

RINA FITRIANA

## Business intelligence system model to measure the performance of lecturers' scientific publications

Pengarang Yun-Chia Liang Miwan Kurniawan Hidayat, Dedy Sugiarto, Rina Fitriana

Tanggal terbit 2025/8/1

Jurnal Telkomnika

Jilid 23

Terbitan 4

Halaman 954-964

Penerbit Universitas Ahmad Dahlan

Artikel Scholar [Business intelligence system model to measure the performance of lecturers' scientific publications \\*](#)  
MK Hidayat, D Sugiarto, R Fitriana, YC Liang - TELKOMNIKA (Telecommunication Computing ..., 2025  
[Artikel terkait](#) 3 versi



Dedy Sugiarto

## Business intelligence system model to measure the performance of lecturers' scientific publications

[PDF] dari uad.ac.id

Pengarang Miwan Kurniawan Hidayat, Dedy Sugiarto, Rina Fitriana, Yun-Chia Liang

Tanggal terbit 2025/8/1

Jurnal TELKOMNIKA (Telecommunication Computing Electronics and Control)

Jilid 23

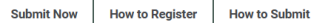
Terbitan 4

Halaman 954-964

Deskripsi Scientific publication data is sourced from the SINTA website to measure the performance of journals, institutions, and researchers in Indonesia. Accessing and analyzing data for institutional needs is restricted, and lecturer development patterns based on lecturer characteristics remain untapped. The study aims to analyze and design business intelligence system models to measure the performance of scientific publications using dimensional models, clustering, on-line analytical processing (OLAP), and prototyping. Research methods are carried out through data and information needs analysis, data warehouse design, data mining and OLAP application, business intelligence system development, and system evaluation. The resulting dimensional models are the researcher index model, the researcher score model, the publication article model, and the research subject model. Measurements of data size and processing time show that the star schema has data of 336 KB and a processing time of 0.00554 seconds, is the best model compared to the snowflake's schema, which has data of 368 KB and a processing time of 0.00611 seconds. Davies-Bouldin Index (DBI) measurements show the best clustering performance is the X-means algorithm with K as many as 5 clusters (Kmin= 3, Kmax= 5) and a DBI value of 0.537040.

Artikel Scholar [Business intelligence system model to measure the performance of lecturers' scientific publications](#)  
MK Hidayat, D Sugiarto, R Fitriana, YC Liang - TELKOMNIKA (Telecommunication Computing ..., 2025  
[Artikel terkait](#) 3 versi

- By Issue
- By Author
- By Title



847-856

- Editorial Boards
- Reviewers
- **Author Guidelines**
- **Online Submission**
- Policy of Plagiarism Screening
- **Peer Review Process**
- **Publication Fee**
- **Abstracting and Indexing**
- Repository Policy
- **Register as Reviewer**
- Publication Ethics
- Visitor Statistics
- Contact Us

https://telkomnika.uad.ac.id/index.php/TELKOMNIKA/issue/view/1053			<div> <input type="text"/> <div> <div>Search Scope</div> <div>All</div> <div>Search</div> </div> </div> <div> Browse <ul style="list-style-type: none"> <li>By Issue</li> <li>By Author</li> <li>By Title</li> </ul> </div>	
<b>Modified electro-optical modulator based bipolar optical code division multiple access for free-space optics</b>	<a href="#">PDF</a>	857-870		
<i>Eddy Wijanto, Kevin Sutanto</i>				
<b>Outlier detection and clustering of fifth-generation wireless channel model datasets</b>	<a href="#">PDF</a>	871-881		
<i>Jojo Blanza, John Bernard Cipriano</i>				
<b>Archimedes multiband micro ribbon spiral antenna for energy harvesting</b>	<a href="#">PDF</a>	882-895		
<i>Edison Andrés Zapata Ochoa, Vanessa García Pineda, Alejandro Valencia Arias, Francisco Eugenio López Giraldo</i>				
<b>Design of a concurrent tri-band LNA based on composite right/left-handed transmission line resonators</b>	<a href="#">PDF</a>	896-905		
<i>Faycal El Hardouzi, Mohammed Lahsaini, Mustapha Bahich, Badr Nasiri, Younes Achaoui</i>				
<b>A compact five-band patch antenna covering WLAN, WiMAX, X, and Ku-bands</b>	<a href="#">PDF</a>	906-917		
<i>Suthasinee Lamultree, Wutthipong Thanamalapong, Kanawat Nuangwongsa, Charinsak Saetiaiw</i>				
<b>Energy scavenging-aided NOMA uplink communications: performance analysis</b>	<a href="#">PDF</a>	918-931		
<i>Huu Q. Tran, Khuong Ho-Van</i>				
<b>Energy analysis and comparative study of n-wheel graphs in hierarchical wireless sensor network architectures</b>	<a href="#">PDF</a>	932-942		
<i>Jerlinkasmir Rubancharles, Naseema Valiyaveettil Abdul Lathief, Veninstine Vivik Joseph</i>				
<b>High-speed dividing device with the formation of quotient and remainder</b>	<a href="#">PDF</a>	943-953		
<i>Yevgeniya Aitkhozhayeva, Khalicha Yubuzova</i>				

https://telkomnika.uad.ac.id/index.php/TELKOMNIKA/issue/view/1053				
<b>Business intelligence system model to measure the performance of lecturers' scientific publications</b>	<a href="#">PDF</a>	954-964		
<i>Miwan Kurniawan Hidayat, Dedy Sugiarto, Rina Fitriana, Yun-Chia Liang</i>				
<b>Factors influencing blockchain adoption intention in Philippine small and medium enterprises</b>	<a href="#">PDF</a>	965-975		
<i>Victor James C. Escolano, Wei-Jung Shiang, Alexander A. Hernandez, Darrel A. Cardaña</i>				
<b>Enhancing realism in hand-drawn human sketches through conditional generative adversarial network</b>	<a href="#">PDF</a>	976-985		
<i>Imran Ulla Khan, Depa Ramachandraiah Kumar Raja</i>				
<b>An extensive framework for assessing the quality of websites</b>	<a href="#">PDF</a>	986-999		
<i>Sasi Bhanu Jammalamadaka, Bala Krishna Kamesh Duvvuri, Sastry Kodanda Rama Jammalamadaka, Vishnu Priya Biyyapu</i>				
<b>Fuel consumption prediction of civil air crafts using deep learning: a comparative study</b>	<a href="#">PDF</a>	1000-1009		
<i>Quoc Hung Nguyen, Hoang Lan Nguyen</i>				
<b>A convolution neural network model for knee osteoporosis classification using X-ray images</b>	<a href="#">PDF</a>	1010-1019		
<i>Omar Khalid M. Ali, Abeer K. Ibrahim, Bilal R. Altamer</i>				
<b>Grid search vs Bayesian optimization for intensity scoring classification and channel recommendation prediction</b>	<a href="#">PDF</a>	1020-1031		
<i>Kelly Mae, Dinar Ajeng Kristiyanti</i>				
<b>Deep learning-based image super-resolution using generative adversarial networks with adaptive loss functions</b>	<a href="#">PDF</a>	1032-1045		
<i>Hani Q. R. Al-Zoubi</i>				

### A new resonant-based sensor for non-invasive measurement of blood glucose levels

[PDF](#)

Abolfazl Bijari, Faeze Foolad, Mohammadreza Khorshidi

1046-1057

### Optimizing signal conversion in uniform FBGs with InGaAs photodetectors for medical sensors

[PDF](#)

Tengku Emrinaldi, Bambang Widiyatmoko, Bunga Meyzia, Sumiaty Ambran, Saktioto Saktioto, Mohamad Syahadi, Agitta Rianaris, Dwi Hanto

1058-1068

### Integrating artificial bee colony and cauchy algorithms for distribution network reconfiguration with soft open points

[PDF](#)

Nguyen Tung Linh, Nguyen Quynh Anh

1069-1083

### Energy-efficient certificateless signcryption for secure data transfer in wireless sensor networks

[PDF](#)

Paruvathavardhini Jaganthan, Sargunam Balusamy

1084-1096

### Developing a robust data integrity verification framework for cloud storage utilizing Boneh-Lynn-Shacham signatures

[PDF](#)

Raed Abdulkareem Hasan, Mustafa M. Akawee, Enas Faek Aziz, Omar A. Hammood, Tole Sutikno

1097-1107

### Perceived ease of use, usefulness, and task interdependence: impacts on employee performance in higher education

[PDF](#)

Inayati Mandayuni, Kiagus Muhammad Sobri, Alfritri Alfritri, Andries Lionardo

1108-1119

### Design of a soft circular patch antenna operating in the 60 GHz band for 5G/6G applications

[PDF](#)

Salah-Eddine Didi, Imane Halkhams, Abdelhafid Es-Saay, Mohammed Fattah, Said Mazer, Moulhime El Bekkali

1120-1127

### EdgeShield: a robust and agile cybersecurity architecture for the internet of medical things

[PDF](#)

Anass Misbah, Anass Sebba, Imad Hafidi

1128-1136

#### TELKOMNIKA 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

**04915079**

[View TELKOMNIKA Stats](#)

https://telkomnika.uad.ac.id/index.php/TELKOMNIKA/about/editorialTeam

UAD

Universitas  
Ahmad Dahlan

TELKOMNIKA

(Telecommunication Computing Electronics and Control)

