

## Factors Influencing Agile Practices: A Survey

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### ABSTRACT

In the last decade agile methodologies have gained widespread popularity among the software community. Software practitioners across the globe are adopting agile methodologies to meet the challenges involved with turbulent business environment where requirements changes with time. Agile as name means flexibility is a group of various methodologies emphasizing the practice of Whole team, Short releases, Measures, Customer collaboration, Test-driven development, Pair programming and Refactoring.

In this paper we have presented the results of a survey conducted online to show the various factors considered by software practitioners while adopting agile methodologies and the effects of practicing agile on their customers and business. On the basis of the results of questions asked in the survey we have drawn six hypotheses namely agile method popular among practitioners, Impact of team size, Impact of requirement gathering for agile methodologies, Effective requirement capturing method, Time taken to resolve a problem and Impact of small response time with customer on software development. The results of this research work clearly indicates adopting agile have increased the productivity of an organization while increasing customer satisfaction.

**Keywords:** Agile, Crystal, DSDM, Extreme Programming, FDD, Scrum

### 1. INTRODUCTION

Agile software development is an emerging discipline of software engineering [6] constituting of set of principles initially advocated by a group of seventeen software practitioners and now practiced by many software professionals worldwide. Agile can be defined [6] as: An iterative and incremental software development process performed in a highly collaborative manner within an effective framework that produces a high quality software meeting the changing requirements of its stakeholders in scheduled time.

In the previous studies [2] it is shown that there are many factors under management control that impact the implementation of an agile software

Development methodology. Access to external resources, requirements capturing and organization size all significantly impact the implementation of an agile software development methodology. In the present work we moved a step ahead and tried to find the effects of other factors like access level to stakeholders to fix a problem, elicitation techniques and strategies used to capture requirements, effect of experience of professional in the field and impact of team size on successful implementation of an agile methodology. In the present work we also tried to find the effect of agile methodologies on customer satisfaction and the effect on productivity of business of an organization.

### 2. AGILE SOFTWARE DEVELOPMENT METHODOLOGIES

Agile SDM is a group of various methodologies used to produce highly potential software in scheduled time meeting customer's requirements. Agile software development methodologies share several features including the practice of Whole team, Short releases, Measures, Customer collaboration, Test-driven development, Pair programming, Prototyping, Refactoring (to improve the quality of code) and Lesser documentation to produce quality software.

#### 2.1 EXTREME PROGRAMMING (XP)

Extreme programming is a software development methodology based on the set of practices mainly pair programming, customer collocation with development team stressing customer satisfaction [1].

Extreme programming is most popular among developers because of its simpler rules of Iterative planning, Daily communication and Team empowerment. Extreme Programming can improve programming quality while shortening delivery schedules.

#### 2.2 CRYSTAL CLEAR

Crystal Clear is an example of agile or light weight methodology. Crystal clear states people effects more a software development than processes and tools [4]. Crystal clear is a collection of methodologies named as toolkit elements which

organizations combine to make a suitable methodology to their project.

In Crystal clear number of elements used to create a methodology increases and decreases with the size of project, larger the size of project more the elements.

### 2.3 FEATURE DRIVEN DEVELOPMENT (FDD)

Feature-driven development is an iterative and incremental software development process. FDD blends a number of industry-recognized best practices into a cohesive whole. These practices are all driven from a client-valued functionality (feature) perspective. Its main purpose is to deliver tangible, working software repeatedly in a timely manner.

### 2.4 DYNAMIC SYSTEMS DEVELOPMENT METHODS (DSDM)

Dynamic Systems Development Methods (DSDM) is an agile software development framework. Dynamic systems development method sought to fix cost, quality and time at the outset and uses the prioritization scope into *musts, shoulds, coulds* and *won't haves* to adjust the project deliverable to meet the stated time constraint [5]. DSDM is used for developing software and non-IT solutions.

### 2.5 SCRUM

Scrum is iterative and incremental framework within which practitioners can employ various processes and techniques to develop a complex product.

Core to Scrum is Sprint, a time-boxed effort usually two weeks to a month. In sprint work is divided in sub parts and is to be completed in the assigned time limit. Once a sprint is defined no changes can be made to it. A sprint begins with planning meeting and ends with demonstrable release.

