



## Study of Different Agile Methodologies and Designing of General Agile Methodologies (GAM) Framework

Swati Chawla\*

M.TECH, CSE Student(Amity University)  
Noida, India

Prof. Sanjeev Thakur

Professor, CSE, Amity University  
Noida, India

*Abstract- For the people related to software development industry, it was a continuous challenge to select the appropriate software development methodology. Since the early 1990s, the general trend in software development technology was to change from the plan-driven approach to more iterative incremental development approaches. This change has led to the birth of a group of methodologies called “agile methodologies”. The values and principles are becoming more prevalent in the software development industry. At the later stage, since 2004, the focus of selecting specific agile methodology shifted to selection of the most appropriate practices from the agile family. This paper, contribute towards greater understanding of software development issues and would be useful to developers who want to adopt agile methodologies as generic development culture without thinking about the specific agile methodology.*

### I. AGILE METHODOLOGIES

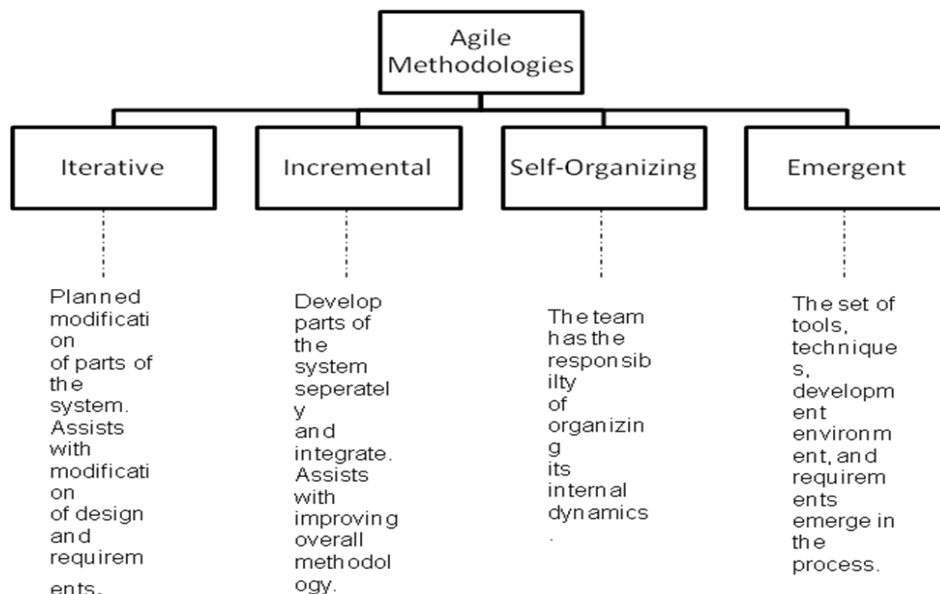
With the emergence of agile methodology, the perspective of the practitioners shifted from the traditional process oriented and documentation oriented approach to a less document centric approach to a more people oriented approach. This approach was very friendly with the people following the different processes under the waterfall/iterative waterfall models. Agile methodology was initially created for small teams using iterative model. Agile methodology was earlier named as “Lightweight Methodology”. Afterwards, the name “Agile Methodology” was adopted [1]. With the increase in number of types of Agile Methodologies, the challenge to find the most appropriate methodology for a given situation also increased.

This section defines Agile Methodologies and an overview of some of the commonly used Agile Methodologies in order to define the approach introduced by the agile practices.

The term “Agile” means flexible, ready for motion or any activity and adjustability. Agile Methodologies are lightweight, flexible, efficient, low in risk, predictable and easy way of developing software.

Agile Methodologies of a software development process is iterative, self-organizing, incremental and emergent [6].

- Iterative: Delivers a full system at the very beginning and then changes the functionality of each subsystem with each new release.
- Self-organizing: The team has the autonomy to organize itself to best complete the work items.
- Incremental: The system as specified in the requirements is partitioned into small subsystems by functionality and a new functionality is added with each new release.
- Emergent: Technology and requirements are allowed to emerge through the product development cycle.



With the emergence of Agile Methodologies, a new approach of working in software industry also evolved [2]. The approach of heavy document and process oriented approach, changed to a more people centric and less document driven approach. There is a misconception related to the planning in Agile. It is assumed that there is no or very little planning in “Agile” [3]. On the contrary, agile projects are more precise than the traditional projects and it is done rigorously for each increment of the project. Agile Methodologies provide a risk mitigation approach, as the most important feature of agile planning is feedback.

