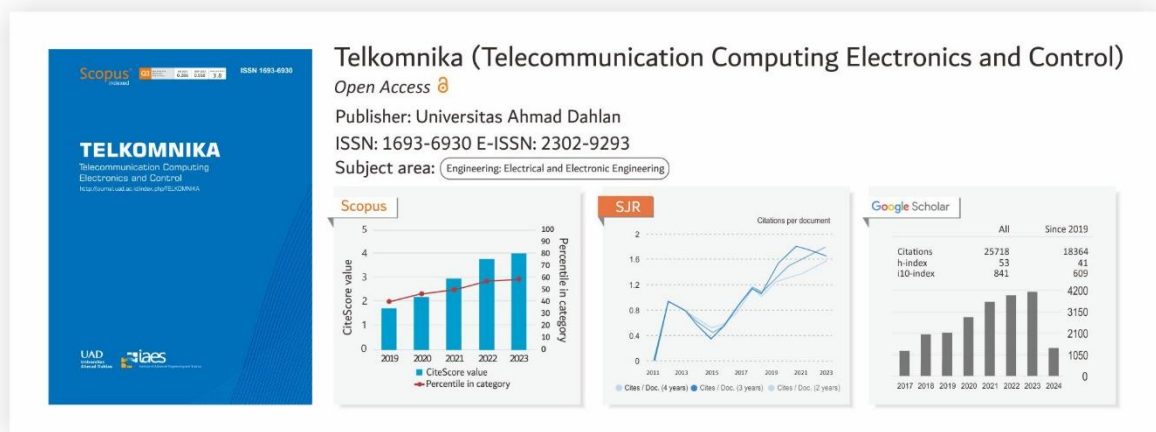
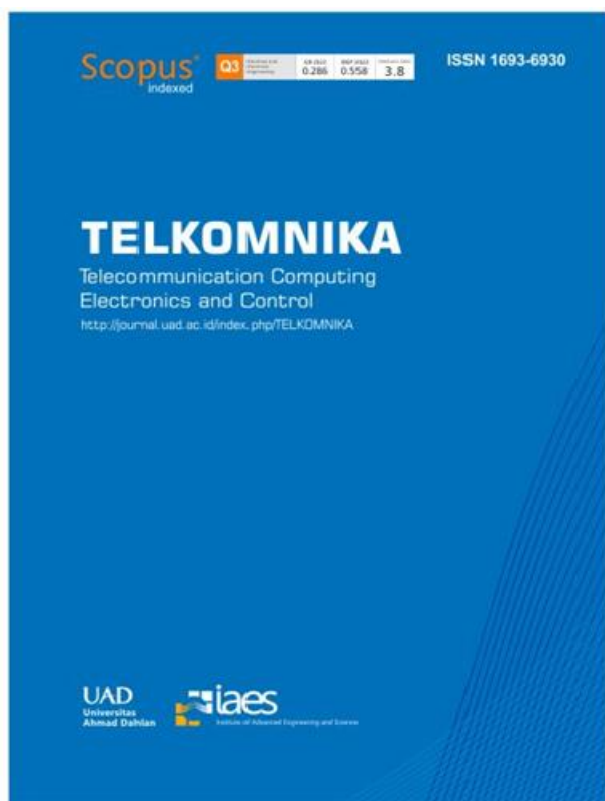




Home > Vol 23, No 1

TELKOMNIKA (Telecommunication Computing Electronics and Control)

TELKOMNIKA (Telecommunication, Computing, Electronics and Control) ISSN: 1693-6930, e-ISSN: 2302-9293 is a peer-reviewed, scientific journal published by [Universitas Ahmad Dahlan \(UAD\)](#) in collaboration with [Institute of Advanced Engineering and Science \(IAES\)](#). The aim of this journal is to publish high-quality articles dedicated to all aspects of the latest outstanding developments in the field of electrical & electronics engineering and computer science. Its scope encompasses the applications of Telecommunication, Computing, Electrical & Electronics, and Instrumentation & Control. It was first published in 2003. TELKOMNIKA started its publication as a bimonthly journal, releasing 6 issues per year, starting from issue 1 of volume 16 in 2018. The journal registered in the Crossref system with Digital Object Identifier (DOI) prefix 10.12928. The journal has been indexed by [SCOPUS](#) (CiteScore: 4.0, Q2 CiteScore Quartile in Electrical and Electronic Engineering, SNIP: 0.649, SJR: 0.271), [Scimago](#), [Google Scholar](#), [Scholar Metrics](#) etc; accredited 'A' Grade by DGHE (Ministry of Research, Technology and Higher Education, Republic of Indonesia); registered BASE - Beilfeld Academic Search Engine and CORE JMI, etc. The journal also has a license agreement with ProQuest LLC and EBSCO Publishing.



Telkomnika (Telecommunication Computing Electronics and Control)

Open Access

Publisher: Universitas Ahmad Dahlan

ISSN: 1693-6930 E-ISSN: 2302-9293

Subject area: (Engineering Electrical and Electronic Engineering)



USER

Username

Password

☐ Remember me

QUICK LINKS

- Editorial Boards
- Reviewers
- Author Guidelines
- Online Submission
- Policy of Plagiarism Screening
- Peer Review Process
- Publication Fee
- Abstracting and Indexing
- Repository Policy
- Scopus Add missing document
- Publication Ethics
- Visitor Statistics
- Contact Us

Q2 CiteScore Quartile in Electrical and Electronic Engineering

4.0

CiteScore

58th percentile

Powered by Scopus

JOURNAL CONTENT

Search

Search Scope

All

Home > Editorial Team

Editorial Team

Editor-in-Chief

Prof. Dr. Ir. Tole Sutikno, ASEAN Engg., Universitas Ahmad Dahlan, Indonesia

Area Editor for Electrical Power Engineering

Assoc. Prof. Dr. Ahmet Tuke, Cukurova University, Turkey

Area Editor for Electronics Engineering

Prof. Ing. Mario Versaci, Università degli Studi di Reggio Calabria, Italy

Area Editor for Power Electronics and Drives

Prof. Dr. Yang Han, University of Electronic Science and Technology of China, China

Area Editor for Instrumentation and Control Engineering

Prof. Dr. Paolo Visconti, University of Salento, Italy

Area Editor for Signal, Image and Video Processing

Prof. Dr. Nidhal Carla Bouayneya, Rowan University, United States

Area Editor for Communication System Engineering

Prof. Dr. Zahridha Zakaria, Universiti Teknikal Malaysia Melaka, Malaysia

Area Editor for Computer Network and System Engineering

Assoc. Prof. Dr. Muhammad Nadzir Marseno, Universiti Teknologi Malaysia, Malaysia

Area Editor for Computer Science and Information Systems

Assoc. Prof. Dr. Wenquan Liu, Curtin University of Technology, Australia

Area Editor for Machine Learning, AI and Soft Computing

Prof. Dr. Luis Paulo Reis, Universidade do Porto, Portugal

Area Editor for Internet of Things

Assoc. Prof. Dr. Chau Yuen, Singapore University of Technology and Design, Singapore

