

Conference Paper

Design and Implementation of a Database and RBAC for Scientific and Competency Mapping Web-based Information System for Lecturers at UPN “Veteran” Jawa Timur

Tresna Maulana Fahrudin*, Achmad Yusuf Al Makruf

Faculty of Computer Science, Universitas Pembangunan Nasional “Veteran” Jawa Timur, Surabaya 60294, Indonesia

*Corresponding author:

E-mail:

tresna.maulana.ds@upnjatim.ac.id

ABSTRACT

Scientific and competency mapping web-based information system aims to address several relevant issues within the context of the Tri Dharma framework in higher education, specifically at UPN "Veteran" Jawa Timur. One of the primary issues is how to review and evaluate the implementation of Tri Dharma, especially in the areas of Education and Teaching, Research, Community Service, and publications, in alignment with the parent-subfields of study and competencies mapping in each study program. Therefore, the research proposes to create an innovative solution that can review and evaluate the alignment of implementation of Tri Dharma in higher education. The research developed a database and Role Base Access Control (RBAC) for web-based information system that lecturers can input education and teaching, research, community service activities, and publications based on the available academic fields, while also helping to identify lecturer expertise according to the knowledge mapping in their respective study programs through a visualization dashboard. The development plan for this application begins with the planning phase, including analyze the system's business processes to understand the system needs of users, designing the necessary features, completing master data such as a list of parent field of study and subfield of study for each study program. This is essential for obtaining an initial understanding of the data structure for the database design. After the database design has been completed, the next step is to implement the database design into an actual database structure using MySQL and then proceed with the development of the web-based application. The system was designed to generate curriculum vitae and visualization in the spider chart to make it easier for the user to understand their scientific and competencies.

Keywords: Scientific mapping, lecturer competency, MySQL databases, web-based information system, UPN Veteran Jawa Timur

Introduction

Based on the Tri Dharma of Higher Education, education, research, and community service, as goals that must be achieved by universities and must be implemented well (Rusilowati & Pratiwi, 2022). It requires a higher education system that is closely related to the organization, implementation, and evaluation of the learning process, as well as competent human resource capabilities to improve the quality of education. Lecturers, as human resources, play a crucial role in the quality of student education, thus requiring lecturers who have competence in their respective fields (Kaur, 2019). Therefore, monitoring the competence of lecturers is a necessity.

Over the last few years, there has been no evaluation process for monitoring the suitability of Tridharma implementation, especially based on maps of scientific fields and lecturer competencies in

How to cite:

Fahrudin, T. M., & Al Makruf, A. Y. (2024). Design and implementation of a database and RBAC for scientific and competency mapping web-based information system for lecturers at UPN “Veteran” Jawa Timur. *8th International Seminar of Research Month 2023*. NST Proceedings. pages 297-307. doi: 10.11594/nstp.2024.4148

each study program at UPN Veteran Jawa Timur. The monitoring process is often carried out using conventional methods, requiring a large amount of time and resources by contacting lecturers in each study program and filing physical documents. The lack of accessibility to information about the knowledge and competence of lecturers for students, staff, and university leaders is a challenge in terms of transparency and accessibility. Hence, there is a need for efficient access to enhance productivity and transparency (Muhie et al., 2020). Addressing this problem can be achieved by building and developing a web-based application to record the implementation of the Tri Dharma for each lecturer which will help monitor the suitability of the scientific map and lecturer competence.

According to Muhie et al. (2020) also mentioned the advantages of using a web-based system in managing evaluations for lecturers, including maintaining the accuracy, confidentiality, and integrity of evaluation data. Additionally, the results of evaluations can be viewed in real time and quickly. A web-based application is necessary for effectiveness, facilitating easy communication among all parties and establishing follow-up mechanisms. By combining a web-based application with Scientific and competency information management for lecturers, a website can be created for data collection related to education, research, and community service carried out by lecturers in their respective fields. This website can be further developed for greater effectiveness and ease of use.

