

A Systematic Literature Review of Application Development to Realize Paperless Application in Indonesia: Sectors, Platforms, Impacts, and Challenges

P H Prastyo*¹, A S Sumi², S S Kusumawardani³

^{1,2,3}Department of Electrical and Information Technology Engineering, Universitas Gadjah Mada

E-mail: Pulung.hendro@mail.ugm.ac.id¹, aminsiddiqsumi@mail.ugm.ac.id², suning@ugm.ac.id³

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Abstrak. *Paperless* merupakan bentuk ideal era informasi dengan kelebihan berupa efisien waktu, ramah lingkungan, manajemen dokumentasi yang baik, serta menjadi langkah penting meningkatkan citra organisasi dalam bidang lingkungan. Dalam konteks lingkungan, *paperless* adalah langkah nyata mengurangi penggunaan pohon untuk kertas. Konsep *paperless* sudah diusulkan pemerintah dan telah dijamin secara hukum sehingga berbagai sektor memulai untuk mengimplementasikan konsep *paperless* baik sektor pemerintahan, pendidikan, maupun industri. Sampai saat ini belum diketahui berapa banyak sektor yang mengimplementasikan aplikasi *paperless*, *platform* apa saja yang digunakan untuk mengembangkan aplikasi *paperless*, dampak dari penggunaan aplikasi *paperless* dan tantangannya bagi Indonesia. Oleh karena itu, penelitian ini bertujuan untuk mengetahui lebih detail tentang pemanfaatan aplikasi *paperless* baik dari sektor, *platform*, dampak, dan tantangannya bagi Indonesia. Data-data yang digunakan pada penelitian ini adalah artikel jurnal yang dipublikasikan pada jurnal-jurnal terakreditasi Sinta yang membahas tentang pengembangan aplikasi *paperless* pada sektor pemerintahan, pendidikan, dan industri mulai tahun 2010 hingga 2019. Data-data tersebut dianalisis menggunakan metode *Systematic Literature Review* (SLR). Hasil dari penelitian ini menunjukkan bahwa sektor yang paling sering mengembangkan aplikasi *paperless* adalah sektor pendidikan sedangkan *platform* yang dominan digunakan untuk mengembangkan aplikasi *paperless* adalah *website*. Dampak penggunaan aplikasi *paperless* memiliki dampak positif baik dari segi performansi, penghematan anggaran, maupun permasalahan lingkungan yang dihasilkan oleh limbah kertas. Aplikasi *paperless* adalah jawaban di era digital dalam mendukung pelestarian lingkungan. Adapun tantangannya adalah bagaimana pemerintah membuat regulasi untuk mendukung aplikasi *paperless* di seluruh instansi dan memberikan dukungan dana kepada sektor-sektor yang penggunaan kertasnya tergolong banyak akan tetapi kekurangan dana dalam mengimplementasikan aplikasi *paperless*. Aplikasi *paperless* juga harus mudah digunakan dan pengguna harus diberikan pelatihan secara kontinyu agar aplikasi *paperless* dapat diimplementasikan dengan mudah.

Kata kunci: *paperless*; *systematic literature review*; *platform* aplikasi; pendidikan

Abstract. Going paperless is an ideal form of the information era with the advantages of being time-efficient, environmentally friendly, proper documentation management, and it is an important step to improve the perception of the organization in the environmental field. From the environmental perspective, paperless is a concrete step to reduce the use of trees for paper. The paperless concept has been proposed by the government and has been legally guaranteed, so various sectors have begun to implement the paperless concept such as in the government, education, and industry sectors. However, there has been limited research that studies how many sectors implement paperless applications, the platforms that are used to develop paperless applications, the impacts of using paperless applications and the challenges for Indonesia. Therefore, this study aims to find out more details in the use of paperless applications in terms of sectors, platforms, impacts, and challenges for Indonesia. The data used in this study are articles of journal accredited by Sinta discussing the development of paperless applications in the government, education, and industry sectors from 2010 to 2019. The data are analyzed using the Systematic Literature Review method (SLR). The results of this study indicate that the sector that constantly develops paperless applications is the education sector, while the dominant platform used to develop paperless applications is the website. The impact of using paperless applications has a positive impact both in terms of performance, budget savings, and solving environmental problems generated by paper waste. Paperless applications are the solution in the digital era in supporting environmental preservation. The challenge is how the government makes regulations to support paperless applications in all agencies and provides financial support to sectors in which the use of paper is classified as significant but lacks funds in implementing paperless applications. Paperless applications must also be easy to use, and users must be provided continuous training so that paperless applications can be implemented easier.

Keywords: paperless; systematic literature review; application platform; education

1. Introduction

Going paperless is a new form of conservative paper to reduce paper waste and solve environmental problems generated by paper products. Paperless is also an ideal form of the information age with the advantages of being time-efficient, environmentally friendly, better documentation management, and an essential step in building the organization's image in the field of environment and its environmental responsibilities. In the environmental context, going paperless is a concrete step to reduce the use of trees for paper. It is based on the fact that nearly 4 billion trees worldwide are cut down every year for paper, which represents about 35 percent of all trees cut down [1]. Therefore, going paperless is a concrete step to overcome the problem.

