Design and Validation of Instrument for the Development of Information System Model for Personal Health Record Management of Elementary School Students

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Abstract: The information system for managing personal health records of elementary school students has an important role in maintaining children's health. Recording health data, such as health screening activities in elementary schools, is important to see children's growth and development. The purpose of this research is to design and validate the research instruments needed for the development of the Student Personal Health Record Management Information System (SIM-RKPS). The quantitative descriptive research method, using a questionnaire of 14 items distributed to 36 respondents. The results of the validity test show that most of the items in the research instrument have a high Corrected Item-Total Correlation value, meaning that each item is strongly correlated with the total scale. This significant correlation value reflects that the items are able to measure the same construct well. Items such as the SOP for Data Management and Special Budget have a correlation value of 0.912 which means that these items are very valid. Most items have a correlation value > 0.7 which is a generally accepted threshold for good validity. However, there are some items, such as Sick Student Handling, which has a lower correlation value of 0.582 indicating that this item has a weaker relationship with the constructed being measured. The reliability test showed a Cronbach's Alpha value of 0.972, indicating that this instrument is reliable.

Keywords: SIM-RKPS, Validity Test, Reliability Test

INTRODUCTION

The development of information technology has affected various sectors, including the health sector. One of the important efforts that can be made in the health sector is the management of personal health records of elementary school students. These health records include data related to disease history, immunizations, allergies, and other health data that are important for schools, parents, and medical authorities to pay attention to (Natalia & Anggraeni, 2022). This research aims to develop and validate instruments that can be used in building an information system model for the management of students' personal health records.

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Instrument design is an important process in the development of information systems (Khoiriyah & Dwi, 2024). These instruments are used to collect data relevant to development goals, such as user needs and system performance evaluation. In the context of developing an information system model, the right design of instruments plays a big role in ensuring the success of system implementation, because information systems greatly affect the performance and effectiveness of organizations (Rahman Abdillah et al., 2023). This design process must be carried out carefully to produce an instrument capable of providing valid and reliable data.

The first stage in instrument design is identifying clear objectives and gathering information (Waruwu, 2024). These goals typically relate to specific aspects of the system you want to measure, such as efficiency, reliability, and user satisfaction. Without a clear purpose, the instrument design will lose focus and may not be able to collect relevant data. Therefore, at this stage, the developer must really understand the variable that is to be measured and then translated into the form of an appropriate instrument (Ihsan, 2015).

Next, developers need to formulate the items or questions that are part of the instrument. This item should be relevant to the measured aspect and presented in clear and easy-to-understand language for respondents (Fadli, 2021). The item development process requires precision, as poorly designed instruments can produce inaccurate data (Hernawati, 2017). Each item should be designed to reflect the measured aspects directly and comprehensively (Hendryadi, 2017).

Once the item has been developed, the instrument must be tested for content validity. This validity refers to how well the instrument can measure all relevant aspects. For this reason, a review from experts or practitioners who have expertise in the field of information systems is needed (Roselina, 2017). This process aims to ensure that the instrument includes all the important elements related to the variables being measured and that no important aspects are missed. In addition to the validity of the content, the instrument must also be tested for reliability. Reliability refers to the ability of an instrument to produce consistent results when used in the same situation. Reliability testing can be done by certain methods, such as test repetition or item splitting (split-half). Reliable instruments are important to ensure that the data obtained is stable and reliable for decision-making (Maulana, 2022).

The next step is to test the empirical validity of the instrument. The test was conducted by collecting data from relevant populations and analyzing the relationships between items in the instrument. Statistical analysis techniques, such as factor analysis, are often used to ensure that

the items used actually measure the desired variables (Yusup, 2018). With these tests, developers can ensure that the instrument is working as it should in real-world situations.

Instrument validation is the next important stage (Lehmann-Mendoza et al., 2024). Validation aims to ensure that the instrument developed actually measures what it is supposed to measure. There are several types of validity that must be tested, such as construction validity which measures the extent to which an instrument can reflect the theoretical concept in question, as well as predictive validity which measures the instrument's ability to predict future performance of the system. This test is carried out through the collection of field data to measure the accuracy of the instrument.

METHOD

The quantitative descriptive research method includes three main stages of research, the first stage of instrument development used in this study is in the form of a questionnaire with 14 question items distributed to 36 respondents. The questionnaire instrument is designed to explore user needs for SIM-RKPS. The instrument was developed based on literature studies related to health information systems, as well as through consultation with experts in the field of health and information technology. The main focus of the questionnaire is to identify key elements in the management of student health data, such as the type of health data, the main users of the system (teachers, principals, and medical personnel), as well as the key features desired.

