

AI-Powered Financial Liquidity Management System for SME Apparel Businesses in Sri Lanka

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Abstract - The apparel industry is a significant contributor to the economy of Sri Lanka. Small and medium enterprises are the most powerful sector in this industry. However, managing the financial liquidity in the SME apparel industry is a moderate challenge in Sri Lanka. Cash flow and liquidity are mismanaged by the authority, the SME apparel industry lacks maintaining cash flow statements, insolvency of SME businesses due to bankruptcy, and the tendency to have a risk when making a decision are the main problems for managing financial liquidity management system in SME apparel in Sri Lanka. This paper proposes an AI-powered financial liquidity management system specifically designed for the SME apparel businesses in Sri Lanka including machine learning, artificial intelligence techniques, and predictive analytics to provide real-time insights and proactive decision support for managing liquidity and it is a system that can manage employee's salary, details, business's income, business's outcome, and risks. This proposed solution provides an excellent way of authentication and authorization, generating reports, risk prediction, and automating the cash flow infrastructure.

Keywords: AI-powered system, financial liquidity management, SME apparel businesses, Sri Lanka, cash flow management, Machine Learning (ML), Artificial intelligence (AI).

I. INTRODUCTION

SME businesses stand for Small and Medium-sized Enterprises. [1] These are companies that, in terms of yearly revenue, assets, and personnel count, fit within a specific size range. The specific requirements for a company to be considered an SME can vary by country, although they are often distinguished by having fewer resources and a smaller operational footprint than major enterprises. SMEs have a significant role in the generation of jobs. They frequently have a greater labor-intensive character and are capable of quickly adapting to market demands, which increases the number of

employment prospects in the surrounding areas. SMEs encourage innovation, entrepreneurship, and creativity. They frequently introduce novel concepts, goods, and services to the market, stimulating expansion and diversification of the economy.

SME's constitute a nation's economic backbone, and this is undoubtedly true of Sri Lanka. Nearly 48% of Sri Lanka's overall exports and valuable foreign currency come from the country's garment industry. [2] The financial crisis has cast a shadow over the economics and the financial prospects of SMEs in the apparel industry. The impact of SMEs plays a crucial role in the sector's growth, employment generation, and economic development. Employment generation can be described as the SME providing a large number of opportunities for workers including skilled and unskilled labor. Other than that advantage there are many other advantages that Sri Lanka gains from this SME business in the apparel industry.

Liquidity refers to the ability of a company to meet its short-term obligations, such as paying its bills and payroll, as well as its long-term commitments, such as repaying loans and increasing capital. Also, in the process of liquidity management, assume that the company has its own cash on hand. It will be a help in the future process of the company. The proactive practice of making sure a business has enough cash on hand to satisfy its financial obligations when they become due is known as liquidity management. [3] Businesses may reduce the risk of missing other payments by being proactive and having a strategy in place. They can also make sure they have enough cash on hand to cover both their immediate and long-term demands.

Financial liquidity management is crucial for businesses in any industry, SMEs in the apparel sector face unique challenges that demand tailored solutions. Existing literature fails to sufficiently address the specific needs and constraints of SME apparel businesses in Sri Lanka when it comes to effectively managing their cash flow, working capital, and

financial resources. Without appropriate liquidity management systems, these businesses may face difficulties in maintaining sufficient cash reserves, meeting financial obligations, managing inventory levels, and effectively planning for future growth.

Throughout the business process, there are several risks that can be expected in the SME apparel market. First, there is a risk associated with demand and the supply chain, which involves issues with locating high-quality raw materials, keeping consistent suppliers, and controlling inventory levels. Production schedules and quality assurance may be affected by fluctuating costs, delivery hold-ups, and supply chain interruptions. The availability of competent labor, machine upkeep, and equipment malfunctions are a few examples of production hazards. SMEs could have trouble fulfilling production goals, guaranteeing efficient production procedures, and maintaining high standards for product quality. Thirdly, there are a lot of financial hazards, which include things like managing cash flow, getting credit, and managing debt. SMEs may have trouble obtaining sufficient finance, handling payment delays, and maintaining profitability.

From that point of view, our focus is on making a system that will be useful to manage the cash flow, and which can be used to record all the inflows and the outflows of the business. On the other hand, there is an option that will predict the risk average of each decision that the administration will get through the business. All the past data will be calculated, analyzed, and trained to predict the risk. This system will be a great deal for all administrators who are facing difficulty in their cash flow management, especially for SME business owners who have a huge risk in their business.