The paperless concept has been proposed by the government and legally guaranteed so that various sectors have begun to implement the paperless concept of the government, education, and industry sectors [2]. In the government sector, Sulistiyono et al. [3] conducted research on the utilization of the Paperless Office System in the E-Government Case Study of the Ministry of Education and Culture. In the industrial sector, Rusmawan and Pamungkas [5] researched the Price and Sales Bid Information System at CV Inspirasi Software.

However, a little research has been conducted on how many sectors implement paperless applications, what platforms are used to develop paperless applications, and the impacts of using paperless applications and challenges for Indonesia. Therefore, this study aims to find out more details on the use of paperless applications in terms of sectors, platforms, impacts, and challenges for Indonesia.

The data used in this research are articles published in SINTA (Science and Technology Index), that discuss the development of paperless applications in the government, education, and industry sectors from 2010 to 2019. These data were analyzed using the Systematic Literature Review (SLR) method. SLR is one method that uses review, study, structured assessment, classification, and categorization of evidence-

based that has been produced previously [6]. The steps and strategies for carrying out a systematic review are so well planned and structured, which this method is very different from the method that can only be prepared for a literature study [6].

2. Theoretical Framework

2.1. Systematic Literature Review (SLR)

Systematic Literature Review is a method for identifying, evaluating and interpreting all available research that is relevant to a particular research question, or topic area, or exciting phenomenon. It can be used to summarize interesting research, find new gaps in specific research topics, and position new research [7].

2.2. Application Development (Software Development)

Software development is a multi-layered process that allows developers to develop high-quality computer software [8]. Meanwhile, according to Rosa A.S and Saladin [9], software development is developed to produce economically valuable software that is trusted and works efficiently using machines.

2.3. Paperless

Going paperless is a new form of conservative paper to reduce paper waste and solve environmental problems generated by paper products. Going paperless is also an excellent model of the information era with the benefits of being time-efficient, environmentally friendly, better documentation management, and an essential step in the organization's perception in the field of environment and its environmental responsibilities [1].

3. Methodology

3.1. Object of research

The object of the research is the application used to realize paperless movement. The paperless applications have been chosen as the research objects because of the following reasons:

1. Application development to realize paperless movement is very useful because it is environmentally friendly, time-efficient, and excellent documentation management, as well as helps reducing paper waste.
2. Paperless applications are implemented in various sectors such as government, education, and industry.
3. Paperless application can be developed on various platforms, including websites, mobile, or desktop.
4. Paperless applications have impacts and challenges.

3.2. Research Methods

3.2.1. Review Method. SLR is carried out in three stages: planning, implementing and reporting literature reviews[10]. The first step in the planning stage is to identify the need for a systematic literature review. Next is to develop a review protocol that will be used. The Review Protocol is designed to direct the review planning and reduce the possibility of researcher bias. The next step is to evaluate the review protocol used. In this study, the development of paperless applications in Indonesia became a primary study.

Finally, in the implementation stage, research questions, search strategies, inclusion and exclusion criteria selection, quality assessment, data collection, and data analysis are conducted. Review protocols

are presented in sections 3.2.2, 3.2.3, 3.2.4, 3.2.5, 3.2.6 and 3.2.7. The review protocol is developed, evaluated, and improved iteratively during the review implementation and reporting stages.

In the reporting step, data analysis is discussed in detail and presented in tables and graphs.

3.2.2. Research Question. Research questions (RQ) are determined to keep the review focused. The RQ was designed with the help of Population, Intervention, Comparison, Outcomes, and Context criteria (PICOC) [7]. Table 1 shows the PICOC structure of the research question.

Table 1. Summary of PICOC

Structure	Description
Population	Paperless application development
Intervention	Sector, platform
Comparison	n/a
Outcomes	1. Understanding the number of sectors implementing paperless applications, 2. Understanding what platforms are commonly used to develop paperless applications, 3. Understanding the impacts of paperless applications and challenges for Indonesia
Context	The sectors used in this study consist of 3 sectors, namely education, government, and industry

The research questions and motivations addressed by this literature review are shown in Table 2.

Table 2. Research Question (RQ)

ID	Question	Motivation
RQ1	What sectors constantly develop paperless applications in Indonesia?	Identify the sectors that most often develop paperless applications
RQ2	What platforms are widely used to develop applications in realizing paperless in Indonesia?	Identify the platform most often used to develop paperless applications
RQ3	What are the impacts and challenges of developing paperless applications in Indonesia?	Identify the impacts and challenges of developing paperless applications in Indonesia

3.2.3. Search Strategy. Search strategy is used to obtain relevant resources to answer research questions (RQ) and related references. The search process is done by using the Mozilla Firefox and Safari search engines with the site addresses <https://scholar.google.co.id/> and <http://garuda.ristekdikti.go.id/>. The keywords used in this study “*Aplikasi paperless*”, “*perangkat lunak paperless*”, and “*software paperless di Indonesia.*” These keywords obtained 473 articles.

3.2.4. Inclusion and Exclusion Criteria. This stage is carried out to decide whether the data (journal articles) found are suitable for use in SLR research or not. Eligible journal articles are included in the Inclusion Criteria, and unsuitable ones are selected in the Exclusion Criteria. These criteria can be seen in Table 3.

3.2.5. Quality Assessment. In SLR research, the data found is evaluated based on the following quality assessment criteria questions:

QA1. Are the journal articles Sinta-accredited (S1-S6)?

QA2. Are journal articles published in 2010-2019?