The second stage is to test the validity and reliability of the instrument, the instrument that has been developed is then tested for validity using the validity of the construct and the validity of the content. Reliability tests are performed using Cronbach's Alpha technique to ensure that the instrument is consistent and reliable in measuring system development needs. The trial subjects consisted of 36 respondents consisting of teachers, school principals and medical personnel of health centers in the city of Semarang.

The third stage of information system model development uses the Unified Modeling Language (UML) approach by utilizing use case diagrams and class diagrams to illustrate system needs and workflows. The data collected from the questionnaire is used as a basis in modeling. The development of the model is carried out in stages and involves evaluation by experts or experts to ensure that the system is in accordance with the user's needs and runs effectively and efficiently.

RESULTS

The first stage of instrument development is the identification of several key components identified in the development of the SIM-RKPS model, such as student health data, there are several types of data that need to be managed by the system, including: immunization history, allergies, special health conditions, and results of student health screening examinations.

Table 1. Student health data

No.	Types of Health Data	Inspection Data	Update Frequency
1.	Immunization	Polio Vaccine, DPT, MMR	Every time it is done
2.	Allergy	Food allergies, medications	Every need
3.	Periodic Inspections	Weight, height	Periodic

The main users of this system include teachers who can be used to monitor the health of students in schools. Parents can monitor their children's health conditions online. Medical personnel can enter and update student health data. Some of the key features that users want include health notifications (for example, when students need to be immunized). Student health reports that can be accessed by parents and teachers. Integration with local health systems for emergency reporting.

The second stage is to test the validity and reliability of the instrument. The results of the development of the instrument as shown in table 2, show that this instrument has good content validity based on the evaluation of experts (information technology experts and health experts). A Cronbach's Alpha value of 0.972 indicates that the instrument is reliable to use. The respondents' assessment in answering the system needs analysis using the Likert scale with criteria ranging from (1) strongly disagree, (2) disagree, (3) agree, (4) strongly agree. Furthermore, the results of the questionnaire that have been filled out by the respondents are analyzed using the SPSS program according to the needs of the researcher.

Table 2. Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.972	.972	14

Table 2, Reliability Statistics shows the results of reliability analysis using Cronbach's Alpha, which yielded a value of 0.972, showing that the instrument or questionnaire consisting of 14 items has a very high level of internal consistency. The same value was also seen in Cronbach's Alpha Based on Standardized Items 0.972 which confirms that the reliability results remain consistent

even though these items are standardized. With a value close to 1, this instrument is considered very reliable for measuring internal consistency between items.

Table 3. Item-Total Statistics

| Indicator of Research Questionnaire	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
HR Competencies	46.65	30.290	.740	.	.972
Human Resources in Charge	46.92	28.910	.862	.	.969
Data Management Task	46.92	28.910	.862	.	.969
Organizational Structure	46.84	29.029	.855	.	.969
SOP Data Manager	46.73	29.092	.912	.	.968
Health Data	46.92	29.521	.742	.	.972
Data Logging	46.92	28.910	.862	.	.969
Integrated Data	47.00	29.389	.775	.	.971
Special Budget	46.73	29.092	.912	.	.968
Training Budget	46.73	29.092	.912	.	.968
Small Doctor Budget	46.81	28.991	.875	.	.969
UKS Room	46.73	29.092	.912	.	.968
UKS Equipment	46.81	28.991	.875	.	.969
Handling of Sick Students	46.92	30.354	.582	.	.975

In table 3, the Item-Total statistical analysis is included which aims to measure the reliability of the questionnaire instrument using Cronbach's Alpha value. Table 3, includes 14 indicators, such as "HR Competencies", "Data Management Task", "Health Data", and others, which relate to various aspects of data and resource management in SIM-RKPS. The Scale Mean if Item Deleted and Scale Variance if Item Deleted values indicate the average and variance of the scale if each item is deleted, with the variation of the mean value ranging from 46.65 to 47.00 and the variation of the variance between 28.910 to 30.354. The Corrected Item-Total Correlation value describes the correlation between each item with a total score of the scale, which ranges from 0.502 to 0.912. This indicates that most items have a strong correlation with the total scale, signaling that these items support each other in measuring the desired variable. Cronbach's Alpha if Item Deleted value displays an alpha value if the item is removed from the scale, with alpha values ranging from 0.968 to 0.975. This high Cronbach's Alpha value indicates that the overall instrument has excellent internal consistency, with values above 0.9 indicating very strong reliability. None of the items significantly decreased the value of Cronbach's Alpha when removed, so it can be concluded that the entire item is relevant and maintainable in the questionnaire instrument.

