CODE PROJECT
For those who code

Articles » Development Lifecycle » Design and Architecture » Methodologies

Agile software development methodologies and how to apply them.

By **Monjurul Habib**, 24 Jul 2013

★★★★★ 4.95 (161 votes)

Prize winner in Competition "Best overall article of June 2013"

Introduction

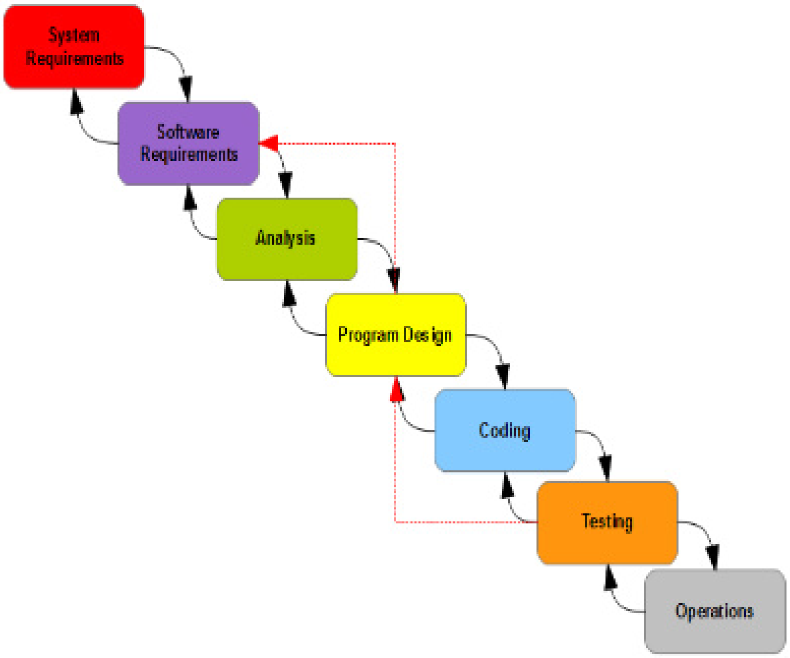
This article is about basic introduction to Agile software development methodologies and how to apply them. It is about how to work together to achieve a common goal. This is not only suitable for the Software Developers but also for Team Leaders, Project Managers, Product Managers, Development Managers, Testers, QA Managers, QA Engineers, Technical Writers, UX Designers, anyone involves in the delivering of software. This article focus on how technology team work together well to plan, build and deliver software. It does not talk about code or not focus on specific technology or not only about Microsoft tools. Hope this will improve your professional life and the effectiveness of your team.

The need for professional behave. Does our industry knows what it means to behave? The definition of a software developer, who sits in a room spend some time and code comes out. We get very confuse about deadlines, date, estimates and all of the things we are suppose to be doing, we do them badly. Now thats not unusual. Our industry is still young.

Background

Winston Royce's Waterfall Model

"From the 1970 IEE paper "Managing the Development of Large Software Systems"



There are two essential steps common to all computer program developments, regardless of size or complexity. There is first an analysis step, followed second by a coding step. Then he introduced most five important steps:

Step 1: PROGRAM DESIGN COMES FIRST

Allocate processing, functions, design the data base, define data base processing, allocate execution time, define interfaces and processing modes with the operating system, describe input and output processing, and define preliminary operating procedures. Write an overview document that is understandable, informative and current.

Step2: Document the Design

The first rule of managing software development is ruthless enforcement of documentation requirements.

Step 3: Do It Twice

The second most important criterion for success revolves around whether the product is totally original. If the computer program in question is being developed for the first time, arrange matters so that the version finally delivered to the customer for operational deployment is actually the second version insofar as critical design/operations areas are concerned.

Step 4: Plan, Control, and Monitor Testing

It is the phase of greatest risk in terms of dollars and schedule. It occurs at the latest point in the schedule when backup alternatives are least available, if at all.

