*Analysis of Information Systems Development Methods: A Literature Review*

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**Abstract** - The development of information systems encompasses a variety of approaches and platforms. These platforms or tools suitable for creating information systems include web-based, desktop-based, or mobile-based solutions. The Software Development Life Cycle (SDLC), specifically the process used to design and construct information systems, aims to deliver high-quality systems that align with customer preferences and the benefits of system creation. This research was carried out to establish a model for developing website-based information systems. The data for this model was gathered from pertinent literature spanning the years 2019 to 2023. The research methodology employed here is a Systematic Literature Review (SLR). SLR is a method used to identify, assess, and interpret all existing research within a specific subject area, focusing on topics of interest and research questions associated with a particular subject. The findings of this research highlight the primary approaches used in the development of website-based information systems, as well as the pros and cons of employing such systems, as demonstrated in this study. The research findings indicate that the most commonly used method in information system development is the waterfall method, with the education and business sectors being the most frequently focused areas.

**Keywords** - Information Systems Development, System Literature Review (SLR), Software Development Life Cycle (SDLC), Waterfall.

**Intisari** - Pengembangan sistem informasi mempunyai berbagai metode dan platform yang bermacam-macam. Platform atau sarana yang bisa digunakan pada pengembangan sistem informasi yakni platform berbasis web, desktop atau mobile. *Software Development Life Cycle* (SDLC) yakni, siklus yang dipakai pada pengembangan atau pembuatan sistem informasi guna menghasilkan sistem berkualitas tinggi berdasarkan keinginan pelanggan atau manfaat dibuatnya sistem tersebut. Penelitian ini dilakukan dengan tujuan untuk menentukan model pengembangan sistem informasi yang datanya diperoleh berdasarkan literatur yang relevan dari tahun 2019 sampai 2023. Metode yang dipakai dalam penelitian ini yakni, *system literature review* (SLR). Metode SLR dimanfaatkan dalam mengidentifikasi, meninjau, mengevaluasi, serta menafsirkan seluruh penelitian yang tersedia di bidang subjek pada suatu fenomena yang menarik, dan pertanyaan penelitian terkait hal tertentu. Hasil penelitian ini menunjukkan bahwa metode yang paling banyak dipakai pada pengembangan sistem informasi adalah metode waterfall, sedangkan fokus bidang yang digunakan paling banyak adalah bidang pendidikan dan bisnis.

Kata Kunci - Pengembangan Sistem Informasi, System Literature Review (SLR), Software Development Life Cycle (SDLC), Waterfall.

1. **Introduction**

Information systems play a crucial role, and their significance grows in tandem with the rapid expansion of companies and organizations. The ever-increasing demand for superior information systems is driven by technological advancements, corporate progress, procedural alterations, government regulations, and the need for information access. The process of creating information systems is commonly known as information system development. This development involves the creation of computer-based systems designed to address organizational challenges or capitalize on emerging opportunities. System development can encompass the development of entirely new systems to replace outdated ones or the enhancement of existing systems, typically undertaken when the previous system's efficiency is compromised or it faces various issues.

Information system development is closely linked to the System Development Life Cycle, commonly referred to as SDLC, which serves as the fundamental methodology for creating information systems. SDLC encompasses several phases, commencing with planning, followed by analysis, design, implementation, and concluding with system maintenance. This SDLC concept draws from a variety of software development models to establish a structured framework for planning and managing the development of information systems. SDLC is a process that entails transforming or advancing software systems using tried-and-tested methodologies and practices from previous software development experiences. There are several implementation approaches within the process stages of SDLC, including the Parallel Model, Sequential Model (Waterfall), Iterative Model, RAD (Rapid Application Development) Model, Prototyping Model, V-shaped Model, Spiral Model, and Agile Development. In essence, system development involves revitalizing an older system, either by reconfiguring it or replacing it with a new system that aligns with improved and more beneficial directions. The decision to revamp or replace an old system is driven by various factors, such as the emergence of issues, or the pursuit of key opportunities and directives from leadership.

Due to the importance of information system development methods, in this research data was collected from previous to current research on information systems to determine information system development methods. The research will be carried out using a systematic literature review method, namely to interpret and evaluate all existing research based on specific research questions, topic areas or phenomena. It is hoped that this literature review will provide an overview of the types of information system development that often appear in articles contained in journal databases from 2019 to 2023.

