Contents:

◆ Agile Methodology:

The word “Agile” means …

- The ability of moving your body quickly and easily.
- The ability of thinking quickly and clearly.

❖ In Business

“Agile” is used for describing ways of planning and doing work wherein it is understood that making changes is important part of the job, taking in account market changes.

❖ In Software Development

term “Agile” is adapted to mean the ability to respond to changes (changes from Requirements, Technology and People).

The most important thing to know about Agile methods or processes is that the only thing that matters is Agile teams. The processes we describe as Agile are **environments** for a team.

◆ Extreme Programming (XP):

❖ Definition:

Extreme programming or XP is a software development methodology (Type of agile software development) which is intended to improve software quality and responsiveness to **changing customer requirements**. it advocates (يدعو) frequent "releases" in short development cycles, to improve productivity (االنتاجية) and introduce checkpoints at which new customer requirements can be adopted (اعتماد).

❖ XP Creator:

Kent Beck, American software engineer and the creator of Extreme Programming, He was born in 1961

He created XP during his work on the C3 project. He became the C3 project leader in 1996 and began to refine the development methodology used in the project

❖ Embrace Change:

A key assumption of Extreme Programming is that the cost of changing a program can be mostly constant over time.

❖ Some XP properties:

- **lightweight:** because XP does not overburden the developers with giant processes.
- **efficient:** XP always seeks to getting the best result with minimum cost.
- **low-risk:** Strategies followed in XP minimizes the chances of system failure.
- **flexible:** because it very friendly with frequently changing requirements.
- **predictable:** because everything within XP is follows a plan.

❖ “Extreme” Meaning:

Extreme means that take the effective principles and practices to extreme levels.

- **Code Review** is effective as the code is reviewed all the time.
- **Testing** is effective as there is continuous testing.
- **Design** is effective as everybody needs to do refactoring daily.
- **Iterations** are effective as the planning game for release planning and iteration planning.

◆ **Where to use XP?**

There is not such a thing (development methodology) that is perfect for everything or any situation. And this is the case here as well. So, when XP should be used?

- **Extreme Programming (XP) response to problem:**

  Domains whose requirements change Your customers may not have a firm idea of what the system should do. You may have a system whose functionality is expected to change every few months.

- **XP set up to address the problems of project risk:**

  If your customers need a new system by a specific date the risk is high. If that system is a new challenge for your software group the risk is even greater. If that system is a new challenge to the entire software industry the risk is greater even still. The XP practices are set up to mitigate the risk and increase the likelihood of success.

- **XP is set up for small groups of programmers:**

  Between 2 and 12, though larger projects of 30 have reported success. Your programmers can be ordinary, you don't need programmers with a Ph.D. to use XP. But you cannot use XP on a project with a huge staff. We should note that on projects with dynamic requirements or high risk you may find that a small team of XP programmers will be more effective than a large team anyway.

As a Conclusion we can use XP when:

- Customer cannot describe the system (Unclear requirements).
- Requirements change rapidly and frequently
- Low Technical Skills
- Small Team (2~16) Developers
- High Risk

◆ **Extreme Programming Values & Principles:**

XP provides values and principles to guide team behavior. The team is expected to be self-organize.

❖ **Communication:**

Communication plays a major role in the success of a project. Problems with projects often arise due to lack of communication. Many circumstances may lead to the breakdown in communication.

Some of the common problems are:

- A developer may not tell someone else about a critical change in the design.
- A developer may not ask the customer the right questions, and so a critical domain decision is blown.
- A manager may not ask a developer the right question, and project progress is misreported.
- A developer may ignore something important conveyed by the customer.

Extreme Programming emphasizes continuous and constant communication among the team members, managers and the customer.

The Extreme Programming practices, such as **unit testing**, **pair programming**, **simple designs**, **common metaphors**, **collective ownership** and **customer feedback** focus on the value of communication.

✓ **Good to know:**

XP employs a coach whose job is to notice when the people are not communicating and reintroduce them. Face-to-Face communication is preferred and is achieved with pair programming and a customer representative is always onsite.

❖ **Simplicity:**

Extreme Programming believes in 'it is better to do a simple thing today and pay a little more tomorrow to change it' than 'to do a more complicated thing today that may never be used anyway'.

The principles here are:

- Do what is needed and asked for, but no more.
- Do the simplest thing that works (The DTSTTCPW principle).
  Note: A coach may say DTSTTCPW when he sees an Extreme Programming developer doing something needlessly complicated.
- Take small simple steps to your goal and mitigate failures as they happen.
- Never implement a feature you do not need now (YAGNI principle You Aren't Going to Need It).