Associate Editors

Prof. Dr. Simon X. Yang, University of Guelph, Canada
Prof. Dr. Ahmad Saudi Samour, Lampung University, Indonesia
Prof. Dr. Alex Pappachen James, Indian Institute of Information Technology and Management-Kerala, India
Prof. Dr. Antonios Gasteratos, Democritus University of Thrace, Greece
Prof. Dr. Badrul Hisham Ahmad, Universiti Teknikal Malaysia Melaka, Malaysia
Prof. Dr. Chi-Hua Chen, Fuzhou University, China
Prof. Dr. Emilio Jimenez-Macias, University of La Rioja, Spain
Prof. Dr. Francis C. M. Lau, Hong Kong Polytechnic University, Hong Kong
Prof. Franco Frattolillo, Ph.D., University of Sannio, Italy
Prof. Dr. George A. Papakostas, International Hellenic University, Greece
Prof. Dr. Huchang Luo, Sichuan University, China
Prof. Longquan Yong, Shaanxi University of Technology, China
Prof. Dr. Mahmoud Moghavi, University of Malaya, Malaysia
Prof. Ing. Mario Versaci, Università degli Studi di Reggio Calabria, Italy
Prof. Dr. Melchior Pierre, University of Bordeaux, France
Prof. Dr. Pascal Lorenz, University of Haute Alsace, France
Prof. Dr. Qiang Yang, Zhejiang University, China
Prof. Dr. Sanjay Misra, Covenant University, Nigeria
Prof. Dr. Sunder Singh, SLIT Longowal, India
Prof. Dr. Teddy Surya Gunawan, International Islamic University of Malaysia, Malaysia
Prof. Dr. Zhenyu Zhou, North China Electric Power University, China
Prof. Dr. Zita Vale, Instituto Politécnico do Porto, Portugal
Assoc. Prof. Dr. D. Jude Hemanth, Karunya University, India
Assoc. Prof. Dr. Hamed Moshall, The University of Guilan, Iran, Islamic Republic of
Assoc. Prof. Dr. Imran Sarwar Bajwa, Islamia University, Pakistan
Assoc. Prof. Dr. Jumril Yunus, Universiti Kebangsaan Malaysia, Malaysia
Assoc. Prof. Dr. Peng Zhang, University of Connecticut, United States
Assoc. Prof. Dr. Shahrin Md Ayub, Universiti Teknologi Malaysia, Malaysia
Asst. Prof. Dr. Andrea Francesco Morabito, University of Reggio Calabria, Italy
Asst. Prof. Dr. Domenico Cuorano, University of Naples Federico II, Italy
Dr. Abdullah M. Tiliyasu, Tokyo Institute of Technology, Japan
Dr. Adamu I. Abubakar, International Islamic University Malaysia, Malaysia
Dr. Ash-Hay Phan, Skolkovo Institute of Science and Technology (Skoltech), Russian Federation
Dr. Ararat Al-Dweik, Khalifa University, United Arab Emirates
Dr. Arcangelo Castiglione, University of Salerno, Italy
Dr. Ariane Mercatini, University of Rome 'Tor Vergata', Italy
Dr. Athanasios Kakarountas, University of Thessaly, Greece
Dr. Anelli Castiglione, University of Naples Parthenope, Italy
Dr. Griengrae Rajchakit, Maejo University, Thailand
Dr. Javed Iqbal, Sarhad University of Science and Information Technology, Pakistan
Dr. Khader Shameer, Mount Sinai Health System, United States
Dr. Lai Khin Wee, Universiti Malaysia, Malaysia
Asst. Prof. Dr. Makram A. Fakhri, University of Technology, Iraq
Mark S. Hooper, IEEE Consultants' Network of Silicon Valley, United States
Dr. Paolo Crippa, Università Politecnica delle Marche, Italy
Dr. Qammar Hussain Abbas, University of Glasgow, United Kingdom
Dr. Ramon J. Duran, University of Valladolid, Spain
Dr. Saleem Abdullah, Abdul Wali Khan University Mardan, Pakistan
Dr. Santhanakrishnan V. R. Anand, New York Institute of Technology, United States
Dr. Sudhanshu Tyagi, Thapar Institute of Engineering and Technology, India
Dr. Winai Jaikha, King Mongkut's Institute of Technology Ladkrabang, Thailand

USER

Username

Password

☐ Remember me

QUICK LINKS

- Editorial Boards
- Reviewers
- Author Guidelines
- Online Submission
- Policy of Plagiarism Screening
- Peer Review Process
- Publication Fee
- Abstracting and Indexing
- Repository Policy
- Scopus Add missing document
- Publication Ethics
- Visitor Statistics
- Contact Us

