

# INFLUENCE OF STATIC TESTING IN AGILE DEVELOPMENT: A CASE FROM PAKISTAN SOFTWARE MARKET

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**ABSTRACT**—*This research paper focuses on Software Static Testing in Agile Development Methodology, highlighting variety of challenges. We propose a framework for implementation of Static Testing in Agile Development. To increase its acceptability with respect to Pakistan community, we take a case from Pakistan Software Market.*

Index Terms— Software Static Testing, Software Development Life Cycle, Agile Development, White Box Testing, Dynamic Testing

## I. INTRODUCTION

This study analyses the problems that arise due to ignored software testing techniques while software development in Pakistan software houses. As software industry is doing rapid growth, but still they lack in more technical solutions towards software development. Software Testing is done in many ways, depending on the choice of software development life cycle, one adapts. Due to issues like cost, unavailability of expertise and lack of standards, Pakistan software market is far behind than any other markets in Asia. We aim to discuss software static testing techniques in agile development and attempting to design a framework easily applicable in software houses. This could help the developers, testers, designers to fill in the technological barriers that exist due to less or no use of static testing techniques.

Although agile development is one of the most focused area in software development, but Pakistan is still far behind in software development using agile methodology. Some of the reasons can be use of technical and managerial processes [1] that continuously adapt and adjust the changes derive from experiences that one gained during development with emergent requirements and change in development environment.

Static testing is an important part of software testing. Software testing is done to remove bugs and errors in the system under development and it continues even after deployment. Software testing has been categorized into two main parts:

- Static Testing
- Dynamic Testing

Static Testing is about finding the human faults that later convert into failures. It is supposed that if faults are stopped at earlier stages, then there will be fewer chances of software failures. Static testing intends to inspect code from every point of view. Hence, increasing coder's efficiency and reducing faults.

By reviewing literature, we observe that due to involvement of more human resources in static testing, from managerial to technical level, its adaption rate is very low. Our study aim is to find a solution for low adaption of static testing in agile development. We will further breakdown our study by taking a case from Pakistan software house. The method to conduct our study will be survey based. This study and

participatory audience research will be conducted from a selected software house working in agile development. Results are expected to be in form of framework that could be implemented for further analysis.

## II. BACKGROUND

### A. Literature Review

Define As we notice, software development is moving forward and expanding. It has now merged into many new domains with growing need, it is becoming more complex. There are different approaches to software development, keeping in view the cost, time and resources required [10]. After various software development approaches like Object Oriented, rational Unified Process, Agile Methodology was introduced [13,10]. Main focus of this methodology was to deal with the difficulties of:

1. Evolving requirements
2. Customer involvement
3. Deadlines and budget
4. Miscommunication

Tabinda [3] also described agile methodology in terms of its acceptance in late 90's because of:

1. Simple planning
2. Short iteration
3. Earlier release
4. Frequent customer feedback

According to a survey, given in [4], almost 41% of the projects have now adopted agile methodology and 65% of such projects are using agile techniques. Agile model is an extension to one of the conventional software development life cycle Waterfall model. Agile models have iterations rather than phases. Each iteration has its own artifact in form of working code. Small teams work in collaboration to define quick prototypes and problem solution.

As shown in Figure 1, the simple agile method life cycle:

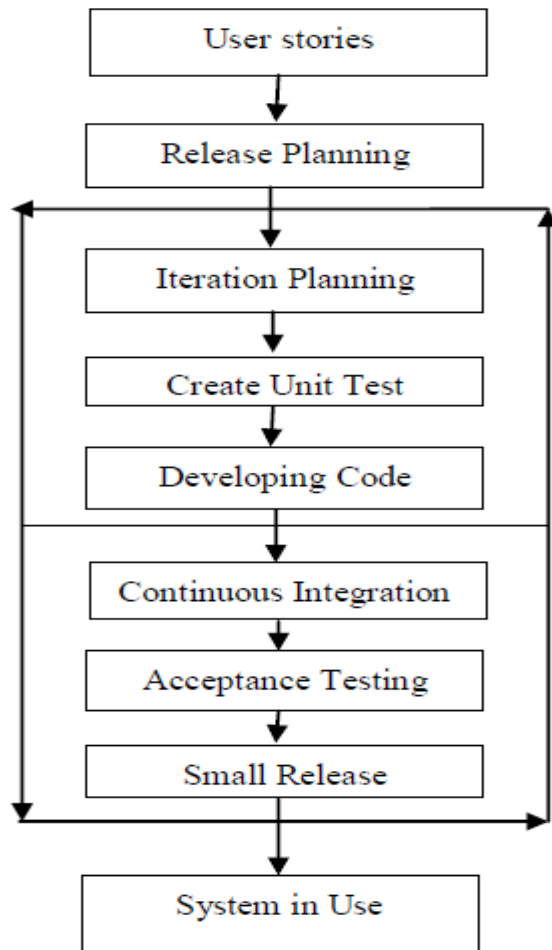


Fig. 1: Agile Method Life Cycle

Software development in agile methodology focuses on frequent release and direct involvement of customer.

Some of the factors that should be communicated well in agile teams are discussed in [7]:

1. Agile concepts and techniques help the best firm to be better
2. There is more to success than implementing agile concepts and techniques
3. Most firms still have a long way to go to become more agile

As discussed in [1], there are some limitations of agile software process:

1. Limited support for distributed development environments
2. Limited support for subcontracting
3. Limited support for building reusable artifacts
4. Limited support for development involving large teams
5. Limited support for developing safety-critical software
6. Limited support for developing large complex software

The author further claimed that some aspects of software development project can benefit from agile method while others can benefit from a less agile or more predictive approach. Agile method was designed to increase efficiency with extra pressure on developers. They can't afford the time and effort required for manual testing [8].

