

**Bachelor of Software Engineering Honors’ Degree Programme**

**The Open University of Sri Lanka**

**Academic Year: 2024/25**

**EEX5362 - Performance Modelling**

**Mini Project - Deliverable 01 - Report**

**Name: A.M.V.D Abeysinghe**

**Reg Number: 222516538**

**SNumber: s22010366**

**Performance analysis of an E-commerce warehouse**

**1. System Identification**

The system will be used analyze a complex e-commerce warehouse and logistics network. Managing the entire order management process effectively from beginning to end is one of the system's biggest challenges. from the moment a customer places an order to the moment it is dispatched for delivery, the process should be efficient.

The process of the system has measurable performance characteristics because of the,

* Variable demand: Number of orders can change even throughout the day because of factors like seasonal sales or holidays
* Large product range: The warehouse manages different stock keeping units /ids with different storage needs, packing and picking methods.
* Interdependent processes: The whole system is a connected chain of different processes of order receiving, item picking, packing and shipping. A delay in one area can affect the entire order completion process.
* Resource limitations: There are only a limited number of resources, including human resources, machines, etc.

The goal is to process a large number and different type of orders quickly and accurately while managing costs and resources effectively.

**Data Sets**

To analyze this system, the following two datasets will be used:

1. Logistics Warehouse Dataset,

Original source / URL: ‘<https://www.kaggle.com/datasets/ziya07/logistics-warehouse-dataset>’

This dataset provides operational data from the warehouse, including information about inventory levels, package tracking, processing times and warehouse logistic details. This will be used to model the processes within the warehouse

2. Retail Sales Dataset,

Original source / URL: ‘<https://www.kaggle.com/datasets/mohammadtalib786/retail-sales-dataset>’

This dataset provides data on customer orders, sales figures, product details and dates. This will be used to model the input to the system. The demand and inputs of customer orders that the warehouse must complete.

A logical mapping will be created between the 2 datasets to simulate the completion of incoming orders.

**2. Performance Objectives**

The main goal of this analysis is to model the warehouse's operations to identify opportunities for optimization. The key performance objectives will be,

1. Maximize throughput,

* Calculate the total number of orders successfully picked, packed and dispatched per day.
* Objective is to identify strategies like new picking routes or staffing changes to increase this number.

2. Minimize shipping time,

* Measure the average time from an order is received by the system to when it is loaded onto a delivery truck.
* Objective is to reduce this average time and also reduce the time differences to make processing times more predictable.

3. Identify and analyze bottlenecks,

* Measure the wait times at each important process step such as waiting for a picker or waiting for a delivery truck, etc.
* Objective is to find which specific process is the main bottleneck that limits and delays the overall system throughput.

4. Optimize resource allocation:

* Measure the percentage of time spent busy vs idle of key resources like package pickers, packers and machines, etc.
* Objective is to determine the optimal number of staff or machines needed to meet demand without excessive cost or non-working time.