Q2 CiteScore Quartile in Electrical and Electronic Engineering

4.0

CiteScore

58th percentile

Powered by Scopus

JOURNAL CONTENT

Search

Search Scope

All

By Issue

By Author

By Title

Editorial Board Members

Assoc. Prof. Dr. Tossapon Boongoen, Mae Fah Luang University, Thailand
Prof. Dr. Samir Ladaci, National Polytechnic School of Constantine, Algeria
Assoc. Prof. Dr. Nicola Ivan Giannoccaro, University of Salerno, Italy
Prof. Dr. Imran Shafique Ansari, University of Glasgow, United Kingdom
Prof. Dr. Jia-Chin Lin, National Central University, Taiwan
Prof. Dr. Fateh Krim, Ferhat Abbas University of Setif, Algeria
Assoc. Prof. Dr. Mohd Ashraf Ahmad, Universiti Malaysia Pahang, Malaysia
Dr. Brij Bhoshan Gupta, National Institute of Technology Kurukshetra, India
Dr. Haruna Chirima, National Yunlin University of Science and Technology, Taiwan, Province of China
Assoc. Prof. Dr. Giovanni Pau, Kore University of Enna, Italy
Assoc. Prof. Dr. Candid Reig, University of Valencia, Spain
Assoc. Prof. Dr. Nik Rumzi Nik Idris, Universiti Teknologi Malaysia, Malaysia
Prof. Dr. Youssef Errami, University Chouaib Doukkali, Eljadida, Morocco
Prof. Dr. Faycal Djeflal, University of Batna, Batna, Algeria
Assoc. Prof. Dr. Jinsong Wu, Universidad de Chile, Chile
Dr. Auzani Jidin, Universiti Teknikal Malaysia Melaka, Malaysia
Assoc. Prof. Dr. Larbi Boubchir, University of Paris 8, France
Prof. Dr. Felix Abu, Valahia University of Targoviste, Romania
Prof. Dr. Tarek Bouktir, Ferhat Abbas University, Setif, Algeria
Dr. Lisandro Lovisolo, Universidade do Estado do Rio de Janeiro, Brazil
Dr. Kamil Dimiller, Near East University, Cyprus
Dr. Harish Chandra Dubey, Microsoft Corporation, United States
Dr. Thi-Lan Le, International Research Institute MICA, Viet Nam
Dr. Georgia Tseliou, Panepistimion Patron, Patra, Greece/European Patent Office (EPO), Netherlands
Dr. Vorapoj Patanavijit, Assumption University, Thailand
Dr. Abdurrahman Ennemed, Bright Star University, Libya
Dr. Taghi Javdani Gandomani, Shahrekord University, Iran, Islamic Republic of
Dr. Angelo Trotta, University of Bologna, Italy
Dr. Sushil S. Thale, Fr. C. Rodrigues Institute of Technology, India
Dr. Ying-Khai Teh, San Diego State University, United States
Prof. Salazar Addison, Universidad Politécnica de Valencia, Spain
Dr. Prasant Kumar Sahu, IIT Bhubaneswar, India
Dr. Thanh D. Nguyen, Banking University of Ho Chi Minh City, Viet Nam
Dr. Riza Muhida, University of Bandar Lampung, Indonesia
Dr. Jitendra Mohan, Jaypee Institute of Information Technology, India
Dr. Ebrahim Mattar, University of Bahrain, Bahrain
Dr. Pradeep Kumar, University of Kwazulu-Natal, South Africa
Dr. Taichen Chen, National Central University Taiwan, Taiwan, Province of China
Prof. Viranjan Mohan Srivastava, University of Kwazulu-Natal, South Africa
Prof. Pavan Kumar V. V., Vellore Institute of Technology - Andhra Pradesh (VIT-AP) University, India
Prof. Liza Abdul Latiff, Universiti Teknologi Malaysia, Malaysia
Dr. Zain Ismael Razman, Universiti Teknologi MARA, Malaysia
Dr. Zaid Abdi Alkareem Alyaseri, University of Kufa, Iraq
Dr. Reghunadhan Rajesh, Central University of Kerala, India
Dr. Dimitri Papadimitriou, University of Antwerp - imec, Belgium
Dr. Danilo Avola, Università degli Studi di Roma La Sapienza, Italy
Prof. Dr. Eros Passero, Politecnico di Torino, Italy
Dr. Abdalhossein Rezaei, ACECR, Iran, Islamic Republic of
Dr. Karthikeyan Ramasamy, M.Kumarasamy College of Engineering, Karur, TamilNadu, India., India
Dr. Kennedy O. Okokouje, Covenant University, Nigeria
Dr. Syed Manzoor Qasim, King Abdulaziz City for Science and Technology, Saudi Arabia
Dr. Sébastien Lallechère, Université Clermont Auvergne, France
Prof. Mohammed I. Alghamdi, Al-Baha University, Saudi Arabia
Prof. Dr. Eric Renault, UICM, Université Gustave Eiffel, CNRS, ESIEE Paris, France
Prof. Dr. Leo P. Ligthart, Delft University of Technology, Netherlands
Prof. Dr. Mohammad Faz Liew Bin Abdullah, Universiti Tun Hussein Onn Malaysia, Malaysia
Prof. Ming-Fong Tsai, National United University, Taiwan, Province of China
Prof. Dr. Yongmin Zhang, Central South University, China
Prof. Dimitrios Chrysostomou, Aalborg University, Denmark
Prof. Young-Long Chen, National Taichung University of Science and Technology, Taiwan
Dr. Carlo Massaroni, Unistà Campus Bio-Medico di Roma, Italy
Dr. Muhammad Zeeshan Shakir, University of the West of Scotland, United Kingdom

Dr. Min Keng Tan, Universiti Malaysia Sabah, Malaysia
Dr. Chrysovalantou Ziogou, Centre for Research and Technology Hellas, Greece
Dr. Nuri Yilmazer, Texas A&M University-Kingsville, United States
Dr. Quoc-Tuan Vien, Middlesex University, United Kingdom
Dr. Vasco N. G. J. Soares, Polytechnic Institute of Castelo Branco, Instituto de Telecomunicações, Portugal
Dr. Ashkan Sami, Shiraz University, Iran, Islamic Republic of
Dr. Ahmed Toaha Mobashsher, The University of Queensland, Australia
Dr. Md Jan Nordin, Universiti Kebangsaan Malaysia, Malaysia
Dr. Nafarizal Nayan, Universiti Tun Hussein Onn Malaysia, Malaysia
Dr. Mohd Yusoff Mashor, Universiti Malaysia Perlis (UNIMAP), Malaysia
Alireza Ghasempour, University of Applied Science and Technology, United States
Dr. Haikal El Abed, Technical Trainers College (TTC), Saudi Arabia
Dr. Dinh-Thuan Do, Wireless Communications Research Group, Ton Duc Thang University, Viet Nam
Prof. Ahmed El Oualkadi, Abdelmalek Essaadi University, Morocco
Dr. Hanikumar Rajaguru, Bannari Amman Institute of Technology, India
Dr. Nuno Rodrigues, Instituto Politécnico de Bragança, Portugal
Dr. Marco Pellegrini, LIF Srl, Italy
Prof. Carlos Machado Ferreira, Instituto Superior de Engenharia de Coimbra, Portugal
Prof. Felix J. Garcia Clemente, University of Murcia, Spain
Prof. Dr. Hussain Al-Ahmad, University of Dubai, United Arab Emirates
Prof. Chao Hsien Lee, National Taipei University of Technology, Taiwan
Prof. Dr. Mirosław Swiercz, Politechnika Białostocka, Poland
Prof. Dr. Media Anugerah Ayu, Sampoerna University, Indonesia
Prof. Dr. Omar Lengerke, Universidad Autónoma de Bucaramanga, Colombia
Prof. Dr. Srinivasan Alavandar, CK College of Engineering and Technology, India
Assoc. Prof. Dr. Luchakorn Wuttisittikulij, Chulalongkorn University, Thailand
Assoc. Prof. Dr. Mochammad Facta, Diponegoro University, Indonesia
Assoc. Prof. Dr. Mohamed Arezki Mellal, M'Hamed Bougara University, Algeria
Assoc. Prof. Dr. Naziha Ahmad Azli, Universiti Teknologi Malaysia, Malaysia
Asst. Prof. Dr. Supavadee Aramvith, Chulalongkorn University, Thailand
Dr. Achmad Widodo, Universitas Diponegoro, Indonesia
Dr. Sandeep Saxena, Galgotias College of Engineering and Technology Greater Noida (U.P), India
Asst. Prof. Dr. Mohammed I. Younis, University of Baghdad, Iraq
Dr. Azian Azamimi Abdullah, Universiti Malaysia Perlis, Malaysia
Dr. Ahmed Elmisery, University of South Wales, United Kingdom
Dr. Maria Chiara Caschera, CNR IRPPS, Italy
Dr. Azura Che Soh, Universiti Putra Malaysia, Malaysia
Dr. José Alfredo Ferreira Costa, Universidade Federal do Rio Grande do Norte, Brazil
Dr. Tianhua Xu, University of Warwick, United Kingdom
Dr. Petru Adrian Cotfas, Transilvania University of Brasov, Romania
Dr. Sorin Ioan Deaconu, Politechnica University Timisoara, Romania
Dr. Denis Stiawan, Universitas Sriwijaya, Indonesia
Dr. Ke-Lin Du, Concordia University, Canada
Dr. Farhan Aadil, COMSATS Institute of Information and Technology, Pakistan
Dr. Vicente García Díaz, University of Oviedo, Spain
Dr. Mihai Gavrilas, Technical University of Iasi, Romania
Dr. Abdelfatteh Haidine, ENSA El Jadida - University Chouaib Doukkali, Morocco
Dr. Hazura Haroon, Universiti Teknikal Malaysia Melaka, Malaysia
Dr. Jacek Stando, Technical University of Lodz, Poland
Dr. Nisheeth Joshi, Banasthali University, India
Dr. Iakov S. Korovin, Southern Federal University, Russian Federation
Dr. Karl R. P. H. Leung, Hong kong Institute of Vocational Education, Hong Kong
Dr. Luca Di Nunzio, University of Rome Tor Vergata
Dr. Munawar A Riyadi, Universitas Diponegoro, Indonesia
Dr. Rostam Affendi Hamzah, Universiti Teknikal Malaysia Melaka, Malaysia
Dr. Youssef Said, Tunisie Telecom Sys'Com Lab, National Engineering School of Tunis (ENIT), Tunisia