❖ **Feedback:**

Feedback is very important value in XP because it helps to drive changes. This is why we can see it occurs at different levels and phases in the process of the development, for example:

- **Test Cases:** Developers write test cases and that's immediate feedback. If your test cases fail there's something wrong with the code or there's something that you still haven't developed.
- **Unit Tests:** Unit tests tell the developers the status of the system.
- **User Stories:** Developers estimate new stories as soon as they get them from the customer.
- **Customer Interests:** Customers communicate with the developers to clarify what features they are interested in most (So that the developers can focus only on those features).
- **Frequent Releases:** These enable the customer to perform acceptance tests and provide feedback and developers to work based on that feedback.

❖ **Courage:**

Courage means developer must possess the courage to…

- Throw away code if it doesn't work
- Change it if you find a way to improve it
- Fix it if you find a problem
- Try out new things if you think that they might work better than what you have right now.
- Communicate and accept feedback
- Tell the truth about progress and estimates

❖ **Respect:**

Respect is a deep value, one that lies below the surface of the other four values. In Extreme Programming,

- Everyone respects each other as a valued team member.
- Everyone contributes value such as enthusiasm.
- Developers respect the expertise of the customers and vice versa.
- Management respects the right of the developers to accept the responsibility and receive authority over their own work.

◆ **Practices:**

XP provides specific core practices where each practice is simple and self-complete. In this chapter, we will understand XP practices in detail and the advantages of each:

The Extreme Programming practices can be grouped base on nature of the practice, or base on who responsible of implementing the practice:

Nature of Practice	Implementing Responsibility
❖ **Fine Feedback (Rapid):** • Testing • On-Site Customer • Pair Programming ❖ **Continuous Process:** • Continuous Integration • Refactoring • Small/Short Releases ❖ **Shared Understanding:** • The Planning Game • Simple Design • Metaphor • Collective Ownership • Coding Standards ❖ **Developer Welfare:** • 40-Hour Week	❖ **Management Practices:** • On-Site Customer • Planning Game • Small/Short Releases ❖ **Team Practices:** • Metaphor • Collective Ownership • Continuous Integration • Coding Standards • 40-Hour Week ❖ **Programming Practices:** • Testing • Simple Design • Refactoring • Pair Programming

❖ **On-Site Customer:**

The customer is an actual member of the team so the customer will

- Sit with the team
- Bring requirements to the team
- Discuss the requirements with them

There is a common objection to this practice is the fact that it is almost impossible in the real world to find a customer that ready to staying with the team all the time

The answer to that objection is that if the system is not worth the time of one customer then maybe the system is not worth building. In other words, if you're investing big amount of money in building a system you might just as well invest a little more and have one of the people in the customers organization stay with the team and be involved in the whole process.

❖ **Planning Game:**

The main planning process within XP is called the Planning Game. It is a meeting that occurs once per iteration (typically once a week). The Planning Game is to Quickly

Business and development need to make the decisions in tandem. The business decisions and the development's technical decisions have to align with each other.

Business people	Technical people
Scope: How much of a problem must be solved for the system to be valuable in production? **Priority:** If you are given an option, which one do you want? **Dates of releases:** What are important dates at which the presence of the software would make a big difference?	**Estimates:** How long will a feature take to implement? **Process:** How will the work and the team be organized? **Detailed Scheduling:** which stories should be done first?

❖ **Small/Short Releases:**

We should start with producing a simple version of system quickly, and then release new versions in very short cycles. Every release should be as small as possible, so that it is:

- Achievable in a short cycle
- Contains the most valuable and immediate business requirements
- A working system

❖ **Metaphor:**

According to Cambridge online dictionary:
A Metaphor is an expression, often found in literature that describes a person or object by referring to something that is considered to have similar characteristics to that person or object.

For example:

"The mind is an ocean"
"the city is a jungle"

You should guide the entire development with a simple shared story of how the whole system works. So, XP suggests to try to design a system that is easy to explain using real-life analogies. For Example:

Project	Metaphor	Explanation
Variable transparency window	Chameleon	The window will use nanotechnology to vary opaqueness depending on senor readings, e.g. temperature. It can also generate decorative patterns. This is the architecture project.
Ford Motor Company software architecture tool	Compiler	A tool is being developed to combine architectures of components into one major architectural artifact.

