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Analysis of Mobile Based Software Development Model: Systematic Review

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ABSTRACT

Software development has various methods, so the choice of software software method for a developer is very important in order to produce quality software according to standards. Based on this description, the importance of knowledge for a developer in choosing a development method, the authors will conduct a literature review in mobile software development methods. The choice of mobile software development method itself is due to the current mass shift among software providers from desktop and web to mobile. This systematic review aims to analyze a mobile-based software development model. In the compilation of this systematic review we use the new PRISMA (Preferred Reporting Items for Systematic Review and Meta-Analysis).
This review shows the predominant method used in the development of mobile-based male devices. The conclusion of this systematic review is that the most commonly used software development models in mobile software.

1. Introduction

Software development is the development of a software product. Software is usually developed for a variety of purposes. Roger S. Pressman (2002), states that software or software is a program command that is contained in a computer. Which if executed by the user will provide a number of functions while displaying the information desired by the user. The Software Development Process is an application of a structure in the development of software, which aims to develop a system and provide guidance for the success of a system development project through certain stages.

In software development, applications are generally divided into 3 platforms, namely desktop, web and mobile. This research is specific to the mobile platform because mobile devices (smartphones) are a common technology that follows users wherever they are and is able to provide the latest information. Internet users in Indonesia are always increasing every year. The highest increase occurred in smartphone internet users. This increase was due to changes in the provision of software from desktop and web to mobile based. Based on these requirements, it is necessary to know the process of providing mobile applications to suit the user. Provision of mobile applications is inseparable from the process of developing special software development of mobile software.

The main aspect in this systematic review is to identify a software development model for mobile-based software development published in reputable journals. We collected the literature based on a predetermined time period. In section 2, we provide an overview of the mobile software and software development models. In section 3, we present the objectives and research questions. In section 4, we define the research methods we used in compiling this systematic review. In section 5, we present the results of a systematic review of the literature reviews we selected and used to answer the research questions that we have defined in the previous section. In section 6, we discuss the conclusions of this systematic review, and in section 7, we conclude.

2. Literature Review

This research is a research that makes Analysis of Mobile Based Software DevelopmentModel: Systematic Review. In this study, there are several data collection methods used, namely:

A. Software Development Model

Software development can be defined as the process of creating new software to replace old software in its entirety or to improve existing software. This software development methodology is needed so that it can be faster and more precise in describing solutions and developing software. With this development methodology, later it can also help to produce quality software (Darmawan Setiya Budi et al., 2017).

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The System Development Life Cycle or better known as SDLC is a general methodology used to develop information systems. SDLC consists of several phases starting from the planning, analysis, design, implementation to system maintenance phases. The SDLC concept underlies various types of software development models to form a framework for planning and controlling the creation of information systems. SDLC models that are often used include Waterfall and Prototyping. SDLC is the process of developing or changing a software system using models and methodologies used by people to develop previous software systems (based on best practice or well-tested methods). SDLC has several models in the application of the stages of the process, including the Sequential Model or Waterfall model, Parallel Model, Iterative Model, Prototyping Model, RAD (Rapid Application Development) Model, Spiral Model, VShaped Model and Agile Development.

B. Mobile Software

Mobile is a software system that allows any user to perform mobility with the company's PDA-assistant digital equipment on a cell phone or cell phone. Android and iOS are mobile operating systems that currently dominate the market. Mobile applications are also known as web apps, online apps, iPhone apps or smartphone apps. Mobile applications are an improvement from integrated software systems that are commonly found on desktop PCs (Indah Lestari and Anggy Trisnadoli, 2017). Provision of mobile applications is inseparable from the software development process, especially mobile software development. For this reason, in this study a discussion of mobile software development methods consists of wireless development, mobile application development lifecycle model (MADLC) and mobile development (Mobile-D). Of the three software development methods based on mobile wireless development, the longest working phase is eight phases, while the mobile application development lifecycle model (MADLC) has seven phases and mobile development (Mobile-D) has five phases. The choice of mobile software development method is an important factor in the development process (Firamon Syakti, 2018).

C. Research Objectives and Questions

Research Questions (RQ) or research questions are made based on the needs of the selected topic. The overall objective of this literature review is to identify a mobile application-based software development process model. The following are the research questions in this study:

RQ1: What software development process models are most often used to support mobile based software?
RQ2: What types of software development process models can be used in developing mobile-based software?
RQ3: What is the process of developing specific software for mobile?