QA3. Do the journal articles mention the sectors whether the paperless applications are used in the education, government, or industry sectors?

QA4. Do the journal articles include the platform used to develop paperless applications?

QA5. Do journal articles explain the impact of applying paperless applications explicitly or implicitly?

Table 3. Inclusion and Exclusion Criteria

Criteria	Description
Inclusion	<ol style="list-style-type: none">1. The data used are journal articles for the last ten years, starting from 2010 to 2019.2. Data are taken from the SINTA accredited journal.3. Data are obtained through the site https://scholar.google.co.id/ and http://garuda.ristekdikti.go.id/.4. The data describes the sectors, platforms and impacts of implementing a paperless application.
Exclusion	<ol style="list-style-type: none">1. Data on paperless application development is not from Indonesia. The data must come from Indonesia because this research explains the paperless challenges that exist in Indonesia.2. The sectors used are only education, government, and industry.

3.2.6. *Data Collection.* Data collection is the stage in which data for research is collected. Data collection in this study is through several stages, such as:

1. Searching for journal articles on Google Scholar (<https://scholar.google.co.id/>) or Garuda (<http://garuda.ristekdikti.go.id/>)
2. Validating whether the journals are accredited by Sinta or not? If they are not accredited by Sinta, the journal articles will not be used in this study.
3. Storing journal articles that have been collected in the Mendeley application.

3.2.7. *Data Analysis.* At this stage, the journal articles that have been collected will be analyzed to get answers from the Research Question (RQ). The journal articles to be analyzed are:

1. Implementation of paperless applications in Indonesia carried out by education, government, and industry sector (based on RQ1).
2. Platforms used to develop paperless applications in Indonesia (based on RQ2).
3. Impacts and challenges of developing paperless applications in Indonesia (based on RQ3).

4. Results and Discussion

4.1. Result of Search Process

In the result of the search process, the data are grouped by year of publication to see research trends related to the development of paperless applications. The graphs of research trends can be seen in Figure 1.

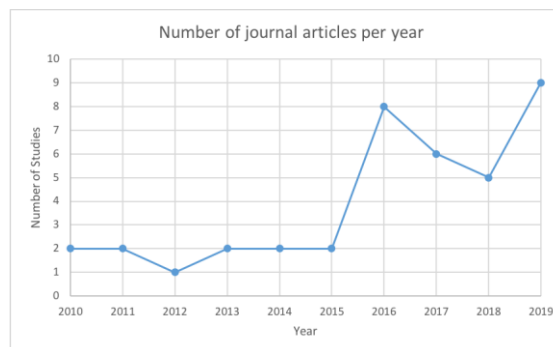


Figure 1. Research Trend of Paperless Application Development Annually

Mostly journal articles of paperless application development were published in 2019 with nine articles, and the minimum number of journal articles was in 2012 with one article only. Journal articles

are selected based on the Quality Assessment Process. The journals used in this study were all Sinta-accredited, which can be seen in Table 4.

Table 4. Selected Journals

No	Journal	Sinta Category
1	CommIT (Communication and Information Technology) Journal	S2
2	Jurnal Media ElektriKa	S5
3	Jurnal Ilmu Pertanian Indonesia	S2
4	JuTISI (Jurnal Teknik Informatika dan Sistem Informasi)	S4
5	Jurnal Spektrum Industri	S3
6	KESMAS:National Public Health Journal	S1
7	Jurnal Nasional Teknik Elektro	S3
8	Jurnal Sains dan Teknologi (SainteknoL)	S3
9	Jurnal Teknik Elektro	S5
10	JATISI (Jurnal Teknik Informatika dan Sistem Informasi)	S3
11	SIMETRIS: Jurnal Teknik Mesin, Elektro, dan Ilmu Komputer	S3
12	Jurnal Teknologi dan Informasi (JATI)	S4
13	Jurnal Rekayasa ElektriKa	S2
14	Jurnal Teknologi Informasi	S6
15	Indonesia Journal of Conservation	S4
16	Jurnal Positif	S4
17	Jurnal Pendidikan IPA Indonesia	S1
18	Jurnal Dinamika Informatika	S5
19	TELKOMNIKA (Telecommunication Computing Electronics and Control)	S1
20	Jurnal COMPILER	S5
21	Jurnal Informatika Pengembangan IT	S3
22	Jurnal TAM (Technology Acceptance Model)	S4
23	Jurnal Agroindustri Halal	S4
24	Journal of Innovative Science Education	S3
25	Matrik: Jurnal Manajemen, Teknik Informatika, dan Rekayasa Komputer	S4
26	Jurnal Ilmu Komputer dan Informatika	S2
27	Jurnal Sistem Informasi	S4
28	PUBLIS (Publication Library and Information Science)	S4
29	Jurnal Taman Vokasi	S4
30	Jurnal Informatika UPGRIS	S5
31	Jurnal Teknologi Informasi dan Ilmu Komputer	S2
32	Syntax Literate : Jurnal Ilmiah Indonesia	S4
33	Jurnal Manajemen Informatika (JAMIKA)	S4
34	Jurnal Nasional Teknologi & Sistem Informasi	S3
35	PIKSEL:Jurnal Penelitian Ilmu Komputer, System Embedded & Logic	S5
36	Matrix : Jurnal Manajemen Teknologi dan Informatika	S3
37	Jurnal Transformatika	S3
38	Jurnal Gantang	S3
39	Jurnal Inovasi Vokasional dan Teknologi	S3

In Table 4, there are three journals accredited by Sinta 1 (S1), Sinta 2 (S2) of 5 journals, Sinta 3 (S3) of 12 journals, Sinta 4 (S4) of 12 journals, Sinta 5 (S5) of 6 journals, and Sinta 6 (S6) of one journal. Most journals are in S3 and S4, while the fewest journals are in S6.

