TRIBHUVAN UNIVERSITY

INSTITUTE OF ENGINEERING

PULCHOWK CAMPUS

A

CASE STUDY PROPOSAL

ON

SORTING AUTOMATION FOR DARAZ NEPAL DISTRIBUTION

CENTER, LALITPUR

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SUBMITTED TO:

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1. Introduction

We are undergraduate students from Department of Electronics and Computer Engineering at Pulchowk Campus, currently in our fourth semester. As part of our Instrumentation course curriculum, we are tasked with conducting a case study through a field visit to gain practical insights into the design, operation, and maintenance of instrumentation systems in industrial environments. This experience is integral to deepening our understanding of real-world applications of these systems.

We are writing to request the opportunity to conduct a field visit to Daraz's operational facilities. As a leading e-commerce company with advanced logistics and warehouse management, Daraz is a great example of how modern instrumentation and automation help keep operations running smoothly, accurately, and efficiently. Visiting Daraz would give us a unique chance to connect the concepts from our classes with real-world applications.

1.1 Purpose Of Visit

The purpose of this visit is to observe the day-to-day operations, identify inefficiencies, and propose automation solutions based on what we've learned, things like sensors, control systems and system design.

This visit will help us identify where tools like sensors, control systems could be introduced to make operations more efficient, reduce human error, and make better use of resources. The knowledge we gain will be a key part of our case study and will help us develop practical solutions that reflect current industry standards.

1.2 Background

Daraz Nepal, a e-commerce platform, operates the DEX Thasikhel Station in Lalitpur, processing thousands of packages daily. Manual sorting processes result in delays and errors, impacting delivery timelines. Automated sorting systems, utilizing instrumentation technologies like sensors, actuators and PLCs, can enhance efficiency, aligning with Daraz's goal of improving logistics in Nepal's growing e-commerce market.

1.3 Problem Statement

The reliance on manual sorting at Daraz's distribution center leads to bottlenecks, reduced throughput, and errors in package routing. These inefficiencies hinder scalability and customer satisfaction. This case study proposes automated sorting solutions to address these

challenges using cost-effective instrumentation tools suitable for Nepal's infrastructure.

1.4 Objectives

The objectives of this case study are:

- To analyze current sorting workflows at DEX Thasikhel Station to identify inefficiencies.

- To design automated sorting systems using Infrared sensors, PLCs, and conveyor belts.

- To assess the feasibility of automation within Nepal's technical and economic constraints.

- To achieve faster sorting and accuracy in package routing.

1.5 Proposed Visit Timeline

We are available for the field visit at any time during the upcoming week and are more than happy to adjust our schedule to match your team's availability. We kindly request a short time window ideally a few hours to conduct our observations and have brief conversations with the relevant personnel. This will help us gather the insights needed for our case study while ensuring minimal disruption to your regular operations.

1.6 Scope

This project focuses on sorting automation for Daraz's Lalitpur distribution center, covering conveyor-based and robotic sorting systems. It includes workflow analysis, system design, simulation, and feasibility assessment.The study is limited to resources available at IOE Pulchowk labs and Daraz's collaboration for site access.

2.   Literature Review

2.1   Related Work

Studies on warehouse automation highlight the use of conveyor systems and robotic arms in e-commerce logistics. For example, Amazon's fulfillment centers employ Kiva robots and conveyor belts for sorting, achieving high throughput. However, such systems are capital-intensive, requiring adaptation for Nepal's context. Local studies in Kathmandu's warehouses suggest PLC-based conveyors as cost-effective solutions.

2.2   Related Theory

Sorting automation relies on instrumentation principles, including:

- **Photoelectric Sensors**: Detect package presence using light-based signals.

- **PLCs**: Coordinate sorting operations via programmed logic.

- **Servo Motors**: Enable precise robotic arm movements for sorting.

These technologies ensure accurate, high-speed sorting, adaptable to diverse package types.

3.   Proposed Methodology

The methodology for this case study includes the following steps:

1. **Workflow Analysis**: Conduct site visits to DEX Thasikhel Station to map manual sorting processes.

2. **Instrument Selection**: Choose cost-effective tools, such as PLCs, actuators and photoelectric sensors, available in Nepal.

3. **System Design**: Develop conveyor-based and automated sorting systems, integrating PLCs and barcode scanners.

4. **Simulation**: Model the proposed system using MATLAB or Factory I/O to validate performance.

5. **Feasibility Study**: Assess costs, power reliability, and scalability in package sorting and distribution.

6. **Reporting**: Compile findings, designs, and recommendations for Daraz Nepal.

4.   Timeline

The proposed schedule for the case study is presented in the following table:

Phase	Duration
Workflow Analysis	2 Days
Instrument Selection	3 Days
System Design	1 week
System Simulation	5 Days
Feasibility Study	3 Days
Final Reporting	1 week

Table 4.1: Project Timeline

5. Expected Outcome

We expect by the end of this case study the successful design and simulation of an automated sorting system for Daraz Nepal's DEX Thasikhel Station. Using cost-effective instrumentation technologies such as PLCs, infrared sensors, and conveyor systems, the automation solution will significantly improve the throughput and accuracy of package sorting. This will result in reduced bottlenecks, faster processing times, and fewer errors in package routing. Additionally, the feasibility study will ensure that the proposed system is adaptable to Nepal's technical and economic landscape, providing Daraz Nepal with a scalable and efficient solution that can support the growth of the e-commerce market in the region.

6.   Conclusion

This case study proposal presents a strategic approach to enhance the sorting efficiency at Daraz Nepal's DEX Thasikhel Station through automation. By addressing the inefficiencies of manual sorting with cost-effective instrumentation technologies, such as PLCs, infrared sensors, and conveyor systems, the proposed solution aims to improve throughput, accuracy, and scalability. The feasibility assessment ensures alignment with Nepal's technical and economic constraints, offering a practical pathway for implementation.

We request Daraz Nepal's collaboration to facilitate site access for workflow analysis and system testing. This partnership would enable the successful execution of the proposed automation system, contributing to Daraz's operational excellence and Nepal's e-commerce growth. We look forward to the opportunity to work together and deliver a transformative solution for the distribution center.