3. Research Methodology

A. PRISMA Guideliness

This systematic review uses the PRISMA guidelines. The PRISMA Guidelines are a minimum set of evidence-based items to report in systematic reviews and meta-analyzes. The goal is to help the authors improve systematic review reporting and consists of 27 items (Endah Fitriasari, 2019). The guidelines are shown in sequence in table 1 below:

Table 1
PRISMA Guidelines

PRISMA *Items*	
Title	Title
	Structured summary
	Rationale
	Objective
	Protocol/registration
	Eligibility criteria
	Information sources
	Search
Abstract	Study selection
	Data collection process
	Data items
	Risk of bias in individual studies
	Summary measures
	Synthesis of results
	Risk of bias across studies
	Additional analyses
Result	Study selection
	Study characteristics

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PRISMA *Items*	
	Risk of bias within studies
	Result of individual studies
	Synthesis of result
	Risk of bias across studies
	Additional analyses
	Summary of evidence
Conclusion	Limitation
	Conclusion
Funding	Funding

B. **Search Process**

The data used is in the 2018–2020 timeframe to maintain the latest and updated literature to be reviewed. Data obtained through the site https://scholar.google.com. The data used is only related to the mobile-based software development model. In searching for literature we use the following keywords in each publisher source:

a) Software Development Model& Mobile Software Development.
b) SDLC&Mobile Software.
c) SDLC & Mobile Based Application.

Literature collected from the search process will undergo several filtering and categorizing processes. In the first filtering process all literature from search sources by looking at the suitability of predefined keywords and in the second filtering process we will eliminate duplicate literatures. Furthermore, in the process of grouping the literature that has been collected, it will be grouped based on the software development process model. Finally, we did a double check in order to minimize the errors that could occur in this study.

C. Quality Assesment

In this study, the data found will be evaluated based on the quality assessment criteria questions as follows:

QA1 : Was journal literature published in 2018–2020?
QA2 : Does the journal literature write down the tools used for software development? 2018–2020?
QA3 : Does the journal literature write down the methods used to develop the software?
From each literature, the answer score will be given below for each of the questions above.
Y (Yes): For problems and methods written in journals within the period 2013-2018 and,
Q (No): For problems and methods that are not listed.

4. Results and Discussion

The results of a literature search conducted on Google Scholar (https://scholar.google.com) are as many as 116 literature. However, out of 116 literatures, only 36 literature whose titles have relevance to predefined keywords, because most of the literature does not focus on mobile-based software development models. From 45 literatures, we grouped literature based on software development methods, the results were 17 literatures using the waterfall method, 14 literatures using the RAD method, 2 literatures using the RAD method, 2 literature using the RUP method, 1 literature using the UTAUT method, 2 literature using the prototype method, and 2 literature using Mobile-D and 5 literature do not mention the method of development. After grouping, we filtered the duplicate literature for each development method group. It turns out that the result is no duplicate literature. In the final stage, we obtained 25 eligible literature. We use these results as a reference for conducting a systematic review.

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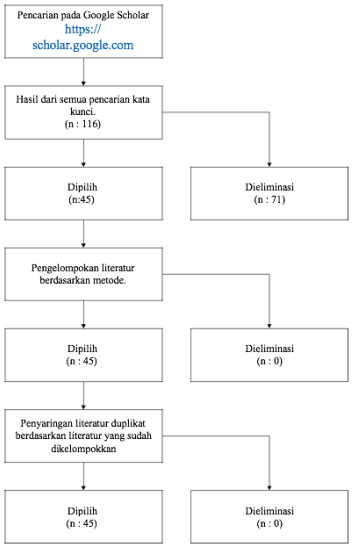

Fig 1 Flow of Literature Search Process

The results of the Quality Assessment in the literature that have been selected that can be used as a reference for answering RQ1 can be seen in table 2.

Table 2
Quality Assessment Results

No	Author	Title	Year	QA1	QA2	QA3	Result
1	Yoyon Efendi	Design Based Educational Game Applications Mobile Using App Inventor.	2018	Y	Y	Y	□
2	Ketut Arya, I Made Agus Wirawan, Gede Aditra Pradnyana	Bali Based Application Introduction to Paribasa Mobile.	2019	Y	Y	Y	□
3	Hamdan Hanafi	Development of Android-Based Mobile Learning in English for Class X SMK Muhammadiyah 1 Patuk.	2019	Y	Y	Y	□
4	Ibnu Aji Pamungkas, Wasis Djoko Dwijoyo	Development of Learning Media Based on Mobile Learning for Freshness Activities Physical Students of class X Middle School Vocational.	2020	Y	Y	Y	□
5	Elsa Wahyu Hidayat, Istanto Wahyu Djatmiko	M-Learning Development For Competency Improvement Pneumatic Elementary In Middle School Vocational.	2018	Y	Y	Y	□
6	Mohammad Muhyidin Nurzaelani, Rusdi Kasman, Septy Achyanadia	Development of National Integration Teaching Materials Mobile based.	2018	Y	Y	Y	□
7	Rizky Ari Pradana, Sulton, Arafah Husna	E-Module Development Based on Mobile Learning SubjectsCultural ArtsConcept of Culture, Art, and Beauty of Class XSMKN 1 Turen Malang.	2020	Y	Y	Y	□
8	Siti Komariah,	Learning Media Development	2018	Y	Y	Y	□

