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|  |  | Application Development Tools  Development methods, tools and techniques | | |  | |
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|  | **Introduction**  This will be a research conducted to find and compare different application development software tools, techniques and methodologies. Strengths and weaknesses of each methodology and advantages and disadvantages of different tools and techniques will be discussed.  Author: K.P.I. Shenesh Perera  Date: 25/06/2019  IDM | | | | |  |
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# What is application development?

An application is the normal slang term for application or program that can be kept running on a PC to achieve some task simpler and more effectively than we could do it without anyone else's help as humans. In the event that you have a cell phone or PC or tablet, you most likely have utilized some game applications, news applications or even guide applications to enable you to locate the nearby supermarkets. Application development is the process of designing, developing and deploying these programs.

Application developers have a programming foundation. As you may envision, the reason it's called application development rather than just computer programming is on the grounds that there are a lot more advances required than a real composition of a PC program. All the steps involved in this process are generally known as the Software Development Lifecycle(SDLC).

# Application Development Methodologies & Techniques

## Waterfall Method

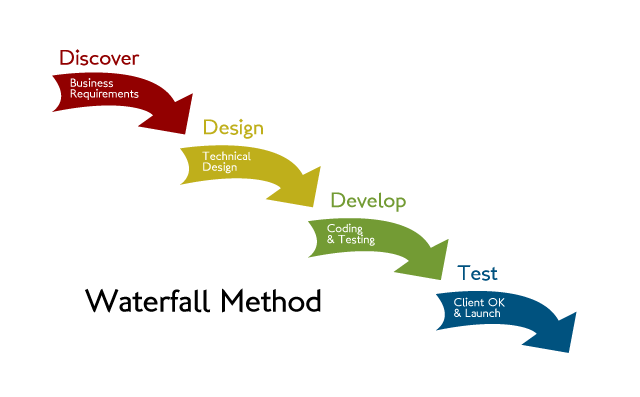


Figure 1.0, waterfall-agilemethodology.blogspot.com, Ravi Agrawal, 06/09/2013

This is a traditional application development approach that gives focus to being linear and sequential over anything else. This is the earliest SDLC approach known to software development and have quite a lot of solutions to existing caveats despite the fact that it’s traditional approach.

The waterfall method has the following requirements:

* Clear documentation
* Product defining must be stable
* Technology used cannot be dynamic
* There are no vague requirements
* Project must be short

Some strengths and weaknesses are:

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| **Strengths** | **Weaknesses** |
| Simple and very easy to comprehend | The solution is not bought to a working point till the end |
| Properly stated milestones | Higher risk and uncertainity |
| Clearly defined stages | Bad for OOP based development |
| Processes and the results are very well documented | Cannot respond to change. |

## Prototype Method

It is a specialized application development methodology that propagates developers towards making only a sample of the entire application first to validate it’s functional efficiency to customers and then make the essential changes afterwards to make it a production ready and a supercharged final solution.

In fact, the best thing about this methodology against waterfall method is that the prototype methodology tends to resolve a set of problems like the sensitivity to changes.

Some strengths and weaknesses are:

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| **Advantages** | **Disadvantages** |
| Gives clear idea about the functionality | Increased management cost |
| Reduces the risk in failure | Higher involvement of clients can both increase cost and time |
| Reduces the probability of unhappy customers | Lots of changes can happen at any given time |
| Helps to gather requirements and overall expectations |  |

## Agile Methodology

This approach is now the most famous and the most used method all around the world. All companies have realized the benefits in Agile development, as such it has become a priority for all DevOps staff to prioritize in their path of learning.

So what makes agile application development so revolutionizing? It’s teamwork. Agile application development at its core relies heavily in the combination of efforts within a team. Collaboration and time boxing difficult tasks and the sheer flexibility in responding to changes as quick as possible is what has made agile project management to triumph over waterfall application development.

The 4 main golden rules in agile application development are:

1. Higher focus on each individual than the processes or the tools involved
2. Development is more important that documentation
3. The collaboration with clients is more important than negotiating with them
4. The process must be able to quickly respond to change than following an absolute plan

Now with these 4 rules it must become obvious what benefits there are in following application development:

* Higher flexibility in terms of prioritization than traditional approach
* Much more predictable and earlier delivery
* The budget, project scheduling and the timeline is more predictable
* Quality is much more improved
* Higher transparency due to high flexibility
* Employees feel more involved leading to productive hours of work

Every agile approach has one thing in common. The tasks are iterative. Each task in a project is divided into short “sprints” which take less time. Unlike waterfall, planning and prioritization aren’t crucial so agile is more flexible in terms of changes.