TELEKOMNIKA Telecommunication, Computing, Electronics and Control

ISSN: 1693-6930, e-ISSN: 2302-9293

[Universitas Ahmad Dahlan](#), 4th Campus

Jl. Ringroad Selatan, Kragilan, Tamanan, Banguntapan, Bantul, Yogyakarta, Indonesia 55191

Phone: +62 (274) 563515, 511830, 379418, 371120

Fax: +62 274 564604

04629961

Home > Archives > Vol 22, No 5

Vol 22, No 5

October 2024

DOI: <http://doi.org/10.12928/telkomnika.v22i5>

Table of Contents

Design of high gain and wideband circular patch antenna based on DGS for 28 GHz 5G applications	PDF
Md. Sohel Rana, Md. Nahid Hasan, Mohammad Faisal, Md Emran Khan	1053-1060
Performance analysis of circular polarization X-band microstrip patch antenna combined with conical horn	PDF
B. Pratiknyo Adi Mahatmanto, Dedi Irawadi, Hidayat Gunawan, Nugroho Widi Jatmiko, Dinari Nikken Sulastrie Sirin, Supriyono Supriyono, Suhermanto Suhermanto, Bambang Dewandaru, Catur Apriono	1061-1072
Graphene based terahertz patch antenna for breast tumor detection	PDF
Lia Moni, Md. Saniat Rahman Zishan, Sumit Hassan Eshan, Raja Rashidul Hasan	1073-1082
Effective capacity analysis of full-duplex-cooperative non-orthogonal multiple access systems	PDF
Huu Quy Tran, Samarendra Nath Sur	1083-1091
Feature selection to improve distributed denial of service detection accuracy using hybrid N-Gram heuristic techniques	PDF
Andi Maslin, Abdul Hamid, Dedy Fitriawan, Anggia Dasa Putri, Tukino Tukino	1092-1103
The causal loop diagram model of traceability system rental equipment in oil and gas supporting companies	PDF
Asep Endih Nurhidayat, Rina Fitriana, Didien Suhardini, Asri Nugrahanti	1104-1112
Augmented reality in customer experience: systematic review	PDF
Christian Cervantes, Sussy Bayona-Ord, Nicolás Pintado Torre	1113-1127
Optimizing multi-tenant database architecture for efficient software as a service delivery	PDF
Sanjeev Kumar Pippal, Sumit Kumar, Ruchi Rani	1128-1137
Navigating the digital shift: a service blueprint for coopetition technology-enabled networks	PDF
Agostinho da Silva, Antonio J. Marques Cardoso	1138-1146
Video semantic segmentation with low latency	PDF
Channappa Gowda D. V., Kanagavalli R.	1147-1156
MDI and PI XGBoost regression-based methods: regional best pricing prediction for logistics services	PDF
Agus Purnomo, Aji Gaudama Putra, Roni Habibi, Syafrizanta Syafrizanta	1157-1166
SYNDIAG: an expert system for disease syndrome diagnosis of traditional Vietnamese medicine	PDF
Truong Hong Thu, Ha Manh Toan, Vu Tung Lam, Nguyen Hoang Phuong	1167-1177
Leveraging of recurrent neural networks architectures and SMOTE for dyslexia prediction optimization in children	PDF
Yuri Pamungkas, Muhammad Rifqi Nur Ramadani	1178-1186
A high accuracy of deep learning based CNN architecture: classic, VGGNet, and ResNet50 for Covid-19 image classification	PDF
Ibnu Utomo Wahyu Mulyono, Eko Hari Rachmawanto, Christy Abika Sari, Md Kamruzzaman Sarker	1187-1195
3D word embedding vector feature extraction and hybrid CNN-LSTM for natural disaster reports identification	PDF
Mohammad Reza Faisal, Dodon Turlinto Nugrahadi, Irwan Budiman, Mulladi Mulladi, Mera Kartika Delimayanti, Septyan Eka Prastyta, Imam Tahyuddin	1196-1208
Enhancing melanoma skin cancer classification through data augmentation	PDF
Mohammed MThamed, Mohammed Merzoug, Mourad Hadjila, Amina Bekkouch	1209-1220
Analysis comparison, calibration, and application of low-cost soil moisture in smart agriculture based on internet of things	PDF
Beny Agustirandi, Inayatul Inayah, Nina Siti Aminah, Maman Budiman	1221-1230
Analysis comparison, calibration, and application of low-cost soil moisture in smart agriculture based on internet of things	PDF
Beny Agustirandi, Inayatul Inayah, Nina Siti Aminah, Maman Budiman	1221-1230
Smart hydroponic agriculture using genetic algorithm based k-nearest neighbors	PDF
Budi Sutrisno, Nico Surantha	1231-1238
Progressive energy management technique for smart load control	PDF
Timilehin Sanni, Mobolade Olawale, Amarachi Attah, Anthony Adoghe, Ayokunle Awelewa	1239-1248
Enhanced matrix-based error correction coding techniques for embedded memories	PDF
Jammula Shrivani, Mandadi Shankar Teja Teja, Manickaraj Vinodhini	1249-1256
Study of ISFET sensitivity to pH variations using Silvaco TCAD	PDF
Nur Afiqah Hani Senin, Anis Suhaila Mohd Zain, Fauziyah Salehuddin, Hazura Haroon, Ahmed Musa Dinar, Norwahidah Abdul Karim	1257-1268
Class-G series audio power amplifier for subwoofer	PDF
Budihardja Murtianta, Darmawan Utomo, Atyanta Nika Rumaksari, Jae-Wook Lee	1269-1279
ANN-based design of miniaturized circular dual-band 4x4 MIMO antenna for 28/38 GHz 5G mmWave applications	PDF
Lahcen Sellak, Asma Khabba, Samira Chabaa, Saïda Ibnyach, Athmane Baddou, Abdelouhab Zeroual, Tole Sutikno	1280-1292
Increasing the perovskite cell performance using comparative layering method between PTAA and PEDOT: PSS layers	PDF
Vahdat Nazarian, Mehran Hossainzadeh Dizaj, Amir Assari, Shahed Chehrdoust Shishvan, Fatemeh Shahnavaz, Tole Sutikno	1293-1301
Observer-based single-phase robustness sliding mode controller for the pitch control of a variable speed wind turbine	PDF
Cong-Trang Nguyen, Chiem Trong Hien, Van-Duc Phan	1302-1309
A highly effective and simplified DPWM algorithm for NPC inverters for high power factor load applications	PDF
Duc Hung Nguyen, Minh-Duc Pham, Nho Van Nguyen	1310-1319
A contrived dataset of substation automation for cybersecurity research in the smart grid networks based on IEC61850	PDF
John Edet Efiog, Jide Ebenezer Taiwo Akinsola, Bodunde Odunola Akinyemi, Emmanuel Ajayi Olajubu, Gariyu Adesola Aderounmu	1320-1330