Table 4. Questionnaire About Needs Analysis

Human Resources for Student Health Data Management at UKS				

No	Questionnaire Question Indicators	Answer			
		1	2	3	4
1.	Human resource competencies for managing student health data at UKS Elementary School (have participated in UKS management training)				
2.	There are human resources in charge of managing student health data at UKS Elementary School. (According to the UKS Governance Book at the Elementary School Directorate of the Ministry of Education and Culture in 2020)				
3.	The UKS data management task is in accordance with the provisions (UKS Governance Book at the Elementary School Directorate of the Ministry of Education and Culture in 2020)				
4.	There is an organization in the management of UKS Elementary School (Organizational Structure)				
Student health data management information system at UKS					
5.	There is an SOP for managing student health data in UKS Elementary School				
6.	Student health data in UKS Elementary School is managed using an information technology-based information system				
7.	Recording student health data at UKS Elementary School is carried out regularly				
8.	Student health data in UKS Elementary School is integrated with data from the health center and the Health Office				
Budget for managing student health data at UKS					
9.	There is a special budget for the management of student health data in UKS Elementary Schools				
10.	There is a budget for training to improve the competence of UKS Elementary School Coaches				
11.	There is a budget for the training of students (small doctors) or student health cadres in elementary schools				
Facilities and infrastructure for managing student health data at UKS					
12.	Adequate and standard UKS space (room area, ventilation and lighting)				
13.	Equipment at UKS is adequate and standard (medical devices, medicines and medical materials)				
14.	Schools facilitate the handling of sick students to health facilities (puskesmas or hospitals) if they cannot be handled at UKS.				

Please provide input related to what needs should be met from the management of student health data at UKS:

Linker Scale: (1) Very unimportant, (2) Moderately important, (3) Important, (4) Very important

The third stage is the development of information system models using use case diagrams. Use case diagrams are one of the various types of UML *(Unified Modelling Language)* diagrams that can illustrate the interaction relationship between the system and the actors involved in each other, such as each actor in figure 2. UKS teacher actors, Input student health data where UKS teachers can input student health data into the system. View the results of the student's health record and print the health report of each student as a report to the principal. Actors of health center officers can input the results of student health checks into the system. Viewing the results of student health records on the system, processing health data from health checks in the work area of the health center and printing student health reports for each school as a report to the head of the health center and can follow up based on student health data. Actors of the health office, saw health reports from various schools and from various health centers in the city of Semarang. Manage health data from various health centers and monitor student health data in the work area of each health center to follow up on the results of student health checks.
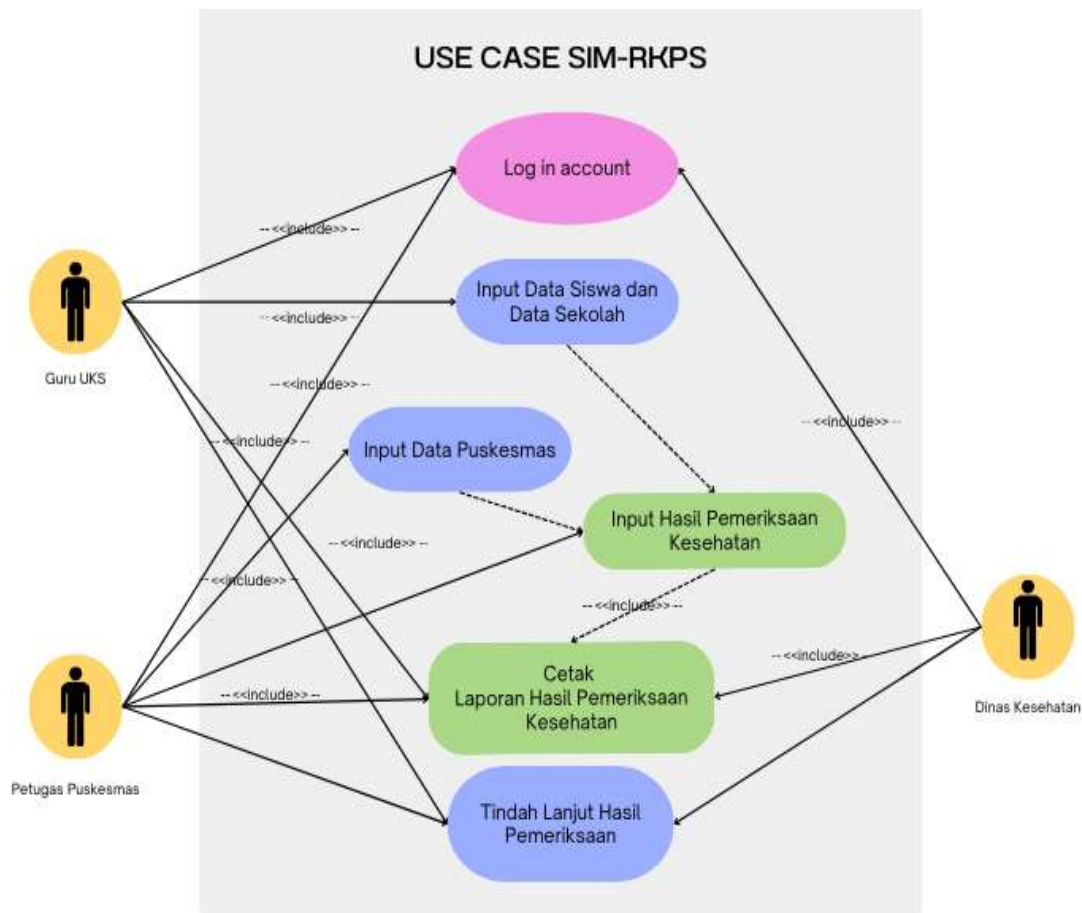
Figure 2. Diagram Use Case Model SIM-RKPS