TABLE I

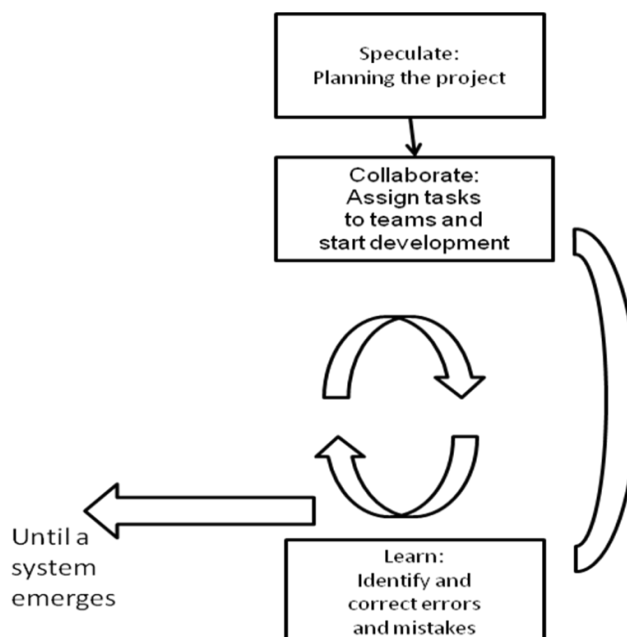
	Values	Principles	Practices
1	Individuals and interactions over processes and tools	Build projects around motivated individuals. Best results emerge from self-organizing teams. Team reflects regularly where and how to improve.	Tacit knowledge. Risk lists.
2	Working software over comprehensive documentation	Measure success only through working software. Continuous attention to technical excellence and fine design. Simplicity is essential.	Incremental development. Iterative development. Running software.
3	Customer collaboration over contract negotiation	Business people and developers work together daily throughout the project. Place emphasis on face-to-face communication.	Customer collaboration. Face-to-face meetings.
4	Responding to change over following a plan	Keep delivery cycles short. Satisfy customer through early and frequent delivery. Welcome changing requirements even late in the project. Promote sustainable development pace.	Configuration management. Frequent releases.

Table 1 represents the different agile values and practices.  
The most commonly used agile methodologies are:

- Adaptive Software Development
- Scrum

**Adaptive Software Development (ASD)**

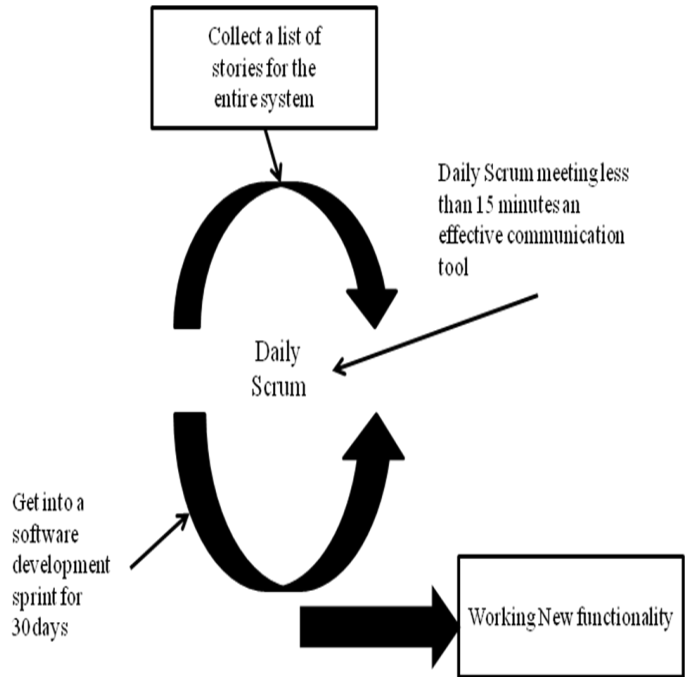
The structure of ASD is illustrated in the following figure.