HOME

ABOUT

LOGIN

REGISTER

SEARCH

CURRENT

ARCHIVES

ANNOUNCEMENTS

Home > About the Journal > Editorial Team

Editorial Team

Editor-in-Chief

[Prof. Dr. Ir. Tole Sutikno, ASEAN Eng.](#), Universitas Ahmad Dahlan, Indonesia

Area Editor for Electrical Power Engineering

[Assoc. Prof. Dr. Ahmet Teke](#), 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 Bouaynaya](#), Rowan University, United States

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
- Register as Reviewer
- Publication Ethics
- Visitor Statistics
- Contact Us

JOURNAL CONTENT

Search

Search Scope

https://telkomnika.uad.ac.id/index.php/TELKOMNIKA/about/editorialTeam

## Area Editor for Communication System Engineering

[Prof. Dr. Zahriladha Zakaria](#), Universiti Teknikal Malaysia Melaka, Malaysia

## Area Editor for Computer Network and System Engineering

[Prof. Dr. Muhammad Nadzir Marsono](#), Universiti Teknologi Malaysia, Malaysia

## Area Editor for Computer Science and Information System

[Prof. Dr. Wanguan Liu](#), Sun Yat-Sen University, China

## 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](#), Nanyang Technological University, Singapore

## Associate Editors

[Prof. Dr. Ahmad Saudi Samosir](#), 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. Dr. George A. Papakostas](#), International Hellenic University, Greece  
[Prof. Dr. Huchang Liao](#), Sichuan University, China  
[Prof. Dr. Mahmoud Moghavvemi](#), University of Malaya, Malaysia  
[Prof. Dr. Media Anugerah Ayu](#), Sampoerna University, Indonesia  
[Prof. Dr. Melchior Pierre](#), University of Bordeaux, France  
[Prof. Dr. Qiang Yang](#), Zhejiang University, China  
[Prof. Dr. Paolo Crippa](#), Università Politecnica delle Marche, Italy  
[Prof. Dr. Pascal Lorenz](#), University of Haute Alsace, France  
[Prof. Dr. Sanjay Misra](#), Covenant University, Nigeria  
[Prof. Dr. Simon X. Yang](#), University of Guelph, Canada  
[Prof. Dr. Surinder Singh](#), SLIET 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  
[Prof. Ing. Mario Versaci](#), Università degli Studi di Reggio Calabria, Italy  
[Prof. Franco Frattolillo, Ph.D.](#), University of Sannio, Italy  
[Prof. Longquan Yong](#), Shaanxi University of Technology, China  
[Prof. Viranjay Mohan Srivastava](#), Birmingham City University, United Kingdom  
[Assoc. Prof. Dr. D. Jude Hemanth](#), Karunya University, India

[Assoc. Prof. Dr. Hamed Mojallali](#), The University of Guilan, Iran, Islamic Republic of  
[Assoc. Prof. Dr. Imran Sarwar Bajwa](#), Islamia University, Pakistan  
[Assoc. Prof. Dr. Jumril Yunas](#), Universiti Kebangsaan Malaysia, Malaysia  
[Assoc. Prof. Dr. Peng Zhang](#), University of Connecticut, United States  
[Assoc. Prof. Dr. Shahrin Md Ayob](#), Universiti Teknologi Malaysia, Malaysia  
[Asst. Prof. Dr. Andrea Francesco Morabito](#), University of Reggio Calabria, Italy  
[Asst. Prof. Dr. Domenico Ciunzio](#), University of Naples Federico II, Italy  
[Asst. Prof. Dr. Makram A. Fakhri](#), University of Technology, Iraq  
[Dr. Eng. Roberto de Fazio](#), Università del Salento, Italy  
[Dr. Abdullah M. Ilyasu](#), Tokyo Institute of Technology, Japan  
[Dr. Adamu I. Abubakar](#), International Islamic University Malaysia, Malaysia  
[Dr. Aniello Castiglione](#), University of Naples Parthenope, Italy  
[Dr. Anh-Huy Phan](#), Skolkovo Institute of Science and Technology (Skoltech), Russian Federation  
[Dr. Arafat Al-Dweik](#), Khalifa University, United Arab Emirates  
[Dr. Arcangelo Castiglione](#), University of Salerno, Italy  
[Dr. Arianna Mencattini](#), University of Rome "Tor Vergata", Italy  
[Dr. Athanasios Kakarountas](#), University of Thessaly, Greece  
[Dr. Grienggrai Rajchakit](#), Maejo University, Thailand  
[Dr. Javed Iqbal](#), Sarhad University of Science and Information Technology, Pakistan  
[Dr. Kennedy O. Okokpujie](#), Covenant University, Nigeria  
[Dr. Khader Shameer](#), Mount Sinai Health System, United States  
[Dr. Lai Khin Wee](#), Universiti Malaya, Malaysia  
[Dr. Qammer Hussain Abbasi](#), University of Glasgow, United Kingdom  
[Mark S. Hooper](#), IEEE Consultants' Network of Silicon Valley, United States  
[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 Jaikla](#), King Mongkut's Institute of Technology Ladkrabang, Thailand

## TELKOMNIKA 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

**04915129**

<https://telkomnika.uad.ac.id/index.php/TELKOMNIKA/pages/view/reviewers>



# TELKOMNIKA

(Telecommunication Computing Electronics and Control)

[HOME](#)
[ABOUT](#)
[LOGIN](#)
[REGISTER](#)
[SEARCH](#)
[CURRENT](#)
[ARCHIVES](#)
[ANNOUNCEMENTS](#)

Home > **Reviewers of TELKOMNIKA**

## Reviewers of TELKOMNIKA

---

The Editors gratefully acknowledge the assistance of the following people, who reviewed manuscripts for TELKOMNIKA (Telecommunication Computing Electronics and Control).

- A. Arockia Basil Raj, Defence Institute of Advanced Technology (Deemed University), India, [Scopus Author ID: 26639770500](#)
- A.N. Afandi, State University of Malang, Indonesia, [Scopus Author ID: 56107604800](#)
- Abdelfatah Kolli, IFSTTAR - French Institute of science and technology for transport, France, [Scopus Author ID: 55800660000](#)
- Abdelhalim Kessal, Université Bachir El Ibrahimi de Bordj Bou Arrenidj, Algeria, [Scopus Author ID: 37664472800](#)
- Adil Denizli, Hacettepe Universitesi, Turkey, [Scopus Author ID: 7101623828](#)
- Adolfo Dannier, Università degli Studi di Napoli Federico II, Italy, [Scopus Author ID: 22834293500](#)
- Afandi, A. N., State University of Malang, , Indonesia, [Scopus Author ID: 56107604800](#)
- Ahmed El-Mowafy, Curtin University, Australia, [Scopus Author ID: 7004059531](#)
- Ahn, Jong Hyun, Yonsei University, School of Electrical and Electronic Engineering, Seoul, South Korea, [Scopus Author ID: 56637126000](#)
- Aiman Zakwan Jidin, Universiti Teknikal Malaysia Melaka, Malaysia, [Scopus Author ID: 56470973700](#)
- Akito Sasaki, University of Tokyo, Japan, [Scopus Author ID: 7402225383](#)
- Akram Reza, Islamic Azad University, Iran, [Scopus Author ID: 26435542000](#)
- Andrea Morabito, Università degli Studi di Reggio Calabria, Italy, [Scopus Author ID: 16024894100](#)
- Angelo Chianese, Università degli Studi di Napoli Federico II, Italy, [Scopus Author ID: 35317103300](#)
- Ardeshtir Hezarkhani, Amirkabir University of Technology, Iran, [Scopus Author ID: 12795689200](#)
- Anif Basgumus, Dumlupinar Universitesi, Turkey, [Scopus Author ID: 85320066000](#)
- Arun Prakash, Motilal Nehru National Institute of Technology, India, [Scopus Author ID: 55810605800](#)
- Awang Pratomo, Universitas Pembangunan Nasional Veteran Yogyakarta, Indonesia, [Scopus Author ID: 35174983600](#)
- Ban Khammas, Universiti Teknologi Malaysia, Malaysia, [Scopus Author ID: 56151984900](#)
- Bayu Khamigor, Bina Nusantara University, Indonesia, [Scopus Author ID: 55792309400](#)
- Bennett, Thomas, Florida Atlantic University, United States, [Scopus Author ID: 57197372255](#)
- Beom Kwon, Yonsei University, South Korea, [Scopus Author ID: 56076830000](#)
- Camila Sundermann, Universidade de Sao Paulo - USP, Brazil, [Scopus Author ID: 56344725900](#)

**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
- **Register as Reviewer**
- Publication Ethics
- Visitor Statistics
- Contact Us