1. **Literature Studies**
	1. *Systematic Literature Reviews (SLR)*

A Systematic Review is a term employed in research methodology to describe a methodical process used to gather and assess research relevant to a specific topic of interest. Several researchers have provided various definitions of Systematic Literature Reviews (SLR) as follows:[1]

1. A Systematic Literature Review (SLR) is a methodology used to systematically identify, interpret, and assess all the available research pertaining to a specific topic, research question, or area of interest.
2. SLR, an evidence-based approach, is employed to systematically search for studies that align with predefined research questions. It involves assessing, synthesizing, and evaluating findings to address those research inquiries.
3. SLR is a research method for comprehensively analyzing the current state of knowledge in a particular field. This involves formally defining the research problem, constructing search criteria, specifying information sources, outlining inclusion and exclusion criteria for identified papers, determining any necessary analysis techniques, and establishing templates for organizing the collected information from the papers.
4. SLR is a research method utilized to investigate issues within the realm of Software Engineering.
	1. *Research Question*

Research questions are created according to the requirements of the selected topic. Following are the research questions used in this research:

RQ1: What website-based information system development methods are most frequently used in 2019-2023?

RQ2: Is the implementation of the SDLC model effective?

RQ3: What are the fields that implement the SDLC model for information system development?

1. *Search Process*

The search process for research journals was obtained from Google Scholar which were published in 2019-2023. This process is carried out to find relevant sources that can answer the Research Question.

1. *Inclusion and Exclusion Criteria*

The stages of Inclusion and Exclusion Criteria were conducted to identify data that met the requirements for use in this research.

1. *Quality Assessment*

Quality Assessment or QA is formed according to a list of problem formulations. QA must contain an assessment to answer all existing problem formulations. In this research, the data found will then be evaluated according to the following quality assessment criteria questions:

QA1 : Is literature regarding the application of the SDLC method in system development

published in 2019-2023?

QA2 : Does the literature describe the platform used in the research?

QA3 : Is the literature written about fields that apply the SDLC method?

Based on each literature, the answer values will be given below for each question above.

Y (Yes): literature that matches the questions in the quality assessment.

N (No): literature that does not match the quality assessment questions

1. **Result and Analysis**

Journals are grouped according to journal type. This is done to make it easier to view journals obtained through the search process. Journal grouping according to Table 1:

TABLE I

Grouping Journals based on journal type

|  |  |  |
| --- | --- | --- |
| No.  | Journals | Quantity |
| 1. | Education Sciences | 2 |
| 2. | Procedia CIRP | 1 |
| 3. | International Journal of Advances in Data and Information Systems | 2 |
| 4. | E3S Web of Conferences | 1 |
| 5. | International Journal of Teaching, Education and Learning | 1 |
| 6. | Applied Engineering and Technology | 1 |
| 7. | International Conference on Applied Science and Technology on Engineering Science | 1 |
| 8. | Dinasti International Journal of Management Science (DIJMS) | 1 |
| 9. | Jurnal Sisfokom (sistem informasi dan komputer) | 12 |
| 10.  | Jurnal Penelitian Ilmu Komputer, System Embedded & Logic | 1 |
| 11. | Jurnal Ilmu Komputer-Agri Informatika | 3 |
| 12. | Jurnal Teknoinfo | 1 |
| 13. | Jurnal Manajemen Informatika & Komputerisasi Akuntasi (METHOMIKA) | 1 |
| 14. | Jurnal Teknologi Informasi dan Ilmu Komputer (JTIIK) | 2 |
| 15. | Jurnal Paradigma | 1 |
| 16. | Jurnal Manajemen dan Bisnis | 1 |
| 17. | Jurnal Testing dan Implementasi Sistem Informasi | 1 |
|  | Total | 33 |

1. *Inclusion and Exclusion Criteria Selection Results*

The selection results based on the Inclusion and Exclusion Criteria have yielded 33 journals from the search process. The next step involves scanning the data.

1. *Quality Assessment Results*

Table 2, presented below, will display the outcomes of the quality assessment, indicating which data is suitable for utilization in this research.

