiya) **Data Period:** September 2025

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The Rohingya refugee crisis is not merely a localized demographic challenge; it represents one of the most statistically significant and operationally daunting humanitarian emergencies of the twenty-first century. Geographically centered in the Cox's Bazar district of Bangladesh, the region has transformed into a high-density logistical theater where the margin for error is effectively non-existent. Since the historic mass influx in August 2017, the population of Forcibly Displaced Myanmar Nationals (FDMN) has surged to over one million, inhabiting what is now the largest and most densely populated refugee settlement on Earth.

For logistics planners, the physical environment of Cox's Bazar is an adversarial factor that dictates the rhythm of aid. The topography is characterized by steep, hilly terrain composed of unstable sandy soil, which is highly susceptible to devastating landslides during the intense monsoon periods. The absence of formal paved road networks within the camp interiors specifically in high-density sectors like Camp 11 and Camp 8 creates a logistical nightmare for the heavy transport assets required to move bulk aid. In this environment, Humanitarian Logistics ceases to be a mere support function and becomes the absolute life-blood of the population. Every kilogram of rice and every liter of oil must be acquired, shipped, stored, and physically delivered through these precarious Last Mile corridors. The success of the mission rests entirely on the ability of supply chains to overcome these physical barriers and infrastructural deficits.

1.1.2 The Strategic Pivot: From Emergency Effectiveness to Protracted Efficiency

As the crisis evolved from an acute emergency into a protracted displacement situation (2020–present), the mandate for aid organizations underwent a fundamental shift in logistical philosophy. The initial goal of Effectiveness simply ensuring aid reached the camp at any cost

to prevent mass starvation has been replaced by the mandate for Efficiency. This transition is a hallmark of mature humanitarian responses where the objective is to deliver food and non-food items (NFIs) at the least possible cost while maximizing the dignity of the recipient.

According to Van Wassenhove (2006), this transition is critical for long-term sustainability; as global donor fatigue sets in and humanitarian budgets shrink, organizations must transition from brute-force delivery to sophisticated supply chain management that optimizes every dollar spent. In the protracted phase, getting food there is no longer enough; the system must now answer "How can we get it there with 0% waste and 100% accountability?" This requires a move away from the high-cost, high-loss models of the early response toward lean, data-driven operations that can withstand years of sustained demand.

1.1.3 The Technological Divide and the Crisis of the Batch System

A significant Technological Divide has emerged within the Rohingya response, creating a two-tiered system of aid delivery. While major international actors such as the World Food Programme (WFP) and UNHCR have deployed advanced Industry 4.0 technologies including blockchain-based E-vouchers and Biometric SCOPE cards to streamline verification and reduce fraud, many local Non-Governmental Organizations (NGOs) and implementation partners remain tethered to primitive, manual methods.

This report is concerned with this digital gap, focusing on the challenges of the Last Mile for local teams who continue to use the Batch Distribution System. This model is a quintessential Push-oriented system that bundles beneficiaries into massive, unmanageable groups to deliver aid in predetermined windows. While this was a necessity during the 2017 response phase, in a protracted 2025 context, it has become a liability. The reliance on manual ledgers and physical bundling leads to the kitting discrepancies and inventory stockouts documented in recent field logs. By failing to transition to digital Pull models, local implementation partners risk creating a Cost of Correction that doubles the logistics expenditure per unit while compromising the dignity and safety of the refugees they serve.

1.2 Operational Context: The "Last Mile" in September 2025

The study is based on the practical reality of the internship term in September of 2025. This paper is specifically targeted to the facilitation of logistic operations within Camp 6, 8 and Camp 11 in the Ukhiya Upazila of Illiteracy and Poverty Alleviation Assistance Organization (IPAO).

At this time, the logistics department was given a challenging mandate of a Double Distribution. The team was forced to liaise with the simultaneous delivery of:

Food Items (FIS): In particular, "Family Boxes" of Lentil, Salt, Sugar, Oil, Toast and Noodles.

General Food Assistance (GFA): In particular, the so-called Rice Packs, which are the main source of caloric consumption of the refugee population.

The environment that existed in this time was characterized by a lot of volume and friction. Field records between September 13 and September 15, 2025 reveal that the logistics team was struggling to deliver more than 6,200 units of supplies in narrow distribution channels. To move in as many goods as possible, the operation greatly depended on a fleet of contract vehicles (documented in ledgers as Vehicle IDs 177427, 110307, etc.) and a list of volunteers, who were engaged on a daily basis (e.g., Tanvirul Hoque, Mahir Arnob).

The given operational window is an ideal example to study due to its demonstration of the flaws of the manual system. The adoption of the paper-based method of synchronization between the movement of the heavy Family Boxes and the perishable Rice Packs with the help of the manual tallying sheet has created major bottlenecks, which served as a sign of the necessity of the process re-engineering.

1.3 Statement of the Problem

1. The main issue that is the focus of this report is that the Batch Distribution System is operationally inefficient and exposed to risks. Although digital "Pull" models (where beneficiaries go shopping in retail stores) exist, local NGOs are usually limited to the "Push" model because of budget reasons or customary practices. The current Batch System has three identified critical failure points, which this research identifies:
2. This can be evaluated through the operational ledgers of September 13, 2025 (Camp 6) in which there was a systemic inability to match complementary goods. Preferably, a refugee should also be given a Rice Pack alongside a Family Box. The data indicates however, huge variances such as one batch where 300 boxes have been given but only 159 rice packs were present. This mismatch compels beneficiaries to wait in line several times or walk away with partial assistance which has a direct effect on their family security.
3. There was an alarming overdependence on individual transport assets in a supply chain at Camp 11 (as was observed on September 14). According to the ledger, the primary stock was moved by only one truck (Vehicle ID 177427) which moved the enormous majority of the stock. On a weak infrastructure such as Ukhiya, where the roads get often stuck by mud or breakdown, a single "prime mover" becomes a Single Point of Failure and the whole distribution cycle can be threatened.
4. The Batch model is costly to operate. It involves the physical mobilization of masses of volunteer workers who will tend to people and unload the trucks. The expense reports of the internship period can point out high recurrent costs in the category of Volunteer Sustenance (Lunch/Dinner) and Staff Transportation (Bus tickets from Cox's Bazar). They are variable expenses which increase with each distribution day and they deprive the funds that would have been used on the beneficiaries themselves.

1.4 Rationale of the Study

Why is this analysis necessary *now*?

Local NGOs must accomplish more with less when donor financing for the Rohingya issue declines (a phenomenon known as "funding fatigue"). The enormous overheads associated with manual distribution are now unaffordable. The first step in reducing costs is identifying these inefficiencies.

By its very nature, the Batch System lacks dignity. It makes vulnerable people, typically women, the elderly, and those with disabilities stand in line for hours an average of four to six hours in the sweltering heat. This research argues for a change to more respectable, digital, and quick distribution strategies by demonstrating the system's inefficiency.

Academic research comparing the particular operational data of local and international NGOs is lacking. By comparing local performance to WFP standards using primary field data, this report closes that gap.

1.5 Research Objectives

The primary objective of this internship report is to conduct a Process Efficiency Analysis of the logistics operations in Camp 6, 8 and Camp 11, benchmarking the manual "Batch System" against digital industry standards.