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No	Author	Title	Year	QA1	QA2	QA3	Result
	Huri Suhendri, Arif Rahman Hakim	Junior High School Student Mathematics Android based.					
9	Restu Hardinata, Susanti Murwitaningsih, Gufron Amirullah	Development of Mobile Learning Coordination System Based on Android.	2018	Y	Y	Y	□
10	Nurul Aini Muhammad Zamroni Uska, Rasyid Hardi Wirasasmita	Android-Based Mobile Learning Development in Basic Network Subjects.	2018	Y	Y	Y	□
11	Made Prima Restami, I Nyoman Suraja Antarajaya, Komang AnikSugiani	Development of Learning Media Based on Mobile Learning For Upgrade Visual Literacy Skills and Learning Outcomes.	2019	Y	Y	Y	□
12	M. Fajrin Palinri, Jemakmun, Kurniati	User Information Software Drug Use Mobile-D method Android based.	2020	Y	Y	Y	□
13	Ryan Andri, Nurul Adha Oktarini Saputri, Muhamad Akbar	Mobile-Based Notification System for Bina Darma University Final Project.	2020	Y	Y	Y	□
14	Aris Mahmudi, Usma Ependi, Nurul Adha Oktarini Saputri	Mobile Software for Motorized Vehicle Repair Services at Honda Plaju Palembang Based On Android By Method RAD (Rapid Application Development).	2020	Y	Y	Y	□
15	Dini Silvi Purnia	Implementation of the RAD method in the Mobile-Based Distributed BAN-SOS Application Design.	2018	Y	Y	Y	□
16	Azmin Albarokah, Rionaldo Wijaya, M. Ammar Faiturrahman, M. Gusti Aji Pamungkas, Heri Mahendra Pratama, Putri Eka Sevtiyuni	Analysis and University Transportation Application Design (Transitas) Based Mobile.	2019	Y	Y	Y	□
17	Adinda Aulia Balqis, Fauza Adelma Syafrizal, arwin Permata Putra, Ike Devanti, Dhiya Fauzia Romiza, Putri Eka Sevtiyuni	Analysis and Design of "Eatzy" Applications on the Device Cellular (Mobile) Based on Android Using RUP method.	2019	Y	Y	Y	□
18	Tezzara Martania Clara Sutjipto	Application of Adoption Utaut Model Technology For Service Systems Mobile-Based Integrated Samsat.	2020	Y	Y	Y	□
19	Muhamad Alda	Laundry Information System UsingWaterfall method	2019	Y	Y	Y	□

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No	Author	Title	Year	QA1	QA2	QA3	Result
		Android Based On Simply Fresh Laundry.					
20	I Made Agus Artawan, Ni Made Estiyanti, I Gusti Lanang Agung Raditya Putra, A.A.Istri	Design Electronic Applications Mobile-Based Indonesian Cooperative (E-Coin).	2020	Y	Y	Y	□
21	Asni Tafrikhatin	Development of Mobile Learning Electrical Measurement for Students of the Titl Expertise Program at SMK.	2018	Y	Y	Y	□
22	Posma Janius Sianturi, Cepi M. Usman, Nanda Firmansyah Antonius T., Tri Wahyu W	Mobile Based E-Ronda Application Development.	2019	Y	Y	Y	□
23	Rojiman Hadisaputra, Nadiyasari Agitha, Moh. Ali Akbar	Design and Build a Cake Ordering Application Mobile Based At Primadona Cake Shop.	2020	Y	Y	Y	□
24	Putri Taqwa Prasetyaningrum, Ozzi Suria, Arita Witanti	Designing E-Resource Libraries Using Customer Relationship Mobile Based Management.	2018	Y	Y	Y	□
25	Siti Mukodimah, Muhamad Muslihudin, Trisnawati	Application for Determination of Quality TSM Workshop For mobile-based students of SMK Pringsewu Regency students.	2019	Y	Y	Y	□

Symbol Description:

✓: For journals or research data used. The data was chosen because it has problems, approaches, and sufficient information for data selection.

x : For journals or data that are not used in research because the data is an article written by a guest editor that tells about the researchers' experiences, problems, approaches, or inadequate information for data selection.

RQ1: What software development process models are most often used to support mobile based software?