The development of the SIM-RKPS model based on information technology can be described by researchers using auxiliary software or *case tools* for information system development to describe each process in the system. An overview of the system involved in student health screening or screening activities can be seen from the connection between the entities involved such as UKS Supervisors, PMIK Puskesmas Officers, Semarang City Education Office and Semarang City Health Office by designing the system using *Contex Diagram* as shown in figure 3. Each entity involved in the system can provide data input or receive reports according to the needs of the information system developed.
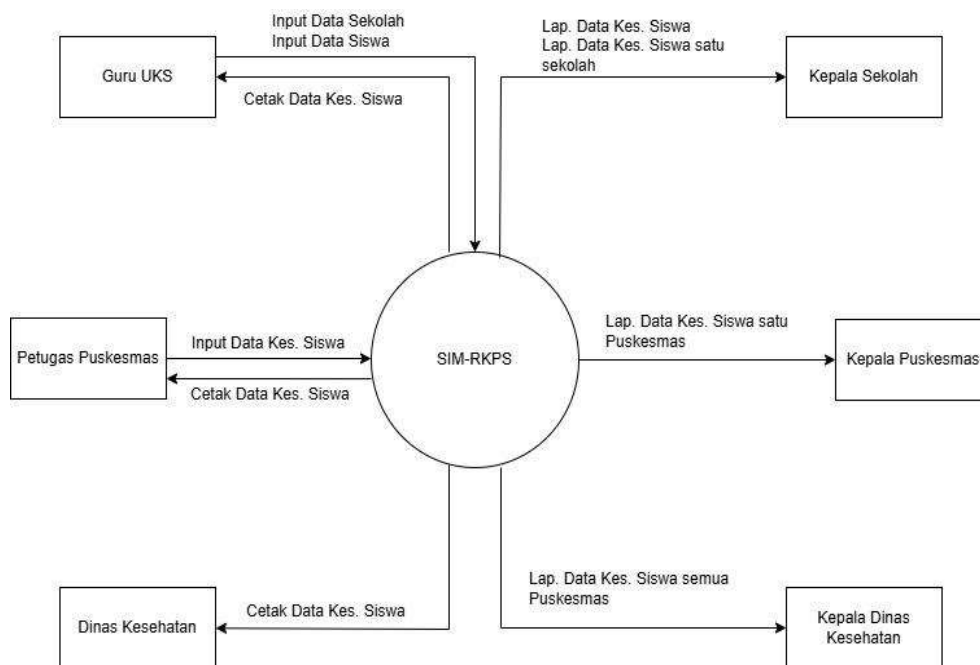