Specific Objectives:

1. To document the end-to-end journey of aid from the warehouse to the beneficiary, identifying physical bottlenecks in the "Last Mile."
2. To analyze the daily distribution ledgers (September 2025) and calculate the precise "Mismatch Rate" between Family Boxes and Rice Packs.
3. To evaluate the "Hidden Costs" of manual logistics, specifically focusing on volunteer labor, transportation, and manual record-keeping expenses.
4. To propose actionable, low-cost steps for local NGOs to transition from manual ledgers to digital data collection (e.g., KoboToolbox) and decentralized transport models.

1.6 Scope and Limitations

1.6.1 Scope of the Study: The Logistical Boundary

The research is strictly localized to the humanitarian distribution points (DPs) managed by the host organization within Camp 6, Camp 8, and Camp 11 of the Ukhiya Rohingya Refugee Settlements. These sites were selected as they represent the highest density sectors for forced displacement, offering a concentrated view of logistical friction.

The analytical focus is narrowed to Outbound Logistics (Distribution) and Inventory Management, specifically the flow of goods from the Ukhiya transit warehouses to the final beneficiary hand-off. The study intentionally excludes upstream processes such as global procurement or international maritime shipping, focusing instead on the tactical push-pull dynamics of the field. The data window is confined to the specific operational cycle between September 4, 2025, and September 24, 2025, capturing a representative snapshot of the Protracted Phase logistics.

1.6.2 Methodological and Data Limitations

While the research was granted granular access to field ledgers, daily kitting counts, and petty cash expenditure reports, certain higher-level financial datasets remained restricted. Consequently, the cost-benefit analysis is grounded in Operational Expenditure (OpEx) such as daily vehicle rentals and volunteer stipends rather than long-term Capital Expenditure (CapEx).

Furthermore, comparative data regarding the internal cost structures of International NGOs (e.g., WFP or UNHCR) is derived from secondary public reports and field-based external observations. This study acknowledges that while proprietary data from these global actors was unavailable, the observable field discrepancies between manual local systems and digital global systems remain statistically significant for the purpose of this supply chain critique.

1.6.3 The Impact of Restricted Visibility

The limitation in accessing high-level financial audits means that the Cost of Correction documented in this report is likely a conservative estimate. According to Van Wassenhove (2006), the hidden costs of humanitarian logistics including administrative overheads and lost opportunity costs during stockouts can often be double what is recorded in field-level petty cash ledgers. By focusing on the Operational Expenditure, this study highlights the immediate, tangible waste generated by manual batching systems in a high-pressure environment.

CHAPTER 2

LITERATURE REVIEW

2.1 Humanitarian Supply Chain Management (HSCM): A Unique Discipline.

Humanitarian Supply Chain Management (HSCM) operates on a logic fundamentally distinct from that of commercial logistics. While commercial supply chains are designed as profit-maximizing engines optimizing every link to capture market share and minimize waste HSCM is a human-centric endeavor characterized by the urgent need to alleviate suffering under chaotic and unpredictable conditions. In the commercial sector, a stockout results in lost revenue; in the humanitarian sector, a stockout can result in the loss of human life.

2.1.1 Defining the Humanitarian Mission: Beyond Movement to Satisfaction

According to **Thomas and Kopczak (2005)**, the pioneers of modern humanitarian logistics, the field is defined as the process of planning, executing, and regulating the effective, economical circulation and conservation of goods and materials and the corresponding information between the source and the point of consumption, with the specific aim of satisfying the end beneficiaries. This definition elevates the role of the logistician from a mere transporter to a strategic coordinator who must manage not just physical goods, but the information flows that ensure those goods reach the right person at the right time.

2.1.2 The "Point of Consumption" in the Mega-Camp Context

In the specific context of the Rohingya crisis, the point of consumption is typically a bamboo and tarpaulin shelter within a high-density mega-camp. Unlike a retail customer who chooses products based on preference, the end beneficiary in Cox's Bazar relies on the supply chain for basic survival staples. The logistics chain must overcome last-mile friction factors such as unpaved, hilly terrain and extreme weather to deliver rice and hygiene kits. Thus, the customer service metric in HSCM is not profit, but the preservation of human life and dignity through the efficient, transparent, and equitable movement of life-sustaining materials.

2.2 The Three Phases of Humanitarian Relief: A Strategic Roadmap

Literature consistently categorizes humanitarian responses into three distinct temporal phases, each requiring a shift in logistical strategy to maintain effectiveness:

1. **Response Phase (0–6 Months): The Urgency Mandate** This period is defined by high levels of chaos, destroyed infrastructure, and a no-regrets approach to aid. The primary objective is the rapid stabilization of the population. In this phase, speed is the primary variable, and operational efficiency is often sacrificed. Logistics are

characterized by Push systems where goods are sent in bulk to the disaster zone without waiting for precise local data, as the cost of delay is death.

2. **Recovery Phase (6–24 Months): Stabilization & Infrastructure** As the acute crisis wanes, the focus shifts toward stabilizing the displaced population and establishing more permanent infrastructure (such as the Kutupalong-Balukhali expansion site). Logistics begin to transition from emergency push to more coordinated, multi-sectoral planning. During this stage, agencies begin to implement more sophisticated inventory tracking and seek to reduce the redundancy that was necessary during the initial shock.
3. **Protracted Operation Phase (2 Years+): The Efficiency Mandate** This phase is marked by long-term maintenance of a settled population. As global attention shifts to newer crises, donor budgets typically shrink, making operational efficiency the paramount objective. The logistical goal is to sustain a consistent standard of aid using the minimum possible resources. This phase requires a transition from logistics (moving things) to supply chain management (optimizing the flow).

2.3 The Protracted Phase (2025): Batch Distribution as a Liability

As of 2025, the Rohingya response is firmly in the Protracted Phase. Scholarly opinion and field assessments from organizations like IOM (2003) suggest that logistical models must evolve to remain sustainable. While Batch Distribution a Push model where standardized kits are physically handed out to large groups is feasible and often necessary during the high-chaos Response Phase, it becomes a strategic liability during protracted operations for several reasons:

1. **High Financial Cost & Operational Drag:** The physical "Pushing" of thousands of tons of rice through difficult terrain involves massive overheads in fuel, fleet maintenance, and volunteer labor. Van Wassenhove (2006) notes that in protracted settings, logistics can account for up to 80% of total relief costs. Maintaining a massive physical fleet for manual distribution becomes a primary source of waste when more agile digital options exist.
2. **The Inefficiency of Manual Verification:** As a crisis enters its third or fourth year, the manual checking of paper ledgers becomes a bottleneck. It causes massive queues, increases the Cost-to-Serve, and is prone to human error.
3. **Disrespect and Loss of Agency:** Protracted reliance on standardized batches strips beneficiaries of their agency. Modern research from the WFP (2022) increasingly favors Cash-Based Transfers (CBT) or Digital Vouchers. These "Pull" models empower refugees to act as economic participants, allowing them to choose what they need from local markets. This shift not only supports the local economy but eliminates the last-mile cost of moving physical goods by the NGO.

By failing to transition from the Response-era Batch System to more agile, digital Pull models, current operations risk becoming economically unsustainable and socially disconnected from the evolving needs of the community in a protracted environment.

2.4 The Batch Distribution System: The Push Model.

2.4.1 Definition of the Push Model

In humanitarian logistics, a Push Model involves moving resources forward in the supply chain based on a top-down plan.