4.2. Result of the Inclusion and Exclusion Criteria

After the search process, data is selected based on inclusion and exclusion criteria. In this process, 473 journal articles were successfully selected into 39 articles. These results can be seen in Table 5.

4.3. Result of Quality Assessment

The inclusion and exclusion criteria and the quality assessment resulted 39 articles. The results of the article must meet the five quality assessment requirements from QA1 to QA5. If the article does not meet one of the conditions, the journal article is not used. The results of journal articles passing the Quality assessment selection can be seen in Table 5.

4.4. Result of Data Analysis

This stage will answer the questions from the Research Question (RQ) and discuss the results in detail.

4.4.1. Sectors that constantly develop paperless application in Indonesia

Based on 39 journal articles that have been obtained in the last ten years starting in 2010-2019, the education Sector dominate the development of paperless applications totaling 25 articles, followed by the industrial sector totaling eight articles and the government sector totaling six articles. The diagram of the number of journal articles in each sector can be seen in Figure 2.

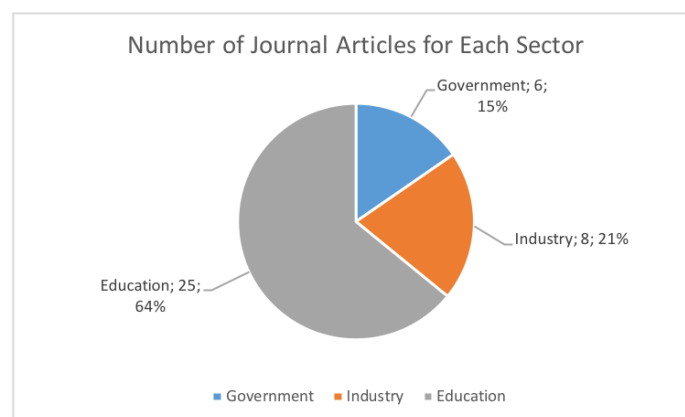


Figure 2. Number of Journal Articles for Each Sector

The educational sector is a sector that often develops paperless applications because this sector is the sector that uses the most paper for learning, teaching, and administrative processes. When the development of paperless applications has been completed, this sector often publishes journal articles so, in this study, the education sector dominates the journal articles obtained.

The industrial sector occupies the second position in developing paperless applications. The reason for the lack of journal articles discussing the industrial sector is due to the lack of researchers studying the development of paperless applications in the industrial sector. The industrial sector emphasizes the applicability rather than documenting research results.

In the governmental sector, this sector is the sector with the least implementation of paperless applications based on the journal article indicators obtained. This sector could have the same cause as the industrial sector.

Table 5. Result of Quality Assessment

ID	Year	Author	Title	Journal	Sinta	Sector	Platform	QA1-QA5	Result
1	2010	Nur Azizah, Ferry Sudarto[11]	Sistem Informasi Akuntansi Dalam Penyajian Audit Financial Report Dengan Menggunakan Computer Assisted Audit Techniques (CAATS)	CommIT (Communication and Information Technology) Journal	S2	Government	Desktop	Yes	✓
2	2010	Bambang Supradono[12]	Pengembangan Kerangka Kerja Migrasi Sistem Paperless Office	Jurnal Media ElektriKa	S5	Education	Website	Yes	✓
3	2011	Meuthia Rachmaniah, Hari Agung Adrianto, Abdul Aziz[13]	Rancang Bangun Sistem Informasi Manajemen Kepegawaian Dengan Metode The Open Group Architecture Framework (Togaf)	Jurnal Ilmu Pertanian Indonesia	S2	Government	Website	Yes	✓
4	2011	Tjatur Kandaga, Vinsensius Felix[14]	Pembuatan Aplikasi Pengelolaan Tugas Akhir Online Berbasis Web Studi Kasus Jurusan Teknik Informatika UKM	JuTISI (Jurnal Teknik Informatika dan Sistem Informasi)	S4	Education	Website	Yes	✓
5	2012	Kartika Firdausy, Muhammad Artha[15]	Perancangan Dan Implementasi Paperless Office Berbasis Wordpress Di ITTC UAD	Jurnal Spektrum Industri	S3	Education	Website	Yes	✓
6	2013	Al Asyary, Hari Kusananto, Anis Fuad[16]	Sistem Pereseapan Elektronik Pada Keselamatan Pengobatan Pasien	KESMAS:National Public Health Journal	S1	Government	Desktop	Yes	✓
7	2013	Husnil Kamil[17]	Pengembangan Aplikasi Distribusi Surat Di Fakultas Teknologi Informasi Dengan Notifikasi Sms Menggunakan Framework Yii Dan Gammu	Jurnal Nasional Teknik Elektro	S3	Education	Website	Yes	✓
8	2014	Susilo Supriyadi Sutikno Sunarno, Rudi Setiawan[18]	Rancang Bangun Sistem Pencitraan Radiografi Digital Untuk Pengembangan Laboratorium Fisika Medik Unnes	Jurnal Sains dan Teknologi (Sainteknol)	S3	Education	Desktop	Yes	✓
9	2014	Etika Mulyawati[19]	Pembuatan Model E-Election Berbasis SMS Gateway Untuk Pemilihan Ketua Osis	Jurnal Tekni Elektro	S5	Education	Website & Mobile	Yes	✓
10	2015	Fransiska Prihatini Sihotang[20]	Analisis Dan Perancangan Sistem Informasi Rekam Medis pada Puskesmas Simpang Timbangan Indralaya	JATISI (Jurnal Teknik Informatika dan Sistem Informasi)	S3	Government	Website	Yes	✓

