ICIIS 2023

"INNOVATE, REGENERATE, and TRANSFORM:
Advances in Engineering for sustainable growth"

This is to certify that

Lina Gozali, ST.,MM.,Ph.D

presented the paper on

***System Modelling and Simulation to Improve Laundry Business
Productivity***

by
Lina Gozali, Louis Valentino, Thomson Richard, Dennis Marcello
in the

2023 IEEE 17th International Conference on
Industrial and Information Systems (ICIIS)

held at the
Faculty of Engineering, University of Peradeniya, Sri Lanka
23rd – 26th August, 2023

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Prof. Maheshi B. Dissanayake
General Chair – IEEE 17th ICIIS 2023

Technical Sessions of ICIIS 2023

Day 1: Friday 25th August

Registration: 08:20   to 8:50

Inaugural session: 08:50   to 10:10

Break: Tea and Networking

Keynote 1: 10:45   to 11:30

   Topic: Edge Cloud-Assisted Assistive Care

   Prof. Mathini Sellathurai

   Dean Science and Engineering of Heriot Watt University, Edinburgh, UK

Session 1: 11:40   to 13:00

Break: Lunch and Networking

Session 2: 13:45   to 14:50

Keynote 2: 14:55   to 15:40

Topic: Electricity Policy in Japan

   Mr. Takanori Shiozawa

   Senior Managing Director and Chief Operating Officer of the Institute of Energy Economics (IEEJ) in Japan

Break: Tea and Networking

Keynote 3: 16:00   to 16:45

   Topic: Energy Markets: Present and Future Trends

   Dr Priyantha D.C. Wijayatunga

   Senior Director for ADB's Energy Sector Office.

Session 3: 16:50   to 18:15

Banquet and Networking: 19:00 onwards.

Day 2: Saturday 26ᵗʰ August

Registration: 08:00   to 8:25

Session 4: 8:30   to 09:45

Session 5: 09:45 to 10:45

Break: Tea and Networking

Keynote 4: 11:05 to 11:50

      Topic: Collaborative Federated Learning for Wireless Communication

      Prof. Arumugam Nallanathan

      Head of the Communication Systems Research (CSR) Group, School of Electronic
      Engineering and Computer Science at Queen Mary University of London,UK

Session 6: 12:00 to 13:00

Award Ceremony: 13:00 to 13:30

Break: Lunch and Networking

Presenting Order	Paper ID	Title	All authors	Presenting Author
1	1570889764	Performance Analysis for Exercise Pose Prediction Using RFE Based Feature Selection	Puvanendran Rukshani, Sharnitha Thangasundram	Puvanendran Rukshani
2	1570890699	An Improved Decision Tree Model for Forecasting Consumer Decision in a Medium Groceries Store	Intan Rahmatillah, Eriana Astuty, Ivan Diryana Sudirman	Ivan Diryana Sudirman
3	1570901530	Classifying YouTube Videos Based on Their Quality: A Comparative Study of Seven Machine Learning Algorithms	Thushan De Siva, Hiruni Madhusha Rupasingha	Thushan De Siva
4	1570901714	Ensemble Learning Approach for Predicting the Necessity of Mental Health Treatments of Employees	Kalani Imanthika, Kumudu Ranasinghe, Hiruni Madhusha Rupasingha	Kalani Imanthika
5	1570897015	System Modelling and Simulation to Improve Laundry Business Productivity	Lina Gozali, Louis Valentino, Thomson Richard, Dennis Marcello	Lina Gozali

Date: 25th August

Time: 16:50 to 18:30

 Session number: 03

System Modelling and Simulation to Improve Laundry Business Productivity

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Abstract - **In this modern industrial era, many developments have occurred in the industry to increase the efficiency and effectiveness of industrial activities. The laundry industry is a service industry for washing several types of clothes and fabrics and still has an increasing demand until now. This service can develop due to the demand and needs of the community who want a fast and clean washing process for people who do not have time to wash. This research is intended to create a system modelling to determine important variables so that the processes that occur in the laundry industry can run effectively and efficiently. The methodology used in this study includes Activity Cycle Diagrams, Causal Loop Diagrams, Flow Diagrams and a comparison of the initial model with the proposed model using statistical analysis. Based on the results of the comparison, the average service level of the proposed model is greater than the average service level of the observations (initial model). Thus, it is stated that the proposed model will increase the productivity of XYZ's laundry business due to the reduction in idle that occurs.**