Figure 3. SIM-RKPS Diagram Contex Design

SIM-RKPS Model Database Design Design

The design of databases and relationships between tables is also made to describe the relationships between tables according to the level of the relationship. In figure 4, The database design includes the Puskesmas table consisting of: id_puskesmas, nama_puskesmas, alamat_puskesmas, created_by, modified_by. The school table consists of: id_sekolah, nama_sekolah, alamat_sekolah, puskesmas, created_by, modified_by. The class table consists of: id_kelas, nama_kelas, sekolah, created_by, modified_by. The student table consists of: id_siswa, nisn_siswa, nama_siswa, tgl_lhr_siswa, gol_darah_siswa, ortu_wali_siswa, jk_siswa,

jenis_dis_siswa, kelas, created_by, modified_by. The checklist consists of: id_periksa, tgl_periksa, td_siswa_a, siswa, modified_by.
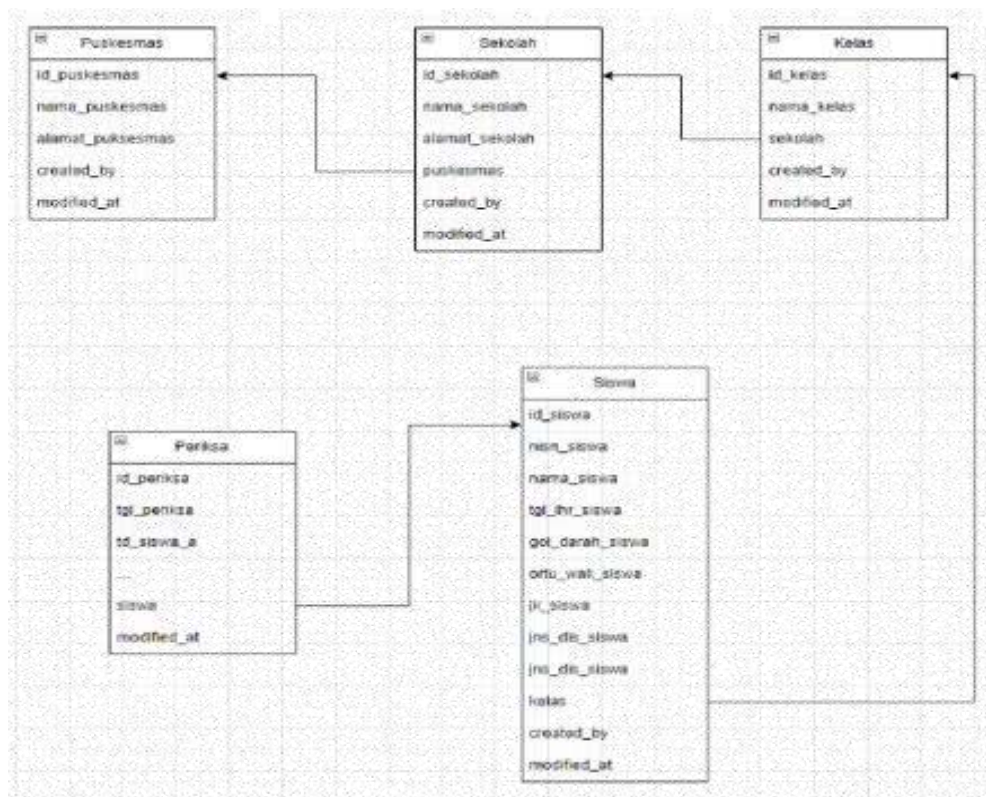
Figure 4. Design of Database and Relationship between Tables

DISCUSSION

The development of an information system for the management of personal health records of elementary school students is very important in supporting real-time student health management. The validation of the instrument carried out in this study shows that the instrument can be used to accurately explore user needs. The designed information system has several features that are expected to help teachers, parents, principals and health center medical personnel in better managing student health.

Theoretically, this study contributes to the literature related to the development of health information systems in the educational environment. The implementation of the system is expected to increase efficiency in managing student health records, reduce the risk of delays in handling certain health conditions, and strengthen communication between schools, parents, and medical personnel.

The limitations of this study include the scope of the area that is still limited to one city, so a wider trial is needed to generalize the results of this study. In addition, the system developed needs

to continue to be adjusted to the prevailing health regulations in Indonesia, as well as the development of information technology.

CONCLUSION

Instrument design and validation are integral parts of the development of information system models. Well-designed and validated instruments can ensure that system developers get accurate and relevant data to support the development of effective information systems (Okpatrioka, 2023). Thus, a good design and validation process helps reduce the risk of failure and increase the efficiency and success of the implementation of information systems in the organization (Hawa, 2024).