## B. Software Testing

Jovanovich [5], on software testing, expressed that it is an important component of Software Quality Assurance and many organizations are spending up to 40% of their resources on testing. Testing is defined in [11], "a process of executing a program with a goal of finding errors." Testing is done by making test cases [12]. Overall, testing is an activity performs for evaluating software quality and for improving it [5].

Software testing is divided into two broad categories:

1. Static Testing
  - a. Code Walkthrough
  - b. Inspection
  - c. Desk Checking
2. Dynamic Testing
  - a. White Box Testing
  - b. Black Box Testing
  - c. Grey Box Testing

As illustrated in Figure 2: Static testing is about reviewing and inspecting the code in different ways. White box testing, on other hand, is highly effective in detecting and resolving problems because bugs can be found before they cause trouble [14]. White box testing is also known as clear box testing [15] as its strategy is debugging. Black box testing is based on output requirement and without any knowledge of internal functionality of program [16].

Testing is a sub part of Software Quality Assurance [17] which is a systematic process of checking to see whether a product or service under development is meeting specified requirements.

## C. Problem Statement

The problems of Pakistan software Houses are different than any other countries, like less expertise, unavailability of local rules and standards, low currency value and less labor cost. Hence, lack of expertise in Static Testing is one of the hurdles. Software houses in Pakistan are not ready to spend money on code inspections by large teams, formal technical reviews, documentation and auditing. This research starts to find the answer of question: "Is static testing techniques helpful in increasing the efficiency of agile methodology?"

In this research, we are using static testing techniques with agile method to accommodate testing in Pakistan software market.

## D. Software Quality Defects in Agile Methods

Scott [6] says that the fundamental nature of software development is changing and quality professionals must change with it. Quality is inherited part of the agile software development in which unit tests and acceptance tests holds much importance. In agile development, common techniques exist such as Code inspections. Some other techniques are:

- a. Refactoring
- b. Test Driven Development (TDD)
- c. Agile Model Driven Development (AMDD)

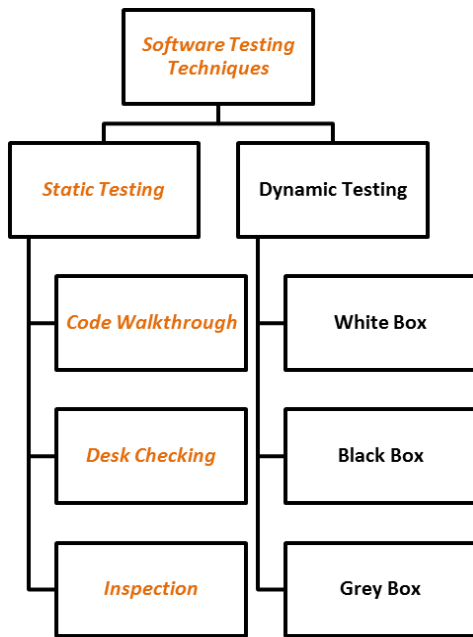


Fig. 2: Software Testing Techniques

These techniques are further elaborated in table 1: In agile software development organization use Quality assurance activities to tackle with the defects that reduce quality [2]. Both manual and automated testing techniques are used but the effort for manual discovery, handling and treatment of these quality defects results in incomplete or costly phases. It is further mentioned in [9], the quality assurance techniques can be categorized into two ways, one is static and other is dynamic. Static techniques do not engage the execution of code. Static techniques engage examination of documentation by individuals or groups. Sometimes static techniques are used to support dynamic techniques and vice versa. Agile methods typically use dynamic techniques.

**E. Problem Analysis**

By reviewing literature, we observe that agile methodology is used with some limitations like frequent customer feedback, changing requirements and iterative phases. In such conditions, they waste less time on documentation of code and reviewing it. Dynamic testing is used to check the functionality and defect detection. But for fault detection static testing is not much in practice. In Pakistan software houses, where testing is still like a new born baby, only black box testing is focused. Code inspection, desk checking and walkthroughs are like the farthest corner of the world.

**III. METHODOLOGY**

Pakistan software market is growing rapidly in software development. But in software testing, they are just doing experiments with quality. In agile method, dynamic testing is focused in some software houses that shifted from conventional development to agile methods. To method to conduct our research will be survey based. This survey and participatory audience research will be conducted from one of a selected software house in Pakistan. The expecting findings in the study will have a guideline to design a

framework to accommodate static testing, hence beneficial for the community. Results will be drawn after data analysis of gathered data. A framework will be proposed for implementation of static testing in agile development in Pakistan.

TABLE I: AGILE DEVELOPMENT TESTING TECHNIQUES

Refactoring	TDD	AMDD
A disciplined way to make changes to source code to improve its design.	Developer must first write a test that fails before they write ne functional code. Some of its steps are: -add test -run the test -update the code -run the test again -if test fails, go to step 3 -once the test pass the next step is to start again	They just model, as they think documentation is a waste of time. They focus on building high quality software.

**IV. CONCLUSION & FUTURE WORK**

Static testing will enhance the coder efficiency and output in agile development and enable the users to develop confidence in quality end product. In future, we expect academic and practitioners to implement and evaluate out framework in various Pakistan software houses.

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