**JOURNAL CONTENT**

Search

Search Scope

All

https://telkomnika.uad.ac.id/index.php/TELKOMNIKA/pages/view/reviewers

- \* Debnit Awang, Universiti Teknologi Malaysia, Malaysia, [Scopus Author ID: 35956779900](#)
- \* Camila Sundermann, Universidade de Sao Paulo - USP, Brazil, [Scopus Author ID: 56344725900](#)
- \* Chénier, Félix, Institut universitaire sur la réadaptation en déficience physique de Montréal, Pathokinesiology Laboratory, Montreal, Canada, [Scopus Author ID: 50560896200](#)
- \* Chiara Bedon, Università degli Studi di Trieste, Italy, [Scopus Author ID: 36468065600](#)
- \* Chih-Lung Shen, National Kaohsiung First University of Science and Technology, Taiwan, [Scopus Author ID: 7402860121](#)
- \* D'Agostino, Fabio, Consiglio Nazionale delle Ricerche, Institute for Coastal Marine Environment, Rome, Italy, [Scopus Author ID: 14055634900](#)
- \* Da Silva, Leandro Aureliano, Universidade de Uberaba, Department of Electrical Engineering, Uberaba, Brazil, [Scopus Author ID: 23567719100](#)
- \* Darak, Sumit Jagdish, Indraprastha Institute of Information Technology Delhi, New Delhi, India, [Scopus Author ID: 36169103800](#)
- \* Deepali K. Boraknade, St. Vincent Pallotti College of Engineering and Technology, India, [Scopus Author ID: 56081507700](#)
- \* Dethan, Jacob F.N., Monash University Malaysia, Malaysia, [Scopus Author ID: 57200495795](#)
- \* Dilek Kıcıoğlu, Türkiye Bilimsel ve Teknolojik Araştırma Kurumu, Turkey, [Scopus Author ID: 25652213800](#)
- \* Dominic Williams, Hewdon Consulting, United Kingdom, [Scopus Author ID: 35996114000](#)
- \* Durgesh Singh, UGC-DAE Consortium for Scientific Research India, India, [Scopus Author ID: 56037689000](#)
- \* Elisa Negri, Politecnico di Milano, Italy, [Scopus Author ID: 56349650400](#)
- \* Eroshkin, Sergey, Moscow State Technical University of Civil Aviation, Moscow, Russian Federation, [Scopus Author ID: 25654790600](#)
- \* Faisal Ahmed, Islamic University of Technology, Bangladesh, [Scopus Author ID: 26025950100](#)
- \* Fernandes, Diogo A.B., PepsiCo, , Poland, [Scopus Author ID: 55959661700](#)
- \* Ferretti, G., Politecnico di Milano, Dipartimento di Elettronica Informazione e Bioingegneria, Milan, Italy, [Scopus Author ID: 56227784200](#)
- \* Ferry Wahyu Wibowo, AMIKOM Yogyakarta University, Indonesia, [Scopus Author ID: 55443377300](#)
- \* Ferry Wahyu Wibowo, AMIKOM Yogyakarta University, Indonesia, [Scopus Author ID: 55443377300](#)
- \* Fornace, Kimberly M., Royal Veterinary College University of London, United Kingdom, [Scopus Author ID: 24472918000](#)
- \* Fraire, Juan Andres, Universidad Nacional de Cordoba, Argentina, [Scopus Author ID: 55667636500](#)
- \* Garcia, Elena, Universidad Politécnica de Madrid, Madrid, Spain, [Scopus Author ID: 7402250033](#)
- \* Gatc, Jullend, Kalbis Institute, Indonesia, [Scopus Author ID: 56118948100](#)
- \* Ghodrati Amiri, Gholamreza, Iran University of Science and Technology, Iran, [Scopus Author ID: 16633816200](#)
- \* Gilmanur Rashid, ABB Group, United States, [Scopus Author ID: 37124754300](#)
- \* Guanglei Tian, China Jiliang University, China, [Scopus Author ID: 8569129500](#)
- \* Guo, Jinhua, University of Michigan-Dearborn, United States, [Scopus Author ID: 22733942100](#)
- \* Guoxing Zhan, Wayne State University, United States, [Scopus Author ID: 26533613300](#)
- \* Hadi Nasiri-Rad, Semnan University, Iran, [Scopus Author ID: 26321877600](#)
- \* Hairol Nizam Mohd Shah, Universiti Teknikal Malaysia, Malaysia, [Scopus Author ID: 35185637500](#)
- \* Hekmati, Arsalan, Shahid Beheshti University, Tehran, Iran, [Scopus Author ID: 24605066200](#)
- \* Hong-Wei Yang, Nanjing Agricultural University, China, [Scopus Author ID: 8271300900](#)
- \* Hossein Shahinzadeh, AmirKabir University of Technology, Iran, [Scopus Author ID: 55855215900](#)
- \* Hugeng, Hugeng, Universitas Multimedia Nusantara, Tangerang, Indonesia, [Scopus Author ID: 55135962100](#)
- \* Hung Tran, Mälardalens högskola, Sweden, [Scopus Author ID: 7202596558](#)
- \* Imamul Muttakin, Edwar Technology Co., Indonesia, [Scopus Author ID: 36703129000](#)
- \* Intan Areni, Hasanuddin University, Indonesia, [Scopus Author ID: 38361089400](#)
- \* Ioannis Korkontzelos, Edge Hill University, United Kingdom, [Scopus Author ID: 57194016459](#)
- \* Izhak Michaelievski, Ariel University, Israel, [Scopus Author ID: 6507717638](#)
- \* Jian Ouyang, Nanjing University of Post and Telecommunications, China, [Scopus Author ID: 57201237501](#)
- \* Jianhua Yan, Zhejiang University, China, [Scopus Author ID: 7403729306](#)
- \* Jidin, Auzani Bin, Universiti Teknikal Malaysia, Malaysia, [Scopus Author ID: 36910175700](#)
- \* Jingyu Tang, PLA University of Science and Technology, China, [Scopus Author ID: 57194456480](#)
- \* John K. Tarus, Beijing Institute of Technology, China, [Scopus Author ID: 56469465400](#)
- \* Jullend Gatc, Kalbis Institute, Indonesia, [Scopus Author ID: 56118948100](#)
- \* Kamarudin, Muhammadramlee, Cranfield University, Cranfield, United Kingdom, [Scopus Author ID: 11940735500](#)
- \* Kartika Firdausy, Universitas Ahmad Dahlan, Indonesia, [Scopus Author ID: 57190671256](#)
- \* Kelton A.P. Costa, UNESP-Universidade Estadual Paulista, Brazil, [Scopus Author ID: 54917025300](#)
- \* Khalil Azha Mohd Annuar, Universiti Teknikal Malaysia Melaka, Malaysia, [Scopus Author ID: 56333614300](#)
- \* Khan, Diba, National Center for Health Statistics, Hyattsville, United States, [Scopus Author ID: 55933880400](#)

https://telkomnika.uad.ac.id/index.php/TELKOMNIKA/pages/view/reviewers

- \* Sarawat, Mukesh, Jaypee Institute of Information Technology University, India, [Scopus Author ID: 35956779900](#)
- \* Seifollah Gholampour, Islamic Azad University, Iran, [Scopus Author ID: 54782577400](#)
- \* Sema Candemir, National Library of Medicine, United States, [Scopus Author ID: 15126895200](#)
- \* Sevenpri Candra, Bina Nusantara University, Indonesia, [Scopus Author ID: 55933427100](#)
- \* Shengyi Yang, Beijing Institute of Technology, China, [Scopus Author ID: 56383094300](#)
- \* Shihing Ni, China Three Gorges University, China, [Scopus Author ID: 20734969700](#)
- \* Shummugala, Alagarsamy, Velammal College of Engineering and Technology, India, [Scopus Author ID: 24282083700](#)
- \* Simorangkir, Roy B.V.B., Macquarie University, School of Engineering, Sydney, Australia, [Scopus Author ID: 55847312400](#)
- \* Son Ali Akbar, Universitas Ahmad Dahlan, Indonesia, [Scopus Author ID: 57189354770](#)
- \* Subroto, Imam Much Ibnu, Universitas Islam Sultan Agung Semarang, Indonesia, [Scopus Author ID: 56287856000](#)
- \* Sujoy Das, Maulana Azad National Institute of Technology, India, [Scopus Author ID: 57198674103](#)
- \* Szafran, Jacek, Lodz University of Technology, Department of Structural Mechanics, Lodz, Poland, [Scopus Author ID: 35957543300](#)
- \* Tariq, Moeenuddin Uddin, Universiti Teknologi Malaysia, Malaysia, [Scopus Author ID: 56537881200](#)
- \* Thien D. Nguyen, University of Newcastle, Australia, [Scopus Author ID: 57043828800](#)
- \* Tinghuan Chen, Southeast University, China, [Scopus Author ID: 57112829000](#)
- \* Tumiran, Gadjah Mada University, Indonesia, [Scopus Author ID: 24279155800](#)
- \* Venizelos Efthymiou, University of Cyprus, Cyprus, [Scopus Author ID: 24470028400](#)
- \* Vesna Popović-Bugarin, University of Montenegro, Montenegro, [Scopus Author ID: 55621699400](#)
- \* Wang Zhifu, Collaborative Innovation Center of Electric Vehicles in Beijing, China, [Scopus Author ID: 33368387500](#)
- \* Wanglong Qin, Nanjing University of Aeronautics and Astronautics, China, [Scopus Author ID: 55951564100](#)
- \* Wenzhun, Huang, Xijing University, China, [Scopus Author ID: 55965063400](#)
- \* Xiao-Chen Yuan, Macau University of Science and Technology, Macao, [Scopus Author ID: 36562860900](#)
- \* Xinxi Zhang, Tsinghua University, China, [Scopus Author ID: 35235901000](#)
- \* Yadav, Arvind R., Parul Institute of Engineering and Technology, India, [Scopus Author ID: 56118640500](#)
- \* Yang, Bintang, Shanghai Jiao Tong University, China, [Scopus Author ID: 24780190500](#)
- \* Yaqun He, China University of Mining Technology, China, [Scopus Author ID: 8853879300](#)
- \* Yemez, Yücel, Koc Üniversitesi, College of Engineering, Istanbul, Turkey, [Scopus Author ID: 6603243760](#)
- \* Yong, Longquan, Shaanxi University of Technology, School of Mathematics and Computer Science, Hanzhong, China, [Scopus Author ID: 35390527600](#)
- \* Yunsheng Guo, Inner Mongolia University of Science and Technology, China, [Scopus Author ID: 55821704500](#)
- \* Yusoff, Mohd Fairus Mohd, Universiti Teknologi Malaysia Faculty of Electrical Engineering, Malaysia, [Scopus Author ID: 16022550900](#)
- \* Zahra Rahmian, University of Tabriz, Iran, [Scopus Author ID: 56595191000](#)
- \* Zhan, Guoxing, Wayne State University, United States, [Scopus Author ID: 26533613300](#)
- \* Zhang, Chi Yv, Tsinghua University, China, [Scopus Author ID: 8055415600](#)
- \* Zhang, Yifan, Beijing University of Posts and Telecommunications, China, [Scopus Author ID: 56292472600](#)
- \* Zhao, Jufeng, Hangzhou Dianzi University, School of Electronics and Information, Hangzhou, China, [Scopus Author ID: 35202542800](#)
- \* Zhihui Du, Tsinghua University, China, [Scopus Author ID: 7402288638](#)
- \* Zunlin Fan, Air Force Engineering University China, China, [Scopus Author ID: 57007548800](#)