Table 3 below is used to help answer RQ1. Table 3 shows that the software development model most widely used for mobile-based development is as follows

Table 3

Software Development Methods

No	Software Development Methods	Total
1	Waterfall Method	17
2	Research and Development (R&D) Method	14
3	Rapid Application Development (RAD) Method	2
4	Rational Unified Process (RUP) Method	2
5	Unified Theory of Acceptance and Use ofTechnology (UTAUT) Method	1
6	Mobile-D	2
7	Prototype	2

The software development model most often used in 2018-2020 is the waterfall method with 17 literatures.

RQ2: What types of software development process models can be used in developing mobile-based software?

Based on table 3 above, the device development process model used in 2018-2020, there are 6 methods, namely:

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a) The waterfall method is often referred to as the ordered life flow model. In the waterfall method, each stage is completed before the next stage. The waterfall method is a sequential design process that is often used in software development, the process flows downwards like a waterfall through several stages, namely system requirements analysis, system design, coding and finally testing (Kurnia Wahyu et. Al., 2019).
b) Research and development methods or in English Research and Development (R&D) is a research method used to produce certain products and test the effectiveness of these products (Sugiyono, 2013: 297).
c) Rapid Application Development (RAD) is a method of developing an information system in a relatively short time. To develop a normal information system requires a minimum of 180 days, but by using the RAD method a system can be completed in just 30-90 days (Agustinus, 2016).
d) Rational Unified Process (RUP) is a software engineering method developed by collecting various best practices found in the software development industry. The main feature of this method is that it uses a usecase driven and iterative approach to the software development cycle (Azmin Albarokah et. Al., 2019) .em information with a relatively short time. To develop a normal information system requires a minimum of 180 days, but by using the RAD method a system can be completed in just 30-90 days (Agustinus, 2016).
e) Prototyping is a system development technique that uses a prototype to describe the system, so that the user or owner of the system has an overview of the system development he will do. The prototyping model goes through several stages, namely: needs analysis, building prototyping, prototyping evaluation, coding the system, testing the system, evaluating the system and using the system (Zulkiplih et. Al., 2020).
f) The Mobile-D method is one of the methods suitable for mobile application development because it is agile and flexible. Mobile-D is the development of several frameworks, namely Extreme Programming, Crystal and Rationale Unified Process (Flora & Chande, 2013).
g) Unified Theory of Acceptance and Use of Technology (UTAUT) is one of the latest technology acceptance models developed by Venkatesh, et al. UTAUT combines the successful features of eight leading technology acceptance theories into one theory. The eight leading theories put together in UTAUT are the theory of reasoned action (TRA), technology acceptance model (TAM), motivational model (MM), theory of planned behavior (TPB), combined TAM and TPB, model of PC utilization (MPTU). , innovation diffusion theory (IDT), and social cognitive theory (SCT). UTAUT has been shown to be more successful than the other eight theories in explaining up to 70 percent of user variants (Venkatesh, et al, 2003).

RQ3: What is the process of developing custom software for mobile?

The development of mobile-based applications is increasing all the time. This condition can be seen from the number of users who access the internet via smartphones always increasing from year to year (APJII, 2018). Internet users who access via smartphones can be ascertained using a mobile application. The type of mobile application is also an important factor in increasing internet access via smartphones. To produce a mobile application that suits user needs, development is needed in accordance with software development principles. So that the selection of a development method is very important for a developer. The software development method is a management method in carrying out the development process. The purpose of using software development methods is to achieve user needs and produce standardized software. The development of software used by users has begun to shift from previously desktop and web-based and now to mobile-based. Currently, there are various software development methods, including (Stapić et al., 2016):

a) Mobile application development process.
b) Wireless development.
c) Mobile application development lifecycle model (MADLC).
d) Agile Methodology for Mobile Software Development, MASAM methodology.
e) Mobile Application Development Methodology.
f) Mobile Development (Mobile D)

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5. Conclusions

RQ1. Referring to the results of a systematic review that we conducted in journals published from 2018-2020, then the mobile software development model that is most widely used in this study is waterfall.
RQ2. Based on the results of the QA that has been carried out, there are 7 software development methods used in 2018-2020, namely: Waterfall, Research and Development (R&D), Rapid Application Development (RAD), Rational Unified Process (RUP), Prototyping, Mobile -D and Unified Theory of Acceptance and Use of Technology (UTAUT) .2020, so the mobile software development model most widely used in this study is the waterfall.

RQ3. There are 6 methods for the mobile software process model, namely: Mobile application development process, Wireless development, Mobile application development lifecycle model (MADLC), Agile Methodology for Mobile Software Development, MASAM methodology, Mobile Application Development Methodology and Mobile Development (Mobile D).

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