1. **The Logic:** In a refugee setting, the demand is constant and predictable meaning everyone needs food. Therefore, rather than waiting for orders, the agency pushes standardized batches of food from the Ukhiya warehouses to the Camp Distribution Points (CDPs) according to a fixed calendar.
2. **Batching as the Delivery Unit:** The Batch is the core unit of this push. It is designed to group a specific number of beneficiaries to ensure that the physical arrival of people matches the physical arrival of the trucks.

2.4.2 Operational Mechanics of the System

The system functions through three distinct stages of the Push:

1. **Stage 1: Warehouse Allocation (The Source):** Based on the census data for Camps 6, 8, and 11, the warehouse team prepares a total volume of goods (the 6,200 units mentioned in this data).
2. **Stage 2: Tactical Batching (The Conduit):** Beneficiaries are assigned a "Batch Number." This acts as a scheduling tool to prevent 50,000 people from arriving at the CDP at the same time. The Push is timed so that when Batch 1 is called, the corresponding trucks are ideally already at the CDP.
3. **Stage 3: Last-Mile Fulfillment (The End-Point):** The goods are pushed from the truck directly into the hands of the beneficiary. Success is measured by Turnover rate how quickly the pushed inventory is cleared.

2.4.3 Advantages of the Batch/Push Model in Rohingya Camps

1. **Security & Crowd Control:** By pushing aid in batches, IPAO maintains order. It prevents the riots or stampede risks often associated with open-flow distribution in high-density areas.
2. **Predictable Resupply:** It allows for a structured transport schedule. Vehicles like #177427 can be assigned specific batch-related trips in advance.
3. **Resource Management:** In an environment with limited storage, the Push model ensures that food does not sit in camp warehouses for long, reaching the 99.4% turnover rate you identified.

2.4.4 Systemic Inefficiencies

This research highlights that while the model is good for security, it is currently suffering from Tactical Friction:

1. **The Bullwhip Effect:** Because the batches are not standardized (varying from 100 to 300 families), a small delay at the warehouse pushes a much larger delay down the line. If a truck arrives with 100 boxes for a batch of 300 people, the Push stalls.
2. **Asynchronous Kitting:** The Push becomes ineffective when different components of the kit (Rice vs. Boxes) move at different speeds. In your data, Batch 7's variance (-203 rice packs) shows a failure in the synchronization of the push, leading to incomplete aid delivery.
3. **Lack of Agility:** The Push model is rigid. As seen on September 16th, when the stock dropped to 36 units, the system had no Safety Stock to handle an error in the push. If the next push from the warehouse is delayed by a landslide, the distribution stops entirely.

2.4.5 Strategic Evaluation

In the **Rohingya Refugee Crisis**, the Batch Distribution System is a Security-First Logistics Model. While it is less efficient than a market-based Pull system (like Vouchers), it is the most reliable way to ensure that large volumes of physical goods move through a congested Last Mile.

Optimization Goal: To make this Push Model efficient, IPAIO must transition from Manual Batching (reactive) to Standardized Unit Loading (proactive), ensuring that every Push contains a perfectly matched and standardized volume of aid.

The logistical model that is being utilized by most of the local NGOs in Camp 6, 8 and Camp 11 and the focus of this efficiency analysis is theoretically a Push Supply Chain.

2.4.6 Theoretical Mechanism

Production and distribution activities in a Push system are made using central planning and long-term forecasts. Estimating the demand (e.g. "We project 1,500 families in Camp 6 need Family boxes") is done by the upstream authority (the NGO Head Office or Donor), and then pushed down the chain to the point of distribution.

The Flow: Donor -> Central Warehouse-> Truck-> Distribution Point-> Beneficiary.

The Imperfection: The beneficiary has no control over the time, amount, or the type of flow. They are passive recipients.

2.4.7 The Bullwhip Effect of Relief Operations.

The biggest weakness of the Push model that has been recorded in the literature on supply chain is the Bullwhip Effect. The small error made in the estimation of demand at the upstream results in tremendous inefficiencies and variations at the downstream.

Theoretical Application: When the Head Office predicts the camp population of 1,000 on old data, but 850 of the beneficiaries show up, the supply chain lacks a real-time provision to prevent the push.

Liaison to Study Data: This theoretical principle describes the Synchronization Gap that is witnessed in the Camp 6 ledgers (September 13, 2025). The disparity between "Family Boxes" and "Rice Packs" is a stereotypical sign of the Bullwhip Effect, in which two separate supply chains (Food vs. NFI) are driven independently but not in real-time, leading to gluttonies of one product and shortages of another at the "Last Mile."

2.4.8 The Implication: Commercialization of Aid.

According to scholars, the Push systems within the refugee camps result in the Monetization of Aid (Nyile & Shale, 2021). Since the beneficiaries get an average package of goods irrespective of their individual preferences, they frequently end up selling the commodities they do not like (e.g., surplus lentils or soap) at a huge discount in the secondary black market to purchase the ones they like (e.g., fresh fish or vegetables). This is an enormous waste to the donor and poor distribution of resources.

2.5 The Pull Model: Cash- based transfers and Digital E-Vouchers.

2.5.1 Conceptual Foundation of the Pull Model

The Pull Model operates on the principle that if local markets are functional and goods are available, it is more efficient to provide beneficiaries with the means to purchase what they need rather than shipping standardized kits.

Demand-Driven: Delivery is triggered by the beneficiary's decision to buy, rather than a top-down warehouse schedule.

Market-Centric: It relies on and strengthens local vendors, who "pull" stock into the camp based on what people are actually buying.

2.5.2 Cash-Based Transfers (CBT)

Cash transfers provide physical or electronic currency directly to households, offering the highest level of flexibility.

1. **Dignity and Choice:** Beneficiaries can prioritize their most urgent needs, such as specialized medicine, fresh produce, or debt repayment, which standardized boxes cannot provide.

2. **Logistical Efficiency:** By replacing physical material flows with financial flows, organizations can bypass the costs of large-scale warehousing and heavy vehicle fleets.
3. **Economic Multiplier:** Every \$1 distributed in cash can generate over \$2 in indirect market benefits for the local economy.

2.5.3 Digital E-Vouchers

E-vouchers are a hybrid tool often used when agencies want to ensure aid is spent on specific categories (e.g., nutritious food) while still allowing for beneficiary choice.

1. **The Technology:** Beneficiaries receive a "smartcard" (like the WFP SCOPE card) or a mobile phone "wallet" pre-loaded with value.
2. **Verification:** Transactions are secured through PINs or biometric data (like iris scans used in Jordan), which virtually eliminates the risk of fraud or lost aid.
3. **Offline Functionality:** Advanced systems, such as RedRose, allow merchants to process transactions offline in remote areas and sync data later, making the pull model feasible even in camps with poor connectivity.

The other model, which is popularized by the World Food Programme (WFP) and extensively used by the international agencies in Cox's Bazar, is the "Pull Supply Chain," and it is commonly carried out via Cash-Based Transfers (CBT). (WFP, 2022)

2.6 The Influence of Technology (SCOPE Platform).

The SCOPE beneficiary information and transfer management platform is the operational backbone of the International Model. It allows for:

Identity Verification: The aid should be sent to the registered person in question (this will eliminate the Ghost Beneficiary fraud prevalent in paper systems).

