I. INTRODUCTION

A. Background

Kanban is the type and number of units needed and is written on a card like a tag sent from one part of the process to another [1]. Kanban is frequently used in production facilities to make sure each process is completed in the correct order before going on to the next one. The principle is a workflow system that uses visual cues to limit the amount of work being done (Work-in-Process, or WIP) so that it can be completed within the capacity and resources already available [2].

The study focuses on solving the problem of the Yazaki Corporation subsidiary, which operates in the component manufacturing sector, with its main product wiring harness in optimizing production processes. Manual kanban systems are vulnerable to human error and loss of kanban cards, which can cause bottlenecks and delays in the production process [3]. At a subsidiary of Yazaki Corporation, the manual kanban system encountered several issues, including circuit accumulation in the store that resulted in the stock activity process Old Kanban Transfer Order (STO), redundancy of kanban cards, and cutting processes without or missing kanban. This impacts the longer lead time between pre-assembly and the final circuit assembly for storage, impeding the accomplishment of production targets.

TABLE I. LEAD TIME REPORT FROM PRE-ASSEMBLY TO FINAL ASSEMBLY

Lead Time Components	Processing Time (s)
Information Total	14400
Process Total	2885
Convey Total	928
Stagnation Total	15226

Table I shows the data on circuit movement that experienced time inflation, contributing to delays during the period from November 2022 to March 2023. Additionally, the loss of 699 kanban at Yazaki Corporation's subsidiary significantly impacted the stagnation in waiting times, raising urgent concerns regarding managing the kanban system process.

To address this challenge, a digital kanban system must be designed to allow integrated control over the kanban movement. Implementing a digital Kanban system can enhance visibility and control over the flow of materials in the production process, reducing waiting times and improving operational efficiency [4]. In this case, a digital Kanban web application best implements a digital Kanban system. A digital Kanban web application offers a more efficient and flexible solution than physical Kanban, with features such as real-time tracking, high accessibility, and the ability to automate specific tasks [5]. With real-time monitoring and data-driven decision-making, the web-based Kanban system enables teams to work faster, more effectively, and produce high-quality results.

This system is expected to record information in real-time from kanban cards, reduce the discrepancy in the number of kanban between planned and actual loads, address issues with kanban placement and delayed Stock Transfer Order (STO) processes, and become crucial to circuit movement on the production line. Using QR code scanning and thermal printing technology in manufacturing systems can accelerate identifying and updating material status, increasing responsiveness to demand changes and reducing human errors [6]. QR code scanning and thermal printing features serve as a solution and support for optimizing circuit movement. In addition, to ensure that the implemented digital kanban system can truly optimize circuit movement on the production line, a system performance test will be conducted using performance testing methods that evaluate the efficiency and speed of data processing [7].

B. Limitation of Study

This study addressed the issues faced by the Yazaki Corporation subsidiary. The new master data from August 2023 to December 2023 will be compared with the previous master data, which uses production data from November 2022 to March 2023, to demonstrate that the performance of the front-end website in circuit movement processes impacts production line optimization. The observation includes developing and optimizing the digital Kanban system, focusing solely on the front-end application related to circuit movement for the Kanban web system without discussing the back-end, particularly during the Final Assembly, Pre-Assembly, and Printing phases. The system development is limited to using a JavaScript framework, specifically ReactJS, to build the front-end of the digital Kanban system at the Yazaki Corporation subsidiary. The implementation is also limited to integration within the local network at the subsidiary. Performance testing uses metrics such as request time and initial page load time, each tested through five trials. Subsequently, overall performance testing of the page involving circuit movement processes is conducted using Google Lighthouse 10.