TELKOMNIKA Telecommunication, Computing, Electronics and Control

ISSN: 1693-6930, e-ISSN: 2302-9295

Universitas Ahmad Dahlan, 4th Campus

Jl. Ringroad Selatan, Kragilan, Tamanan, Banguntapan, Bantul, Yogyakarta, Indonesia 55191

Phone: +62 (274) 563515, 511830, 379418, 371120

Fax: +62 274 564604

04629957

USER

Username:

Password:

☐ Remember me

[Login](#)

QUICK LINKS

- Editorial Boards
- Reviewers
- **Author Guidelines**
- **Online Submission**
- Policy of Plagiarism Screening
- **Peer Review Process**
- **Publication Fee**
- Abstracting and Indexing
- Repository Policy
- Scopus: Add missing document
- Publication Ethics
- Visitor Statistics
- Contact Us

Q2 CiteScore Quartile in Electrical and Electronic Engineering

4.0

2023
CiteScore

58th percentile

Powered by **Scopus**

JOURNAL CONTENT

Search:

Search Scope:

All

[Search](#)

Bi

The Causal Loop Diagram (CLD) Model of Traceability System Rental Equipment in Oil and Gas Supporting Companies

Asep Endih Nurhidayat¹, Rina Fitriana²

^{1,2}Department of Industrial Engineering, Industrial Technology Faculty, Universitas Trisakti, Jakarta, Indonesia

Article Info

Article history:

Received month dd, yyyy

Revised month dd, yyyy

Accepted month dd, yyyy

Keywords:

Traceability

Supply Chain

Rental Equipment

ABSTRACT

In carrying out the equipment rental business process in oil and gas supporting companies, there is often an imbalance in terms of efficiency which causes customer complaints, decreased Request For Quotation, high handling and breakdown costs. So this has a direct impact on decreasing sales and profits. The aim of this research is to find out what factors influence the system so that it can improve the efficiency of running business processes. In problem solving, the first thing to do is identify the variables related to the system, design a rich picture diagram to briefly describe the system, then create an influence diagram to see the relationships that occur in the variables, then create a Causal Loop Diagram modeling (CLD) produces dynamic factors related to cause and effect problems that influence the traceability system implemented in the Company. The results obtained are that to increase Request For Quotation you must pay attention to the level of efficiency, customer satisfaction and rental prices. High rental prices are influenced by maintenance costs and high equipment prices which also have an impact on decreasing efficiency and customer satisfaction. If rental prices are low it will increase efficiency and customer satisfaction which has a direct effect on profits and sales.

This is an open access article under the [CC BY-SA](#) license.



Corresponding Author:

Asep Endih Nurhidayat

Industrial Engineering Doctoral Program, Trisakti University, Jakarta, Indonesia

Email: annoerhidayat@gmail.com

1. INTRODUCTION

The Industrial Revolution and globalization provide challenges as well as opportunities for companies operating in it. To be able to survive and win the competition, companies need to make plans by turning existing challenges into opportunities for business [1]. All companies engaged in industrial activities will compete with each other to get customers to sell the products they produce. One of them is the oil and gas industry, where this industry is one of the largest contributors of foreign exchange to the country and its scope is very broad, from upstream to downstream activities. To increase customer satisfaction in the OIL and Gas industry, what must be considered is maintaining service quality[2].

Quality is a dynamic condition related to products, people/labor, processes and tasks, and the environment that meets or exceeds customer or consumer expectations. [3]. From this understanding, the meaning of service quality can be concluded that quality is relative because it is dynamic depending on the satisfaction of each service user. Service quality is determined by two things: expected service and perceived service. Expected service and perceived service are determined by the dimension of service quality [4] consisting of :

1. Tangibles: Appearance of physical facilities, equipment, personnel, and communication materials

2. Reliability: The ability to perform promised services reliably and accurately
3. Responsiveness: Willingness to help customers and fast service
4. Assurance: employee knowledge and courtesy and their ability to convey trust and confidence
5. Empathy: The company provides individual attention and attention to its customers.

The development of Outsourcing strategic management in the OIL and Gas industry is increasingly receiving attention because of its potential and has recently become one of the most popular alternatives [5]. This strategy is to solve several problems in the Oil and Gas industry, which has developed in scope, from resource sharing to the need for advanced technology [6]. The implementation of outsourcing by oil and gas companies was previously considered critical and strategic and very risky if handed over to external companies (work partners), but is now made easier by the many companies or supporting services available on the market.

Oil and Gas (Oil and Gas) supporting services companies operate in business activities that provide upstream and downstream oil and gas services. These supporting service activities consist of oil and gas construction and non-oil and gas construction services. The oil and gas construction services business is a service for handling building or construction work or other physical forms that aim to support oil and gas business activities. Oil and gas construction services consist of construction planning services including design and engineering (design engineering), construction implementation (EPC, installation and commissioning) and construction supervision. Meanwhile, non-construction oil and gas services are work services other than construction services to support oil and gas businesses such as seismic and non-seismic surveys, demolition, inspection, underwater work and other services.

In oil and gas construction work, one thing that is often needed is the availability of equipment to carry out construction or maintenance projects at the project site. Usually, oil and gas companies for this equipment use equipment owned by contractor service companies or in other words, oil and gas companies rent equipment to contractor service companies. By renting equipment, there are many obstacles faced, both from the equipment rental company and also from the renting company. Savin et al. in [7] provides an overview of the rental company's business model "the company invests in equipment that has potential demand, and a flow of customers subscribes to the company, renting out its equipment. After each rental, the equipment is returned to the company, and the rental duration is usually much shorter than the life of the equipment, so each unit can be used repeatedly." It can be seen that running an equipment rental business has great potential and opportunities, but it cannot be denied that the initial investment is expensive and requires a large amount of capital.

In the business processes carried out by oil and gas supporting companies, problems are usually found, including frequent damage to equipment while in the field, equipment specifications that do not match what consumers need and there are even loss of equipment. These problems result in the company's performance decreasing which results in complaints from customers and increased handling costs. Apart from that, there is often an imbalance in terms of efficiency which causes customer complaints, decreased Request For Quotation, high handling costs and breakdowns. So this has a direct impact on decreasing sales and profits.

To reduce various problems in equipment rental activities, the use of information technology in the form of implementing a traceability system is a very important tool for the Company in carrying out the equipment tracking process both before the rental is carried out, during the rental process and until completion of the rental. The treasury system also aims to increase security and effectiveness in the equipment rental process. A good traceability system is able to minimize poor and unsafe material quality in the supply chain [8]. Sistem *Traceability* sangat bergantung pada rekaman informasi. Diperlukan mekanisme yang kuat untuk memfasilitasi pengumpulan dan otentikasi informasi apa pun, agar dapat diperbarui dan dibagikan melalui rantai pasokan [9].

From this research it is hoped that it can answer; What variables are related to the system? What are the relationships between variables that are cause and effect? And to increase the level of efficiency, what main factors must be considered? To analyze problems that occur, it is done using systems thinking, consisting of three kinds of things: elements (in this case characteristics), interconnections (how these characteristics relate to and/or provide feedback to each other), and function or purpose. In particular, the most invisible part of a system, namely its function or purpose, is often the most crucial part of determining system behavior. While not all systems have clear goals or objectives, systems thinking does [10]. Systems Thinking is equipped with tools to understand the basics and principles of dynamic decision making [11], while the methodology in this case is a set of modeling and learning technology used in Systems Thinking [12]. Modeling will be used to understand the structure of a system, and show how changes in one area will impact the entire system and all its constituents at a certain time. [13].