The research conducted by Anastasia et al. (2022) included the development of a web-based information system for lecturers to record their activities related to the Tri Dharma, namely education and teaching, research, community service, and publications, based on Rapid Application Development (RAD) at the Faculty of Mathematics and Natural Science, Sam Ratulangi University. The researchers designed the web-based application through data observation and interviews, incorporating several features such as allowing lecturers to log in to their respective accounts, add data, edit data, delete data, and implement a security system so that visitors can only view profiles and lists of lecturers. The researchers used a simple MySQL database system with 10 tables for data storage (Anastasia et al., 2022).

Another research conducted by Ramdania et al. (2019) described the design of a web-based lecturer performance reporting application using Unified Modeling Language (UML) to illustrate the system design, with the research object being lecturers from private Islamic higher education institutions. The database used in this research is based on MySQL. The study detailed that the website system operated effectively as it could process lecturer data related to education, research, and community service. It was an easily usable application with assured security measures.

Another study conducted by Gultom et al. (2021) developed an information system that could be used by the Research and Community Service Center (P3-M) for managing research and community service activities to be carried out by lecturers at the University of Yayas Papua. The researchers used the waterfall model for its development process and employed Unified Modeling Language (UML) to construct the system design (Gultom et al., 2021).

Therefore, considering efficiency, ease of access, and guaranteed security, we have developed a Scientific and Competency Mapping web-based information system called SIKAD (“**Sistem Informasi Pemetaan Keilmuan dan Kompetensi Dosen**”) that integrates data into a MySQL database and Role Base Access Control (RBAC) concept. The purpose of this development is to facilitate lecturers in inputting data related to education, research, community service, and publications based on the available fields of expertise. It also assists in identifying the expertise of lecturers according to the field of expertise map in their respective study programs in the form of dashboard visualization.

Material and Methods

System design

System design is conducted before forming the database system to provide an overview of how the database system is created and define the overall system architecture. (Nasution et al., 2022). Before implementing a database design, it is necessary to analyze the system's business processes to

understand the system needs of users (Kaniški & Vincek, 2018). Techniques for exploring user needs through several questions, interviews, and discussions with users are recorded and translated into documents that are easy for users to understand. The challenge in developing the system is that apart from designing the database design, it is completing master data such as a list of faculties, study programs, parent field of study, and subfield of study for each study program. The parent field of study and subfield of study for each study program will be collected based on surveys conducted through Google Forms for the all-study program. The master data that has been completed is entered into the database, while the database was built using a MySQL database by creating relational tables. Apart from designing the database, then create a user interface mockup according to user experience needs. Figure 1 shows the proposed system design of the research.

User role

Three types of user roles can access the Scientific and Competency Mapping web-based information system: super admin, admin, and lecturer. The super admin has access to all tables in the database and has the privilege to perform CREATE-READ-UPDATE-DELETE (CRUD) operations, while the admin needs to register and log in through the super admin. It is important to develop security systems that protect information systems from external threats. An important stage in the development of data protection in information systems is the creation of a high-level model, independent of software, that meets the requirements for safeguarding and securing a system. One of the basic concepts of the protection model is access control. The purpose of access control in information systems is to limit the actions or operations that can be performed by system users. Access control based on the role concept is an interesting alternative to traditional systems of the DAC (Discretionary Access Control) or MAC (Mandatory Access Control) type. The RBAC (Role Based Access Control) model, based on the concept of roles, defines user access to information based on the activities that users can perform in a system (Poniszewska-Maranda, 2011).

MySQL database

MySQL is one of the most commonly used Database Management System software (DBMS), with over 6 million installations worldwide. MySQL offers many advantages to its users, including free, open source, stable, flexible, having good security, being suitable for database management, and experiencing rapid software development (Susanto & Meiryani, 2019). MySQL provides an interface for users to create tables that are related to each other in the database by specifying names and attributes, primary key and foreign key relationships in the table, and operations to manipulate data in the table. RBAC concept is used in the development of the proposed system. Basic to advanced CRUD operations can be implemented to manipulate data according to user needs, whether they want to add data, modify data, delete data, or view data (Zmaranda et al., 2021). In the software development framework known as the MVC (Model-View-Controller) concept, the database is considered as a model that has a schema and data-related logic.