ID	Year	Author	Title	Journal	Sinta	Sector	Platform	QA1-QA5	Result
11	2015	Yudie Irawan[21]	Analisa Dan Perancangan Otomatisasi Surat Pengantar Rt Berbasis Sms Gateway Sebagai Penerapan Konsep Paperless Office	SIMETRIS : Jurnal Teknik Mesin, Elektro Dan Ilmu Komputer	S3	Government	Mobile	Yes	✓
12	2016	Nizar Rabbi Radliya[22]	Pembangunan Sistem Aplikasi Kuliah Online Sebagai Sarana Penunjang Kegiatan Perkuliahan Di Universitas Education Indonesia Kampus Tasikmalaya	Jurnal Teknologi dan Informasi (JATI)	S4	Education	Website	Yes	✓
13	2016	Taufik Fuadi Abidin, Fitra Riyandi, Rahmad Dawood[23]	Pembaruan Aplikasi Paperless Office Universitas Syiah Kuala	Jurnal Rekayasa Elektroika	S2	Education	Website	Yes	✓
14	2016	Mulia Sulistiyono, Fatah Yasin[3]	Pemanfaatan Paperless Office System Dalam E-Goverment Studi Kasus Kementerian Pendidikan Dan Kebudayaan	Jurnal Teknologi Informasi	S6	Government	Website	Yes	✓
15	2016	Muhamad Taufiq, Erna Noor Savitri, Andin Vita Amalia[24]	Efektivitas Penerapan Electronic Portofolio Pada Perkuliahan Praktikum Ipa Dasar Untuk Mendukung Kebijakan Paperless	Indonesia Journal of Conservation	S4	Education	Website	Yes	✓
16	2016	Adi Pratomo, Ronny Mantala[25]	Pengembangan Aplikasi Ujian Berbasis Komputer beserta Analisis Uji Guna Sistem Perangkat Lunaknya Menggunakan Metode SUMI (Software Usability Measurement Inventory)	Jurnal Positif	S4	Education	Desktop	Yes	✓
17	2016	Muhamad Taufiq, Erna Noor Savitri, Andin Vita Amalia[26]	Design of science mobile learning of eclipse phenomena with conservation insight android-based app inventor 2	Jurnal Education IPA Indonesia	S1	Education	Mobile	Yes	✓
18	2016	Yulianto, Setia Wardani, Wibawa[27]	Sistem Informasi Manajemen Produksi Unit Painting & Packaging CV. Karya Hidup Sentosa Berbasis WEB	Jurnal Dinamika Informatika	S5	Industry	Website	Yes	✓
19	2016	Aiman Zakwan Jidin, Norfadzlia Mohd Yusof, Tole Sutikno[28]	Arduino Based Paperless Queue Management System	TELKOMNIKA (Telecommunication Computing Electronics and Control)	S1	Industry	Desktop & Mobile	Yes	✓

ID	Year	Author	Title	Journal	Sinta	Sector	Platform	QA1-QA5	Result
20	2017	Astika Ayuningtyas, Alif Restu Pramudi[29]	Undang-an Paperless Berbasis Cloud Computing Dengan Memanfaatkan Cloudinary	Jurnal COMPILER	S5	Education	Mobile	Yes	✓
21	2017	Tri Sandhika Jaya, Dwirgo Sahlinal[30]	Perancangan Kantor Digital Berbasis Framework dengan Metode Waterfall pada Politeknik Negeri Lampung	Jurnal Informatika Pengembangan IT	S3	Education	Website	Yes	✓
22	2017	Tutik Lestari, Agustinus Eko Setiawan, Heru Prasetiawan[31]	Perancangan Sistem Informasi Scheduling SIT (System Integration Test) Berbasis Web Pada PT. Collega Inti Pratama	Jurnal TAM (Technology Acceptance Model)	S4	Industry	Website	Yes	✓
23	2017	Aditia Ginantaka, Endrianur Rahman Zain[32]	Perancangan Sistem Informasi Traceability Produk Pangan Halal UKM Unggulan Berbasis Digital Business Ecosystem	Jurnal Agroindustri Halal	S4	Industry	Website	Yes	✓
24	2017	Arfilia Wijayanti, Sukamto[33]	Development of Heat Transfer Learning Media Based on Android Application Inventor (AI) to Instill Student Self Directed Learning	Journal of Innovative Science Education	S3	Education	Mobile	Yes	✓
25	2017	Toni Anwar, Yoga Willy Utomo[34]	Implementasi Paperless Office Pada Sistem Monitoring Dan Evaluasi Program Kerja Organisasi Mahasiswa	Matrik : Jurnal Manajemen, Teknik Informatika, dan Rekayasa Komputer	S4	Education	Website & Mobile	Yes	✓
26	2018	Rahmandani Herlambang, Husni Thamrin[35]	Aplikasi Paperless Library Dan Pengukuran Dampak Dengan Model Is-Impact	Jurnal Ilmu Komputer dan Informatika	S2	Education	Website	Yes	✓
27	2018	Yance Sonatha ,Indri Rahmayuni, Alde Alanda, Iswandi Saputra[36]	Rancang Bangun Aplikasi Knowledge Management Berbasis Web	Jurnal Inovasi Vokasional dan Teknologi	S3	Industry	Website	Yes	✓
28	2018	Meta Amalya Dewi[37]	Penggunaan Simple Additive Weighting Dalam Pengembangan Sistem Penunjang Keputusan Penentuan Bonus Karyawan	Jurnal Sistem Informasi	S4	Industry	Website	Yes	✓
29	2018	Ach. Nizam Rifqi[38]	Implementasi Sistem Institutional Repository Hasil Karya Ilmiah Sivitas	PUBLIS (Publication Library)	S4	Education	Website	Yes	✓