To find out environmental factors that are variables that are value-free but have certain behavioral patterns, that is, if a variable changes, it will influence other variables according to the behavioral pattern. [14]. Causal loop diagrams highlight the core elements of a system, and the system behavior that emerges from their

interactions [15]. Visualize factors, relationships and how they influence each other in a system. The relationship can be positive – when A increases, B also increases, or when A decreases, B also decreases – and is illustrated with a blue arrow and a '+' symbol; or negative – when A increases, B decreases, or when A decreases, B increases – and is illustrated with a red arrow and a '-' symbol [16], [17]. Factors and relationships form a series of close causal relationships, known as 'feedback loops'. [18]. The aim of this research is to determine the impact of dynamic factors related to cause and effect problems that influence the traceability system implemented in oil and gas supporting companies using the Causal Loop Diagram (CLD) model.

2. METHOD

This research uses a descriptive method with a qualitative approach because it requires an understanding of what happens in the business processes in the traceability rental equipment system run by oil and gas supporting companies. The flow of this research is as follows:

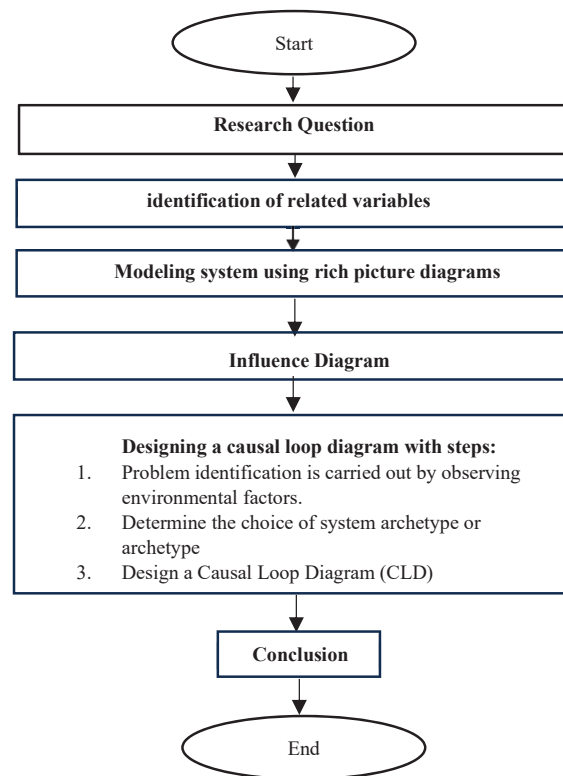


Figure 1. Flow chart

Apart from that, it is also necessary to understand how far efforts have been made to improve the quality of business processes. The following are the system stakeholders in this research :

1. Problem Owner: Company owner
2. Problem Solver: Project Manager, IT development
3. Problem Customer: Oil and Gas Companies
4. Problem User: Operational Department. Technician, Equipment user (customer)

3. RESULTS AND DISCUSSION

3.1. Rich Picture Diagram

The goal of creating a rich picture is to capture, informally, the main entities, structures, and points of view in a situation, ongoing processes, current known problems, and any potential [19]. The rich picture for traceability of equipment in OIL and Gas Companies can currently be seen in the image below:

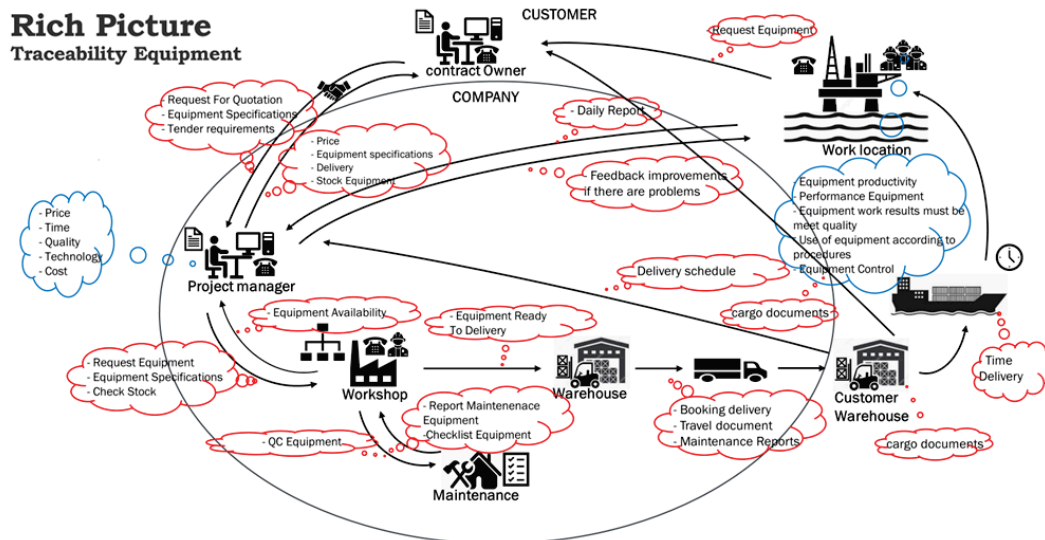


Figure 2. Rich Picture Diagram

3.2. Influence Diagram

Creating an Influence Diagram aims to describe the relationship and influence between components involved in the system [20]. The Influence Diagram from this research can be seen as follows:

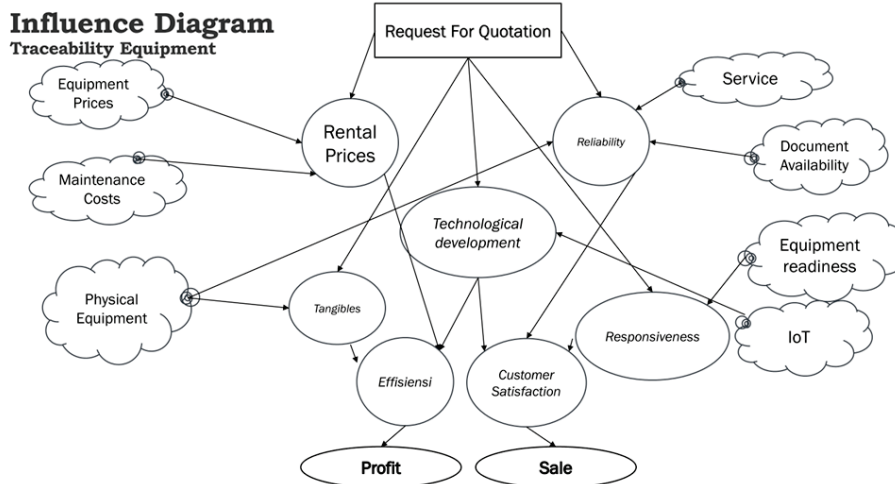


Figure 3. Influence Diagram

3.3. Causal Loop Diagram (CLD)

The CLD model is a model that is widely used in solving problems with a system approach that considers the dynamic complexity of the system or to support a dynamic system approach [21], [22], [23]. The CLD model emphasizes its attention to the cause and effect relationship between components between the factors that are influenced in a diagram in the form of a curved line ending with an arrow that connects the system components to each other. [24]. Data analysis uses a causal loop diagram (CLD) using the following process [25]:

1. Problem identification is carried out by observing environmental factors that have a direct or indirect influence on ongoing business processes.
2. Determine the choice of system archetype or archetype, namely the Limit to Success (Growth) archetype pattern, remembering that business processes at a certain point will experience obstacles to growth due to various reasons
3. Design a Causal Loop Diagram (CLD). After obtaining the relationship between various variables and the company's service quality, a Loop diagram was prepared using the Vensim application program.