Results and Discussion

Modul page

Table 1 shows the access rights for each role on the features provided. The symbol (V) indicates that the user has access, and the symbol (X) indicates that the user does not have access. Admin has access specific tables related to their study programs, including tables such as "*induk_ilmu*" (parent field of study), "*cabang_ilmu*" (subfield of study), "*pengajaran*" (teaching), "*penelitian*" (research), "*pengabdian*" (community service), "*publikasi*" (publications), "*jenis_publikasi*" (publication types), "*hak_cipta*" (copyright and intellectual property), "*riwayat_pendidikan*" (education history), "*rumusan_kebijakan*" (policy formulations), "*narasumber*" (speaker), and "*penghargaan*" (achievement).

Lecturers need to register and log in independently, there are certain tables they can only view, such as "prodi" (study programs), "jabatan_fungsional" (academic positions), "pangkat" (academic ranks), "golongan" (academic level), "jenis_publicasi" (publication types), "induk_ilmu" (parent of field study), and "cabang_ilmu" (subfield of study). Other access is limited to their respective study programs, including tables such as "pengajaran" (teaching), "penelitian" (research), "pengabdian" (community service), "publikasi" (publications), "hak_cipta" (patent), "riwayat_pendidikan" (education history), "rumusan_kebijakan" (policy formulations), "narasumber" (speaker), and "penghargaan" (achievement).

Table 1. The access rights for each feature in the module

No.	Modul	Feature	Super Admin	Admin	Lecturer
1.	Home	Login	V	V	V
		Field: Username, Password, Captcha Sign-up	X	X	V
		<u>For lecturer page:</u> Field: username, password, status_user, id_fakultas_admin, id_prodi_admin Forgot Password Field: Username	V	V	V
2.	Manage users				
	Super Admin manages [Admin user and lecturer user]	Add data – CREATE	V	X	X
		Update data – UPDATE	V	X	X
		Delete data – DELETE	V	X	X
		Show data - READ	V	X	X
	Admin manages lecturer user	Add data – CREATE	V	V – based on study program	X
		Update data – UPDATE	V		X
		Delete data – DELETE	V		X
		Show data - READ	V		X
3.	Dashboard	A. Spider Chart for Parent Field of Study	V	V	V
	Tab Menu (3 Tabs)	Retrieve data from total count for each academic field each study program			
		Use a filter (dropdown chaining faculty → study program)			
		Set the default chart to display according to the study program (for admin/ lecturer)			
		B. Spider Chart for Subfield of Study	V	V	V
		Retrieve data from total count for each academic subfield each study program			

To be continued...

No.	Modul	Feature	Super Admin	Admin	Lecturer
		Use a filter (dropdown chaining faculty → study program)			
		Set the default chart to display according to the study program (for admin/ lecturer)			
		C. Spider Chart for (2 chart) for each lecturer	V	V	V
		Retrieve data from total count for each parent field and subfield of study according to lecturer login session			
		Use a filter (dropdown chaining faculty → study program)			
		Set the default chart to display according to the study program (for admin/ lecturer)			
4.	Profile	Add data – CREATE	V	V – based on	V – based
		Update data – UPDATE	V	study pro-	on study
		Delete data – DELETE	V	gram	program
		Show data - READ	V		and ses-
					sion
5.	Faculty	Add data – CREATE	V	V	X
		Update data – UPDATE	V	V	X
		Delete data – DELETE	V	V	X
		Show data - READ	V	V	V
6.	Study program	Add data – CREATE	V	V	X
		Update data – UPDATE	V	V	X
		Delete data – DELETE	V	V	X
		Show data - READ	V	V	V
7.	Academic position for each study program	Add data – CREATE	V	V	X
		Update data – UPDATE	V	V	X
		Delete data – DELETE	V	V	X
		Show data - READ	V	V	V
8.	Academic rank	Add data – CREATE	V	V	X
		Update data – UPDATE	V	V	X
		Delete data – DELETE	V	V	X
		Show data - READ	V	V	V
9.	Academic level	Add data – CREATE	V	V	X
		Update data – UPDATE	V	V	X
		Delete data – DELETE	V	V	X
		Show data - READ	V	V	V
10.	Parent field of study	Add data – CREATE	V	V – based on	X
		Update data – UPDATE	V	study pro-	X
		Delete data – DELETE	V	gram	X
		Show data - READ	V		V – based
					on study
					program

To be continued...