ID	Year	Author	Title	Journal	Sinta	Sector	Platform	QA1-QA5	Result
30	2018	Rahmatia Joisangadji, Subagyo, Bayu Rahmat Setiadi[39]	Development of e-module integrated QR code in a lesson of Air Conditioner (AC) to support paperless	and Information Science) Jurnal Taman Vokasi	S4	Education	Mobile	Yes	✓
31	2019	Ifriandi Labolo[40]	Implementasi QRCode Untuk Absensi Perkuliahan Mahasiswa Berbasis Paperless Office	Jurnal Informatika Upgris	S5	Education	Mobile	Yes	✓
32	2019	Ramadhan Rakhmat Sani, Defri Kurniawan[41]	Rancang Bangun Sistem Try Out Berbasis Paperless untuk Evaluasi Hasil Belajar Siswa dengan MVC	Jurnal Teknologi Informasi dan Ilmu Komputer	S2	Education	Website	Yes	✓
33	2019	Ponsen Sindu Prawito, Andika Rangga Saputra[42]	Aplikasi Sistem Informasi Perpustakaan Politeknik Praktisi Bandung Berbasis Desktop	Syntax Literate: Jurnal Ilmiah Indonesia	S4	Education	Desktop	Yes	✓
34	2019	M. Thoriqul Falahi[43]	Rancang Bangun Aplikasi Paperless Office Berbasis Web Sebagai Sistem Pengolahan Dan Pencatatan Data Menggunakan Restful Api	Jurnal Manajemen Informatika (JAMIKA)	S4	Education	Website	Yes	✓
35	2019	Indra Sontana, Alam Rahmatulloh, Andi Nur Rachman[44]	Application Programming Interface Google Picker Sebagai Penyimpanan Data Sistem Informasi Arsip Berbasis Cloud	Jurnal Nasional Teknologi & Sistem Informasi	S3	Industry	Website	Yes	✓
36	2019	Uus Rusmawan, Petrus Dwi Ananto Pamungkas[5]	Sistem Informasi Penawaran Harga Dan Penjualan Pada CV. Inspirasi Software	PIKSEL: Jurnal Penelitian Ilmu Komputer, System Embedded & Logic	S5	Industry	Desktop	Yes	✓
37	2019	Ardian Prima Atmaja, Aminudin Azis[4]	Sistem Informasi Terintegrasi Evaluasi Kegiatan Mengajar Dosen Sebagai Implementasi Sistem Penjaminan Mutu Internal	Matrix: Jurnal Manajemen Teknologi dan Informatika	S3	Education	Website	Yes	✓
38	2019	Hilyah Magdalena, Umami, Hadi Santoso[45]	System Model for Web-Based Teacher Performance Assessment	Jurnal Transformatika	S3	Education	Website	Yes	✓
39	2019	Puji Astuti, Febrian	Blended Learning Syarah: Bagaimana Penerapan dan Persepsi Mahasiswa	Jurnal Gantang	S3	Education	Website	Yes	✓

4.4.2. Platform widely used to develop paperless realization in Indonesia

Based on 39 journal articles obtained in the last ten years, website-based platforms dominate paperless applications. Twenty-four journal articles discuss website-based platforms, six journal articles discuss desktop and mobile platforms, two journal articles discuss the hybrid website and mobile platforms, and one journal article discusses hybrid desktop and mobile. These data are shown in Figure 3.

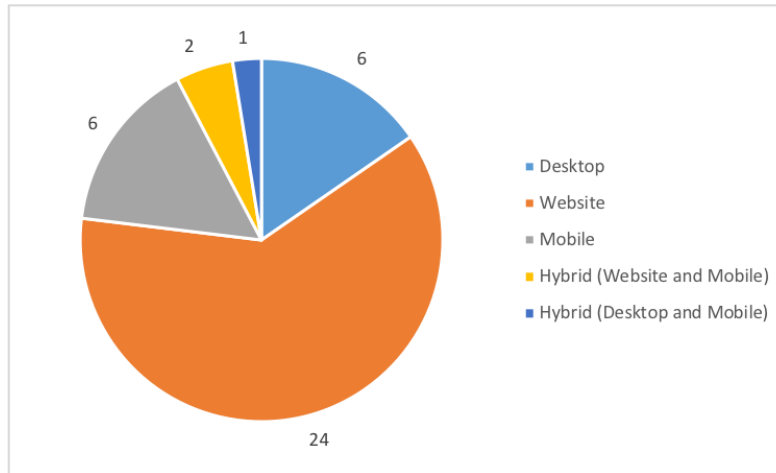


Figure 3. Number of Journal Articles Based on Their Platform

4.4.3. Impact of Paperless Application Development in Indonesia

Based on 39 journal articles obtained in the last ten years, the impacts of developing paperless applications in Indonesia are described in Table 6.