II. LITERATURE REVIEW

Data envelopment analysis has been suggested as a method by Angela Tran Kingyens, Joseph C. Paradi, and Fai Tam [6] to anticipate the bankruptcy of businesses in the retail apparel industry. It highlighted the situation that has led to several small and large enterprises declaring bankruptcy, which has serious global societal repercussions.

III. METHODOLOGY

When a system is implemented, it is constructed, assemble, and shaped using the design model's tools and technology. The main focus of this section is on outlining how technology and tools are employed to produce the finished output. The most frequently used programming languages and technologies in the creation of the "ApexShield" online application are Node JS, React JS, Express JS, Python, and PostgreSQL. Tailwind CSS is used for styling the interfaces of

web applications. Within the Node JS framework, the backend is implemented using Express JS, and the front end is implemented using React JS. PostgreSQL is an advanced open-source relational database that is suitable for managing financial data with high security. It supports a rich set of advanced features, including complex queries, nested transactions, and multi-version concurrency control. [7]

According to the high-level architectural diagram as shown in Figure 1, the express JS server-side framework is the first level and is installed inside a Node JS server. [8] Node JS is a quick JavaScript runtime environment that is used to create server-side applications, but it lacks the ability to handle HTTP method processing, file serving, and request handling. Express JS can help with this situation. Additionally, connecting it to databases like MongoDB, MySQL, etc. is quick. [9] The choice of Express JS and Node JS as the backend development language and framework comes from this reason.

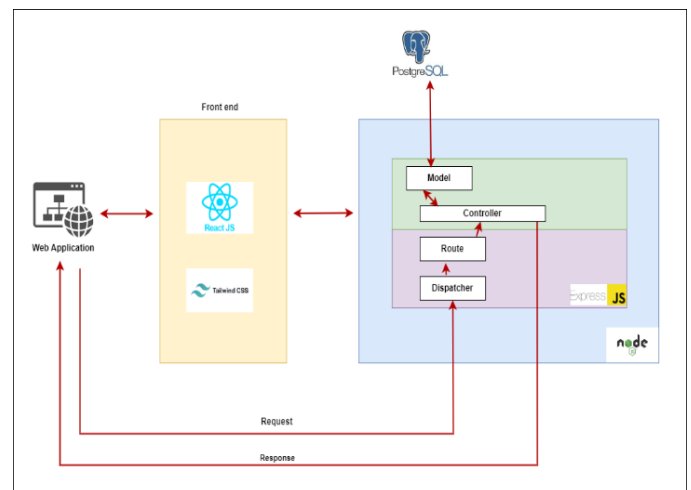


Figure 1: System Architectural diagram

Systems design is the process of defining a system's components, such as modules, architecture, and components, as well as their interfaces and data, depending on the requirements that have been given. It involves identifying, creating, and designing systems that meet the unique demands and requirements of a company or organization. There are three stages to the development design.

- Architectural design
- Physical design
- Logical design

Firstly, the research will begin by conducting a thorough needs analysis and requirement-gathering process. This will involve engaging with SME apparel businesses in Sri Lanka through surveys, interviews, and focus groups to understand their current financial liquidity management practices,

challenges, and desired outcomes. This input will form the foundation for designing the system and ensuring its relevance and effectiveness. Next, based on the gathered requirements, a conceptual design of the AI-powered financial liquidity management system will be developed. This will involve determining the core functionalities, data inputs, algorithms, and decision-making processes that the system will employ. Consideration will be given to incorporating AI techniques such as machine learning and predictive analytics to enhance the system's capabilities in forecasting and risk assessment.

Once the conceptual design is established, the research will move toward the technical design phase. The UI/UX design will focus on creating an intuitive and user-friendly interface that enables SME owners and managers to easily navigate the system, access relevant information, and make informed financial decisions. Usability testing and iterative feedback loops will be employed to refine the UI/UX design and ensure it meets the specific requirements and preferences of the end users. Overall, the design part of the research will involve a comprehensive and user-centered approach, considering the unique challenges and requirements of SME apparel businesses in Sri Lanka. By integrating their feedback, incorporating AI techniques, and prioritizing usability, the design phase aims to create an AI-powered financial liquidity management system that effectively addresses the specific needs of SMEs in the apparel industry and enhances their financial stability and growth potential.

The proposed system is divided into four main components.

- Manage employees and predict demand and supply-side risks in SME apparel.
- Manage company outcomes and predict risks in post-production and marketing.
- Manage a real-time reporting and dashboard system with data classification and encryption.
- Manage company assets and income and predict export risk management.