Real Time Data Visibility: Providing the NGO with real time information on what exactly is being consumed in which camp.

Flexibility: The ability to top up accounts remotely allowing the NGO to respond in times of emergency (e.g. post-fire response) without the need to physically mobilize the trucks.

The literature substantiates that a shift to CBT and Pull systems would enhance the dignity of beneficiaries since they are regarded as empowered consumers and not passive consumers (Harvey, 2007).

2.7 The Last Mile Disaster Relief Problem

In contemporary logistics literature, the "**Last Mile**" is defined as the final leg of a supply chain, representing the movement of goods from a local distribution center to the ultimate destination. In commercial sectors (e.g., Amazon or DHL), this stage is characterized by

high-frequency, small-volume deliveries designed for consumer convenience. However, it is paradoxically the most costly and least efficient segment, often accounting for up to **28% to 53% of total supply chain costs** due to the "fragmentation of deliveries" and urban congestion (Gevaers et al., 2011).

In the context of **Humanitarian Disaster Relief**, the Last Mile ceases to be a matter of commercial convenience and becomes a critical bottleneck for survival. While the "First Mile" (international procurement) and "Middle Mile" (regional transport) benefit from economies of scale, the Last Mile is where the system often collapses. In refugee camp settings, such as the Rohingya settlements in Cox's Bazar, the Last Mile is the point of physical contact between the NGO and the beneficiary. This segment is plagued by "the broken link" problem: infrastructure is frequently destroyed by the very disaster the NGO is responding to—be it monsoons, landslides, or earthquakes.

Furthermore, humanitarian Last Mile logistics must navigate "service tiering" and "security constraints" that do not exist in the commercial world (Balcik et al., 2008). Factors such as rough terrain, lack of paved roads, and the high density of beneficiaries turn the delivery van into a "single point of failure." Efficiency in this stage is not measured by profit margins, but by **"Distribution Equity"** and **"Response Lead Time."** Every delay in this final stage leads to a direct increase in beneficiary vulnerability, making the optimization of this "broken mile" the primary challenge of modern humanitarian operations. While commercial last-mile logistics focus on consumer doorstep delivery (Gevaers et al., 2011), the humanitarian last-mile is defined as the critical interface between the NGO and the refugee, where infrastructure failure often creates a 'broken link' in aid delivery (Balcik et al., 2008).

2.8 Factors of Friction at the Camps.

According to research, there are a number of friction factors that are specific to the Last Mile when it comes to settlement of refugees:

2.8.1 Infrastructure Deficits: The Topographical Barrier

Infrastructure in humanitarian contexts is often the primary determinant of delivery velocity. In settlements like **Ukhiya** (Cox's Bazar), the terrain is defined by hilly topography and a total lack of paved arterial roads. Research highlights that while international procurement is efficient, the final stage often collapses due to "environmental exhaustion of assets."

1. **The Muddy Road Effect:** Unpaved roads turn into impassable bogs during the monsoon season. This necessitates the use of smaller, less efficient vehicles, which increases the "cost-per-unit" and leads to frequent mechanical failures.
2. **Fleet Degradation:** The constant navigation of steep, uneven inclines accelerates the wear-and-tear on humanitarian fleets, creating a cycle where delivery is slowed not by lack of supply, but by the physical inability of vehicles to reach the Camp Distribution Points (CDPs).

2.8.2 Crowd Control Costs: The Security-Logistics Nexus

Unlike commercial logistics, where the goal is consumer convenience, humanitarian logistics in settlements must manage "high-density desperation." **Van Wassenhove (2006)** argues that logistics accounts for 80% of disaster relief, yet a significant portion of that "effort" is diverted to non-transport activities like safety and security.

1. **Manpower Intensity:** Handling thousands of individuals requires a massive security apparatus. The recruitment, training, and deployment of volunteers and police represent a major "hidden cost" in the Last Mile.
2. **The Risk of Chaos:** Without structured batching systems, the risk of stampedes or civil unrest at distribution sites remains high. This friction forces agencies to slow down delivery speeds in favor of security protocols, often leading to "logistical bottlenecks" where goods sit idle because the crowd is too large to process safely.

2.8.3 Manual Verification: The "Paperwork" Bottleneck

One of the most persistent friction factors is the reliance on manual identity verification. **Tatham and Christopher (2014)** describe the "Last Mile" as the point where the NGO meets the refugee, yet this meeting is often hampered by a slow, analog verification process.

- **Physical Face-to-File Matching:** In many camps, staff must manually check physical ration cards against paper ledgers. This creates a "transactional lag" where the speed of the truck is irrelevant because the speed of the queue is dictated by the speed of the pen.
- **The Queue-Wait Variance:** Manual checking leads to massive variance in wait times, which can range from two to six hours. This not only diminishes beneficiary dignity but also prevents the "inventory velocity" required to reach the 99.4% turnover rates necessary in lean supply chains. Modern research advocates for **Digital E-Vouchers** or biometric scans (iris/fingerprint) to eliminate this specific friction.

The analysis of Vehicle 177427 (from Camp 11 data) in this report is a great example of Last Mile fragility. In a low-infrastructure setting, the system lacks resilience when the entire "Last Mile" is dependent on a single physical asset.

2.9 Conceptual Framework for this Study

To rigorously evaluate the operational landscape of the Rohingya refugee response, this study employs a **Comparative Efficiency Framework**. This framework is designed to bridge the gap between theoretical supply chain models and the lived realities of field logistics in Cox's Bazar. By contrasting the **Local/Push Model** (currently utilized by IPAO) against the **International/Pull Model** (as seen in modern CBT/E-voucher systems), the study assesses organizational performance across three critical pillars derived from contemporary humanitarian logistics literature.

2.9.1 Process Efficiency: The Temporal Dimension (Time)

Time is the most immediate metric of success in a humanitarian context, where delays directly correlate with increased beneficiary vulnerability. This study utilizes **Queue Theory** and **Lead Time Analysis** to measure the following:

1. **Total Throughput Time:** This measures the end-to-end velocity of the Last Mile, from the moment a transport vehicle is loaded at the Ukhiya warehouse to the moment the final beneficiary in a batch receives their ration.
2. **Queue-Wait Variance:** Beyond average wait times, this analysis looks at the Queue-Wait Variance, the difference between the shortest and longest wait times within a single batch. High variance often indicates friction in manual verification processes or crowd control bottlenecks.
3. **Cycle Time Optimization:** The study evaluates the Cycle Time of distribution assets (trucks and staff), determining if the batch system successfully minimizes the idle time of vehicles waiting for beneficiary batches to be cleared.

2.9.2 Cost Efficiency: The Resource Dimension (Money)

Efficiency in resource-scarce environments is measured by the **Cost-to-Serve (CTS)** metric. This study expands beyond simple transport costs to include the hidden overheads required to sustain a physical distribution network:

1. **Direct Last-Mile Costs:** This includes fuel consumption, vehicle maintenance (accelerated by the hilly terrain of Ukhiya), and fleet depreciation.
2. **Hidden Human Capital Costs:** The study quantifies the "shadow costs" of delivery, including the recruitment, training, and daily sustenance of the massive volunteer force and security personnel required for crowd management in a batch-based system.
3. **Unit Delivery Ratio:** By calculating the total overhead spent per single unit of aid delivered (e.g., one 20kg rice pack), the framework compares the financial sustainability of Pushing physical goods versus Pulling digital value.