Table 6. Impacts of Paperless Application Development Based on Journal Articles

Article Code	Impact	Challenge
1	It provides benefits and performance support for auditors in presenting financial reports by using the CAAT system to help test and evaluate the reliability of company files (substantive test) without using more papers (paperless).	-
2	It has better Documentation Management and neat data management with the help of technology to convert paper documents into digital documents and transform business processes using many papers into business processes supported by paperless applications.	It has Lack of training and awareness of the paperless office system periodically for all personnel involved in utilizing paperless office processes.
3	The system design made can be known transparently in terms of both the completeness of the file and the lack of completeness of the file. Proven application of paperless applications can facilitate the administrative process.	-
4	It provides a centralized and paperless process which can be accessed anytime and anywhere simultaneously by its users and this system makes it easy for both students and supervisors because there is no need to match schedules between students and their lecturer to supervise.	It has the inadequacy of the paperless application features so that it needs to improve several features to ensure the reliability of the application.

Article Code	Impact	Challenge
5	The system that was built provides easy digital and computerized document management as well as can reduce paperless usage. The results of the average percentage of testing obtained by respondents who stated strongly agree = 26.5%, agree = 71%, less agree = 2.5%, and disagree = 0%.	-
6	The use of a computerized physician order entry (CPOE) system in writing prescriptions is proven to be able to reduce the number of adverse drug events (ADE). Medication errors such as the mistake of writing the name of the drug, determining the dose, and using the right type of drug for patients with certain health conditions in the health service can be minimalized. Prescription writing on paper is transformed into a better paperless application.	It is difficult to use because of communication disruptions between doctors and patients.
7	Software designed has fulfilled the standard of good use with the concept of paperless, which can reduce paper usage including centralized and neat archiving, ease and efficiency in distributing document archives, and avoiding document defects during distribution.	-
8	The results of this study can be used as a basis for recommendations to improve the performance of radiographic facilities using digital DSLR camera-based intensifying screens for digital radiography examinations which are reliable, self-managed, environmentally friendly (without chemicals), and paperless based on UNNES conservation program.	-
9	The study makes it easy for students to vote on student candidates. Voters can make the selection process effectively and efficiently and reduce the use of paper during data collection and election (paperless).	-
10	The research generates a new health care system (paperless application) by replacing a system which still uses paper in its administrative process to provide better, faster, and more efficient services to patients.	-
11	The effectiveness generated through the design of the system had a significant impact on the administration of population letters because it integrated the SMS gateway as a personal identity from Neighbourhood Association (RT) to Village Office (<i>Kelurahan</i>) and was undoubtedly very environmentally friendly (paperless).	-
12	The research makes it easier for students and lecturers to communicate or carry out the lecture process outside the planned schedule, and can improve the effectiveness of lecturers in providing lecture material files and practice questions to students (paperless).	-
13	The results of the paperless office application update show that the level of user satisfaction is increasing in terms of system quality, information, and service.	-
14	It is saving resources, such as labour, paper, time, and costs because it reduces the number of official documents that must be printed.	-

Article Code	Impact	Challenge
15	The use of Electronic portfolios is very useful in supporting, realizing, and managing the use of paper effectively and efficiently (Paperless Policy). From the results of the media test and evaluation, it was recommended that the Electronic Portfolio media developed gets a 96.55% eligibility percentage, which means it is very feasible to be used in IPA course.	It has not yet determined an excellent paperless policy.
16	Application development using the SUMI method can solve a variety of problems, such as the process of conducting exams, both midterm, and end of semester exams as well as the making of questions, supervision, correction, and assessment carried out with manual methods by lecturers. With this application, paper can be saved according to the concept of paperless.	-
17	Based on the results of experts' validation, it can be concluded that the applicability of the Science of Mobile Learning of Eclipse Phenomena with Conservation Insight is feasible and has an impact on reducing the use of paper (paperless) in the learning process.	-
18	By utilizing information systems, a production activity can run more effectively and efficiently because the planning and reporting process can be done quickly and accurately. It can also reduce paper usage (paperless).	-
19	The proposed system replaces conventional paper tickets with SMS tickets which can reduce paper usage (paperless) at customer service points.	-
20	It provides solutions for users in streamlining time and cost savings during the process of making and sending invitations. Paperless invitation application designed has been successful in sending invitations electronically without having to use paper like the conventional method (paperless).	-
21	The search for hardcopy documents in the future is easier to do because of electronic storage, so this has an impact on spending a little money. Paperless can save a budget for the long term.	-
22	The Scheduling System Integration Test (SIT) application provides an ease to deliver Functional Test documents and control the handling of SIT Resume Results properly as well as make resume reports based on required period without using a lot of papers (paperless).	-
23	The design of a halal product information system assists Muslims to be able to easily validate information related to the feasibility of a product/food for consumption without having to use paper as its information media (paperless).	-
24	Based on the results of data analysis, it can be concluded that heat propagation learning media based on Android can be used as a learning resource which can increase the independence of student learning. Application Inventor (AI) is very feasible and effective, and it gets a positive response	-