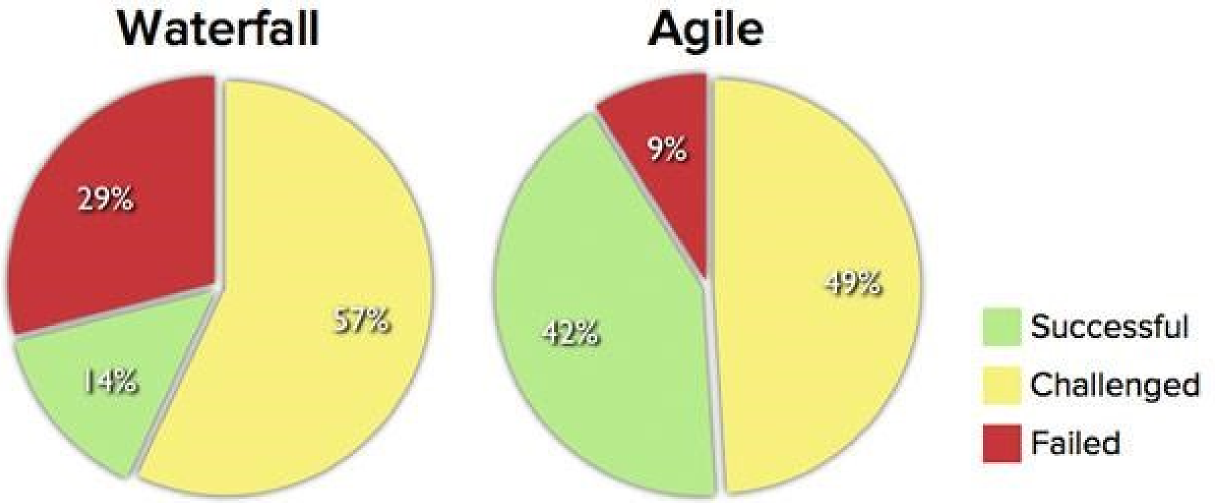
Step 5: Involve the Customer

It is important to involve the customer in a formal way so that he has committed himself at earlier points before final delivery.

A careful reading of Royce's paper reveals:

- Each phase should pass iteratively to the next
- The entire process should be exercised twice before release
- Royce knew that a single pass will fail

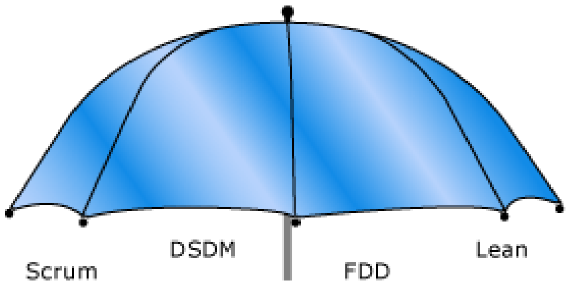
Unfortunately, for the process illustrated, the design iterations are never confined to the successive steps.



Source: The CHAOS Manifesto, The Standish Group, 2012.

What are all this stuff ?

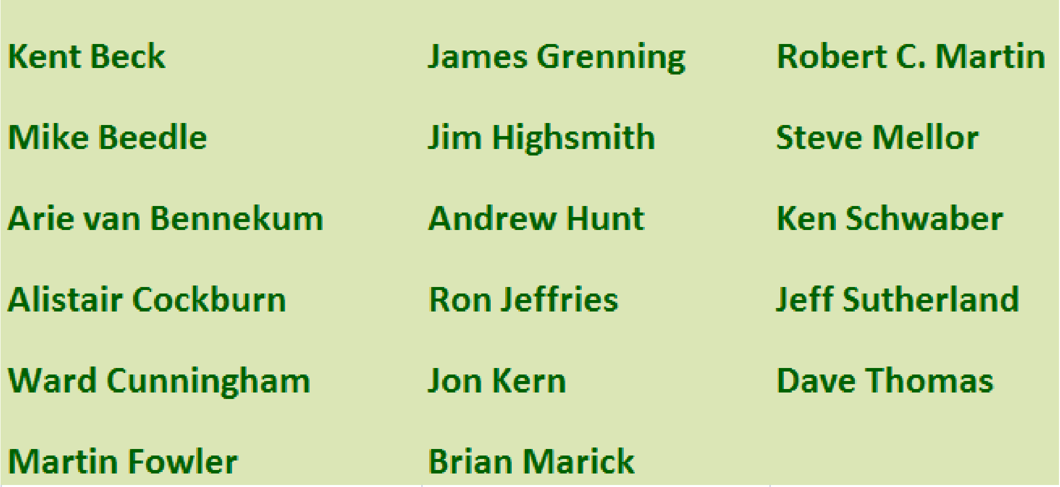
The answer is :



Agile development is not a methodology in itself. It is an umbrella term that describes several agile methodologies. At the signing of the Agile Manifesto in 2001, these methodologies included Scrum, XP, Crystal, FDD, and DSDM. Since then, Lean practices have also emerged as a valuable agile methodology and so are included under the agile development umbrella in the illustration later.

To learn more read Agile Principles and Values, by Jeff Sutherland

Original Signatories



Kent Beck	James Grenning	Robert C. Martin
Mike Beedle	Jim Highsmith	Steve Mellor
Arie van Bennekum	Andrew Hunt	Ken Schwaber
Alistair Cockburn	Ron Jeffries	Jeff Sutherland
Ward Cunningham	Jon Kern	Dave Thomas
Martin Fowler	Brian Marick	

Ref: agilemanifesto.org

Manifesto for Agile Software Development

Ref: agilemanifesto.org

We are uncovering better ways of developing software by doing it and helping others do it. Through this work we have come to value:

- **Individuals and interactions** over processes and tools
- **Working software** over comprehensive documentation
- **Customer collaboration** over contract negotiation
- **Responding to change** over following a plan

That is, while there is value in the items on the right, we value the items on the left more.