No.	Modul	Feature	Super Admin	Admin	Lecturer
11.	Subfield of study	Add data – CREATE	V	V – based on study program	X
		Update data – UPDATE	V		X
		Delete data – DELETE	V		X
		Show data - READ	V		V – based on study program
12.	Teaching	Add data – CREATE	V	V – based on study program	V – based on study program
		Update data – UPDATE	V		and session
		Delete data – DELETE	V		
		Show data - READ	V		
13.	Research	Add data – CREATE	V	V – based on study program	V – based on study program
		Update data – UPDATE	V		and session
		Delete data – DELETE	V		
		Show data - READ	V		
14.	Community service	Add data – CREATE	V	V – based on study program	V – based on study program
		Update data – UPDATE	V		and session
		Delete data – DELETE	V		
		Show data - READ	V		
15.	Publication	Add data – CREATE	V	V – based on study program	V – based on study program
		Update data – UPDATE	V		and session
		Delete data – DELETE	V		
		Show data - READ	V		
16.	Publication type	Add data – CREATE	V	V	X
		Update data – UPDATE	V	V	X
		Delete data – DELETE	V	V	X
		Show data - READ	V	V	V – based on study program
17.	Copyright and intellectual property	Add data – CREATE	V	V – based on study program	V – based on study program
		Update data – UPDATE	V		and session
		Delete data – DELETE	V		
		Show data - READ	V		
18.	Educational history	Add data – CREATE	V	V – based on study program	V – based on study program
		Update data – UPDATE	V		and session
		Delete data – DELETE	V		
		Show data - READ	V		
19.	Policy formulation	Add data – CREATE	V	V – based on study program	V – based on study program
		Update data – UPDATE	V		and session
		Delete data – DELETE	V		
		Show data - READ	V		

To be continued...

No.	Modul	Feature	Super Admin	Admin	Lecturer
20.	Speaker	Add data – CREATE Update data – UPDATE Delete data – DELETE Show data - READ	V	V – based on study program	V – based on study program and session
21.	Achievement	Add data – CREATE Update data – UPDATE Delete data – DELETE Show data - READ	V	V – based on study program	V – based on study program and session
22.	Curriculum Vitae	Print Curriculum Vitae	V	V – based on study program	V – based on study program and session

Implementation of relational database

Database system design is built to connect the user's table (as the primary key) to profile, teaching, research, community service, and publications tables. The profile table also connects to academic positions, academic rank, and academic level table. Other supporting tables that are connected from the user table include policy formulations, speaker, and achievement tables, which users can use to input their activities. The database system is used so that the lecturer can input data on Tri Dharma activities they are undertaking by their scientific and competency mapping. Figure 2 shows the implementation of a relational database in SIKAD Web-based Information System.