Keywords - **Modelling Simulation, System Dynamics, Laundry Industry, Productivity Increasing, Idle Improvement**
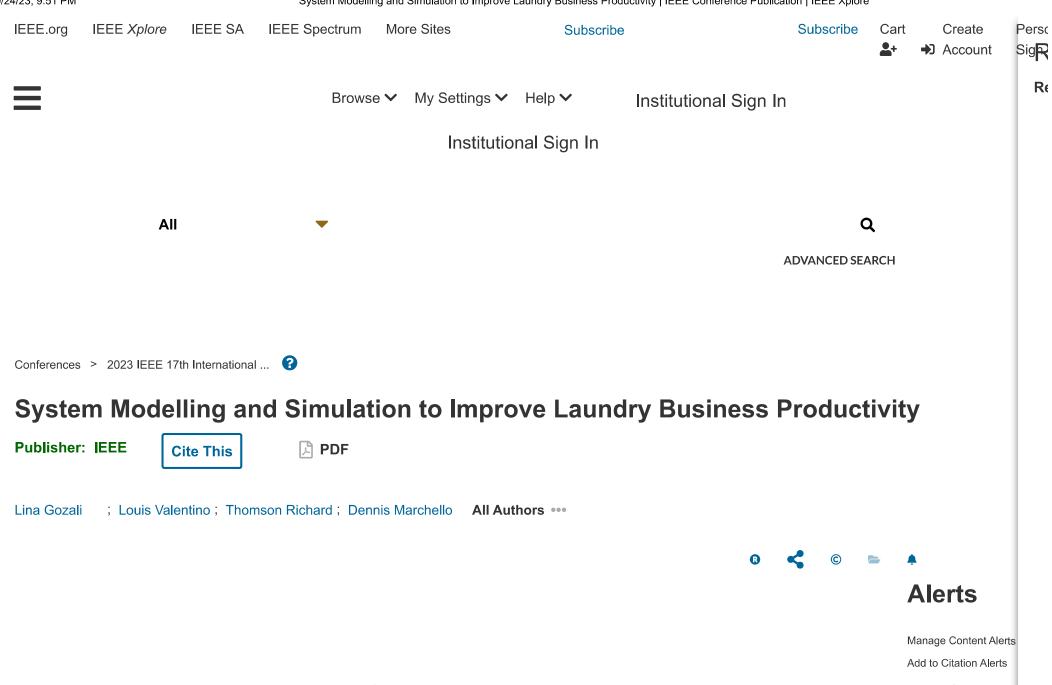
I. INTRODUCTION

Industrial growth in these modern times is growing very rapidly. This rapid growth is inseparable from the rapid development of information and knowledge that can be learned by almost every human being [1]. The abundance of information enables people to create new businesses and develop them in various sectors and scales [2]. With a lot of information and knowledge about the industry, it is also expected to be able to increase the effectiveness and efficiency of the industry itself [3]. One industry that is often encountered is the laundry industry, which has a fast cycle and process turnaround. In connection with the fast process in the laundry industry, it must have an orderly process flow that is effective and efficient to meet the needs of its customers. The laundry industry is a service industry for washing several types of clothes and fabrics. This service can be developed due to the demand and needs of people who need a fast and clean washing process but do not have the time for it. The laundry industry can develop because of the establishment process as well as the simple work process to generate the expected profits. The process must be supported by a good system to prevent obstacles in the system and in any processes. For this reason, this research is important to create a modelling system to determine the variables and processes in the laundry industry so that it might be able to run effectively and efficiently. Based on the observation, when the workers experience fatigue, the productivity is decreased. This occurence caused the productivity of the system became unstable. However, this research is focused on the system modelling without considering the decreased productivity caused by external factors such as behaviour of customer and fatigue of workers, which in future research we will include these factors.

The research subject in this study is XYZ Laundry, which is a laundry outlet that operates in West Jakarta City, Special Capital Region of Jakarta. XYZ Laundry serves all types of clothing and bed linen, ranging from clothes and pants, for babies to adults, and others. In a day, the laundry activities can reach approximately 10 Kg of clothes. This laundry outlet has 2 washing machines that are used daily and operates from 8 am to 8 pm. This outlet also irons clothes after washing and drying so that the clothes are neatly packed. Operating hours are from Monday - Sunday but will be closed on holidays.

System dynamics has been widely used because its usage is versatile and compatible with systems. This can be seen in the wide usage of previous research and studies. Reference [4] used system dynamics without simulation to carry out a conceptual framework on energy service industry in China which is beneficial to the optimization and upgrading of China's energy service industries. Reference [5] used system dynamics to improve the performance of construction companies in Thailand by identifying key factors affecting construction performance as well as their relationship. Reference [6] studies managerial behavior and used system dynamics which includes simulation model to analyzed and revealed the structure of relationship between earning related factors and delay of cognitive in management decision in Japan banking sector to improve their performance. Reference [7] used system dynamics to analyze the interrelations of the factors that have an impact on employee performance, and developed a causal loop diagrams that were then transferred to stock and flow diagrams for the mathematical simulation to improve the overall performance of a company and its sustainability. The literature review of previous work is conducted mostly on

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II. METHODOLOGY

III. RESULT

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In this modern industrial era, many developments have occurred in the industry to increase the efficiency and effectiveness of industrial activities. The laundry industry is a service industry for washing several types of clothes and fabrics and still has an increasing demand until now. This service can develop due to the demand and needs of the community who want a fast and clean washing process for people who do not have time to wash. This research is intended to create a system modelling to determine important variables so that the processes that occur in the laundry industry can run effectively and efficiently. The methodology used in this study includes Activity Cycle Diagrams, Causal Loop Diagrams, Flow Diagrams and a comparison of the initial model with the proposed model using statistical analysis. Based on the results of the comparison, the average service level of the proposed model is greater than the average service level of the observations (initial model). Thus, it is stated that the proposed model will increase the productivity of XYZ's laundry business due to the reduction in idle that occurs.