Mainly the liquidity management system will manage the company's cash flow. It will maintain how the inflows and outflows of cash occur within the organization [10]. It will monitor and analyze the company's revenue streams, expenses, and financial transactions to provide a comprehensive view of the cash position. As well as outgoing cash for expenses including raw materials, operating costs, employee salaries, and loan repayments. By analyzing these cash inflows and outflows, the system will provide real-time insights into the company's liquidity status. [11]

A) Manage employees and predict demand and supply-side risks in SME apparel

This functionality has two main subfunctions: managing employees and predicting supply-side risks in the company. Managing employees is the main function of developing cash flow in the system. This is because it impacts large amounts of cash on the company's liquidity. Managing employee functionality is proposed as one of the main components of web applications.

Managing employees is the main function of developing cash flow in the system. This is because it impacts large amounts of cash on the company's liquidity. Managing employee functionality is proposed as one of the main components of web applications. An authenticated user can log into the web application and manage employee details and salaries in the system. After the new employee is added to the system, the user can view all employee details in one interface named "All Employees" each of which contains two buttons for updating and deleting employee records. If the user wants to permanently delete an employee record from the system, the user can click the delete button; if the user wants to update any field of an employee, he/she can click the update button and update the desired field. In addition, the user can manage the employee salary in the proposed system. Although this system is designed for small and medium enterprises in apparel businesses, it will recruit several employees to work, and managing salary is the main problem for managing the liquidity of a business in a correct manner. Therefore, when managing employee salaries, management must calculate salaries according to the job position and overtime amount separately. The below equation shows how the system calculates the salary of each employee who worked in an SME company.

$$Es = Bs + (Oh * Or) \tag{1}$$

As seen in (1), "Es" is denoted as the Employee salary, "Bs" is defined as the employee's basic salary according to the job position in the company, "Oh" is defined as Overtime (O.T) hours, and "Or" is defined as the overtime rate for a

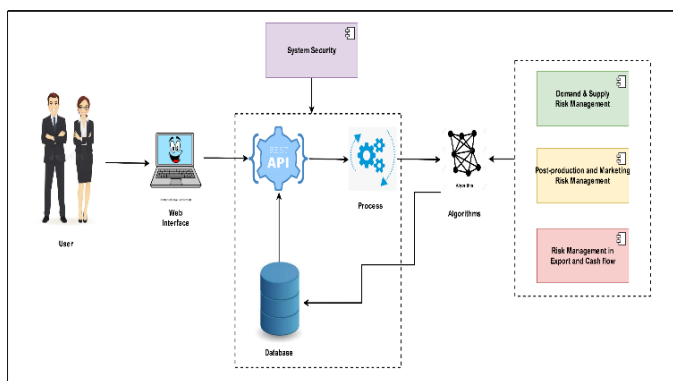


Figure 2: System Overview

specific employee. For a specific employee in an SME apparel business, the overtime rate should also be different. These rates are stored in the database to calculate wages according to the equation. The proposed system filters the employee salary once the user provides input such as job position and overtime hours.

The second sub-function predicts supply-side risks in SME apparel. The proposed system mainly predicts two types of supply-side risks that can occur in SME apparel businesses in Sri Lanka. This is because they have one or two suppliers. Predictive analytics can analyze supplier data, including past delivery times and responsiveness, to identify potential risks. [12] Late deliveries or poor communication with suppliers can lead to production delays and customer dissatisfaction. Another supply-side risk is the unavailability of raw materials. The availability of raw materials is essential for maintaining a smooth production process. The proposed system predicts the risks of raw material unavailability using machine-learning algorithms. It analyses supplier capacities and historical data to forecast potential shortages or disruptions in the supply of raw materials. [13] This risk prediction enables proactive measures such as identifying alternative suppliers or adjusting production schedules.

When predicting risks in a system, several machine-learning algorithms can be used. But must use the algorithm that gives the highest accuracy for the prediction. Logistic regression is used for binary classification tasks, and the goal is to predict the probability of an event belonging to two classes. Firstly, logistic regression to train the dataset to get high accuracy for predicting demand and supply side risks. Because of the AI-powered approach, our focus moved on to the neural network algorithm named RNN for training the model. It gives the highest accuracy for it.