Scrum is a methodology that can be used on small and large projects. Scrum focuses more on management of the development process than coding techniques [3].

## 3. RESEARCH ANALYSIS

To make a sustainable progress in this area we have created a questionnaire and conducted an online survey by sending survey links to 1793 software practitioners across the globe including mailing list of agile alliance. There were 12 questions asked reflecting requirements of agile methodologies and the factors considered during adoption and implementation of agile methodologies.

Questions asked in the survey:

1. Which agile methodology preferably is adopted by your organization?
2. Project type working on?
3. Term used to refer stakeholders?
4. Access level to stakeholders?
5. Elicitation technique used by developers to learn about stakeholders requirements?

6. Practice use to elicit requirements?
7. Technique used to capture requirements?
8. Professional position in the industry?
9. Work experience in the industry?
10. Employee Size: Work force in the organization?
11. Business sector organization deals in?
12. Effect of agile practices on satisfaction of business stakeholders and work produced?

On the basis of results of survey we have drawn six hypotheses showing factors which effect the successful implementation of agile methodologies and meet the requirements mentioned in the agile manifesto.

**H1: Popular adopted agile methodology:** Extreme Programming is adopted by the most.

**H2: Impact of team size on agile methodologies:** Agile methodologies are chosen by small team's more than large teams.

**H3: Impact of requirement gathering for agile SDM:** The requirement gathering is most effective with One-on-One interactions with stakeholders.

**H4: Effective requirement gathering method:** Agilist's uses methods like user stories, Free form diagrams to capture requirements which can be altered at any stage of development process.

**H5: Agile practitioners use to resolve problems immediately:** Agile practices gives higher access level to stakeholders.

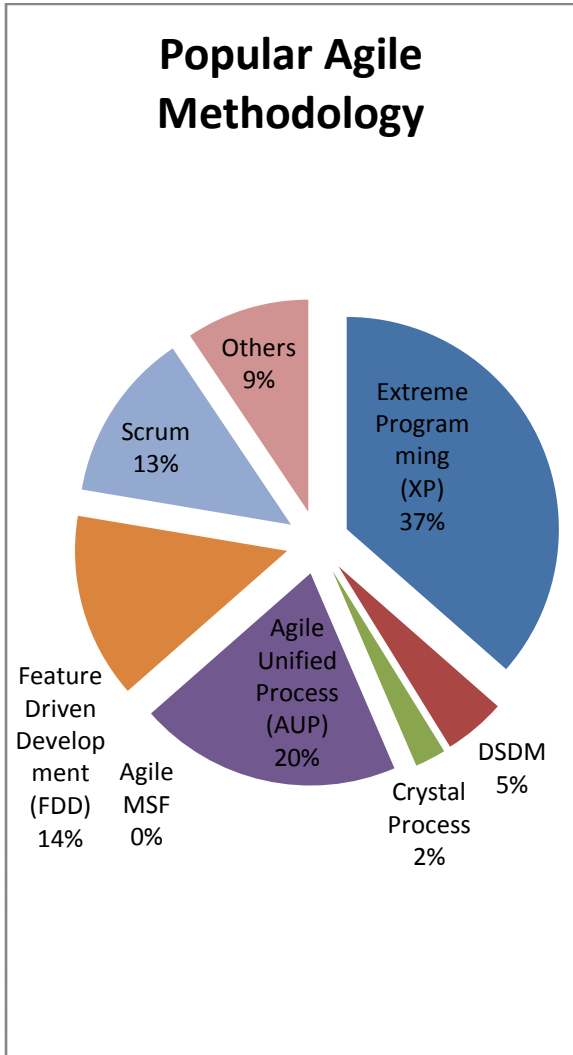
**H6: Impact of small response time with customer on software development:** Adopting agile has increased customer satisfaction and work produced.

## 4. RESULTS

There were only 103 respondents out of 1793 invitations having response rate of 5.77%. Although the response rate is very low and cannot present the clear picture of larger population but can help us to draw conclusions on the successful adoption and implementation of agile methodologies. In this section now we are presenting the results of various questions asked in the survey and draw the conclusions of hypotheses created.