2.9.3 Operational Resilience: The Risk Dimension (Reliability)

Resilience refers to the system's ability to maintain a consistent standard of aid delivery despite environmental or logistical shocks. This study focuses on two indicators of supply chain health:

1. **Kitting Synchronization & Mismatch Rates:** A critical focus is placed on the "Synchronization Rate" between complementary goods. The study calculates the frequency of "Kit Mismatches"—instances where Family Boxes and Rice Packs arrive in unequal quantities—forcing beneficiaries to wait through multiple delivery cycles.
2. **Stockout Vulnerability (Safety Stock Analysis):** The framework assesses the risk associated with "Lean" logistics. By analyzing the frequency and proximity of

stockouts (such as the 36-unit buffer observed in September), the study measures the system's "Agility" or lack thereof in the face of sudden supply chain disruptions like landslides or monsoon-related road blockades.

3. **Single Point of Failure (SPF) Identification:** Resilience is also measured by fleet diversification. The study identifies SPF risks where over-reliance on a single transport asset (e.g., Vehicle 177427) makes the entire distribution cycle vulnerable to mechanical failure.

Framework Pillar	Push Model (Batch System)	Pull Model (Cash/E-Voucher)
Process Efficiency	Measured by Batch Clearance Speed.	Measured by Transaction Latency.
Cost Efficiency	Focuses on Fleet and Volunteer Overheads.	Focuses on Financial Fees and Market Prices.
Operational Resilience	Measured by Kitting Synchronization.	Measured by Market Stability and Digital Uptime.

Table 2.1: Framework Pillar

2.10 The Global Paradigm Shift: From Legacy Batching to Digital Ecosystems

The prevailing body of humanitarian literature consistently underscores a profound and irreversible paradigm shift within the global aid sector. We are witnessing a transition from the traditional Push/Batch model, a supply-driven approach characterized by physical inventory movement toward the Pull/Digital model, which leverages financial technology and real-time data to empower beneficiary choice.

2.10.1 The Batch System as a Legacy Relic

The Batch Distribution System is increasingly categorized in scholarly circles as a legacy relic of the initial emergency response phase. Historically, during the acute onset of the Rohingya crisis, the primary objective was the rapid stabilization of life-saving metrics. In such high-chaos environments, the rigid, top-down control of the batch system was necessary

to ensure security and mass coverage. However, as the crisis has entered a protracted stage, the inherent flaws of this model—namely its lack of flexibility, high overhead costs, and the Last Mile friction described in previous sections—have become glaring liabilities. The batch system is inherently reactive, often leading to the Bullwhip Effect where minor warehouse delays result in major distribution bottlenecks at the camp level.

2.10.2 The Digital Model: The Future of Sustainable Aid

Conversely, the Digital/Pull model represents the future of sustainable, dignified, and cost-effective humanitarian assistance. By utilizing Electronic Vouchers (E-Vouchers) and Cash-Based Transfers (CBT), organizations can shift the logistical burden from the NGO to the local market. This model replaces the heavy physical footprint of "Last Mile" truck deliveries with the invisible efficiency of digital transactions. It achieves a "Pull" effect where aid is triggered by actual household needs rather than centralized forecasts. Beyond efficiency, this model restores agency to the refugees, allowing them to function as economic actors rather than passive recipients of standardized kits. It significantly reduces the need for massive fleet dependency (such as the over-reliance on single vehicles like Vehicle 177427) and eliminates the "mismatch rates" observed in physical kitting.

2.10.3 Transitioning to Quantitative Validation

This theoretical dichotomy between the rigid past and the agile future sets the critical stage for the empirical data analysis presented in the following chapters. While the literature provides the "why," the distribution ledgers from September 2025 provide the "how." By examining the real-world data from **Camps 6, 8, and 11**, this study will move beyond theoretical abstractions to quantitatively demonstrate these systemic inefficiencies. The analysis will use the IPAO field logs to prove that the "Push" model's reliance on manual batching and physical inventory is no longer the most resilient path forward for the Kutupalong expansion site, paving the way for data-driven recommendations for a digital transition.

CHAPTER 3

DATA PRESENTATION & OPERATIONAL ANALYSIS

3.1 Analysis of Camp 6 Distribution (The "Mismatch" Phenomenon)

The distribution log for Camp 6 on September 13, 2025, provides a clear example of the inefficiencies inherent in manual batching.

Batch No.	Family Boxes (Qty)	Rice Packs (Qty)	The "Gap"
Batch 1	300	159	-141 (Mismatch)
Batch 2	300	159	-141 (Mismatch)
Batch 3	220	160	-60 (Mismatch)
Batch 4	160	180	+20 (Surplus)
Batch 5		180	-180 (Mismatch)
Batch 6		180	-180 (Mismatch)
Batch 7		180	-180 (Mismatch)
Batch 8		180	-180 (Mismatch)
Batch 9		120	- 120 (Mismatch)

Table 3.1: Camp 6 Operational Log (Sept 13)

The data reveals a chaotic supply chain.

1. The Critical Ration Gap: Batch 1 Analysis

In the opening phase of the distribution (Batch 1), the logistical team successfully processed 300 Family Boxes, yet managed to deliver only 159 Rice Packs. This results in a startling 53% ration completion rate. From a humanitarian perspective, this implies that nearly half of the vulnerable families in the initial queue were provided with secondary relief items but were denied their primary caloric staple. This discrepancy forces a "Double-Trip Burden" on the refugees, requiring them to wait at the Camp Distribution Point (CDP) for extended periods or return at a later time, effectively doubling the Last-Mile cost for the beneficiary while undermining the dignity of the aid process.

2. Reactive Logistics: Batch 4 Analysis

By the time the operation reached Batch 4, the data indicates a reactive attempt to rectify previous errors, yet this created a new set of logistical complications. In this phase, the team distributed only 160 Boxes while pushing a surplus of 180 Rice Packs. This "Sudden Surplus" suggests a disorganized effort to compensate for the rice shortages in earlier batches. However, in a high-density environment like Ukhiya, such fluctuations are dangerous. Distributing extra stock outside of a standardized kitting protocol creates a "Scramble Effect," where refugees, sensing a shortage or an unexpected surplus, may break queue protocols. This reactive logistics approach exponentially increases the demand for crowd control manpower and raises the risk of site-wide security incidents.

3. Systematic Rhythm Failure and Operational Fatigue

Perhaps the most damaging insight from the Camp 6 data is the total lack of standardization in throughput volume. Batch sizes were observed to fluctuate randomly dropping from 300 to 220, and finally to 160 families per unit. In logistics management, efficiency is built on a Steady State or Rhythm. When batch sizes vary by over 45% between cycles, the volunteer teams and police personnel cannot establish a predictable workflow.

This lack of a Standard Distribution Unit (SDU) leads to rapid Operational Fatigue. Staff must constantly recalibrate their verification speed and physical loading movements, which significantly increases the Data Error Rate in manual ledgers. The unpredictable nature of these batches prevents the optimization of vehicle turnaround times, as trucks are either overloaded or underutilized, ultimately resulting in the 0.5% safety stock crisis observed at the end of the distribution period.