ASD has five primary goals: adaptive culture, adaptive frameworks, adaptive collaboration, adaptive scale and adaptive management [4]. The Adaptive Software Development Lifecycle has different lifecycle phases. These are: Speculate Collaborate and Learn. Planning of ASD is based on results which are based on group of deliverables. ASD is limited to project management activities. There are several outputs at various phases of ASD. These are Speculate and Collaborate.

**Scrum**

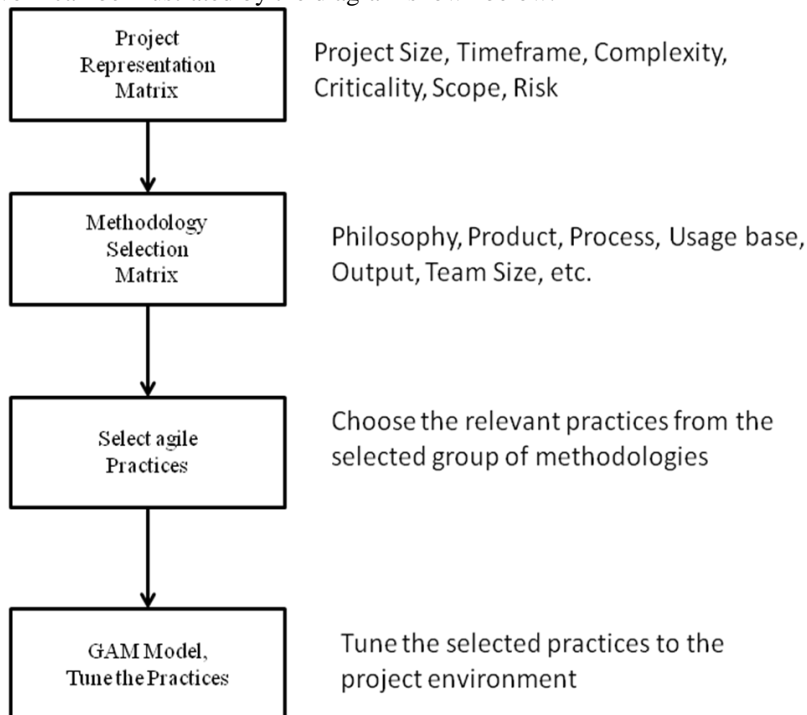
The structure of Scrum is illustrated in the following figure



Scrum is used to control complex and unpredictable systems. Sprint is a technique in which the prioritized list of requirements is developed without allowing any change in thirty day iteration. Daily Scrum is a project monitoring technique that gives the management the control of the project as they know what happens on the daily basis. This methodology has mainly three deliverables: product Backlog, Sprint Backlog and at the end of each sprint a working product is delivered.

**II. METHODOLOGY SELECTION AND TAILORING FRAMEWORK**

The selection framework can be illustrated by the diagram shown below.



The methodology selection process has three stages. The first stage deals with the classification of the software development projects and leads to the choice of the general group of methodologies that would be suitable for that project. In the second stage, a selection matrix is used. The selection matrix is composed of one methodology for each column. The third stage assumes that agile methodology practices have been selected by then and provides the details of how to tune them to the given project's environment [5]. The tuning is done through a technique called the GAM model. The process of the GAM model consists of three phases: phase one identifies practices that relate to people issues, phase two identifies practices that relate to technical issues, and phase three outlines the practical tuning steps.

**Stage one: Project Classification Matrix**

In order to be able to match a methodology to a given project it is necessary to first classify the project and then classify the methodologies. This stage provides a top- level evaluation of project parameters to determine the applicability of agile methodologies to the project.

Table below illustrates the basic project parameters that are defined by conducting semi-structured interviews by project managers and the software developers. The aim of this interview is to get the practical information about the project.

TABLE II

Project Parameters	Rating 0 to 5	Methodology Choice
Requirements Stability		
Project Size		
Development Timeframe		
Project Complexity		
Project Risk		

Requirement Stability: 0 means very unstable requirements and 5 means very stable requirements.

Project Size: 0 represents team size of 2 to 10 and 5 means team size of more than 100 people.

Development Timeframe: 0 means time from 1 week to 2 months and 5 means beyond 2 years.

Project Complexity: 0 means less or not so complex project and 5 means complex project including real time.

Project Risk: 0 represents high risk project and 5 represents low risk project.

**Stage two: Methodology Selection Matrix**

The aim of this stage is to determine which agile methodology would be more applicable to a given project select agile practices from these methodologies.