### 4.1 H1: POPULAR ADOPTED AGILE METHODOLOGY

This hypothesis is drawn from the results of question: Which agile methodology your organization has adopted.

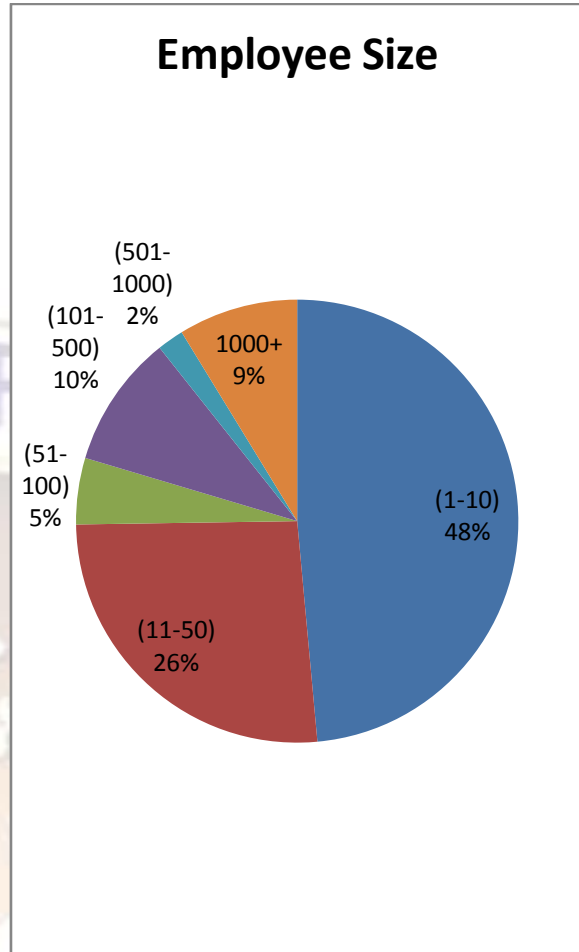


**Figure 1 Popular Agile Methodology**

From the results as shown in the chart given above we can clearly deduce that Extreme Programming is most popular and adopted by practitioners at most. Next to XP is Agile Unified Process than Feature driven development and so on and Crystal Process is used by only 2% of 103 respondents. There were no reply for Agile MSF and hence it is not used by any of respondent practitioner. Nine respondents replied as ATDD, RUP and Lean as the adopted agile methodology as others.

**4.2 H2: IMPACT OF TEAM SIZE ON AGILE METHODOLOGIES**

This hypothesis is drawn from the results of question: Employee Size: Work force in the organization.



**Figure 2 Impact of Team Size**

The results of this question clearly indicate that agile methodologies are mostly adopted by organizations having small workforce or employees i.e. from employee size of 1-10 and 11-50 in the organization. The organization's having employee size of 501-1000 is very less to adoption of agile methodologies i.e. only 2% of 103.

**4.3 H3: IMPACT OF REQUIREMENT GATHERING FOR AGILE SDM**

This hypothesis is drawn from the results of two questions:

1. Elicitation technique used by developers to learn about stakeholders requirements.
2. Practice use to elicit requirements.

Elicitation followed by developers	Response Count
Stakeholders representative	40
Written specifications	24
Direct interaction with stakeholders	29
The team creates their own requirements	10

Figure 3 Elicitation technique used by developers to learn about stakeholders requirements

Practice followed to elicit requirements	Response Count
High level Requirements envisioning	30
Detailed Requirements envisioning	20
User interface Prototyping	15
Whiteboard sketching	09
Paper based modeling	05
CASE modeling	02
Demonstration of working software	10
JIT model storming	09
Structured modeling	03
One-on-one interviews with stakeholders	30

Figure 4 Practice followed to elicit requirements

From the results of these two questions we can clearly deduce results to our hypothesis H3: Impact of requirement gathering for agile SDM.

The results in the survey shows majority of developers directly interact with stakeholder's representative or stakeholder to elicit requirements. In very few cases the development team creates requirements of their own.