TABLE II

Quality Assessment Results

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| No. | Authors | Journal Title | Year | Q1 | Q2 | Q3 | Result |
| 1. | [2] | Factors Associated With Students’ Performance In English In The Implementation Of Spiral Progression | 2019 | Y | Y | Y | 🗸 |
| 2. | [3] | Pengembangan Fitur E-Matur Dengan V-Model Sebagai Alat Pengaduan Publik Untuk Website Badan Kepegawaian Negara | 2019 | Y | Y | Y | 🗸 |
| 3. | [4] | Implementasi Metode Extreme Programming Pengembangan Sistem Informasi Izin Produk Makanan | 2019 | Y | Y | Y | 🗸 |
| 4. | [5] | Consumer Satisfaction of Sorabel Applications Using The Delone and Mclean Method | 2020 | Y | Y | Y | 🗸 |
| 5. | [6] | Pengembangan Aplikasi Android Patriot Pangan sebagai Sarana *e-Particiation* untuk Sistem Ketahanan Pangan Nasional | 2020 | Y | Y | Y | 🗸 |
| 6. | [7] | Sistem Informasi Penjualan Pada TB Harmonis Menggunakan Metode FAST | 2020 | Y | Y | Y | 🗸 |
| 7. | [8] | Implementation of Agile Methodologies in an Engineering Course | 2020 | Y | Y | Y | 🗸 |
| 8. | [9] | Metode Exteme Programming Dalam Pengembangan Aplikasi Legalisir Online Berbasis Web Service | 2020 | Y | Y | Y | 🗸 |
| 9. | [10] | Aplikasi Pengelolaan Data Kepegawaian Berbasis Web Pada PT. Pelayaran Sakti Inti Makmur Palembang | 2020 | Y | Y | Y | 🗸 |
| 10. | [11] | Improving The Performance of Student Teams in Project-Based Learning With Scum | 2021 | Y | Y | Y | 🗸 |
| 11. | [12] | A Framework For Generating Agile Methods For Product Development | 2021 | Y | Y | Y | 🗸 |
| 12. | [13] | Application of the Waterfall Method on a Web-Based Job Training Management Information System at Trunojoyo University Madura. | 2021 | Y | Y | Y | 🗸 |
| 13. | [14] | Android Trainer Wawancara Pekerjaan Dalam Bahasa Inggris menggunakan Audio Visual Dengan Metode Prototype | 2021 | Y | Y | Y | 🗸 |
| 14. | [15] | Sistem Informasi Setoran Wajib Jemaat Menggunakan Framework Codeigniter | 2021 | Y | Y | Y | 🗸 |
| 15. | [16] | Application of Simple Additive Weighting (SAW) Method and Decision Table in Decision Support System Determines the Level of Problem Student Punishment Levels. | 2021 | Y | Y | Y | 🗸 |
| 16. | [17] | Website-Based E-Pharmacy Application Development to Improve Sales Services Using Waterfall Method | 2021 | Y | Y | Y | 🗸 |
| 17. | [18] | Aplikasi Monitoring Data Imunisasi Berkala Untuk Meningkatkan Pelayanan Posyandu Menggunakan Metode RAD Berbasis Android | 2021 | Y | Y | Y | 🗸 |
| 18. | [19] | Penerapan Metode Prototype Pada Perancangan Sistem Informasi Penggajian Karyawan (Persis Gawan) Berbasis Web | 2022 | Y | Y | Y | 🗸 |
| 19. | [20] | Aplikasi Satu Pintu Penerimaan Siswa Baru Pada Sekolah Menengah Atas. | 2022 | Y | Y | Y | 🗸 |
| 20. | [21] | Kombinasi Metode Waspas dan Moora Dalam Menentukan Calon Kepala Desa Hiteurat Padang Lawas Utara. | 2022 | Y | Y | Y | 🗸 |
| 21. | [22] | Pengembangan Aplikasi Sistem Informasi Pendataan Bangunan (SIPBANG) Pada Dinas Pekerjaan Umum Dan Penataan Ruang (DPUPR) Kota Malang Menggunakan *Framework* Scrum | 2022 | Y | Y | Y | 🗸 |
| 22. | [23] | Perancangan Arsitektur Sistem Pemesan Tiket Wisata Online Menggunakan Framework Zachman. | 2022 | Y | Y | Y | 🗸 |
| 23. | [24] | Pengembangan Sistem Layanan SPAB (Sarana Penyedia Air Bersih) Berbasis Web. | 2022 | Y | Y | Y | 🗸 |
| 24. | [25] | Payroll Information System Design Using Waterfall Method | 2022 | Y | Y | Y | 🗸 |
| 25. | [26] | Perancangan Aplikasi Helpdesk Ticketing System Pada PT. Indonesia Nippon Seiki. | 2022 | Y | Y | Y | 🗸 |
| 26. | [27] | Pengembangan Aplikasi Penggajian Karyawan Dengan Menggunakan Metode Agile Berbasis Mobile Android. | 2023 | Y | Y | Y | 🗸 |
| 27. | [28] | Implementation of simple additive weighting (SAW) in determining nutrition in toddlers. | 2023 | Y | Y | Y | 🗸 |
| 28. | [29] | Perancangan Sistem Informasi Inventory Barang Berbasis Web Menggunakan Metode Agile Software Development | 2023 | Y | Y | Y | 🗸 |
| 29. | [30] | Marketplace Selection Based on Product, Price, and Promotion Using the Simple Additive Weighting (SAW) Method. | 2023 | Y | Y | Y | 🗸 |
| 30. | [31] | Implementation of Performance Assessment Of Indragiri Institute Of Technology And Business Using The Simple Additive Weighting (SAW) Method | 2023 | Y | Y | Y | 🗸 |
| 31. | [32] | Analisis Kepuasan Pengguna E-Learning SMA Xaverius 1 Palembang menggunakan Metode End User Computing Satisfaction | 2023 | Y | Y | Y | 🗸 |
| 32. | [33] | Implementation Of The Simple Additive Weighting (SAW) Method For Selection Of Salesperson | 2023 | Y | Y | Y | 🗸 |
| 33. | [34] | Perancangan Sistem Informasi Kas Berbasis Web Dengan Menggunakan Metode Waterfall. | 2023 | Y | Y | Y | 🗸 |