3.2 Systemic Inefficiency: The Persistent Failure of the Batch Synchronization Model

The operational data from September 15th two days after the initial discrepancies provides definitive evidence that the kitting failures at the Camp Distribution Points (CDP) are not isolated incidents or the result of individual human error. Instead, they are symptomatic of a deeply flawed Systemic Batch Process that lacks the necessary synchronization for complex humanitarian kitting.

3.2.1 The Myth of the "Driver Error": A Comparative Analysis

To address the failures of September 13th, the logistics team attempted to correct the flow on September 15th by rotating the transport assets. The primary prime movers were replaced with different vehicles (ID 110307 and 110104). However, despite the change in hardware and drivers, the statistical pattern of failure remained identical. In the opening phase of the distribution, Batch 1 manifested a critical synchronization gap of 100 units (300 Family Boxes vs. only 200 Rice Packs).

This persistence proves that the Last Mile bottleneck is asset-independent. Whether the truck is Vehicle 177427 or 110307, the Push-based Batch Model remains unable to reconcile two different inventory streams (Food and Non-Food Items) in a high-pressure environment. According to Thomas and Kopczak (2005), when a supply chain relies on manual batching without real-time kitting verification at the source, the error rate remains constant regardless of the personnel involved.

3.2.2 The Protracted Liability: Batch Processing as a Bottleneck

The September 15th data serves as a primary case study for why Batch Processing, while effective in the high-urgency Response Phase, becomes an operational liability during the Protracted Phase (2025). In a stabilized environment, the goal is "Lean Efficiency," yet the batch system introduces unnecessary friction:

1. **The Synchronization Lag:** Because the warehouse pushes boxes and rice as separate volume targets, the CDP team is forced to act as a secondary assembly line under suboptimal conditions.
2. **The Verification Gap:** Manual ledgers cannot flag a 100-unit discrepancy in real-time. By the time the gap is identified, the beneficiaries have already been processed, leading to the Cost of Correction discussed in previous sections.

As noted by Van Wassenhove (2006), true logistical maturity requires moving away from these uncoordinated pushes. The failure of September 15th underscores that the only way to eliminate the 100-unit gap is to transition to Synchronized Loading Protocols, where the unit of measure is the complete kit rather than the individual commodity.

3.2.3 Population Pressure and Systemic Fragility

The IOM (2003) site assessments for Cox's Bazar emphasize that the physical density of the camps leaves zero room for logistical rework. When Batch 1 fails to synchronize 100 units, it creates a crowd-management crisis that propagates through all subsequent batches (2, 3, and 4). This systemic fragility means that a single kitting error at the warehouse level translates into hours of delay for thousands of refugees. To protect the dignity of the beneficiaries and the safety of the volunteers, the Batch System must be replaced with a Digital Verification Loop that prevents a truck from departing the warehouse if the Rice-to-Box ratio is anything less than 1:1.

Ledger Camp 6							
Date	Family Box	Quantity	Vehicle		Rice Packs	Quantity	Remarks
15-Sep	Batch 1	300	110307	120509	Batch 1	200	
	Batch 2	260	110104	110103	Batch 2	200	
	Batch 3	286	120509	110828	Batch 3	200	
	Batch 4	100	110103	110307	Batch 4	300	
	Batch 5	228	110108	110108	Batch 5	200	
	Batch 6	260	110104	110307	Batch 6	300	
	Batch 7	300	177427	110103	Batch 7	97	
	Batch 8	0			Batch 8	0	
	Total	1734			Total	1497	

This confirms that the inefficiency is systemic to the Batch Process, not the fault of a specific driver or vehicle.

3.3 Analysis of Camp 11 (The Fragile Link Phenomenon)

The operations in Camp 11 on September 14, 2025, reveal a different vulnerability: Asset Dependency.

Batch No.	Family Boxes	Primary Vehicle	Secondary Vehicle	Rice Packs
Batch 1	300	177427	110098	310
Batch 2	300	177427	110307	310
Batch 3	300	177427	110387	320
Batch 4			110098	330
Batch 5			110307	330

Table 3.2: Camp 11 Operational Log (Sept 14)

3.4 Supply Chain Risk Assessment: Inventory Velocity and the Crisis of Stock Insecurity

The quantitative analysis of the September 13–16 cycle reveals an inventory system operating at the absolute limit of its capacity. While a high turnover rate is typically a sign of lean efficiency in commercial logistics, in the volatile environment of the Rohingya camps, it signals a dangerous lack of Operational Resilience.

3.4.1 The 99.4% Turnover Paradox

Between September 13th and 16th, the IPAO warehouse processed a massive depletion of goods, moving from an initial stock of 6,200 units down to a negligible remnant. This

represents an Inventory Turnover Rate of 99.4%. In traditional supply chain literature, such a high velocity is praised for minimizing holding costs (Chopra & Meindl, 2013). However, in a humanitarian Last-Mile context, this Lean approach is a double-edged sword. There is essentially zero margin for error; the system is running hot, meaning any delay in the upstream supply chain such as a blocked transport artery or a procurement delay would result in an immediate cessation of aid delivery. The efficiency observed here is not a result of strategic planning but rather a symptom of extreme resource scarcity.

3.4.2 The September 16th Buffer Crisis

The most alarming data point occurs at the conclusion of the cycle on September 16th, where the Quantity Left in the ledger reached a mere 36 units. For an operation serving thousands of families across multiple camps, a buffer of 36 units is statistically equivalent to zero. This state of Stock Insecurity places the mission in a position of extreme vulnerability. According to the Safety Stock theories established by Tatham and Christopher (2014), humanitarian organizations should maintain a calculated buffer to account for Lead-Time Uncertainty. By allowing the stock to hit such a low floor, IPAO effectively lost its Agility, the ability to respond to a sudden influx of new refugees or a localized emergency within Camp 8 or 11.

3.4.3 Transitioning from Reactive to Proactive Visibility

The underlying cause of this inventory brinkmanship is the reliance on a Reactive Manual System. Because the ledger is updated only after the physical distribution is complete, the logistics team is driving while looking in the rearview mirror. They are unaware of the 36-unit crisis until the day is over. Modern humanitarian standards suggest that real-time data visibility is the only way to prevent such near-miss stockouts. To optimize this, the report recommends shifting toward a Digital Inventory Dashboard that triggers automated replenishment alerts when stock levels fall below a 10% safety threshold, ensuring that the Last Mile is never halted by a lack of physical stock.

CHAPTER 4

COMPARATIVE EFFICIENCY ANALYSIS

This chapter compares the "Chaotic Reality" of Sheet 2 data against the "Digital Standard" of International NGOs.

4.1 Comparative Analysis: IPAO NGO (BD) vs. Global Standards

Current IPAO Operations: The Legacy Reactive Model The logistical landscape in Camps 6, 8, and 11 is currently governed by a Push-Legacy framework, which prioritizes immediate physical movement over long-term supply chain synchronization. IPAO's operations are characterized by tactical variability; for instance, batch sizes are often adjusted mid-operation (ranging from 100 to 300 units) to react to fluctuating crowd sizes or transport delays. This lack of standardization forces the volunteer teams into a state of constant recalibration, which significantly increases the risk of manual data entry errors. Furthermore, the reliance on asynchronous delivery where family boxes and rice packs are treated as independent logistical streams results in a fragmented service where the Last Mile becomes a bottleneck of incomplete rations, undermining the core mission of food security.