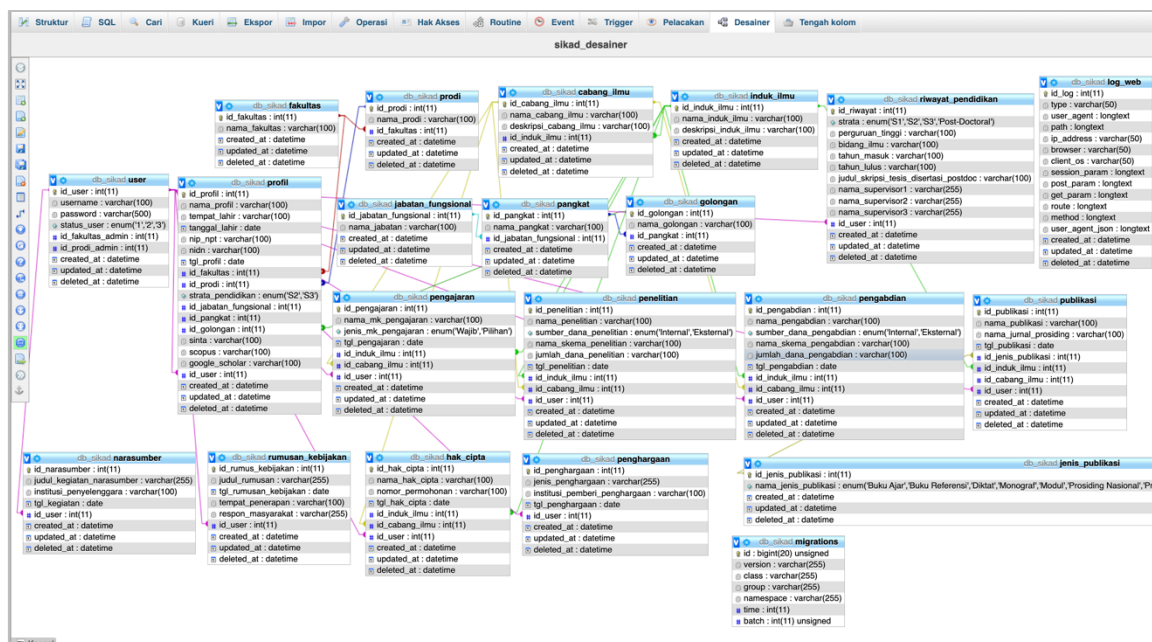


Figure 2. Implementation of a relational database in SIKAD Web-based Information System

User interface mock up

Figures 3 and 4 show the user interface mock up in the login page and register page of SIKAD Web-based Information System. The login page allows the user to fill in e-mail as username and password field, while the register page provides several fields such as name, employee ID number (NIP), national

lecturer registration number (NIDN), gender, date of birth, place of birth, academic position, academic rank, academic level, Sinta ID, Scopus ID, and Google Scholar ID.

