A Comparative Study of Agile and Waterfall Software Development Methodologies

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Abstract*: In earlier software development all processes were completed and implemented but now this is not a scenario. In the modern era, changes are frequent to any software product or module that is in a development phase, due to market competition's priority of requirement changes Because the traditional process models are incompatible with these changes, agile methodology is used instead.. The earlier waterfall model was convenient because of less requirement of features and the emergency of the application in a short period. This Paper Discusses the Comparative Analysis of the waterfall model and agile methodologies while agile methodologies are taking over, even though the waterfall model is older and time-consuming it is still used in many sectors The paper will help other software development process models. The agile method plays an important role in the areas of software project management, software schedule management, etc. The main aim of agile is Customer satisfaction as well as faster development with a low defect rate. This reflects the comparison of the agile processes with the waterfall model software development life cycle model. Agile processes are always beneficial; they have their own set of downsides. The agile method promotes continuous iteration of development and testing throughout the software.*

Keywords: Agile Methodology, Software development lifecycle, Extreme programming, Scrum, waterfall model

I. INTRODUCTION

During the software development process, the software development life cycle has two major components: one emphasizes process, and the other is software and process quality. Agile software development focuses on iterative and dynamic development, it allows to change requirements in response to client demands. It helps Adaptive planning, iterative development, and time boxing are all aided by it. It's a theoretical framework that promotes expected interactions throughout the development process. SDLC is a framework that identifies the actions taken at each stage of the software development life cycle [1], and it comes with various models, such as spiral, waterfall, and rapid application development (RAD). Software development operations such as planning, analysis, design, coding, testing, and maintenance must be executed according to the customer's need. It depends on the various applications to select the specific model. However, in this paper, we will deal with agile processes and methodologies. The agile process is a software development process in itself [2]. The agile process is an iterative technique in which customer satisfaction is highly prioritized because the customer is directly involved in the product evaluation [3]. The agile method follows the SDLC, which includes gathering requirements, analysis, design, coding, and testing, as well as delivering partially implemented software and waiting for feedback from customers.

The waterfall model is the first model for software development it is also called the linear sequential model The waterfall model each phase must be completed before the next phase

II. LITERATURE REVIEW

Agile methodologies are software development strategies that are used iteratively to deliver high-quality software providing adaptability and flexibility concerning changing conditions. It focuses on project management that is informal and more flexible, increasing transparency as well as communication. Role of agile methodologies in software development was described in the Agile Manifesto [4] and includes the following:

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- Delivering workable software on time;
- Customer satisfaction
- Acceptable changes
- Business owners and developers frequently Work together.
- The developments based on motivated individuals
- Continuously test software after each iteration

These are usually achieved by the customers and the developers who worked together in the course of development of the software. In agile development, the developers' teams are small in size as it is usually considered to achieve the following reasons Cost, Schedule, Requirement, and quality. Accordingly, software usually fails because of the following reasons as clearly stated:

- Lack of defined requirements and poor communication;
- Unresolved business requirements issues;
- Requirements changed before the project is finished;
- By-the-developers untested software codes;

Software that the user hasn' t-test To develop software that is robust and at the same time solves some of the problems listed above we need development methods that represent a new approach to planning and managing large software development projects.

On the Other hand Waterfall model is based on step-by-step phases of defining the requirements, building the Software, testing the software, and finally deploying the software. These phases are regarded as the oldest model but are regarded as essential methods in traditional methods of software development. In the waterfall model, we move to the next phase only when one phase of the development is completed. It is more suitable for projects whose requirements do not quickly change until when the project is finished; therefore, more suitable for projects that have stable or unchanged user requirements for a long period.[5]

III. RESEARCH METHODOLOGY

This paper is based on a comparative study of two different methodologies, and their application in different circumstances. The in-depth analysis makes it clear to understand the implementation of agile and waterfall models during different projects. The approach is descriptive and discusses the crucial identification of appropriate processes used in the software development life cycle

IV. COMPARISON BETWEEN WATERFALL AND nimble SOFTWARE DEVELOPMENT MODEL

Before agitating the comparison the different parcels are demanded to be discovered for better study which will help in secerning between the two models i.e. Waterfall and Agile. (4,5) Aspect Water Fall Model nimble model Primary pretensions Stability, high assurance Rapid value, responding to change Abecedarian thesis It's Specific prognosticated and developed using extended and detailed planning Grounded on fast feedback and changes, by small platoon, software that's of high quality with the use of continue improvement in design and testing is developed stoner conditions Details and description before perpetration Interactively input Communication system Formal Informal client relations devoted onsite guests, concentrated prioritized supplements Need client Interaction Till The contract Quality control Not easy to plan, late testing and veritably delicate Testing is done as the software is being developed, design, or demand is endless Reworked cost High Low Development direction Fixed Flexible design size Large design Small or Medium size design Testing At the End Of rendering For each Step