Some strengths and weaknesses are:

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| **Strengths** | **Weaknesses** |
| Responds to changes almost immediately | Lacks documentation |
| Allows direct communication and complete transparency with customers | Can go out of track as the final outcome is not decided in the beginning |
| Better than most development methods and techniques as it is easier to fix errors and not worry about aftereffects | Works best in considerably small teams |
| Higher quality in terms of cost effectiveness | Relies mostly on teamwork |

## Rapid Method

Aims to provide extremely quick results, rapid application development is usually used to give excellent development propogataion with the assistance/combination of other development methods.

It is used to take the maximum advantage from the development tool/envrironment or software. It is designed in a way to map the functionality of the entire software development procedure to highlight the participation of a particular consumer/user.

As such, developers skilled in this particular method are quite rare because the factors that have to be considered are pretty verbose and complicated.

Some strengths and weaknesses are:

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| **Strengths** | **Weaknesses** |
| The entire development process takes very little effort | Depends on a team for performance |
| Makes it possible for clients to review every now and then | Modularized systems are involved, and are usually the only system involved |
| Encourages user feedback and utilizing it for improvement | Extremely skilled developers are required as complexities are very high |
|  | Won’t work well on projects with small budgets |

## Spiral Model method

It’s a very sophisticated design and is usually in very large projects in order to reduce the risks or unpredictable variables in the system that may affect the system in a negative manner. According to the spiral model, developers begin with a very small level and then explore higher up considering the risks that are involved.

It is a crucial necessity to crafting a plan for working through the spiral model, as such the core requirements of this application development method is more or less are consistency, observation and conversant management.

Some strengths and weaknesses are:

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| **Strengths** | **Weaknesses** |
| Risks factors and unpredictable variables are greatly reduced | Very high in terms of cost |
| Excellent for large and complex projects | Failing to do proper risk analysis might jeopardize the entire project |
| Not sensitive to changes to functionality further up the spiral | No point in a low risk project |
| Shows it’s brilliance when used for highly risky projects with variable requirements | Might end up with the project never finishing on time |

## Extreme Programming Method (XP)

Extreme Programming is probably the only method that has extremely high involvement of clients within the project, it is a type of agile application development methodology, it is also more commonly known as the XP methodology. The use case of this type of methodology is highlighted specifically when the atmosphere in which the project has been taken is extremely unbalanced in several factors. Higher tractability within the modelling procedure of the XP method is one of it’ greatest strengths

The primary purpose of the XP model is to reduce the cost of essentials in application development, but changes in projects that use this method are extremely costly and is quite mutual given the cost of certain essentials are reduced.

Some strengths and weaknesses are:

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| **Strengths** | **Weaknesses** |
| Focuses mostly on the perspective of the client | Depending on clients may become a hindrance |
| Rationalized plan and schedule establishing is a key factor | Frequent meetings to ensure proper development increases the costs involved |
| Developers that are hired to work with the XP method are usually highly committed | Excessive changes in development are a necessity |
| More and more modern methods and tools are used to create high quality software | Future outcomes are difficult to know |

# Application Development tools

Application development tools are software that are used in any stage of the software development lifecycle that helps/assists in creating a solution for any given problem. From testing to writing the code in a programming language, application development tools used by a developer is essential. There are many available but only those that are within the context of this business related problem or mobile application development will be talked about.

## Flutter

Flutter is Google’s mobile application software development kit, with a functional framework, widgets and other tools that allow developers to build and deploy visually appealing and blazing fast mobile applications both on Android and iOS platforms.

It’s free and open source and is written in an object oriented programming language known as Dart that’s easy to learn. It comes with its own widgets that are extremely performant and renders timelessly. Mobile apps written in flutter look and feel great.

Some advantages and disadvantages are:

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| **Advantages** | **Weaknesses** |
| Fast code writing | Less support and even less libraries out there |
| Compatible with android and iOS | Community is still small |
| Very less testing involved | Continuous Integration/Deployment is till immature |
| Highly performant |  |

## React Native

React Native is a framework based on JSX, ES6 JavaScript syntax, state management and props. It is a Javascript framework that has reactive programming at it’s core and natively supporting iOS and Android. It is based on the famous frontend framework ReactJS, from Facebook for building powerful and fast user interfaces in a component based style. The difference between React and React Native, is that React targets the browser and React Native targets the mobile.