Global Standards: The Paradigm of Lean Resilience In contrast, international benchmarks established by organizations like the World Food Programme (WFP) and the Sphere Project advocate for a High-Gear supply chain that emphasizes Standardized Unit Loads (SUL) and Ration Integrity. Global standards dictate that a distribution is only successful if it is Synchronous, meaning a family receives a 100% complete kit (2,100 kcal minimum) in a single transaction. This methodology utilizes Real-Time Data Visibility (e.g., WFP SCOPE) to eliminate the inventory blindness seen in manual ledgers. By maintaining a Resilience Buffer of 5-10%, global standards ensure that the supply chain can absorb environmental shocks, such as the monsoons in Cox's Bazar, without reaching the dangerous 0.5% depletion levels observed in the IPAO logs.

Evaluating the IPAO operation against Sphere Standards and WFP Global Benchmarks highlights specific areas for local improvement.

Feature	IPAO (Rohingya Camps: Legacy Push)	Global Humanitarian Standards (Lean Pull)
Distribution Strategy	Variable Units: Batch sizes fluctuate (100–300) based on immediate field pressures and manual estimates.	Standardized Unit Loads (SUL): Fixed units are utilized to optimize truck payloads and fuel efficiency.
Nutritional Delivery	Asynchronous: Families often receive boxes and rice at different times, creating a "ration gap."	Full-Kit Distribution: Sphere Standards mandate that a ration must be 100% complete to meet the 2,100 kcal requirement.
Logistics Visibility	Manual Ledgers: Data is reconciled at the end of the day, resulting in a 12-hour reporting lag.	Real-Time Tracking: Digital platforms (e.g., WFP SCOPE) provide instant visibility into stock levels and depletion.
Safety Stock	Minimal (0.5%): High inventory velocity with zero margin for error or mechanical failure.	Resilience Buffer (5-10%): A calculated "Agile" buffer is maintained to absorb climate or transport shocks.

Table 4.1: IPAO VS Global Standard

4.2 The Synchronization Test

Metric	Local Batch System (Your Data: Sheet 2)	International Model (WFP E-Voucher)
Kitting Accuracy	Low: 980 Family Boxes vs 1500 Rice Packs (35% mismatch).	High: 100% Match (Customer picks items together).
Stockout Risk	High: Batch 4 (Camp 11) had 0 Rice Packs.(Sept15)	Low: Retailers restock daily based on digital demand.
Asset Risk	Centralized: Dependent on Vehicle 177427.	Decentralized: Dozens of suppliers use their own trucks.
Data Lag	High: Discrepancies noted in manual ledgers.	Zero: Real-time inventory deduction.

Table 4.2: The Synchronization Test

4.3 The Cost of Correction: Economic Implications of Logistical Mismatches

The logistical discrepancies observed in the Camp 6 distribution ledger specifically the 53% ration gap where family boxes were delivered without primary rice packs do not merely represent a service delay; they create a measurable financial deficit. In humanitarian logistics, the Cost of Correction is often exponentially higher than the cost of the initial delivery.

4.3.1 Re-Distribution and the Overhead Trap

When the supply chain fails to synchronize complementary goods, the NGO is forced to trigger a Secondary Distribution Cycle. This necessitates scheduling an entirely new operation day to reach the families who received incomplete kits. According to Thomas and Kopczak (2005), this logistical rework is the most inefficient use of humanitarian funding. The overhead costs ranging from administrative planning to the mobilization of site security must be paid a second time to deliver a single missing item. This turns a streamlined Push model into a fragmented and costly operation, where the Last Mile is traversed twice for the same beneficiary result.

4.3.2 Double Handling and Resource Redundancy

The Cost of Correction is most visible in the redundant expenditure on human and physical capital. As evidenced by the personnel logs in Sheet 3, a successful distribution relies on a massive manpower footprint (e.g., volunteers like Tanvirul and Mahir).

Labor Redundancy: Re-hiring the volunteer team and police presence for a Correction Day effectively doubles the labor cost per unit for those specific missing rice packs.

Asset Inefficiency: Furthermore, re-renting transport assets like Vehicle 177427 for a second trip to the same location destroys the Unit Delivery Ratio. Instead of one truck trip delivering a full kit, two trips are required, doubling the fuel consumption and maintenance wear-and-tear. As Van Wassenhove (2006) notes, these hidden costs of double handling can consume up to 40% of a distribution budget if synchronization is not managed via real-time data or standardized kitting.

4.3.3 Differentiated Comparison: Initial vs. Corrective Logistics

The table below differentiates the economic footprint of a First-Time-Right distribution versus the Correction model observed in the field.

Financial Feature	First-Time-Right (Standard)	Cost of Correction (IPAO Observed)	Impact on Sustainability
Asset Utilization	Single trip per batch; optimized fuel and rental.	Double Rental: Truck must be re-rented for a second delivery day.	Decreases fleet longevity and doubles carbon footprint.
Manpower Expense	One-day wage/sustenance for volunteers and security.	Redundant Labor: Personnel must be paid for a second day of crowd control.	Diverts budget away from purchasing actual aid commodities.
Cost-to-Serve (CTS)	Minimum CTS per family; high efficiency.	Inflated CTS: The cost to deliver the missing 20kg rice pack exceeds the value of the rice itself.	Reduces the overall "Value for Money" (VfM) for international donors.
Logistics Visibility	Proactive replenishment based on stock.	Reactive Crisis Management: High-stress, uncoordinated "catch-up" logistics.	Leads to operational fatigue and increased human error rates.

Table 4.4: Initial Vs Corrective Logistics

CHAPTER 5

RECOMMENDATIONS & CONCLUSION

5.1 Strategic Recommendations for Local NGOs

Source: Analysis of September 2025 Ledger Objective: Operational Efficiency in Camps 6, 8 and 11.

According to the data of September 2025, we have found certain inefficiencies in the process of aid transportation and monitoring. The recommendations below are aimed at mending this imbalance in supplies, increasing the reliability of transport, and averting stock outs.

Address the "Synchronization Gap" (Immediate Term)

The Question: Camp 6 data is marked with a considerable discrepancy: 300 Family Boxes were transported, yet 159 Rice Packs received.

The Impact: This left 141 sets of beneficiaries unfinished. When in a strained camp atmosphere, giving out a Family box without the food staple can result in misunderstanding, denial of assistance, or insecurity. The way items are loaded to various trucks presently poses a great risk of failure in the event of a delay of one truck.

Recommendation: Adopt Pre-Packed Bundling.

We must change our current loading duties of individually loading items to loading a pre-assembled kit at warehouse level.

The Operational Change: DON'T load Truck A with Boxes and Truck B with Rice.

The One-Touch Process: Before the trucks arrive, warehouses are supposed to be physically taped or wrapped with one Family Box to one Rice Pack.

Bundle: Put the items together.

Count: Log this as "1 Aid Set."

Load: Load these complete sets onto the pallets.

The Advantage: This makes sure that a truck will never unload less than a complete, ready-to-distribute set. No orphan stock (unnecessary individual items) will be left at the point of distribution even when a truck is late.

Important Objective: Get rid of non-matching inventory at distribution centers by October 1st.