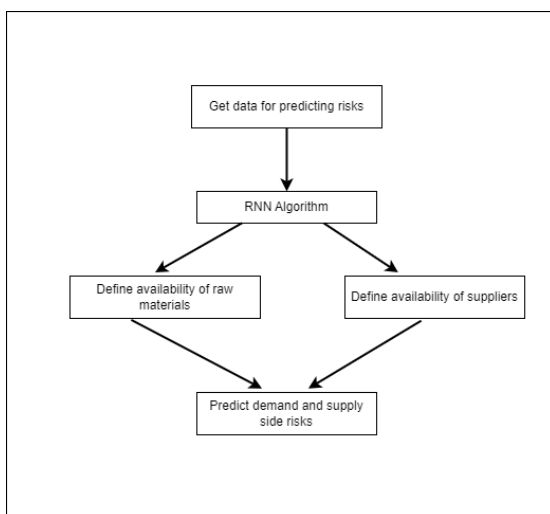


Figure 3: Workflow of predicting demand and supply side risks

By leveraging predictive analytics and AI techniques to predict demand and supply side risks, SME apparel businesses can make informed decisions and take proactive measures to mitigate potential disruptions. This allows businesses to optimize production plans, manage inventory levels, maintain a reliable supply chain, and meet customer demand effectively while minimizing operational risks.

B) Manage Outcomes and Predict Post-production and Marketing Side Risks in SME Apparel

From this functionality, there are 2 main sub-functions called predicting risks in the post-production process and managing the cash flow in the outcome. Considering the two sub-functions, outcome management is the main function that will be called and managed in the cash flow management system. From that function, it will cover all the cash outflows of the company. On the other hand, the system will predict the risks that can happen in the post-production of a garment factory will be managed through the AI-based system that will run through a machine learning model.

The main reason behind this implementation is to manage the cash flow of the SME business in the Apparel industry. The biggest problem those businesses face today is they do not manage a good cash flow history within the management. To avoid that issue our team has suggested user-friendly cash flow management which is mainly used to record the inflows and outflows of the company. From that function administration or any other party can add the outflows to the system using basic details of the cash outcome and after that, there will be some CRUD operations running through the system which will be based on the user role to have the security authentications. Other than that, there will be some reports about these outflows and users can download it at any time for the acknowledgement of their use. Also, there are some opportunities to get a statistic of the outflows according to some restrictions such as date, category, etc.

Along with that system, there is a function to predict risks in the post-production and marketing part of SME apparel businesses. In the context of SME apparel businesses in Sri Lanka, post-production and marketing risks pose significant challenges. [14] After the production process, post-production risks include issues related to quality control, timely delivery, and inventory management. SMEs may face difficulties in maintaining consistent product quality, meeting deadlines, and efficiently managing their inventory levels, which can impact customer satisfaction and brand reputation. Overcoming these post-production and marketing risks requires strategic planning, strong supply chain management, effective quality control measures, and innovative marketing strategies tailored

to the specific challenges faced by SMEs in the apparel industry. [15]

This component will cover all the post-production processes and marketing sector and predict the risk average of each decision through the process and it will have a huge impact on the decision-making of the administration. After all, it will be a great help for the apparel business. [16]

C) Manage a real-time reporting and dashboard system with multi-level security features while ensuring the confidentiality, availability, and integrity of the data

Managing a real-time reporting and dashboard system with multi-level security features while ensuring confidentiality, availability, and integrity of the data is crucial in the context of an AI-powered financial liquidity management system for SME apparel. Financial data are valuable to unethical hackers. [17] SMEs are often at a higher risk of data breaches than larger businesses in the apparel industry. This study focuses on the effective protection of financial data through the utilization of real-time reporting, interactive dashboards, data classification, and encryption techniques.

Real-time reporting allows businesses to access up-to-date and accurate financial liquidity information. It provides insights into cash flows, receivables, payables, and other liquidity indicators. This timely information empowers users to make correct and proactive decisions to manage financial liquidity effectively. The dashboard system provides a visual representation of the financial data. Through user-friendly and intuitive interfaces, users can monitor liquidity-related data in a comprehensive and easily understandable manner. For different authenticated user levels, users can visualize different dashboards and only contain related financial liquidity data.

The proposed system contains multilevel security features that address an identified literature gap for SMEs within Sri Lanka's apparel industry. [18] These security features include asymmetric encryption with physical dongles, two-factor authentication, and limited-time access to highly restricted areas. To implement multi-factor authentication for user login, the system includes the use of physical tokens and 2-factor authentication for highly restricted areas, such as income, outcome, assets, and employee salary rates. To monitor and log all system activities to detect and prevent potential security threats, including intrusion attempts and unauthorized access.