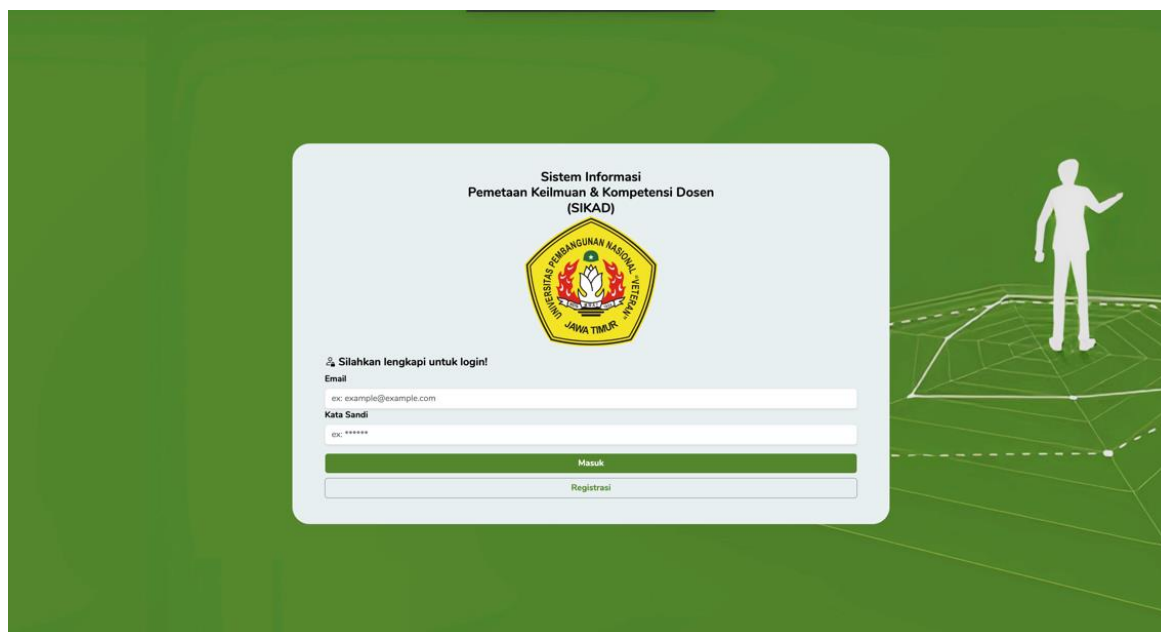


Figure 3. User Interface Mock Up in Login Page of SIKAD Web-based Information System



Figure 4. User interface mock up in register page of SIKAD web-based information system

Spider chart for mapping scientific and competency lecturer

The spider chart is one of the features that can be used by both admins and lecturers to display statistics of the mapping of lecturer scientific and competency in the database. The spider chart can be configured to display based on the parent field or subfield of study in each study program. Figure 5 shows the spider chart design in SIKAD Web-based Information System. This spider chart will make it easier for users to understand the concentration of scientific and competence of each lecturer.



Figure 5. The spider chart design in SIKAD Web-based information system

Generate curriculum vitae

One of the features provided in the Scientific and Competency Mapping web-based information system is the ability to print a curriculum vitae (CV) to assist lecturers. The CV will display personal biodata, education history, teaching experience, research, community service, scientific article publications, participation in scientific seminars, book publications, copyright and intellectual property, experience in formulating public policies, roles as a speaker, and achievement. Figure 6 shows the curriculum vitae design in SIKAD Web-based Information System for Tri Dharma activities.

A. Identitas Diri

1	Nama Lengkap (dengan gelar)	Tresna Maulana Fahrudin, S.ST., M.T.
2	Jenis Kelamin	Laki-laki
3	Jabatan Fungsional	Asisten Ahli
4	NIP/NPT	
5	NIDN	
6	ID Sinta	6779119
7	ID Scopus	57195644106
8	Google Scholar	ZX4Mm8AAAAJ
9	Tempat dan Tanggal Lahir	
10	E-mail	
11	Nomor Telepon/HP	

B. Riwayat Pendidikan

	S-1	S-2	S-3	Post-Doctoral
Nama Perguruan Tinggi	Politeknik Elektronika Negeri Surabaya	Politeknik Elektronika Negeri Surabaya		
Bidang Ilmu	Informatika	Informatika dan Komputer		
Tahun Masuk-Lulus	2011-2015	2015-2017		
Judul Skripsi/Tesis/Disertasi	Sistem Informasi Pelayanan Administrasi Direktorat Intelijen Keamanan Kepolisian Daerah Jawa Timur	Klasifikasi No Evidence of Disease (NED) pada Pasien Kanker Payudara Menggunakan Metode Decision Tree		
Nama Pembimbing/Promotor	Wiratnoko Yuwono, S.T., M.T. Ferry Astika Saputra, S.T., M.Sc.	Iwan Syarif, S.Kom., M.Kom., M.Sc., Ph.D Aliridho Barakbah, S.Kom., Ph.D		

C. Pengalaman Pengajaran dalam 5 Tahun Terakhir

No.	Tahun	Nama Mata Kuliah	Jenis Mata Kuliah	Induk Ilmu	Cabang Ilmu
1.	2023	Data Mining II	Wajib
2.	2023	Deep Learning	Wajib
3.	2023	Analisis Data Eksploratif	Wajib

D. Pengalaman Penelitian dalam 5 Tahun Terakhir (Bukan Skripsi, Tesis, maupun Disertasi)

No.	Tahun	Judul Penelitian	Sumber Dana*	Pendanaan Skema Penelitian	Jml (Juta Rp)	Induk Ilmu	Cabang Ilmu
1.	2021	KEBI: Sistem Deteksi Kesalahan Ejaan Bahasa Indonesia pada Naskah Karya Ilmiah Berbasis Web	Internal	Skema Riset Dasar - UPN "Veteran" Jawa Timur	Rp. 12.500.000		
2.	2023	Cakrawala DN	Eksternal	DTRPM	Rp. 125.000.000		