This study succeeded in developing and validating an instrument for the development of an information system model for the management of personal health records of elementary school students. Instruments that have been tested for validity and reliability can be used to identify user needs and become the basis for the development of information systems. The use of this system is expected to enhance student health management and facilitate communication between schools, parents, and medical personnel.

Conflict of Interest

The authors declare that they have no conflict of interest.

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REFERENCES

Fadli, M. R. (2021). Memahami Desain Metode Penelitian Kualitatif. *Humanika*, *21*(1), 33–54. https://doi.org/10.21831/hum.v21i1.

Hawa, N. (2024). Penerapan Sistem Infomasi Manajemen Pada Suatu Organisasi. *Jurnal Topik Manajemen*, *1*(3), 365–380.

Hendryadi, H. (2017). Validitas Isi: Tahap Awal Pengembangan Kuesioner. *Jurnal Riset Manajemen Dan Bisnis (JRMB) Fakultas Ekonomi UNIAT*, *2*(2), 169–178.

https://doi.org/10.36226/jrmb.v2i2.47

Hernawati, S. (2017). Metodologi Penelitian Dalam Bidang Kesehatan Kuantitatif & Kualitatif. In Heru Santoso W. H (Ed.), *Forum Ilmiah Kesehatan (FORIKES)* (Vol. 11, Issue 1).

Ihsan, H. (2015). Validitas Isi Alat Uukur Penelitian: Konsep Dan Panduan Penilaiannya. *Pedagogia : Jurnal Pendidikan*, *13*(3), 173. https://doi.org/10.17509/pedagogia.v13i3.6004.

Khoiriyah, I., & Dwi, S. (2024). Pengembangan Sistem Informasi Pembangunan Daerah Berbasis Website Menggunakan Metode Waterfall. *Applied Information Technology and Computer Science Technology and Computer Science*, *3*(1), 15–20. https://jurnal.politap.ac.id/index.php/aicoms.

Lehmann-Mendoza, R., Cortés-Moreno, G. Y., Sarabia-González, O., Figuerola-Escoto, R. P., Luna, D., González-Mundo, I., Caselín-Ledezma, R., Vázquez-Dávila, R. A., & Martínez-Arredondo, H. A. (2024). Design and validation of an instrument to evaluate Person-Centered care in health services. *Archives of Public Health*, *82*(1), 1–12. https://doi.org/10.1186/s13690-024-01324-2.

Maulana, A. (2022). Analisis Validtas, Reliabilitas, dan Kelayakan Instrumen Penilaian Rasa Percaya Diri Siswa. *Jurnal Kualita Pendidikan*, *3*(3), 133–139. https://doi.org/10.51651/jkp.v3i3.331.

Natalia, S., & Anggraeni, S. (2022). Skrining Kesehatan Anak Sekolah Sebagai Upaya Deteksi Kesehatan Sejak Dini. *Journal of Community Engagement in Health*, *5*(1), 47–50. https://doi.org/10.30994/jceh.v5i1.340.

Okpatrioka. (2023). Research And Development (R&D) Penelitian Yang Inovatif Dalam Pendidikan. *Dharma Acariya Nusantara: Jurnal Pendidikan, Bahasa Dan Budaya*, *1*(1), 86–100. https://doi.org/10.47861/jdan.v1i1.154.

Rahman Abdillah, Rudi Hermawan, Adhityo Kuncoro, Andreas Adi Trinoto, Fikri Hizryan, & Heri Arifin. (2023). Analisis dan Implementasi Sistem Informasi Persewaan Alat dengan metode Rapid Application Development. *Jurnal Penelitian Sistem Informasi (Jpsi)*, *1*(3), 23–37. https://doi.org/10.54066/jpsi.v1i3.633.

Roselina, W. (2017). Rekayasa Sistem dan Teknologi Iformasi. *Jurnal Online*, *1*(Rekayasa Sistem dan Teknologi Informasi), 19–25. http://jurnal.iaii.or.id.

Waruwu, M. (2024). Metode Penelitian dan Pengembangan (R&D): Konsep, Jenis, Tahapan dan Kelebihan. *Jurnal Ilmiah Profesi Pendidikan*, *9*(2), 1220–1230. https://doi.org/10.29303/jipp.v9i2.2141.

Yusup, F. (2018). Uji Validitas dan Realibilitas Instrumen Penelitian Kuantitatif. *Jurnal Ilmiah Kependidikan*, 7(1), 17–23.