TELKOMNIKA 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

04915428



https://sinta.kemdikbud.go.id/journals/?q=telkomnika#!

SINTA

Author Subjects Affiliations Sources FAQ WCU RINA

Journals

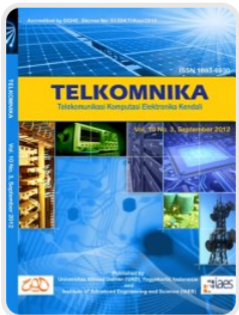
Sort by Impact

Search journals Search... Filter

Results for "telkomnika" [clear search](#)

Previous 1 Next

Page 1 of 1 | Total Records 1



**TELKOMNIKA**  
Telekomunikasi, Komputer, Elektronik dan Kontrol

**TELKOMNIKA (TELECOMMUNICATION COMPUTING ELECTRONICS AND CONTROL)** ✓

[Google Scholar](#) [Website](#) [Editor URL](#)

[Universitas Ahmad Dahlan \(UAD\) in collaboration with Institute of Advanced Engineering and Science \(IAES\)](#)

P-ISSN : 23029293 | E-ISSN : 16936930 Subject Area : Science, Engineering

**S1 Accredited** **Scopus Indexed** **Garuda Indexed**

4,65 Impact	45 H5-index	19.832 Citations 5yr	29.349 Citations
-------------	-------------	----------------------	------------------



# Business intelligence system model to measure the performance of lecturers' scientific publications

Miwan Kurniawan Hidayat<sup>1,2</sup>, Dedy Sugiarto<sup>2,3</sup>, Rina Fitriana<sup>2,4</sup>, Yun-Chia Liang<sup>5</sup>

<sup>1</sup>Study Program of Industrial Engineering, Faculty of Engineering and Informatics, Universitas Bina Sarana Informatika, Jakarta, Indonesia

<sup>2</sup>Master of Industrial Engineering, Faculty of Industrial Technology, Universitas Trisakti, Jakarta, Indonesia

<sup>3</sup>Study Program of Information Systems, Faculty of Industrial Technology, Universitas Trisakti, Jakarta, Indonesia

<sup>4</sup>Department of Industrial Engineering, Faculty of Industrial Technology, Universitas Trisakti, Jakarta, Indonesia

<sup>5</sup>Department of Industrial Engineering and Management, College of Engineering, Yuan Ze University, Taoyuan City, Taiwan

## Article Info

### Article history:

Received Mar 24, 2024

Revised Apr 8, 2025

Accepted May 10, 2025

### Keywords:

Business intelligence

Data mining

Data warehouse

K-means

X-means

## ABSTRACT

Scientific publication data is sourced from the SINTA website to measure the performance of journals, institutions, and researchers in Indonesia. Accessing and analyzing data for institutional needs is restricted, and lecturer development patterns based on lecturer characteristics remain untapped. The study aims to analyze and design business intelligence system models to measure the performance of scientific publications using dimensional models, clustering, on-line analytical processing (OLAP), and prototyping. Research methods are carried out through data and information needs analysis, data warehouse design, data mining and OLAP application, business intelligence system development, and system evaluation. The resulting dimensional models are the researcher index model, the researcher score model, the publication article model, and the research subject model. Measurements of data size and processing time show that the star schema has data of 336 KB and a processing time of 0.00554 seconds, is the best model compared to the snowflake's schema, which has data of 368 KB and a processing time of 0.00611 seconds. Davies-Bouldin Index (DBI) measurements show the best clustering performance is the X-means algorithm with K as many as 5 clusters (Kmin=3, Kmax=5) and a DBI value of 0.537040.

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



## Corresponding Author:

Rina Fitriana

Department of Industrial Engineering, Faculty of Industrial Technology, Universitas Trisakti

St. Kyai Tapa No.1, Grogol, Jakarta, Indonesia

Email: rinaf@trisakti.ac.id

## 1. INTRODUCTION

As a higher education institution, the university strives to enhance lecturer resources by assessing their research output in scientific publications to improve education quality. Scientific publications serve as the final stage in disseminating research findings, contributing to problem-solving where no prior solution exists. According to Indonesian Law No. 14 of 2015, lecturers are required to conduct scientific publications, with universities setting indicators for research output standards, including publications in accredited national and reputable international journals, citation impact, and alignment with research roadmaps. University leaders measure publication performance based on data from indexing institutions such as the Science and Technology Index (SINTA), Scopus, Web of Science, the Directory of Open Access Journals (DOAJ), ProQuest, the ASEAN Citation Index (ACI), Google Scholar, and the Indonesian Publication Index (IPI). The SINTA platform, managed by the Ministry of Education, provides research performance insights for researchers, institutions, and journals. However, as SINTA operates as an external system, universities require an

independent data storage system tailored to internal needs, ensuring better access and analysis for monitoring lecturers' scientific publications. The H-index is a bibliometric indicator widely used in academia, research management, and policy. In simple terms, the H-index combines measures of quantity and impact in one indicator [1]. The problem in this research is the limited access and analysis of data from the SINTA website, which is managed by external systems, making it difficult for higher education institutions to meet their internal information needs for evaluating the performance of academic publications by lecturers. As a means to resolve this issue, it is suggested to create a business intelligence system model that assesses the performance of lecturers' scientific publications using a dimensional model along with data mining methods, thereby allowing higher education institutions to efficiently access, analyze, and leverage data to satisfy their internal information needs. In designing the business intelligence and data mining system model to monitor faculty scientific publications, there are challenges in determining the best dimensional model between star schema and snowflake schema, as well as the most optimal clustering algorithm between K-Means and X-means.

Previous studies have explored different aspects of business intelligence systems, though with certain constraints. Some focused on these systems without comparing dimensional models and data mining algorithms, while others utilized a single data mining algorithm without examining dimensional model alternatives. There have also been comparisons of dimensional models without involving data mining, and research comparing data mining algorithms without incorporating them into a business intelligence system. This research presents a fresh approach by more comprehensively integrating business intelligence systems with data mining algorithms. It not only applies data mining techniques but also compares K-means and X-means to determine the most effective algorithm. Additionally, the study contrasts two major dimensional models, star schema and snowflakes schema, to identify the best model for evaluating lecturers' scientific publication performance. The selection of methods in research refers to previous studies that are tailored to the needs and conditions of the organization, namely comparative research on dimensional model performance [2]; an optimized hybrid approach for enhancing the extract-transform-load (ETL) process efficiency in a data warehouse [3]; X-means clustering research using Davies–Bouldin Index (DBI) evaluation [4]; quality monitoring in higher education with business intelligence dashboards [5]; star-schema research model for lecturer performance in research activities [6]; K-means clustering approach for analyzing customer electricity consumption patterns [7]; a study discussing the integration of data mining within business intelligence to enhance understanding of customer needs [8].

This study focuses on designing an effective business intelligence and data mining system model to monitor faculty scientific publications. The research has two main objectives, which are to determine the best dimensional model between star schema and snowflake schema for managing publication data and to identify the most optimal clustering algorithm between K-means and X-means for accurately and efficiently grouping publication data. Business intelligence is essential for companies of all sizes, providing valuable insights that are key to making timely decisions [9]. To remain competitive and achieve success, businesses must develop analytical strategies that transform these challenges into effective business systems [10]. Business intelligence is a term that merges architectures, methodologies, applications, analysis tools, databases, and tools to access data interactively, enable data manipulation, and for analysts and business managers to perform appropriate analysis [11]. Some of the benefits of using business intelligence are that it helps to view reports independently; helps to identify waste in the system; helps to identify the strengths and weaknesses of the company; improves decision-making processes; enables real-time analysis with quick navigation; facilitates sharing and access of information; provide very fast answers to business questions and problems; provides data visualization so that it is very easy to read, understand, and interpret [12].