E. Pengalaman Pengabdian Kepada Masyarakat dalam 5 Tahun Terakhir

No.	Tahun	Judul Pengabdian	Sumber Dana	Pendanaan Skema	Jml (Juta Rp)	Induk Ilmu	Cabang Ilmu
1.	2021	Pemanfaatan Aplikasi Dashboard Analytics dan Klasku Shopee Sebagai Strategi Promosi dan Peningkatan Penjualan Produk Peralatan Rumah Tangga pada Toko Sumber Rejeki Pasar Kota Gresik	Internal	Skema: Pemanfaatan IPTEKS bagi Masyarakat (PIKAT) - UPN "Veteran" Jawa Timur	Rp. 6.000.000		
2.	2022	Desain Katalog Produk UKM Kampung Kue Surabaya dengan Efek Flipbook Menggunakan Aplikasi Carus Berbasis Android	Mandiri				
3.	2022	Pengenalan Aplikasi Machine Learning for Kids sebagai Media Pembelajaran Artificial Intelligence bagi Guru dan Siswa di Lingkungan Sekolah (SMP Miftahul Ulum Jabon)	Mandiri				

F. Publikasi Artikel Ilmiah Jurnal dalam 5 Tahun Terakhir

No.	Judul Artikel Ilmiah	Nama Jurnal	Tahun Publikasi	Induk Ilmu	Cabang Ilmu
1.	Data Mining Approach for Breast Cancer Patient Recovery	EMITTER International Journal of Engineering Technology	2017		
2.	Pemodelan dan Evaluasi Trend Forecasting Pada Kondisi Korona Kecelakaan Lalu Lintas Menggunakan Trend Moment dan Least Square	Jurnal Sistem Cerdas - Analisis Praktek Indonesia Cerdas (APIC)	2018		
3.	Lyric Text Mining of Dangdut: Visualizing the Semantic Work and Word Pairs of The Legendary Rhema Irena's Dangdut Song in the IPTS Era	Systemic: Information System and Informatics Journal	2018		
4.	Analisa dan Perencanaan Jumlah Penumpang Kereta Api di Indonesia Menggunakan Metode Saranik Deskriptif dan K-means Clustering	Manak. Manajemen, Teknologi Informatika dan Komunikasi	2019		

Figure 6. Curriculum vitae design in SIKAD web-based information system for Tri Dharma activities

The system is able to generate list of articles from national proceeding and international proceeding categories which is illustrated Figure 7.

No.	Nama Pertemuan Ilmiah / Seminar	Judul Artikel Ilmiah	Tahun	Induk Ilmu	Cabang Ilmu
1.	International Electronics Symposium (IES) 2016-IEEE co- sponsored conference	Ant Colony Algorithm for Feature Selection on Microarray Datasets	2016		
2.	International Conferences on Informatics and Computing (ICIC) 2016-IEEE co- sponsored conference	Feature Selection Algorithm using Information Gain Based Clustering for Supporting the Treatment Process of Breast Cancer	2016		
3.	International Conferences on Knowledge Creation and Intelligent Computing (KCIC) 2016-IEEE co-sponsored conference	The Determinant Factor of Breast Cancer on Medical Oncology using Feature Selection Based Clustering	2016		
4.	The International Electronics Symposium on Knowledge Creation and Intelligent Computing (IES-KCIC) 2017-IEEE co- sponsored conference	Discovering Patterns of NED- Breast Cancer Based on Association Rules Using Apriori and FP-Growth	2016		
5.	IEEE 7th International Conference on Serious Games and Applications for Health (SeGAH)	Human Voice Emotion Identification Using Prosodic and Spectral Feature Extraction Based on Deep Neural Networks	2019		

Figure 7. The result of retrieving data from National and International Proceedings

The system can generate books from categories of textbooks, reference books, diktat, monographs, and modules which is illustrated in Figure 8.