D) Manage company assets and income and predict export risk management

In the proposed system, this main component is predicting export risk management. These are some of the main features of financial liquidity management. Therefore, the proposed system focuses mainly on managing company assets and income/inflows.

To utilize the risk prediction functionality, authorized users can log into the system and input specific details related to the export process. These inputs include transportation method, transportation date, the distance the product is exported to, and environmental conditions along the export route. By capturing this information, the system leverages AI-based algorithms and machine learning models to forecast potential risks associated with exporting.

Only an authorized person can log into the system and manage assets and income. Efficient management of company assets, including machinery, equipment, and inventory, is crucial for maintaining smooth operations and maximizing profitability. Several forms were gathered as inputs for the financial liquidity management system of SME apparel businesses. Employee salaries, assets, inflows, and outflows were well managed by the proposed system. When exporting the products the user should input the transportation method, the transportation date, the Distance the product is exported to, and the environmental conditions in the path the product is exported. Economic risks such as currency exchange rate variations, inflation rates, and import/export trends are also considered.

The system takes the above factors that affect the risk related to exporting the product. [19] By meticulously measuring and combining multiple risk aspects, the proposed method provides exporters with a comprehensive risk profile for their export activities. The method provides a full awareness of the risks associated with exporting by taking into account political, economic, legal, logistical, financial, compliance, and environmental factors. Exporters obtain significant insights from this full risk profile, allowing them to make informed judgments and strategic decisions. They can accurately assess the risks connected with their export operations and devise appropriate risk-mitigation strategies. The system should be input with the Transportation method, the weather, the distance the product is exported to, and environmental conditions along the export route. After inputting the details, the machine learning algorithm that has been trained, predicts if the transportation method is at high medium risk or low risk. [20]

IV. RESULTS

'ApexShield' has been developed as a liquidity management system for SME apparel businesses in Sri Lanka to predict risks in demand and supply side, marketing and post-production, and export side. The web application is implemented using NodeJs framework, PostgreSQL database, Flask, and Tensor flow as the middleware technology and the backend of the application is ExpressJs. The research has used machine learning concepts and algorithms for risk prediction. In addition to efficient cash flow management, the SME apparel industry can now harness the transformative power of AI through a cutting-edge AI-powered risk prediction system.

More than 1,000 records were collected for each risk prediction and preprocessed using data preprocessing techniques. Linear regression has been chosen since it assumes a linear relationship between the features and the target variable. It gives the high accuracy for the risk classification. In the model training process, the linear regression model obtained over 91% accuracy for the test input data. On the other hand, 'ApexShield' is a cash flow management system that holds paramount importance for small and medium-sized enterprises (SMEs) operating within the dynamic landscape of the apparel industry. For SMEs in the apparel business, where financial agility is pivotal, an efficient cash flow management system emerges as a guiding compass. This system serves as a financial orchestrator, ensuring that the inflow and outflow of funds are seamlessly monitored, offering users a simplified and user-friendly experience.

V. CONCLUSION & FUTURE WORK

The urgent need for an AI-powered financial liquidity management system designed especially for SME apparel enterprises in Sri Lanka has been addressed in this research report. The lack of suitable liquidity management systems and their effects on the financial stability and expansion potential of SMEs in the garment industry were noted in the literature that already exists. This study sought to create a system that tackles the particular difficulties faced by SMEs in managing their cash flow, working capital, and financial resources using an exhaustive and iterative research design.

The results of this study have important ramifications for Sri Lankan SME apparel enterprises. These companies are able to optimize their cash flow, enhance working capital management, and make wise financial decisions by putting the proposed AI-powered financial liquidity management system into practice. This strategy may improve SMEs' access to growth prospects, lessen the effects of cash flow fluctuations, and improve overall financial stability. It's crucial to recognize that there can be difficulties with such a system's deployment and adoption. SMEs could run into problems with change

management, resource limitations, and technology integration. Therefore, it is advised that SMEs have sufficient help, training, and direction to adopt and utilize the AI-powered system efficiently.

In conclusion, by offering a thorough and specific answer to the financial liquidity management issues faced by SME apparel enterprises in Sri Lanka, this research adds to the body of current information. The suggested AI-driven system has the potential to improve financial stability, bolster decision-making procedures, and promote the expansion and sustainability of SMEs in the garment sector. To optimize the system's usefulness and influence within the SME ecosystem, future research should concentrate on the practical deployment, assessment, and improvement of the system.

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