CLD modeling, using the Vensim PLE v.32 (Vensim32) software program as a tool in describing the CLD. With the following process:

1. Identify Causal Loop Diagram (CLD) Variables

Based on environmental observations that have been described in the observation findings, it can be concluded that there are 17 internal and external service factors. These environmental factors are transformed into variables that are value-free but have certain behavioral patterns, that is, if a variable changes, it will influence other variables according to its behavioral pattern. The selected variables are as follows:

- a. Request For Quotation
- b. Efficiency
- c. Customer Satisfaction
- d. Rental Prices
- e. Tangibles
- f. Technological development
- g. Reliability
- h. Responsiveness
- i. Equipment prices
- j. Maintenance cost
- k. Physical equipment
- l. IoT
- m. Services
- n. Availability
- o. Equipment readiness
- p. Profit
- q. sales

2. Determining the basic pattern of the system or Archetype Limit to Success (Growth) pattern.

From the variables mentioned above, one reinforcing loop and one balancing loop can be described. The basic pattern can be seen as in Figure as follows:

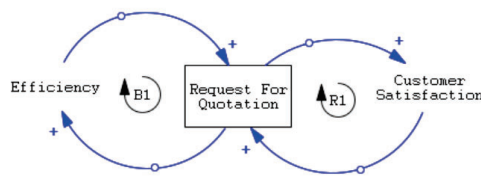


Figure 4. Pola Aarchytype

The higher the Request for Quotation, the higher the level of customer satisfaction, which becomes a reinforcing loop, namely a loop that encourages growth. The higher the Request for Quotation, the higher the demand for efficiency, but with weak efficiency, this will result in a decrease and even result in a reduction in the Request for Quotation given. This situation becomes a balancing loop, namely a loop that limits the growth process. This condition will give rise to a behavior graph / Behavior Over Time / BOT.

3. Causal Loop Diagram (CLD)

Based on the basic pattern above and the selected variables, the Causal Loop Diagram (CLD) modeling is as follows:

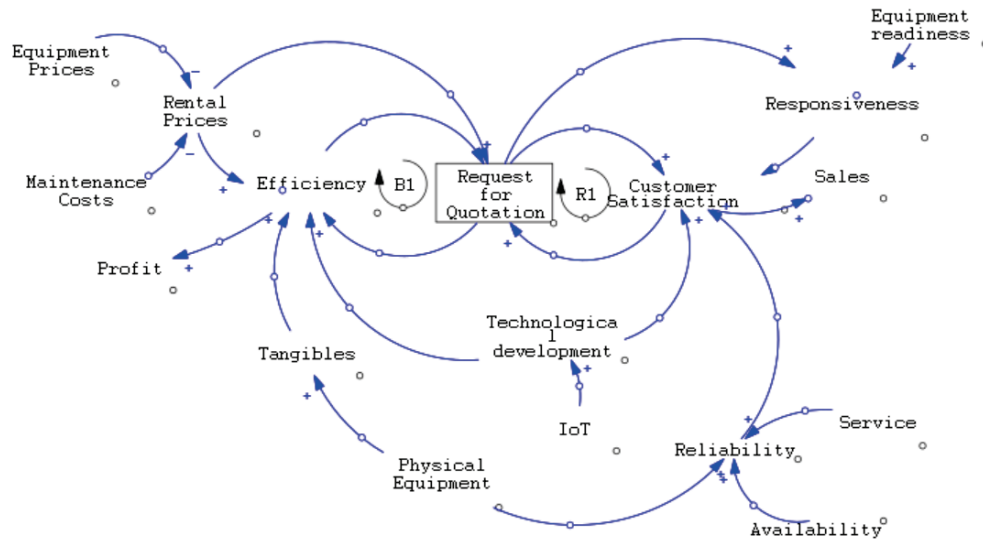


Figure 5. Causal Loop Diagram (CLD)

Tabel 1 Table of Cause and Effect

No	Factor	Cause and effect
1	Request For Quotation	Positive Influential to the increase in Efficiency, Customer Satisfaction
2	Efficiency	Positive Influential to the increase in Rental Prices and Tangibles
3	Customer Satisfaction	Positive Influential to the increase in Technological development, Responsiveness, Reliability
4	Rental Prices	Positive Influential to the decline in Equipment prices, Maintenance cost
5	Tangibles	Positive Influential to the increase in Physical equipment
6	Technological development	Positive Influential to the increase in IoT
7	Reliability	Positive Influential to the increase in Physical equipment, Services, Availability
8	Responsiveness	Positive Influential to the increase in Equipment readiness
9	Equipment prices	Negative Influence on Rental Prices
10	Maintenance cost	Negative Influence on Rental Prices
11	Physical equipment	Positive Influential to the increase in Reliability, Tangibles
12	IoT	Positive Influential to the increase in Technological development
13	Services	Positive Influential to the increase in Reliability
14	Availability	Positive Influential to the increase in Reliability
15	Equipment readiness	Positive Influential to the increase in Responsiveness
16	Profit	Positive Influential to the increase in
17	sales	Positive Influential to the increase in Customer Satisfaction

4. CONCLUSION

Problem solving carried out using the Causal Loop Diagram (CLD) model produces dynamic factors related to cause and effect problems that influence the traceability system implemented in the Company. To increase Request For Quotation, you must pay attention to the level of efficiency, customer satisfaction, and rental prices. High rental prices are influenced by maintenance costs and high equipment prices which also have an impact on decreasing efficiency and customer satisfaction. If the rental price is low it will increase efficiency and customer satisfaction which has a direct effect on profits and sales. Besides that, there are other variables that must be considered, such as tangibles, reliability, responsiveness, technological development, etc. which also influences the Request For Quotation. The results obtained are in the form of a Causal Loop

Diagram (CLD) model which functions as a strategic effort in order to improve the quality and efficiency of oil and gas supporting companies..