Advantages:

- Reduction of buzz words
- A quick and easy way to explain the system

❖ **Collective Ownership:**

In Extreme Programming, the entire team takes responsibility for the whole of the system. Not everyone knows every part equally well, although everyone knows something about every part. If a pair is working and they see an opportunity to improve the code, they go ahead and improve it.

❖ **Continuous Integration:**

Code is integrated and tested many times a day. A simple way to do this is to have a machine dedicated to integration.

Sits when the machine is free.
Loads the current release. (checking for and resolving any collisions).
Runs the tests until they pass (100% correct).

❖ **Coding Standards:**

Developers write all code in accordance with the rules emphasizing:

- Communication through the code.
- The least amount of work possible.
- Consistent with the "once and only once" rule (no duplicate code).

These rules are necessary in Extreme Programming because all the developers can change from one part of the system to another part of the system.

If the rules are not followed, the developers will tend to have different sets of coding practices, the code becomes inconsistent over time and it becomes impossible to say who on the team wrote what code.

❖ **40-Hour Week:**

XP emphasizes on the limited number of hours of work per week for every team-members, to a maximum of 45 hours a week. If someone works for more time than that, it is considered as overtime. Overtime is allowed for at most one week. This practice is to ensure that every team member be fresh, creative, careful and confident.

❖ **Testing:**

Testing is a very importing aspect in XP, where some times the test will be written before the code is written

Note: Release planning also helps team members in defining the test strategy and test approach planning for all iterations.

The tests are automated so that they become a part of the system and can be continuously run to ensure the working of the system. The result is a system that is capable of accepting change.

Note:

- **Manual Testing** is performed by a human sitting in front of a computer carefully executing the test steps.
- **Automation Testing** means using an automation tool to execute your test case suite.

We have many types of testing, but in fact we interesting in 2 in particular in XP:

1. **Acceptance Test:**
   Also known as Functional testing. Acceptance tests are black box system tests. That means we ignores the internal parts, and focus on the output is as per requirement or not.

   Each acceptance test represents some expected result from the system. Customers are responsible for verifying the correctness of the acceptance tests and reviewing test scores to decide which failed tests are of highest priority.

   Acceptance tests are created from User Stories. During an iteration the User Stories selected during the Iteration Planning Meeting will be translated into acceptance tests. A story can have one or many acceptance tests, whatever it takes to ensure the functionality works.

2. **Unit Test:**
   Unit Test in general is a test that testing individual software components or modules. Typically done by the programmer and not the testers, as it requires details knowledge of the internal program design and code.

   Unit test is one of the corner stones of Extreme Programming (XP). But unit tests XP style is a little different, for example:
   - The test will be created before the code.
   - We should test all classes in the system. (getter and setter methods are usually omitted).

Other Types of Tests:

- Integration testing
- System testing
- Regression testing

❖ **Simple Design:**

The system should be designed as simply as possible at any given moment. Extra complexity is removed as soon as it is discovered.

The right design for the software at any given time is the one that:

- Runs all the tests
- Has no duplicated
- Has the fewest possible classes and methods

❖ **Refactoring:**

Refactoring is a way of improving the system. So the developer ask questions like:

- How to make the code simpler.
- Is there any way to restructure the system without changing its behavior to remove duplication, improve communication, simplify, or add flexibility.

Advantages:

- improve the product as a whole
- Increases the developer knowledge of the system

❖ **Pair Programming:**

Pair Programming is a method where two programmers are working using one computer sitting side by side.

In pair programming we have two role:

- One is the **Driver** (or the coder): the one who is writing the code.
- The other is the **Observer** (or the navigator) which is the one who reviews each line of code as it is typed in.

The two programmers switch roles frequently.

Pair Programming if done well means less mistakes are made and should cost the business less.

Advantages:

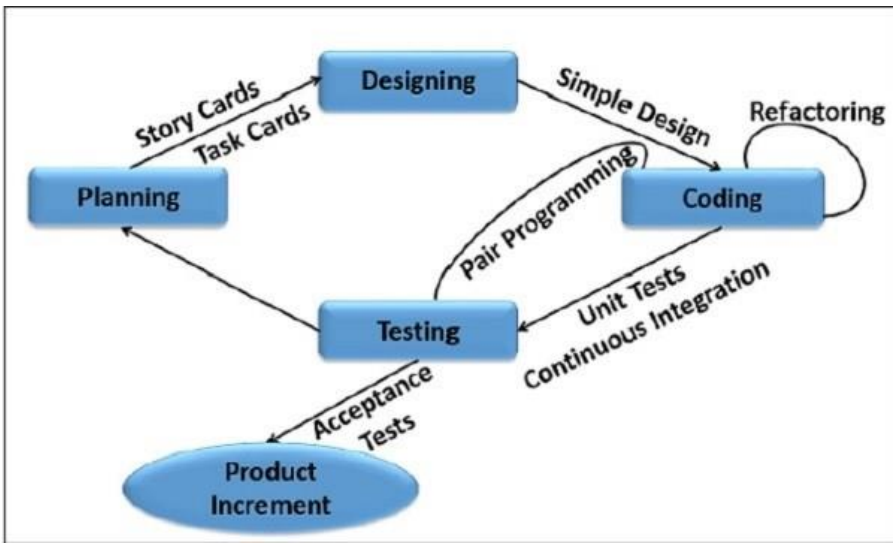
- Roles between the two programmer are switched resulting in emergence of new ideas.
- Programs with fewer bugs.
- Post-production maintenance cost is much less.
- Programmers learn from each other.

◆ **XP Basic Activities:**

XP activities need to be structured in light of the XP principles. This why XP practices are defined:

XP consist of four basic activities. They are:

- Planning
- Designing
- Coding
- Testing



◆ **XP Cycles:**

Incremental planning is based on the idea that our requirements are recorded on story cards, sort of use cases or scenarios that the customer provides. So, the first step in **Incremental Planning** is:

1. Select User Story
2. Release Plan
3. Iterative Plan
4. Development Process
5. Release Software
6. Evaluate System and Iteration

❖ **Select User Story:**

User Stories are short, simple descriptions of a feature told from the perspective of the person who desires the new capability, usually a user or customer of the system. They typically follow a simple template:

As a < type of user >, I want < some goal > so that < some reason >.

1st Step is selecting User Stories for a given release and determine which stories exactly to be included taking into account how much time available and on the priority (priority of a User Story is determined according to their importance to the user).

❖ **Release Plan:**

After *User Stories* have been written team can start the make a *Release Plan.* The *Release Plan* specifies which *User Stories* are going to be implemented for each system *Release*, and dates for those *Releases*. Also, The *Release Plan* sets the *Release* goal and Release time-frame (This gives the customers a set of *User Stories* to choose from during the ***Iteration Planning Meeting*** to be implemented during the next *Iteration*).

Note: An ***Iteration Planning*** is done after ***Release Planning.***

❖ **Iterative Plan:**

After *Plan Release* the *User Stories* are selected (the selected *User Stories* for an iteration is done by the customer from the *Release Plan*) After that the **3rd Step** comes in which is *Iterative Plan*. One of the main tasks that performed in *Iterative Plan* is breaking selected *User Stories* into individual programming tasks to be implemented during the Iteration. So, we take the *User Stories* and we identify specific development tasks that we need to perform in order to realize these Stories.

Note that: An ***Iteration Planning Meeting*** is performed at the beginning of each *Iteration* to produce that *Iteration's plan*.

In **Iteration Plan** the team:

Breaks down the *User Stories* into independent tasks (around 8 hours each).

Performs Risk Assessment of stories and decides on a lightweight plan on how to address the risks as the project moves forward.

Creating acceptance tests for user stories (which is in next step).

❖ **Development Process:**

After finishing all these steps and determine and define our software releases, what user stories will be taken in account in each release, how many iterations, what user stories tasks will be done in each iteration, and so on and so forth … etc. it is the time to start performing our planning steps. So, here we can start develop, integrate and test the code

Of course, these processes (Develop, Integrate and test) are iterative processes (each will be done many times).

- **Develop:**

  Developers sign up to do the tasks and then estimate how long their own tasks will take to complete.

  Note that: It is important for the developer who accepts a task to also be the one who estimates how long it will take to finish. People are not interchangeable and the person who is going to do the task must estimate how long it will take. The ideal development time is how long it would take to implement the Story in code.

  if there were no distractions, no other assignments, and you knew exactly what to do. Longer than 3 weeks means you need to break the story down further. Less than 1 week and you are at too detailed a level, combine some stories. About 80 user stories plus (or minus) 20 is a perfect number to create a release plan during release planning.

- **Integrate:**
  Intergrade means ones we finish a new feature or functionality we should add to the previous parts, until eventually we get the whole system.
  This is why we have integration testing which is testing of integrated modules to verify combined functionality after integration.