In many industries, business intelligence is now widely regarded as a key driver in understanding organizational outputs well and measuring them in real-time to make improvements and changes. Business intelligence as a support in operational and strategic decision-making that can be connected to other information systems, namely customer relationship management (CRM) marketing, visualization, decision support systems (DSS)/executive information systems (SIS), data warehouse, knowledge management, data mining, on-line analytical processing (OLAP), geographic information systems (GIS) [13]. Business intelligence systems have four main components, namely user interface (e.g., data visualization); business performance management (BPM); business analytics; and data warehouse [11]. A data warehouse is unified data from various origins for dimensional data analysis. More technically, a data warehouse is a data collection with a subject, integrated, non-volatile approach with time variations to support management decisions [14]. The relational design of the data warehouse is represented in a dimensional model consisting of a star schema and a snowflake schema. The star schema consists of one centralized fact table and dimension tables. In general, dimension tables in the star schema are not normalized and may contain redundant data. Snowflake schema avoids redundancy in the star schema through dimensional representations of multiple tables associated with referential integrity constraints [14].

Smaller data warehouse sizes and shorter query processing times can determine better dimensional model performance. Small data warehouse size leads to less memory consumption [2]. Data visualization uses

visual representations to explore, understand, and communicate data. Although the name commonly used is data visualization, it means information visualization. Information refers to the contextualized, summarized, and aggregated form of raw data; thus, what appears in a visualization is information rather than raw data itself. Data visualization is inherently linked to statistical charts, scientific visuals, and information graphics [11]. Data mining is defined as the automated process of extracting meaningful insights from large-scale data repositories [15]. This process emphasizes uncovering hidden patterns and relationships to support informed decision-making [16]. The implementation of machine learning in data mining has been widely adopted across industries such as finance, retail, insurance, and telecommunications [17]. Machine learning in this context is categorized into four types: reinforcement, semi-supervised, supervised, and unsupervised learning [18]. Data mining techniques are effective tools to group agricultural product customers based on their purchase behavior [19]. Clustering algorithms are data mining methods used to identify inherent patterns within data and to provide a simplified representation of datasets [20]. K-means is a clustering algorithm that organizes data points into groups by minimizing the distance between each data point and the centroid of its cluster [21].

The K-means algorithm begins by selecting the number of clusters (K), initializing centroids, assigning data to the nearest centroid, and iteratively updating the centroids. In contrast, X-means extends K-means by automatically determining the optimal number of clusters based on the bayesian information criterion (BIC). This method requires setting a minimum (Kmin) and maximum (Kmax) number of clusters, from which it identifies the best K value. X-means operates in two main stages: Improve-Params, which runs K-means until convergence, and Improve-Structure, which evaluates whether clusters should be split using BIC. Validating clustering results is crucial for ensuring reliable application outcomes. Various internal validation metrics are available, totaling at least twelve, including coefficient of variation nearest neighbor (CVNN), scattering-density between and within clusters (S\_Dbw), scatter density (SD), Xie–Beni index (XB), DBI, Silhouette coefficient (S), Dunn index (D), I index, Calinski–Harabasz index (CH), Gamma index (Γ), R-squared (RS), and root mean square standard deviation (RMSSTD) [22]. Among them, the DBI is commonly used to assess cluster quality. Cohesion in this context refers to how closely data points are grouped around the center of their cluster, and optimal clustering is indicated by a DBI value approaching zero [4].

This study aims to design an efficient business intelligence and data mining system model to track faculty scientific publications, ensuring effective data organization and insightful analysis. It explores the selection of the most appropriate dimensional model, evaluating the advantages of star schema and snowflake schema in optimizing data structuring, retrieval speed, and query performance. Additionally, the study seeks to determine the most effective clustering algorithm, comparing K-means and X-means based on their accuracy and computational efficiency in categorizing publication data. The research methodology involves a comparative evaluation of both dimensional models using performance metrics, while clustering techniques are assessed through validity indices and efficiency analysis. The expected outcome is a scalable and reliable system that enhances data-driven decision-making, enables comprehensive faculty publication monitoring, and strengthens research assessment processes within academic institutions.

## 2. METHOD

This section explains how about the research steps, the data collection and data warehouse design phase in this research refers to the data warehouse process stages used in the study of massively parallel processing systems to enhance the scalability of data warehouse processing [23]. The selection of the best dimensional model between star schema and snowflake schema refers to research on the advantages and disadvantages of both models [2]. OLAP technology supports the design and examination of complex multidimensional structures within business data [24]. The business intelligence system integration phase is adapted from the methodology in the study of business intelligence solutions for online banking companies [25], while the system evaluation phase uses the system usability scale (SUS) method based on the usability evaluation of e-Government websites [26]. Figure 1 explains the flow of stages in the research conducted.

### 2.1. Data and information needs analysis

Qualitative descriptive is used to provide simple and clear explanations of phenomena [27]. This approach helps explain how business intelligence systems function and support organizational goals. In the data needs analysis stage, data is identified and collected through observation and document review related to lecturers' scientific publications. Secondary data is obtained through data extraction from the university system and the SINTA website [28]. Web scraping is used to automate data collection into structured formats [29], making research more efficient [30].

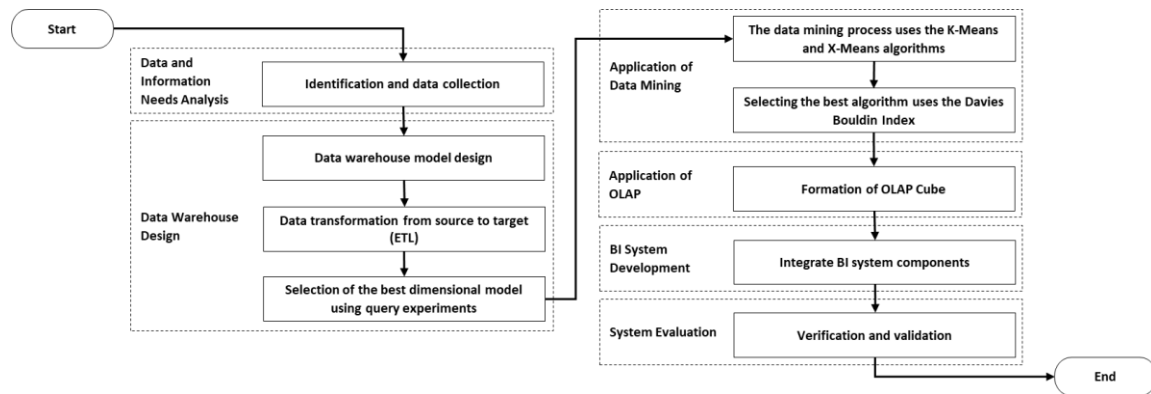


Figure 1. Stages in the research

## 2.2. Data warehouse design

This phase includes several steps. The data warehouse model design applies two-dimensional models: the star schema, consisting of fact and dimension tables, and the snowflake schema, which adds sub-dimension tables; both are implemented in a database. Data transformation is then carried out from source to target through ETL processes using specific software. The best dimensional model is selected based on experimental results, where smaller data sizes and faster query times indicate better performance.

## 2.3. Application of data mining

The application of data mining through the clustering process of lecturers as researchers involves several stages. First, clustering is performed using K-means and X-means algorithms based on H-index values from Scopus, Google Scholar, and Web of Science on the SINTA website, utilizing data mining software. Then, the best clustering algorithm is selected by comparing the DBI values, which serve as a measure of cluster validity in clustering methods.

## 2.4. Application of OLAP

OLAP cubes facilitate the visualization, exploration, and navigation of data within data warehouses to enhance business intelligence and forecasting [31]. Alongside business intelligence systems, OLAP supports multi-perspective analysis through various queries and operations [32]. Its core structure, the OLAP cube, is a multidimensional model that enables rapid data analysis [11]. OLAP cubes represent data to fulfill informational needs in decision-making processes.

## 2.5. Business intelligence system development

The development of a business intelligence system involves the integration of several key components. A data warehouse functions as the central data source, which is processed by business analytics tools to generate meaningful information. This information is then presented through a user interface using data visualizations in the form of dashboards, in accordance with the architecture of the designed business intelligence system.

## 2.6. System evaluation

Verification and validation are essential activities in evaluating business intelligence systems. Verification ensures the system runs without errors and meets predefined specifications by comparing test outcomes with success indicators. A system passes verification if it functions properly without defects. The SUS is used as a standard to evaluate usability, offering quantitative metrics for statistically analyzing user experience [33].

## 3. RESULTS AND DISCUSSION

Business Intelligence serves as a key tool for organizations in managing open innovation by enabling data analysis that generates insights and fosters innovation [34]. The business intelligence system developed in this study consists of integrated components designed to support decision-making through the monitoring of scientific publication performance. At the core of this system is a data warehouse that functions as a centralized data source, where raw data is processed using business analytics tools. These tools transform the data into meaningful information that reflects the research performance of faculty members and study

programs. The output of this processing is presented through a user-friendly interface in the form of interactive dashboards. These dashboards are aligned with the principles of business performance management (BPM) and serve to visualize trends, patterns, and key performance indicators related to scientific publications. The visual presentation not only enhances accessibility and comprehension for decision-makers but also supports strategic planning in academic institutions.