There are two steps in this stage: the methodology selection step performed to determine whether the project's requirements (as determined in stage one) map to one or more agile methodologies. If the requirements map to one agile methodology then it is recommended to use that methodology. If it maps to more than one agile methodology then the second step of stage two is implemented. In step two of stage two, a set of practices is selected from the relevant agile methodologies.

Table below represent the Methodology Description Matrix

TABLE III

Parameter	Parameter Description	Relation to Customer Values and Priorities	Score
Methodology Philosophy			
Methodology Process			
Methodology Techniques and Tools			
Methodology Scope			
Methodology Outputs			
Adoption and Experience			
Methodology Product			
Roles and Responsibilities			
Support for Distributed Teams			

Table below represent the Methodology Selection Matrix

TABLE IV

Parameter	ASD	Srrum	0 Score
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Methodology Scope			
Methodology Outputs			
Adoption and Experience			
Methodology Product			
Roles and Responsibilities			
Support for Distributed Teams			
Score per methodology			Score per parameter

### Stage Three: Tailoring Agile Methodology Practices

General Agile Methodologies (GAM) model for tailoring agile methodology practices to a given environment. Tailoring of agile practices helps developers to find feasible ways of working with the selected agile practices. The following structure will be used to define the GAM model: values and process

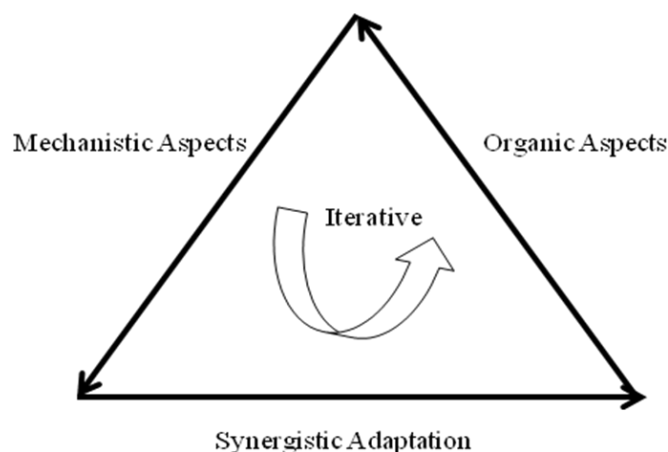
#### Values of the GAM model

The GAM model has two values namely:

- Bonding: Concerned with bringing together everyone who is involved in the project. The major groups involved development team, the management team, the executives and the stakeholders.
- Quality: Concerned with all technical issues such standards of development, development environments, programming tools, management tools and everything else that contributes to the delivery of a high quality product.

#### GAM Process

The GAM model is implemented in three phases. The first phase is the organic aspects, which focuses on identifying agile practices that are concerned with social issues of the development process. The second phase is the mechanistic aspects, which focuses on identifying agile practices that are concerned with technical issues. The third phase is the synergistic adaptation, which focuses on how to bring all the identified practices into the context of the project's environment.



Organic Aspects: Phase one defines how the methodology caters for social issues also known as people issues, and the way these social issues affect the software architecture and how these human issues drive project outcomes.

Mechanistic Aspects: the second phase defines how the methodology values the technical aspects of software development such as the development platform, development technology and form of the deliverables.

Synergistic Adaptation: the third phase represents the tailoring of the selected practices in the two preceding phases of the GAM model. The GAM model in this phase provides specific practical guidance on how to tailor the selected agile practices to a given project environment.

The principle behind the GAM model is to separate the practices into two major groups of social related practices and technical related practices, which forms the two phases. The last phase then deals with the tailoring of these two groups into the project's environment.

### III. CONCLUSIONS

This paper addresses the problem of choosing the most suitable agile methodology practices and tailoring them to a given environment. A comprehensive framework for selecting the most suitable agile practices in a given environment was designed. The selection process is unique because it represents agile methodologies using a comprehensive set of parameters that define a methodology. The set was derived from a number of existing frameworks. A complete tool for tailoring agile methodologies (the GAM model) was designed. The GAM model is unique because it classifies all development practices into technical and social activities and specifies how to tailor a given practice into a given environment. The framework in general encourages the application of agile methodologies as a unified process rather than a many related methods.

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