This direct communication between developers and stakeholders can lead to increase of high understanding of requirements and delivery of a more potential product.

#### 4.4 H4: EFFECTIVE REQUIREMENT GATHERING METHOD

This hypothesis drawn on the basis of question: Technique used to capture requirements.

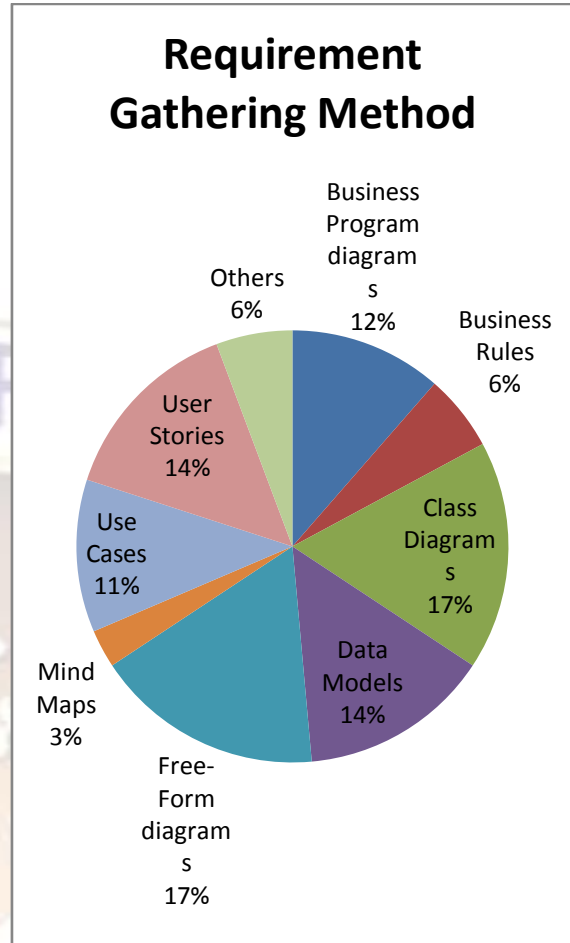


Figure 5 Effective requirement gathering method

Previously software practitioners use to create Mind maps and Business rules and Use cases to capture requirements for a project. From the results of this question we can clearly deduce that practitioners following agile methodologies have migrated from traditional requirement capturing methods and create Business Program diagrams, User Stories, Free Form diagram, Data models and class diagrams which can be altered at any stage of development with the changing requirements of stakeholders.

Respondents who replied as others mentioned Shell statement, UI Prototype, Screen Specifications as their requirement capturing technique.

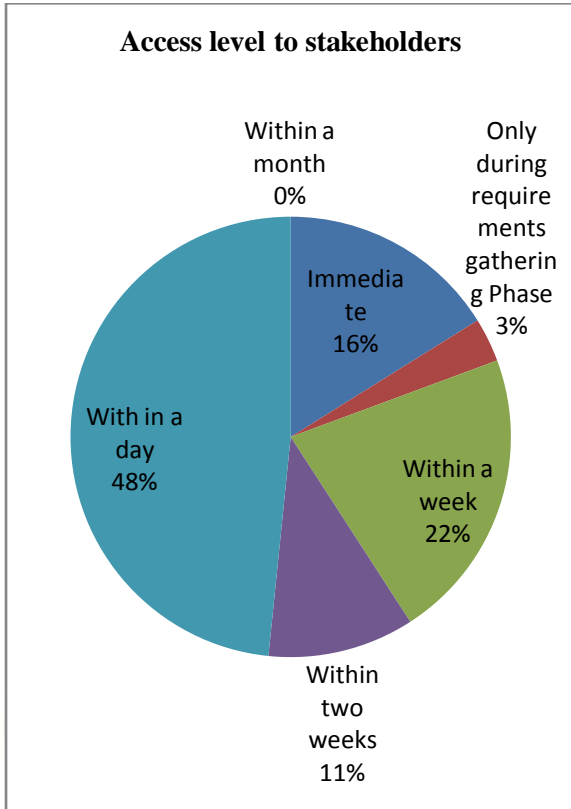
#### 4.5 H5: AGILE PRACTITIONERS USE TO RESOLVE PROBLEMS IMMEDIATELY

Fixing problem is of very big concern in the software industry. Resolving of a problem is completely dependent on the access level to the customer or stakeholder. Sometimes a problem is fixed within a minute and sometimes it takes a lot of



time which directly increases the cost of project and delays the scheduled delivery of product.