In Figure 2, inputs in the scientific publication business intelligence system (SiBIPI) include lecturer and study program data, researcher indexation, and publication article data. The absence of business intelligence and data warehouse systems presents physical barriers. Stakeholders such as research institute officers and heads of study programs act as system users. The system aligns with the university's vision, mission, research roadmap, and government regulations. SiBIPI aims to improve efficiency, effectiveness, and optimization, producing outputs like researcher indexes, scores, and publication data, resulting in a functional prototype. The designed BI system architecture model is illustrated in Figure 3.

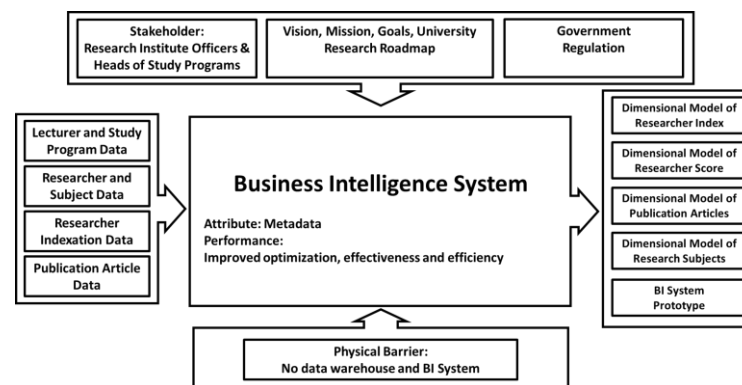


Figure 2. Business intelligence system

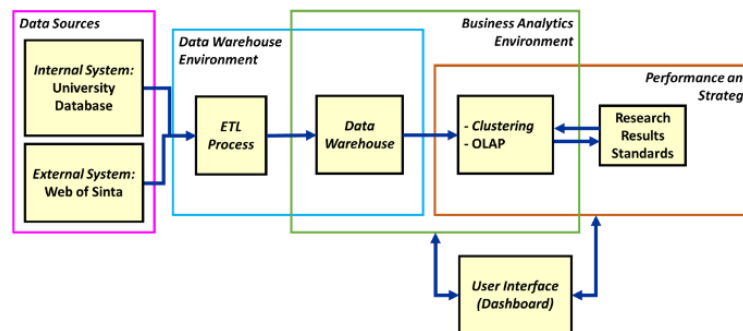


Figure 3. Business intelligence system architecture model

### 3.1. Data and information needs analysis

After identifying the required data and information for designing the business intelligence system, data collection is conducted on lecturers' scientific publications sourced from organizational documents, university databases, and the SINTA website. The data used as a source in the data warehouse includes lecturer and study program data, researcher data and research subjects, researcher indexation data, and publication article data. This data serves as the foundation for building an effective and structured business intelligence system that supports institutional goals. Data collection is conducted through extraction from the university database and the SINTA website using web scraping techniques. Data storage in a data warehouse built on MySQL can offer effective performance [35]. Web scraping is automated using Python programs, which are widely used for data processing and extraction tasks [36]. The information needed includes researcher index data, researcher scores, publication article data, and research subject data, all categorized by lecturers, study programs, indexers, years, and research roadmaps.

### 3.2. Data warehouse design

Data warehouse projects use the ETL method with a predefined schema before storing data, known as “schema-on-write” [37]. This study’s data warehouse design includes model design, data transformation ETL, and model selection. A centralized architecture is applied, with data sourced from databases and spreadsheet files. The ETL process extracts, transforms, and loads data into the warehouse, which users can access through an application interface.

The data model design uses two-dimensional models: the star schema and the snowflake schema. The dimensional model design process consists of four steps: selecting business processes, establishing grain, identifying dimensions, and identifying facts [38]. In the scientific publication monitoring process, grain and dimension identification results in a relationship used to form fact tables. These fact tables are constructed based on the grain and its related dimensions to support data analysis.

One of the dimensional models designed is the researchers’ score model, which presents researcher scores based on lecturers, study programs, and clustering through relationships between score facts and related dimensions. Figure 4(a) show the dimensional score model researchers use the star schema, and Figure 4(b) show the dimensional score model researchers use the snowflakes schema.

One of the dimensional models designed is the researchers’ score model, which presents researcher scores based on lecturers, study programs, and clustering through relationships between score facts and related dimensions. Figure 4(a) show the Dimensional Score model researchers use the Star Schema, and Figure 4(b) show the Dimensional Score model researchers use the Snowflakes Schema.

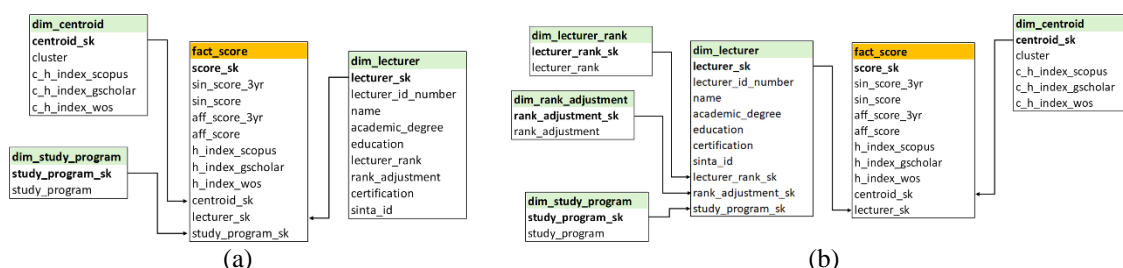


Figure 4. Dimensional model of researcher score: (a) star schema and (b) snowflakes schema

The ETL process is essential for loading data into the data warehouse, ensuring it meets defined standards. Various ETL tools support data extraction from different sources and manage initial, historical, and incremental loading, each with unique structures and functions [39]. In this study, ETL processes for dimension and fact tables in star and snowflake schema models are handled using Pentaho Data Integration. For instance, the ETL process in the article fact table uses components like table input, add sequence, select values, and table output.

Various organizations have utilized MySQL to develop extensive database systems [40]. MySQL software is used as a database management system in a data warehouse. Data on star schema models and snowflakes schema models are stored in separate databases. Experiments on the same data and results from applying queries were performed on both dimensional models to find out which model performed better between the star schema and snowflakes schema in the data warehouse for this case. The query experiments consist of 4 queries, including information about the index, the score, the published article, and the subject of research. The total query processing time for the star schema model is 0.00554 seconds, while the total query processing time for the snowflakes schema model is 0.00611 seconds. A comparison of experimental results can be seen in Table 1. The comparison between the star schema model and the snowflakes schema in the experiment shows that the star schema model is the best model chosen because it has a smaller data size of 336 KB and a shorter query processing time of 0.00554 seconds.

Table 1. Comparison of dimensional models

Model dimensional	Total size (KB)	Runtime (sec)
Star schema	336	0.00554
Snowflakes schema	368	0.00611

### 3.3. Application of data mining

The application of data mining aims to group researchers based on H-index values in Scopus, Google Scholar, and Web of Science. Researchers are grouping by applying two clustering algorithms, namely the

K-means and X-means algorithms. The data used for clustering is sourced from a data warehouse that has undergone a transformation process and has been cleaned. K-means and X-means algorithms are used with clustering (K) as many as 5 clusters at the clustering modeling stage. Grouping is done gradually with K values ranging from 2, 3, 4, and 5. The clustering process uses data mining software. Python programs were used as data mining software in this study.

Cluster validation using the DBI method on the K-means and X-means algorithms with a grouping (K) of 5 clusters is calculated during the clustering process using Python programs as data mining software. Cluster validation results are compared to select the best clustering. Table 2 compares DBI values after the clustering process. The results of the comparison of DBI values show that the best clustering performance is the X-means clustering algorithm with optimal grouping (K) of 5 clusters (Kmin=3, Kmax=5) and DBI value of 0.537040.

Table 2. DBI value comparison

K-means clustering		X-means clustering		
K/cluster	DBI value	K	Cluster	DBI value
K=2	0.778144	Kmin=2, Kmax=5	4	0.614357
K=3	0.682411	Kmin=3, Kmax=5	5	<b>0.537040</b>
K=4	0.655393	Kmin=4, Kmax=5	5	0.553758
K=5	0.734986	Kmin=5, Kmax=5	5	0.747751

### 3.4. Application of OLAP

An OLAP cube was developed as a data analysis technique in this business intelligence system to fulfill functional requirements in delivering essential information. The system includes several OLAP cubes, such as the researcher index cube, researcher score cube, publication articles cube, and research subject cube. Specifically, the publication articles cube provides detailed information about published articles, as illustrated in Figure 5.