Diversify the Transport Fleet (Medium Term)

The Problem: The activities of Camp 11 are too vulnerable, as they are based on one big machine: Vehicle 177427. The Change: The whole supply chain of Camp 11 halts when this vehicle stops. Using a single, large truck is also a risk in terms of navigation because during the monsoon season, large trucks do not cope in narrow, muddy areas.

Alternative: Change to a Multi-Vehicle Model.

The Logistics Officer ought to stop thinking of hiring a big truck and instead consider a more flexible approach.

Fleet Strategy: Reassign the budget to hire three smaller local trucks (i.e., 1.5-ton pickups) in place of a large lorry.

The Advantage:

Redundancy: When one truck fails, the other two can carry on with the cycle. It does not go to zero but rather operates at 66% capacity.

Agility: Camp choke points can be traversed with smaller vehicles much quicker than large trucks, decreasing turnaround time.

Vendor Management: Engage the services of these vehicles by other owners to ensure that in the event of a dispute by one vendor, there would not be a service disruption.

Strategic Benefit: Makes supply chains more resilient and keeps the aid flowing even in cases of mechanical breakdown.

Digitise Tally Sheet (Strategic)

The Problem: The ledger indicates that in Camp 11, Batch 4 registered 0 Rice. This implies a blind stock out- the distribution team never knew they were running out until pallets were empty.

The Consequence: The use of paper tally sheets results in a data lag. The Warehouse Manager frequently cannot observe the stock level until the end of the day and cannot afford to order the emergency refills on time.

5.2 Conclusion

The existing Batch Distribution System is structurally inefficient, as demonstrated by the forensic examination of the September 2025 ledgers from Camps 6 and 11. The information shows a system in which the moving components are constantly out of sync. The "Synchronization Gap" that results from the 35% difference between Family Boxes and Rice Packs causes unnecessary confusion at the point of delivery.

Even though the logistics team moved over 6,200 units in a few days, they were essentially battling an inefficient procedure despite their extraordinary effort. There is an excessive chance of complete operational failure when entire camp sections rely on single vehicles. Not only do these inefficiencies waste resources, but they also damage the human dignity of the beneficiaries who are awaiting aid.

The organization needs to switch from "Pushing Batches" (sending supplies mindlessly) to "Pulling Data" (responding to real-time needs) in order to move forward. The NGO can close the inventory gap, save operating expenses, and ultimately provide help with the accuracy and dignity that refugees deserve by implementing the digital standards utilized by international organizations.

CHAPTER 6

REFERENCES

- Thomas, A., & Kopczak, L. R. (2005).** *From Logistics to Supply Chain Management: The Path Forward in the Humanitarian Sector*. Fritz Institute.
https://mediaweb.saintleo.edu/Courses/MGT492/MGT492_Fritz.pdf
- IOM. (2003).** *Needs and Population Monitoring: Cox's Bazar*. International Organization for Migration.
<https://data.humdata.org/dataset/iom-bangladesh-needs-and-population-monitoring-npm-round-11-site-assessment>
- Van Wassenhove, L. N. (2006).** *Humanitarian Supply Chains: Humanitarian Aid Logistics* (p. 476). Journal of the Operational Research Society.
<https://ethambassadors.ethz.ch/files/2018/06/Van-Wassenhove-2006-Humanitarian-aid-logistics-supply-chain-management-in-high-gear.pdf>
- WFP. (2022).** *Cash Based Transfers in Humanitarian Assistance*. World Food Programme.
<https://www.wfp.org/cash-transfers>
- Chopra, S., & Meindl, P. (2013).** *Supply Chain Management: Strategy, Planning, and Operation* (5th ed., pp. 250-255). Pearson Education.
- Kovács, G., & Spens, K. M. (2007).** Humanitarian logistics in disaster relief operations. *International Journal of Physical Distribution & Logistics Management*, 37(2), 99–114.
<https://doi.org/10.1108/09600030710734820>
- Gevaers, R., Van de Voorde, E., & Vanellander, T. (2011).** Characteristics and Cost Drivers of Last Mile Logistics. *Research in Transportation Business & Management*, 2, 56-64.
<https://www.sciencedirect.com/science/article/abs/pii/S2210539511000204?via%3Dihub>

Appendix

Ledger Camp 6									
Date	Family Box	Quantity	Vehicle	Rice Packs		Quantity	Remarks		
13-Sep	Batch 1	300			Batch 1	159			
	Batch 2	300			Batch 2	159			
	Batch 3	220			Batch 3	160			
	Batch 4	160			Batch 4	180			
	Batch 5				Batch 5	180			
	Batch 6				Batch 6	180			
	Batch 7				Batch 7	180			
					Batch 8	180			
					Batch 9	122			
		980					1500		

Ledger Camp 6									
Date	Family Box	Quantity	Vehicle	Rice Packs		Quantity	Remarks		
15-Sep	Batch 1	300	110307	120509	Batch 1	200			
	Batch 2	260	110104	110103	Batch 2	200			
	Batch 3	286	120509	110828	Batch 3	200			
	Batch 4	100	110103	110307	Batch 4	300			
	Batch 5	228	110108	110108	Batch 5	200			
	Batch 6	260	110104	110307	Batch 6	300			
	Batch 7	300	177427	110103	Batch 7	97			
	Batch 8	0			Batch 8	0			
	Total	1734			Total	1497			

Ledger Camp 8										
Date	Family Box	Quantity		Vehicle		Rice Packs		Quantity		Remarks
13-Sep	Batch 1	300				Batch 1		60		
	Batch 2	300				Batch 2		180		
	Batch 3					Batch 3		180		
	Batch 4					Batch 4		180		
	Batch 5					Batch 5				
						Batch 6				
						Batch 7				
						Batch 8				
		600						600		

Ledger Camp 8										
Date	Family Box	Quantity		Vehicle		Rice Packs		Quantity		Remarks
15-Sep	Batch 1	300		177427	110103	Batch 1		200		
	Batch 2	300			110828	Batch 2		200		
	Batch 3	286			110108	Batch 3		203		
	Batch 4	0				Batch 4		0		
	Batch 5	0				Batch 5		0		
	Batch 6	0				Batch 6		0		
	Batch 7	0				Batch 7		0		
	Batch 8	0				Batch 8		0		
		886						603		

Ledger Camp 11							
Date	Family Box	Quantity	Vehicle		Rice Packs	Quantity	Remarks
14-Sep	Batch 1	300	177427	110098	Batch 1	310	
	Batch 2	300	177427	110307	Batch 2	310	
	Batch 3	300	177427	110387	Batch 3	320	
	Batch 4			110098	Batch 4	330	
	Batch 5			110307	Batch 5	330	
	Batch 6				Batch 6		
	Batch 7				Batch 7		
	Batch 8				Batch 8		
	Total	900			Total	1600	

Ledger Camp 11									
Date	Family Box	Quantity		Vehicle	Rice Packs		Quantity		Remarks
15-Sep	Batch 1	300		177427	110509	Batch 1	200		
	Batch 2	260		110108	110828	Batch 2	200		
	Batch 3	300		177427		Batch 3	0		
	Batch 4	240		177427		Batch 4	0		
	Batch 5	0				Batch 5	0		
	Batch 6	0				Batch 6	0		
	Batch 7	0				Batch 7	0		
	Batch 8	0				Batch 8	0		
	Total	1100				Total	400		