No.	Judul Buku	Penerbit	Jenis (Buku ajar / buku referensi / diktat /monograf / modul)	Tahun	Induk Ilmu	Cabang Ilmu
1.	Desain Mobile Robot dengan Kendali Smart Phone Android	Scopindo	Buku	2020		
2.	Chatbot: Membangun Mesin Percakapan Pintar dengan Python dan Telegram Bot	Deepublish	Buku	2021		
3.	Strategi <i>Advertising</i> Produk Bagi Pedagang Pasar di Masa New Normal Pandemi Covid-19 Menggunakan <i>Marketplace Dashboard Analytics</i>	Global Aksara Pers	Buku	2021		

Figure 8. The result of retrieving data from the Textbook, Reference Book, Diktat, Monograph, and Module

Conclusion

The Scientific and Competency Mapping web-based information system that integrates data into a MySQL database and RBAC concept offers numerous advantages. Apart from the efficiency in monitoring lecturers' competence levels, lecturers can have access to perform CRUD operations on data stored in the MySQL database. Additionally, the proposed design system can help identify the expertise of lecturers based on expertise maps in each program of study they are involved in. Utilizing a database also helps in determining data interconnections to facilitate the process of generating

curriculum vitae and visualization in spider charts. The access rights given to each role can also increase the level of security.

Acknowledgment

The author would like to thank the Ministry of Education, Culture, Research, and Technology, Research, and Community Service Institute, Universitas Pembangunan Nasional “Veteran” Jawa Timur which has funded this research based on the Assignment Agreement for the Implementation of the Internal Research Program for UPN Mengabdi in 2023, Number: SPP / 124 /UN.63.8/DIMAS/VIII/2023.

References

- Anastasia, L. A., Pinontoan, B., & Latumakulita, L. A. (2022). Design web-based information system of tri dharma higher education for lecturer. *Operations Research: International Conference Series*, 3, pp. 23-31. Bandung: Iora Journal.
- Gultom, L., NurAlam, S., Widiyantoro, M. R., & Robo, S. (2021). Research and community service management information system at P3-M University of Yapis Papua. *Jurnal Teknologi Dan Open Source*, 4(1), 48 - 55.
- Kaur, S. (2019). Role of a teacher in student learning process. *International Journal of Business and Management Invention (IJBMI)*, 8(12), 41-45.
- Kaniški, I., & Vincek, I. (2018). Analyze the system's business processes to understand the system needs of users. *Tehnički Glasnik*, 12(1), 56-61.
- Muhie, Y. A., Wolde, A. B., & Tesfay, C. H. (2020). Efficiency management system as a tool to monitor lecturer's performance. *Journal of Computer Science*, 16(11), 1526-1534.
- Nasution, N., Darmayunata, Y., & Wahyuni, S. (2022). Information system design for monitoring and evaluation of learning on blended learning. *Al-Ishlah: Jurnal Pendidikan*, 14(2), 1633 - 1644.
- Poniszewska-Maranda, A. (2011). Management of access control in information system based on role concept. *Scalable Computing: Practice and Experience*, 12(1), 35-49.
- Ramdania, D. R., Irfan, M., Saprudin, R., Alam, C. N., Ramdhani, M. A., & Yusli, D. (2019). Web-based design for lecturer performance. *Journal of Physics: Conference Series*. Bristol: IOP Publishing.
- Rusilowati, U., & Pratiwi, A. (2022). Lecturers' real contributions to a resilient Indonesia in the era of society 5.0. *Scientific Journal of Reflection: Economic, Accounting, Management and Business*, 5(4), 2022.
- Susanto, A., & Meiryani. (2019). Database Management System. *International Journal of Scientific & Technology Research*, 8(6), 309-312.
- Zmaranda, D. R., Moisi, C. I., Győrödi, C. A., Győrödi, R. Ş., & Bandici, L. (2021). An Analysis of the performance and configuration features of MySQL document store and elasticsearch as an alternative backend in a data replication solution. *Applied Sciences*, 11(24), 1-23.