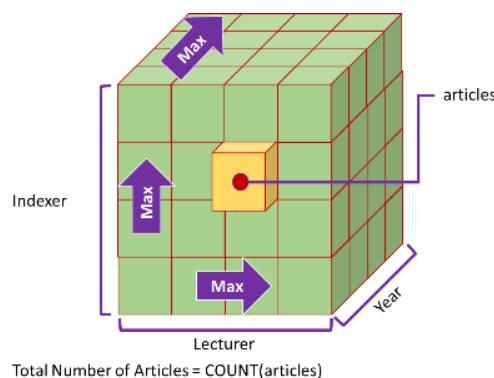


Figure 5. Publication articles cube

### 3.5. Business intelligence system development

The business intelligence system design includes components that generate information to measure scientific publication performance through data visualization dashboards. Power BI is used to build the system, enabling detailed data processing and interactive graphical visualization. One example is the researcher score dashboard, which contains various data visualization elements. The display of the researcher score page in the developed system is shown in Figure 6.

### 3.6. System evaluation

System evaluation is carried out to ensure the system is free from errors and can produce outputs according to user expectations and needs. Verification testing confirms that the system operates based on predetermined specifications and contains no defects. The test results show that the business intelligence system was successfully verified. Validation is conducted using the SUS method to assess user satisfaction. With a SUS score of 86.5, the system falls into the excellent category and is deemed suitable for use.



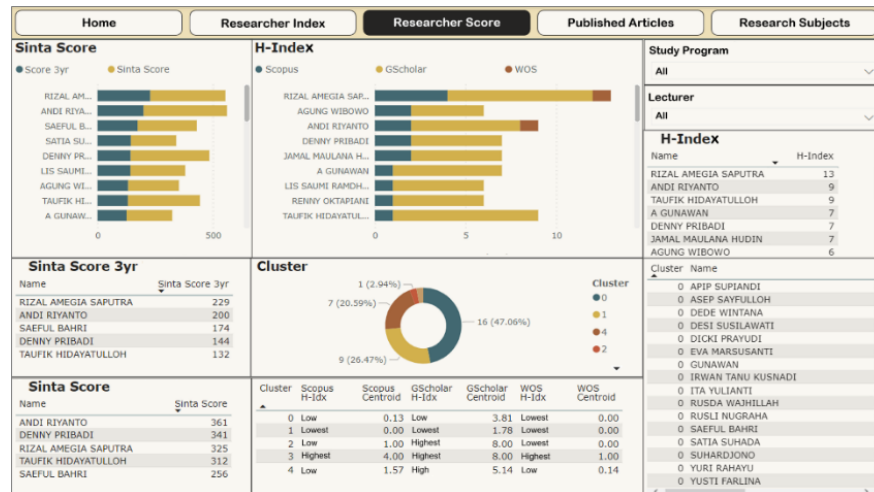


Figure 6. Researcher score page view

### 3.7. Comparison with related studies

This study sets itself apart by evaluating both dimensional models (star schema and snowflake schema) and clustering algorithms (K-means and X-means), unlike many previous studies that focused only on one aspect. Prior research, such as [2], [6], did not comprehensively address both areas. The main strength of this study lies in its integrated approach, assessing data models, data visualization, and clustering performance. However, this research does not explore alternative clustering algorithms such as self-organizing map (SOM), DBSCAN, or K-Medoids. While X-means outperformed K-means, the improvement in clustering performance was relatively modest, suggesting that further investigation into other clustering techniques could be valuable.

### 3.8. Limitations and future work

This study focused on developing a business intelligence and data mining system model to monitor faculty scientific publications, with an emphasis on identifying the most effective dimensional model and the best clustering algorithm. The results indicated that the star schema was more efficient for handling publication data, offering smaller storage requirements and faster query times, while the X-means algorithm outperformed K-means in terms of clustering accuracy. The findings underscore the importance of this research for academic institutions, as it provides a more streamlined approach to managing and analyzing publication data, aiding in the evaluation of faculty performance. Nonetheless, further exploration is needed to assess how these models perform with larger datasets and more complex computing environments. Future studies could investigate additional factors such as memory and CPU usage, as well as the application of more sophisticated machine learning algorithms to enhance decision-making and generate deeper insights.

## 4. CONCLUSION

This study successfully designed a business intelligence and data mining system model to monitor faculty scientific publications by selecting the most efficient dimensional model and the optimal clustering algorithm. The findings confirm that the star schema is the superior choice for structuring publication data, as it minimizes data size (336 KB) and enhances query speed (0.00554 seconds), making it more efficient than the snowflake schema. Meanwhile, the X-means clustering algorithm outperforms K-means, achieving a lower DBI (0.537040) and optimal clustering into 5 groups, demonstrating its superiority in accurately classifying faculty publication data. The adoption of star schema and X-means clustering provides higher education institutions with a more efficient data processing framework, enabling improved faculty performance evaluation and data-driven decision-making. This system enhances the analysis of scientific publications, facilitating better academic resource management and institutional research strategies. Future research should explore scalability with larger datasets, incorporating additional performance metrics such as memory usage, CPU consumption, and network load to further validate the best dimensional model for large-scale data warehouses. Moreover, integrating advanced analytics and machine learning techniques could provide deeper insights, improving strategic decision-making in academic institutions.

FUNDING INFORMATION

Authors state no funding involved.

AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
Miwan Kurniawan	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓
Hidayat														
Dedy Sugiarto	✓	✓		✓	✓	✓		✓	✓	✓				✓
Rina Fitriana	✓	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓
Yun-Chia Liang	✓	✓		✓	✓	✓		✓	✓	✓				

C : Conceptualization	I : Investigation	Vi : Visualization
M : Methodology	R : Resources	Su : Supervision
So : Software	D : Data Curation	P : Project administration
Va : Validation	O : Writing - Original Draft	Fu : Funding acquisition
Fo : Formal analysis	E : Writing - Review & Editing	

CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

DATA AVAILABILITY

The data that support the findings of this study were obtained from a third party under a special license. Data are available from the authors with the permission of the third party. Access to these data is restricted and can be made available upon reasonable request with the permission of the third party.

REFERENCES

[1] G. Fraumann and R. Mutz, *The h-index*. Handbook Bibliometrics | Edition: De Gruyter Reference, 2021.

[2] M. Z. Iqbal, G. Mustafa, N. Sarwar, S. H. Wajid, J. Nasir, and S. Siddque, "A review of star schema and snowflakes schema," in *Intelligent Technologies and Applications (INTAP 2019)*, 2020, pp. 129–140. doi: 10.1007/978-981-15-5232-8\_12.

[3] L. Dinesh and K. G. Devi, "An efficient hybrid optimization of ETL process in data warehouse of cloud architecture," *Journal of Cloud Computing*, vol. 13, no. 1, Jan. 2024, doi: 10.1186/s13677-023-00571-y.

[4] M. Mughnyanti, S. Efendi, and M. Zarlis, "Analysis of determining centroid clustering X-means algorithm with davies-bouldin index evaluation," *IOP Conference Series: Materials Science and Engineering*, vol. 725, no. 1, Jan. 2020, doi: 10.1088/1757-899X/725/1/012128.

[5] A. Sorour and A. S. Atkins, "Big data challenge for monitoring quality in higher education institutions using business intelligence dashboards," *Journal of Electronic Science and Technology*, vol. 22, no. 1, Mar. 2024, doi: 10.1016/j.jnlest.2024.100233.

[6] M. M. Amin, A. Sutrisman, and Y. Dwitayanti, "Development of star-schema model for lecturer performance in research activities," *International Journal of Advanced Computer Science and Applications*, vol. 12, no. 9, pp. 74–80, 2021, doi: 10.14569/IJACSA.2021.0120909.

[7] Y. Chen, P. Tan, M. Li, H. Yin, and R. Tang, "K-means clustering method based on nearest-neighbor density matrix for customer electricity behavior analysis," *International Journal of Electrical Power & Energy Systems*, vol. 161, Oct. 2024, doi: 10.1016/j.ijepes.2024.110165.

[8] M. A. Khder and I. A. Abu-Alsontos, "Business Intelligence and Data Mining: Opportunities and Future," *European Journal of Business and Management*, vol. 13, no. 11, 2021, doi: 10.7176/EJBM/13-11-01.

[9] R. R. Subramaniam, P. Palakeel, M. Arunmozhi, M. Sridharan, and U. Marimuthu, "Factors driving business intelligence adoption: an extended technology-organization-environment framework," *Indonesian Journal of Electrical Engineering and Computer Science*, vol. 34, no. 3, pp. 1893–1903, Jun. 2024, doi: 10.11591/ijeecs.v34.i3.pp1893-1903.

[10] A. E. Nurhidayat, R. Fitriana, D. Suhardini, and A. Nugrahanti, "The causal loop diagram model of traceability system rental equipment in oil and gas supporting companies," *TELKOMNIKA (Telecommunication Computing Electronics and Control)*, vol. 22, no. 5, pp. 1104–1112, Jul. 2024, doi: 10.12928/telkomnika.v22i5.26084.

[11] R. Sharda and E. Turban, *Business intelligence, analytics, and data science: A managerial perspective*. Pearson Education Limited, 2018.

[12] M. Joshi and A. Dubbawar, "Review on business intelligence, its tools and techniques, and advantages and disadvantages," *International Journal of Engineering Research & Technology (IJERT)*, vol. 10, no. 12, pp. 386–391, 2021.




[13] M. Ur Rehman et al., "Elaborating the role of business intelligence (BI) in healthcare management," *Journal of Intelligence Studies in Business*, vol. 12, no. 2, pp. 26–35, Feb. 2023, doi: 10.37380/jisib.v12i2.952.