REFERENCES

- [1] R. Castagnoli, G. Büchi, R. Coeurderoy, dan M. Cugno, "Evolution of industry 4.0 and international business: A systematic literature review and a research agenda," *Eur. Manag. J.*, vol. 40, no. 4, hal. 572–589, 2022, doi: 10.1016/j.emj.2021.09.002.
- [2] M. T. Bebas, "Improving The Quality of Service In The Libyan Oil Sector: A Theoretical Assessment," *Quantrade J. Complex Syst. Soc. Sci.*, vol. 5, no. 1, hal. 17–22, 2023, doi: 10.5281/zenodo.8083998.
- [3] D. Wathanaklang, S. Jomnonkwao, T. Champahom, dan P. Wisutwattanasak, "Exploring accessibility and service quality perceptions on local public transportation in Thailand," *Case Stud. Transp. Policy*, vol. 15, no. December 2023, hal. 101144, 2024, doi: 10.1016/j.cstp.2023.101144.
- [4] H. Vilarinho, M. A. Pereira, G. D'Inverno, H. Nóvoa, dan A. S. Camanho, "Water Utility Service Quality Index: A customer-centred approach for assessing the quality of service in the water sector," *Socioecon. Plann. Sci.*, vol. 92, no. December 2023, hal. 101797, 2024, doi: 10.1016/j.seps.2023.101797.
- [5] K. Gideon, "Outsourcing in the Oil and Gas Industry – A Case Study of Norway," hal. 44–53, 2015, [Daring]. Tersedia pada: <https://dergipark.org.tr/en/pub/quantrade>
- [6] Q. Zhang, J. F. Liu, Z. H. Gao, S. Y. Chen, dan B. Y. Liu, "Review on the challenges and strategies in oil and gas industry's transition towards carbon neutrality in China," *Pet. Sci.*, vol. 20, no. 6, hal. 3931–3944, 2023, doi: 10.1016/j.petsci.2023.06.004.
- [7] P. Coelho, C. Silva, L. M. Ferreira, dan B. Franca, "Operational improvement of an industrial equipment rental system using discrete event simulation," *IFAC-PapersOnLine*, vol. 51, no. 11, hal. 478–483, 2018, doi: 10.1016/j.ifacol.2018.08.364.
- [8] M. M. Aung dan Y. S. Chang, "Traceability in a food supply chain: Safety and quality perspectives," *Food Control*, vol. 39, no. 1, hal. 172–184, 2014, doi: 10.1016/j.foodcont.2013.11.007.
- [9] F. Fessenmayr, M. Benfer, P. Gartner, dan G. Lanza, "Selection of traceability-based, automated decision-making methods in global production networks," *Procedia CIRP*, vol. 107, no. March, hal. 1349–1354, 2022, doi: 10.1016/j.procir.2022.05.156.
- [10] R. D. Arnold dan J. P. Wade, "A definition of systems thinking: A systems approach," *Procedia Comput. Sci.*, vol. 44, no. C, hal. 669–678, 2015, doi: 10.1016/j.procs.2015.03.050.
- [11] N. U. I. Hossain, V. L. Dayarathna, M. Nagahi, dan R. Jaradat, "Systems thinking: A review and bibliometric analysis," *Systems*, vol. 8, no. 3, hal. 1–26, 2020, doi: 10.3390/systems8030023.
- [12] D. V. Behl dan S. Ferreira, "Systems thinking: An analysis of key factors and relationships," *Procedia Comput. Sci.*, vol. 36, no. C, hal. 104–109, 2014, doi: 10.1016/j.procs.2014.09.045.
- [13] D. H. Kim, *Systems Thinking Tools: A User's Reference Guide Systems Archetypes I: Diagnosing Systemic Issues and Designing High-Leverage Interventions Systems*. 2000. [Daring]. Tersedia pada: <https://thesystemsthinker.com/wp-content/uploads/2016/03/Systems-Thinking-Tools-TRST01E.pdf>
- [14] M. Rifaldi, M. Zid, dan B. Sumargo, "Causal Loop Diagram As Approaching Model Analysis in Increasing the Waste Volume At the Covid19 Pandemic Period," *J. Kesehatan. Lingkungan*, vol. 13, no. 3, hal. 180–185, 2021, doi: 10.20473/jkl.v13i3.2021.180-185.
- [15] R. Iannone, G. Martino, S. Miranda, dan S. Riemma, "Modeling Fashion Retail Supply chain through causal loop diagram," *IFAC-PapersOnLine*, vol. 28, no. 3, hal. 1290–1295, 2015, doi: 10.1016/j.ifacol.2015.06.263.
- [16] V. R. Coletta *et al.*, "Causal Loop Diagrams for supporting Nature Based Solutions participatory design and performance assessment," *J. Environ. Manage.*, vol. 280, hal. 111668, 2021, doi: 10.1016/j.jenvman.2020.111668.
- [17] N. Dhiraasna dan O. Sahin, "A multi-methodology approach to creating a causal loop diagram," *Systems*, vol. 7, no. 3, 2019, doi: 10.3390/systems7030042.
- [18] G. Crabolu, X. Font, dan S. Eker, "Evaluating policy complexity with Causal Loop Diagrams," *Ann. Tour. Res.*, vol. 100, hal. 103572, 2023, doi: 10.1016/j.annals.2023.103572.
- [19] P. Checkland dan J. Poulter, "Soft Systems Methodology," *Researchgate.Net*, vol. 10, no. 1, hal. 54–75, 2020.
- [20] S. Basnet, A. BahooToroody, J. Montewka, M. Chaal, dan O. A. Valdez Banda, "Selecting cost-effective risk control option for advanced maritime operations; Integration of STPA-BN-Influence diagram," *Ocean Eng.*, vol. 280, no. April, hal. 114631, 2023, doi: 10.1016/j.oceaneng.2023.114631.
- [21] H. Vermaak, "Using causal loop diagrams to deal with complex issues mastering an instrument for systemic and interactive change," *Consult. Organ. Chang. Revisit.*, hal. 231–254, 2016.
- [22] R. Fitria, H. Rahmayanti, dan B. Sumargo, "The causal loop diagram model of flood management system based on eco-drainage concept," *Sustinere J. Environ. Sustain.*, vol. 6, no. 3, hal. 185–196, 2023, doi: 10.22515/sustinerejes.v6i3.243.
- [23] T. M. Toole, "A project management causal loop diagram," *Assoc. Res. Constr. Manag. ARCOM 2005 - Proc. 21st Annu. Conf.*, vol. 2, no. April, hal. 763–772, 2005.
- [24] Husain, M. Zarlis, H. Mawengkang, dan S. Efendi, "Causal Loop Diagram (CLD) Model in Planning A Sustainable Smart Sharia Tourism," *J. Phys. Conf. Ser.*, vol. 1641, no. 1, 2020, doi: 10.1088/1742-6596/1641/1/012099.
- [25] T. M. Toole, "A project management causal loop diagram," *Assoc. Res. Constr. Manag. ARCOM 2005 - Proc. 21st Annu. Conf.*, vol. 2, no. September, hal. 763–772, 2005.

BIOGRAPHIES OF AUTHORS

	Asep Endih Nurhidayat   received the B.Eng. degree in Industrial Engineering from Institut Teknologi Indonesia, Tangerang, Indonesia, in 2006, and the master's degree in Industrial Engineering from Universitas Mercubuana, Jakarta, Indonesia, in 2011, respectively. He also lecturer, Department of Industrial Engineering, Universitas Indraprasta PGRI. He can be contacted at email: aennoerhidayat@gmail.com
	Rina Fitriana   received the B.Eng. degree in Industrial Engineering from Trisakti University, Indonesia, in 1998, and the master's degree in Operation management from Sekolah Tinggi Manajemen PPM, Jakarta, Indonesia, in 2000, Doctoral degree in Agricultural Industrial Technology. she can be contacted at email: rinaf@trisakti.ac.id

CERTIFICATE

No. 26084/TELKOMNIKA/A/10/2024

TELKOMNIKA (Telecommunication Computing Electronics and Control)

is hereby awarding this certificate to

Asep Endih Nurhidayat, Rina Fitriana, Didien Suhardini, Asri Nugrahanti

as **Author(s)** for paper entitled

The causal loop diagram model of traceability system rental equipment in oil and gas supporting companies

October 1, 2024