Note :

🗸 : Journals were selected because they have problems, approaches and information related to data selection.

🞪 : Journals were not selected because of a lack of information to support data selection.

1. *RQ1 : What SDLC models are used to develop information systems in 2019-2023?*

RQ1 shows the results of grouping the SDLC method used in developing information systems, namely waterfall. The results are shown in Table 3:

TABLE III

SDLC Method Model Grouping

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Information Systems Development Methods | Journal Number | Total |
| 1. | Waterfall | [3], [13], [15], [17], [25], [34] | 6 |
| 2. | Iteration (Iterative) | [10] | 1 |
| 3. | *Rapid Application Development (RAD)*  | [18], [24] | 2 |
| 4. | *Extreme Programming* | [4], [21] | 2 |
| 5. | FAST | [7] | 1 |
| 7. | Prototype | [14], [19], [26] | 3 |
| 8. | Spiral | [2], [20] | 2 |
| 9. | *Framework Zachman* | [23] | 1 |
| 10. | *End User Computing Satisfaction* | [32] | 1 |
| 11. | *Simple Additive Weighting (SAW)* | [16], [28], [30], [31], [33] | 5 |
| 12. | *The Delone and Mclean methods* | [5] | 1 |
| 13. | Scrum | [6], [11], [22] | 2 |
| 14. | Agile | [8], [12], [27], [29] | 4 |
| 15. | V-Model | [3] | 1 |
|  | Total | - | 33 |

The SDLC method is a method that has been widely used in developing information systems. Below are some of the models in the SDLC method:

1. Waterfall: A software development model involves the systematic progression of tasks, including the analysis of software requirements, code creation, design, testing, maintenance, and system support. These tasks are executed sequentially, from the initial stages to the final ones, ensuring thorough planning, detailed documentation, and a step-by-step implementation of the project.
2. Iteration (Iterative): combining processes in the waterfall model (Waterfall) and iteratively in the prototype model.[10]
3. Rapid Application Development (RAD): A software development model that focuses on incremental progress, particularly within tight timeframes.[18]
4. *Extreme Programming* : a development method derived from agile development. The main focus is on teams with the motto "technical how to" adhering to the principles of agile methodology.[4]
5. FAST : An frequently employed system development approach that is characterized by its adaptable structure and can be integrated with other methods. This approach is capable of delivering a high-quality system in a relatively short timeframe.[7]
6. Prototype : supports software development so that it can practice its functionality in order to reduce the risk of failure when creating information systems.[35]
7. Spiral : The spiral model is a software development approach that merges the iterative qualities of prototyping with the disciplined and methodical aspects of linear sequential models. It offers the advantage of swiftly generating new software versions. Under the spiral model, software is developed through a sequence of incremental stages.[20]
8. *Framework Zachman* : The prevailing architectural framework, well-recognized by enterprise data architects, has gained widespread acceptance and utilization since its inception by John A. Zachman in the IBM System Journal in 1987.[23]
9. *End User Computing Satisfaction* (EUCS) : useful for calculating people's satisfaction levels directly using a system.[32]
10. *Simple Additive Weighting (SAW)* : weighted sum method. The SAW method seeks to calculate the combined score by assigning weights to performance ratings for each alternative across all attributes.[30]
11. *The Delone and Mclean methods* : This approach encompasses two key contributions in the comprehension of information system success. It involves creating a system for categorizing the phases of success that has been applied in diverse studies and illustrates the interrelated nature of these models.[5]
12. Scrum : A flexible software development method that is easy to update and can make regular changes. This model is not suitable for small-scale projects.[35]
13. Agile : an information system development method that is more collaborative and open to change, closer to the user and therefore requires a larger team.[35]
14. The V-Model : is an expansion of the waterfall model tailored for software development procedures. The V-Model describes the relationship between quality assurance actions with communication, modeling and construction activities in the first stage.[3]
15. *RQ2 : Is the Implementation of The SDLC model effective?*

In accordance with 33 journals, it shows that the application of the waterfall model is very effective in developing information systems because it is carried out sequentially according to the initial stages to the end, so that the projects carried out have more careful planning, more detailed documentation and sequential elimination. The waterfall model can also be used in developing information systems on a small scale or for individual projects.

1. *RQ3 : What are the fields that implement the SDLC model in information system development?*

The results of RQ3 show that the results of grouping fields that implement the SDLC method in developing information systems are as follows:

TABLE IV

Grouping SDLC Method Implementations

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Area/Sector | Journal Number | Quantity |
| 1. | Government | [3], [6], [21], [22], [24], [25]  | 6 |
| 2. | Health | [17], [18], [28]  | 3 |
| 3. | Education | [2], [8], [9], [11], [13], [16], [20], [32]  | 8 |
| 4. | Finance | [34] | 1 |
| 5. | Religious | [15]  | 1 |
| 6. | Business | [4], [5], [7], [12], [23], [29], [30], [33]  | 8 |
| 7. | Employment | [10], [14], [19], [26], [27], [31]  | 6 |

Based on Table 4 above, the focus areas that are widely used in research are the education sector such as student performance in English, technical courses, online legalization applications, student groups based on projects, job training management, student problem levels based on punishment levels, new student admissions in High School, analysis of e-learning user satisfaction at SMA Xavier 1 Palembang. Then in business fields such as developing a food product licensing information system, consumer satisfaction with the Sorabel application, book sales business, physical product development, online tourist ticket ordering, inventory/supply of goods, selecting marketplaces based on products, prices and promotions as well as calculating the selection of salespeople The best as well as the fields of Government, Work, Health, Finance and Religion also use the SDLC method in developing information systems.

1. **Conclusion**

Based on research that has been carried out with a Systematic Literature Review (SLR) on several literature that has been researched and published in 2019-2023, namely the Software Development Life Cycle (SDLC) model that is often and most widely used is the waterfall method, especially in the educational sector such as student performance in English, engineering courses, online legalization applications, student groups based on projects, job training management, level of student problems based on level of punishment, acceptance of new students at high schools, analysis of e-learning user satisfaction at SMA Xaverius 1 Palembang. Then in business fields such as developing a food product licensing information system, consumer satisfaction with the Sorabel application, book sales business, physical product development, online tourist ticket ordering, inventory/supply of goods, selecting marketplaces based on products, prices and promotions as well as calculating the selection of salespeople The best as well as the fields of Government, Work, Health, Finance and Religion also use the SDLC method in developing information systems.

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