[14] A. Vaisman and E. Zimányi, *Data warehouse systems: Design and implementation*. Berlin, Heidelberg: Springer Berlin Heidelberg, 2014. doi: 10.1007/978-3-642-54655-6.




- [15] P.-N. Tan, M. Steinbach, A. Karpatne, and V. Kumar, *Introduction to data mining second edition*. Pearson Education Limited, 2019.
- [16] R. A. Ramadhani, R. Fitriana, A. N. Habyba, and Y. -C. Liang, "Enhancing quality control of packaging product: A six sigma and data mining approach," *Jurnal Optimasi Sistem Industri*, vol. 22, no. 2, pp. 197–214, Dec. 2023, doi: 10.25077/josi.v22.n2.p197-214.2023.
- [17] X. Teng and Y. Gong, "Research on application of machine learning in data mining," *IOP Conference Series: Materials Science and Engineering*, vol. 392, no. 6, Aug. 2018, doi: 10.1088/1757-899X/392/6/062202.
- [18] M. M. Zaben, M. Y. Worku, M. A. Hassan, and M. A. Abido, "Machine learning methods for fault diagnosis in AC microgrids: A systematic review," *IEEE Access*, vol. 12, pp. 20260–20298, 2024, doi: 10.1109/ACCESS.2024.3360330.
- [19] T.-C. Chen *et al.*, "Application of Data Mining Methods in Grouping Agricultural Product Customers," *Mathematical Problems in Engineering*, vol. 2022, pp. 1–9, Mar. 2022, doi: 10.1155/2022/3942374.
- [20] H. Xu, "Research on clustering algorithms in data mining," in *2022 3rd International Conference on Big Data, Artificial Intelligence and Internet of Things Engineering (ICBAIE)*, IEEE, Jul. 2022, pp. 652–655, doi: 10.1109/ICBAIE56435.2022.9985831.
- [21] A. Poggiali, A. Berti, A. Bernasconi, G. M. Del Corso, and R. Guidotti, "Quantum clustering with K-means: A hybrid approach," *Theoretical Computer Science*, vol. 992, Apr. 2024, doi: 10.1016/j.tcs.2024.114466.
- [22] H. Xiong and Z. Li, "Clustering validation measures," in *Data Clustering*, Chapman and Hall/CRC, 2018, pp. 571–606. doi: 10.1201/9781315373515-23.
- [23] F. C. D. Bani, Suharjito, Diana, and A. S. Girsang, "Implementation of database massively parallel processing system to build scalability on process data warehouse," *Procedia Computer Science*, vol. 135, pp. 68–79, 2018, doi: 10.1016/j.procs.2018.08.151.
- [24] V. A. Sokolov, R. I. Kuzmich, A. A. Stupina, K. A. Ponomareva, and M. V. Pokushko, "OLAP Concept as a Basis for Business Analysis of Multidimensional Data Structures," *European Proceedings of Computers and Technology*, Feb. 2023, pp. 1–10, doi: 10.15405/eptc.23021.1.
- [25] A. E. Viteri, J. G. Cruzado, and L. A. Huaman, "Methodology for business intelligence solutions in internet banking companies," *International Journal on Advanced Science, Engineering and Information Technology*, vol. 12, no. 3, pp. 1173–1181, May 2022, doi: 10.18517/ijaseit.12.3.13670.
- [26] A. Ilyas, S. H. Wajid, and A. Muhammad, "Usability evaluation of E-government website: A use of system usability scale," *Pakistan Journal of Engineering and Technology*, vol. 5, no. 1, pp. 11–15, Mar. 2022, doi: 10.51846/vol5iss1pp11-15.
- [27] A. Tunsu *et al.*, "Family caregivers' experiences of caring for patients with heart failure: A qualitative study," *Journal of the Practice of Cardiovascular Sciences*, vol. 10, no. 1, pp. 9–17, Jan. 2024, doi: 10.4103/jpcs.jpcs\_54\_23.
- [28] F. V. Fernandez, "Intelligent information extraction from scholarly document databases," *Journal of Intelligence Studies in Business*, vol. 10, no. 2, pp. 44–61, Jun. 2020, doi: 10.37380/jisib.v10i2.584.
- [29] S. Goulas and G. Karamitros, "How to harness the power of web scraping for medical and surgical research: An application in estimating international collaboration," *World Journal of Surgery*, vol. 48, no. 6, pp. 1297–1300, Jun. 2024, doi: 10.1002/wjs.12220.
- [30] B. C. von Hohenberg, S. Stier, A. S. Cardenal, A. M. Guess, E. Menchen-Trevino, and M. Wojcieszak, "Analysis of web browsing data: A guide," *Social Science Computer Review*, vol. 42, no. 6, pp. 1479–1504, Dec. 2024, doi: 10.1177/08944393241227868.
- [31] S. Mathur, S. L. Gupta, and P. Pahwa, "Optimizing OLAP cube for supporting business intelligence and forecasting in banking sector," *Journal of Information Technology Management*, vol. 13, no. 1, pp. 81–99, 2021, doi: 10.22059/jitm.2021.80026.
- [32] A. Cuzzocrea, "Evolving OLAP and BI towards complex, high-performance big-OLAP-data-cube-processing analytics frameworks: How to speed-up large-scale, high-dimensional queries over clouds," *Procedia Computer Science*, vol. 246, pp. 4169–4175, 2024, doi: 10.1016/j.procs.2024.09.256.
- [33] A. M. Deshmukh and R. Chalmata, "Validation of system usability scale as a usability metric to evaluate voice user interfaces," *PeerJ Computer Science*, vol. 10, Feb. 2024, doi: 10.7717/peerj-cs.1918.
- [34] N. Qatawneh, "Empirical insights into business intelligence adoption and decision-making performance during the digital transformation era: Extending the TOE model in the Jordanian banking sector," *Journal of Open Innovation: Technology, Market, and Complexity*, vol. 10, no. 4, Dec. 2024, doi: 10.1016/j.joitmc.2024.100401.
- [35] G. Dean, J. Moraes, J. White, R. Deleon, M. Jones, and T. Furlani, "Performance Optimization of the Open XDMoD Datawarehouse," in *Practice and Experience in Advanced Research Computing*, New York, NY, USA: ACM, Jul. 2022, pp. 1–7, doi: 10.1145/3491418.3530290.
- [36] R. Salgotra, P. Sharma, S. Raju, and A. H. Gandomi, "Correction: A Contemporary systematic review on meta-heuristic optimization algorithms with their MATLAB and Python code reference," *Archives of Computational Methods in Engineering*, Dec. 2024, doi: 10.1007/s11831-024-10206-3.
- [37] L. M. Hoi, W. Ke, and S. K. Im, "Manipulating data lakes intelligently with java annotations," *IEEE Access*, vol. 12, pp. 34903–34917, 2024, doi: 10.1109/ACCESS.2024.3372618.
- [38] R. Fitriana, D. Sugiarto, M. K. Hidayat, and Y. E. H. Turnip, *Design of a business intelligence system model*. Wawasan Ilmu, 2024.
- [39] A. Popović, V. Ivković, N. Trajković, and I. Luković, "A domain-specific language for managing ETL processes," *PeerJ Computer Science*, vol. 10, Jan. 2024, doi: 10.7717/peerj-cs.1835.
- [40] P. Yin and J. Cheng, "A MySQL-based software system of urban land planning database of Shanghai in China," *Computer Modeling in Engineering & Sciences*, vol. 135, no. 3, pp. 2387–2405, 2023, doi: 10.32604/cmescs.2023.023666.

## BIOGRAPHIES OF AUTHORS






**Miwan Kurniawan Hidayat**    has an educational background as a graduate of Informatics Engineering at Pasundan University, Bandung, a master of Computer Science graduate at Nusa Mandiri University, Jakarta, and a graduate of a Master of Industrial Engineering at Trisakti University, Jakarta. Career as an IT practitioner and lecturer at Bina Sarana Informatika University, Jakarta in the field of Information Engineering. Many papers have been published in scientific journals. He can be contacted at email: miwan@bsi.ac.id.






**Dedy Sugiarto**    is an associate professor and lecturer in the Department of Information Systems at Universitas Trisakti, Indonesia. He pursued his Doctoral Degree in Agro-Industrial Engineering at IPB University. His research interests include knowledge management, applied statistics, and data mining and text mining. He can be contacted at email: [dedy@trisakti.ac.id](mailto:dedy@trisakti.ac.id).



**Rina Fitriana**    is an associate professor and lecturer in the Department of Industrial Engineering, Universitas Trisakti, Indonesia. Her educational background is a Bachelor of Industrial Engineering from Universitas Trisakti, a Magister of Management from PPM School of Management, and a Doctor of Agro-Industrial Technology from IPB University. She has more than 22 years of teaching/research in the field of Industrial Engineering. Her research interests include quality engineering, analyze system analysis of information system design, data mining, and business intelligence. She can be contacted at email: [rinaf@trisakti.ac.id](mailto:rinaf@trisakti.ac.id).



**Yun-Chia Liang**    is professor and chair, Department of Industrial Engineering and Management, Yuan-Ze University, Taiwan, ROC. His research and interests are meta-heuristics, intelligent computing, production scheduling, logistics management, artificial neural network applications. He can be contacted at email: [ycliang@saturn.yzu.edu.tw](mailto:ycliang@saturn.yzu.edu.tw).