Advantages

• nimble methodology is a fairly straightforward conception that's innovated on the notion that systems are produced in brief duplications. It isn't a collection of technologies. In the form of brief duplications for colorfulsub-modules, duplications are effective for breaking down a large problem into manageablesub-modules. The stoner can view a performing interpretation of the software after any replication before moving on to the following one, making the design as a total more adaptable.(6)

In practice, traditional ways are rather inflexible. Any bitsy revision after conditions are established isn't respected since it necessitates redoing the entire design, but by enforcing an nimble intelligence, it may be altered whenever the client or inventor sees fit.(6)

It's possible to produce and modernize the overall progress report constantly. After each replication, the product's progress can be tracked and estimated.(6)

Disadvantages

Generally speaking, a veritably common error is that numerous people suppose that inflexibility and lack of inflexibility are at the core of nimble. This is untrue in reality because nimble styles have their own set of unequivocal guidelines and norms. Rather than making variations after careful consideration. Everyone is free to suggest any change at any position only to demonstrate their actuality, according to the study simply because everyone claims to be always prepared to acclimatize to any change, without sufficient liabilities.(6)

Regular consumer input may constitute a tailback for the design's advancement. Followers of nimble gospel value relations with guests. still, it might come a weak point in some situations, similar as when the stoner or client does ' t have enough time to spend with the inventors or when the important customer is a elderly director. Large systems do no't always need to be finished under one roof, making coordinating a challenge. suppose of a script where two brigades are working in several metropolises at colorful locales. Is there collaboration similar to two brigades physically seated together?(6)

Waterfall
Advantages

Unlike other styles, the cascade model follows a specific and specified sequence of way. Because every design must go through the same series of events, its structure is straightforward. This includes carrying specifications and supporting attestation, as well as designing, enforcing, testing, delivering, and maintaining the system. Before moving on to the coming stage, a platoon must finish the former one, making any obstacles in the way easy to spot. Because each set of way must be completed before moving on, systems espousing the cascade approach are less likely to be abandoned half through. After the process, your work is more likely to be polished and comprehensive.(7)

The cascade approach does ' t call for particular training or instruments for labor force or design directors, unlike other development methodologies. Without having to go through a delicate literacy wind that can stymie individual success, you can get right into the system. Given that the fabrics encourage platoon thickness, it's thus among the most stoner-friendly systems now in use.(7)

The cascade model commits to the final ideal, product, or deliverable from the launch of the process, which is one of its crucial benefits. brigades are prompted not to transgress from similar fidelity. This point enables everyone to be apprehensive of the planned outgrowth from the morning of the design when you have small enterprise with clear pretensions. That implies that as each step is taken, there's lower chance of getting lost in the ramifications of diurnal operations.

Disadvantages

A platoon always moves forward when using the cascade model, which adheres to a set of way. There's veritably little inflexibility for revision when using this approach's traditional fashion if an unlooked-for event occurs during a design. Up until virtually the very end of the design, a platoon may faithfully cleave to each phase before running into an unanticipated challenge. Making the necessary pivot to keep going forward can be coming to insolvable if a change in the objects or the compass of the job is needed.(7)

The cascade model, which follows a sequence of way, ensures that a platoon always advances. When espousing this approach's traditional fashion, there's veritably limited room for revision if an unlooked-for circumstance takes place throughout a design. A platoon may stick to each phase diligently over to nearly the very end of the design before encountering an unexpected difficulty. However, making the pivot that's needed to go forward can be nearly delicate, If a change in the pretensions or the nature of the job is essential.

The testing step of any project is postponed by the waterfall paradigm until it is necessary. According to the conventional approach, it is the fourth of six steps. Any negative outcomes might necessitate a large adjustment as the project has probably already taken a long time to finish. The proposed value proposition's empirical facts before you consider entering the market may lead to serious user problems that you will need to handle. This drawback is the main impetus behind the creation of agile approaches. There is a lot of potential for issues to go overlooked up until the project is almost finished.

V. CONCLUSION

In this paper, I have provided two models: a waterfall model and agile methodologies. Both models have their uses, pros and cons. Small projects are almost always better suited for an Agile methodology than a Waterfall one. When developing medium-sized projects, both the Waterfall Model and the Agile Methodologies have their number of drawbacks. A flexible Agile Methodology may be too easy to use for the same project while the difficult Waterfall Model may add too much overhead to it. A large, complex project with several teams working on various components of the application at the same time is one of the project types that is challenging to handle in an Agile manner. This kind of project is typically a waterfall project.

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