Article Code	Impact	Challenge
	with a percentage of 88.56% by students. Therefore, the use of books or paper as learning media (paperless) is no longer needed.	
25	The process of evaluating student work programs can be more simplified by implementing a paperless office system through monitoring and providing a quick description of the progress of the organization without having to use paper media as the conventional method.	-
26	The existence of a paperless library helps to manage and access digital libraries without violating copyright.	-
27	Knowledge Management System application can help and facilitate the processing of IT documentation data at PT. Gamatechno Indonesia, such as product documentation, meeting documentation, and training documentation without using a lot of paper (paperless).	-
28	The use of simple additive weighting methods in realizing paperless applications provides objective results to determine the annual bonus number of employees using the criteria of tenure, position, departmental functions and employee performance.	-
29	The use of this paperless application provides easy access in archiving scientific work data and can be neatly managed.	It has inadequate infrastructure and poor interface design.
30	The development of an e-module based on QR code provides support in the campaign to reduce paper usage.	-
31	The implementation of a mobile-based attendance system using QR Code can reduce the use of paper (paperless) in making attendance for each course and also can increase the efficiency and effectiveness of the attendance process.	-
32	The implementation of the try out system based on paperless provides advantages in time and cost efficiency, reduces cheating and accelerates the evaluation process.	-
33	The use of applications can improve library performance because data management becomes easy. Officers also no longer need to record library data in a book repeatedly, and every data is recorded in the application and can reduce the use of paper (paperless) in the library.	-
34	The paperless office application contributes to the recording of data which is efficient, fast, flexible. It surely is environmentally friendly because it can reduce the use of paper mass.	-
35	The use of the Google Picker Application Programming Interface can simplify the process of storing data and accessing data as well as assist companies in saving and handling hard disk and server limitations, and facilitate the distribution process of archive data (paperless) as well.	It lacks hardware infrastructure support.
36	This study is beneficial for people to record prices, sales, making travel documents, invoices, and payment transactions to the issuance of invoices as well as the presentation of income statements without using paper anymore, thereby reducing the use of paper (paperless).	-

Article Code	Impact	Challenge
37	This research provides benefits for students in the assessment process quickly, and it is environmentally friendly (paperless).	-
38	From the results of this study, the performance evaluation process of teachers at SDN 14 Sungailiat can be more accurate, flexible, objective, and paperless.	-
39	Students can carry out learning well even independently. This research also shows that students can be actively involved during online lectures. Without using books/papers (paperless), students can learn well and give positive responses to e-learning.	It lacks adequate infrastructure in supporting the implementation of paperless applications.

4.4.4. *General Challenges for Paperless Application Development in Indonesia.* Based on the impacts and obstacles of the journal articles having been described in Table 6, These are the challenges of the paperless application development in Indonesia, namely:

1. Paperless application development requires enormous costs. However, if it is considered a long term, the paperless application is cheaper than the use of paper used continuously. For the education and government sectors, the budget can be obtained directly from the government.
2. Paperless applications are challenging for some people to use. It takes a user-friendly application that has a UI / UX (User Interface / User Experience) design giving comfort to the user.
3. Infrastructure in maintaining paperless applications is inadequate. It takes infrastructure supporting paperless applications such as internet connections, computers, gadgets, and other supporting equipment.
4. A lot of people still feel challenged to move from the conventional way to use paper, especially in the administration process. The use of applications, according to some people, feels awkward. Therefore, it is necessary to give routine training and paying attention to the user's comfort so users can operate the application easier.

5. Conclusion

1. Based on SLR results in this study, the dominant sector developing paperless applications in Indonesia is the education sector, and the dominant platform used in developing paperless applications in Indonesia is the website.
2. The impact of using paperless applications almost entirely has a positive impact both in terms of performance, budget savings, and environmental problems generated by paper waste. Paperless applications are the solution in the digital era in supporting environmental preservation.
3. The obstacle of the application of paperless applications in Indonesia are made as challenges to develop paperless applications so when these challenges are solved, these obstacles can be minimized, and undoubtedly the use of paper can be reduced greater from the education, government and industry sectors.
4. The challenge of paperless application development in Indonesia is how the government makes regulations or rules to support paperless applications in all agencies and provides financial support to sectors using paper quite a lot but lack of funds in implementing paperless applications. The paperless application must also be easy to use, and users must be given continuous training so the paperless application can be implemented easier.

6. Suggestion

Based on the results of research having been conducted, the authors provide the following suggestions:

1. The results of the Quality Assessment by applying the use of Sinta accredited journals have resulted in many journal articles, not passing the criteria assessment. If a researcher wants to get journal article data emphasizing quantity without considering quality, it can eliminate the Sinta accreditation requirements.
2. This research only uses articles originating from journals, so lots of articles originating from studies not published in journals are not used. It aims to maintain the quality of research results. However, if researchers want to get more data, they can consider using conference, thesis, or report.
3. Due to the emphasis on the challenges of paperless applications in Indonesia, all journal article references must come from Indonesia. For further research, it can use international journal articles with broader paperless application challenges.

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