React Native allows an application developer, to put together UI building components, JS and React all three together and make it portable in browser and mobile too. The core of this framework is “Learn once and write anywhere”, meaning that the compatibility of applications written in React Native are high.

Some advantages and disadvantages are:

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| **Advantages** | **Weaknesses** |
| Mobile application development can be done with web technologies like JS/CSS and HTML | The long term commitment to React Native by Facebook is not exactly clear |
| Cross platform compatibility, iOS and Android | Applications that require very high security might want to combine other technologies |
| Very flexible to changes as code is written in components | As web technologies are involved and Javascript is a loosely typed language that are quite bad at mathematics, projects that have high computations might be slower |
| High performance |  |

## Xamarin

Although originally not the creation of Microsoft, Microsoft took Xamarin in 2016 from it’s founders and made it open source, it’s a cross platform framework that is written in C# which takes a unique approach to developing cross platform mobile applications. Unlike some hybrid mobile application development frameworks that use web technologies, it compiles down to native code for each platform.

Some advantages and disadvantages are:

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| **Advantages** | **Weaknesses** |
| Applications written in Xamarin can achieve native speeds with no difference | All applications developed in Xamarin have a huge size, even a simple “hello world” program is nearly 12 MB. |
| Extremely rich experiences with UI elements | Learning Xamarin requires knowledge of native languages like Java/Swift/Objective-C. |
| Xamarin lets to port almost 90% of the codebase around with the necessity of just redesigning the UI for each platform | Xamarin is free, but the IDE Microsoft provides is very expensive, nearly $4000 in total for the first year. |
| Uniform UIs can be made using Xamarin Forms | It’s quite difficult to integrate 3rd party libraries into Xamarin. |

# What is my choice and why have I chosen it? (Justifications and explanations)

I used the **Progressive Web Application** development technique to develop BookWorm. It is a very new topic to the internet and is rarely ever used but there is a very high expectation peak and opinions by very experienced developers. Progressive web applications are a concept introduced by Google, that are reliable, fast and extremely engaging. It’s a new way to write websites/web applications that make them look and feel like mobile applications!

## So why a progressive web application?

Mainly and primarily because any application that is written in a progressive web application style will run and feel like a mobile application on a browser, a mobile or any device that’s capable of accessing the web!

This cuts down the cost of having to write a desktop application, a mobile application and a website for a particular product, because all you have to do is create just one thing, a progressive web application and it would run and feel like a mobile app on mobiles, desktop app on desktop and a website on a browser.

PWAs are extremely fast and utilizes the latest web concepts in the development lifecycle, test-driven development is a very common approach in the building of a PWA. As such, very low costs and time are required to produce a high functioning application across all platforms.

Another good reason is that in the Stackoverflow Developer survey both 2018 and 2019, it has been declared that Javascript is the most demanded and used language within the development industry. Although Javascript was fairly a useless language before 2015, it is gaining large amounts of exposure and has seemingly become a powerful language after the ECMAScript 2015(ES6) release by the TC39 committee.

Asynchronous programming is the future and PWAs are very concerned with asynchronous development, gone are the days of synchronous development where the call stack has to wait till a particular function has finished executing to move on to the next. Using callbacks, Promises and the async/await(Promise syntax sugar) in ES6, Javascript has come one step closer to become more performant.

I interact with the Google Play books api, directly using the Fetch API in Javascript that allows you to make HTTP requests and handle their errors almost effortlessly.

So any user can find, view and download both audiobooks and books from anywhere around the world at a very high speed from the mobile, desktop or just from the website.

The use of the PWA have satisfied every system requirement,

* less time and cost was required
* extremely fast and cross compatible
* has a great look and feel
* has a dark mode for readers that read at night
* finding, reading and downloading books or audio books has never been this easy
* caching makes the application insanely fast
* BookWorm runs offline as well! Some functions are removed but offline functionality is available.

In short, PWAs are the future of not only mobile application development but of every development category. The revolutionary concept is gaining major exposure and this was my first Progressive Web Application that I wrote, I have definitely fallen in love with how easy and simple it is to write a good looking application that is compatible with iOS, Android and literally any PC!