We have drawn this hypothesis on the basis of question: Access level to stakeholders.



**Figure 6 Access level to stakeholders to fix a problem**

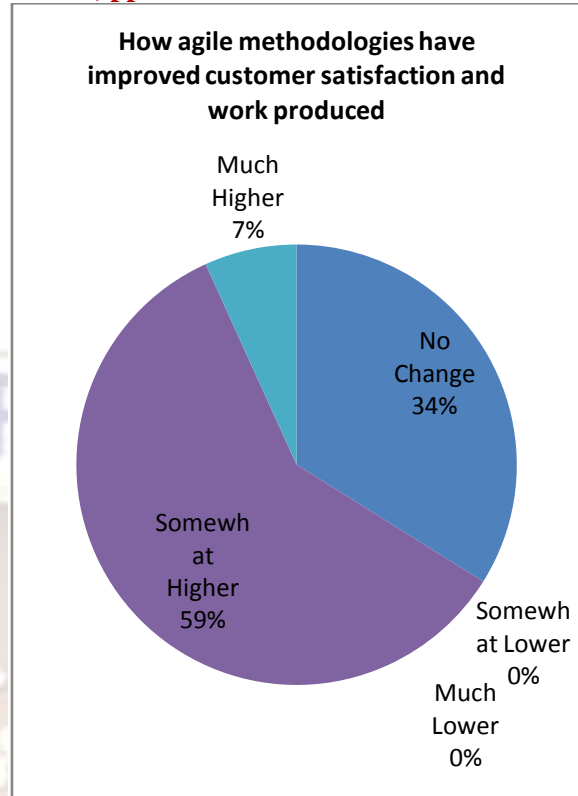
The results clearly shows that majority of agile practitioners contact their stakeholders to fix a problem within a day. 16% of agile practitioners contact their stakeholders immediately.

None of the agile practitioners take long time of a month to fix a problem.

**4.6 H6: IMPACT OF SMALL RESPONSE TIME WITH CUSTOMER ON SOFTWARE DEVELOPMENT**

The idea behind presenting agile methodologies to software community was to increase the communication between developers and stakeholders and to deliver a potential product in scheduled time with the changing requirements of stakeholders.

In this section we have presented the result of how prevalent is agile methodologies adoption to both customers and the development organization. The hypothesis drawn in this section is created by the results of question: Effect of agile practices on satisfaction of business stakeholders and work produced.



**Figure 7 How agile methodologies have improved customer satisfaction and work produced**

Out of 103 respondents only 59 replied to this question. Although the response count for this question is very low and cannot present the vote of larger population but can help us to find how prevalent is agile methodologies adopting.

Majority of respondents replied that adopting agile methodologies have increased their customer satisfaction and work produced. None of the respondent replied as adopting agile has lowered their work produced and customer satisfaction.

The table given below gives clear picture of the respondents.

Effect	Response Count
Much Lower	00
Somewhat Lower	00
No Change	20
Somewhat Higher	35
Much Higher	04

**Figure 8 Response count to effect of agile methodologies on customer satisfaction and work produced**

**5. CONCLUSIONS**

The aim of this research is to find how popular and prevalent are agile practices. The study also aims at analyzing the effect of the various factors which influence the agilist's while practicing agile methodologies. The results to this research clearly indicates agile practitioners have higher level of communication and access level to their stakeholders

to resolve a problem; agilist's have migrated from traditional methods of requirement capturing and practice newer methods like user stories, Free form diagrams to meet challenges involved with changing requirements of stakeholders. The result to this research also shows that small teams practice agile methodologies more than large team size. Extreme programming is found to be most popularly practiced agile methodologies.

At the end we only found that adopting agile methodologies have increased the work produced and the customer satisfaction from organizations practicing agile methodologies.

## **6. ACKNOWLEDGEMENTS**

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