Twelve Principles behind the Agile Manifesto

Ref: agilemanifesto.org

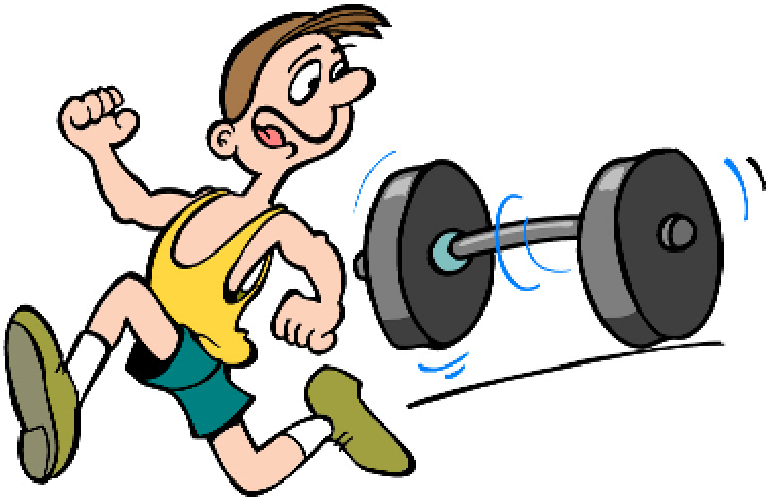
We follow these principles:

1. Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.
2. Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.
3. Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.

4. Business people and developers must work together daily throughout the project.
5. Build projects around motivated individuals.Give them the environment and support they need, and trust them to get the job done.
6. The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.
7. Working software is the primary measure of progress.
8. Agile processes promote sustainable development.The sponsors, developers, and users should be able to maintain a constant pace indefinitely.
9. Continuous attention to technical excellence and good design enhances agility.
10. Simplicity--the art of maximizing the amount of work not done--is essential.
11. The best architectures, requirements, and designs emerge from self-organizing teams.
12. At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.

Please click here for further detail on Agile Manifesto .

Many developers have lived through the nightmare of a project with no practices to guide it. The lack of effective practices leads to unpredictability, repeated error, and wasted effort. Customers are disappointed by slipping schedules, growing budgets, and poor quality. Developers are disheartened by working ever-longer hours to produce ever-poorer software.



DSDM

The DSDM (Dynamic Software Development Method) was developed to fill in some of the gaps in the RAD method by providing a framework which takes into account the entire development cycle. The main features of the DSDM method are as follows:

1. User involvement
2. Iterative and incremental development
3. Increased delivery frequency
4. Integrated tests at each phase
5. The acceptance of delivered products depends directly on fulfilling requirements.

FDD

FDD is a wrapper methodology, in that it allows you to apply a method to manage projects at a very high level, but it still allows you to use other methodologies at a lower level. FDD's focus is on being able to set estimates and schedules and to report on the status of a project as a whole, or at a very granular level, but it doesn't prescribe a specific method to apply in order to create the schedule, leaving that up to you to decide. The idea is that you can look at your project and state with some certainty what the project status is, whether you are on time, slipping, early and so on.

slipping, early and so on.

Lean

Lean Thinking is a way of approaching system optimization focusing on reducing waste and improving overall flow of value through a system. Lean has a rich history in manufacturing and has gained popularity in software development circles in recent years.

Lean comes from Lean Manufacturing and is a set of principles for achieving quality, speed & customer alignment. There are 7 Principles of Lean Software Development:

1. Eliminate Waste
2. Build Quality In
3. Create Knowledge
4. Defer Commitment
5. Deliver Fast
6. Respect People
7. Optimize the Whole

Applying these principles to the work of delivering a software product is not an end goal. One is not said to "Do Lean"; rather one uses Lean principles to guide decision making and to choose techniques that will improve a system overall. For example, the practice of TDD (Test-Driven Development) builds integrity in to software by inspecting it at the point of creation, thus supporting the Lean principle of building integrity in during the creation process.

Plan

In Plan driven development a project is successful if it goes according to plan, so in software development it depends on requirements stability, on having clear and fixed requirements. As you probably know, that is a luxury most software projects don't have.

The plan-driven methodologies, it is less costly to change requirements during the design stage and it is more expensive to adapt to changes when construction has already started. So,lot of energy is put into the planning phase.But software development is different. There is no guarantee that a good design will make construction predictable.

> "Walking on water and developing software from a specification are easy if both are frozen."- *Edward V. Berard*

The Agile approach is to break the dependency on requirements stability and come up with a process that takes into account changes. It does that by using Adaptive Planning and Evolutionary Design.

Adaptive planning implies going through the project cycle many times, re-planning and re-adapting often.

Evolutionary design can be achieved with the help of practices like Self Testing Code, Continuous Integration, Refactoring and Simple Design.

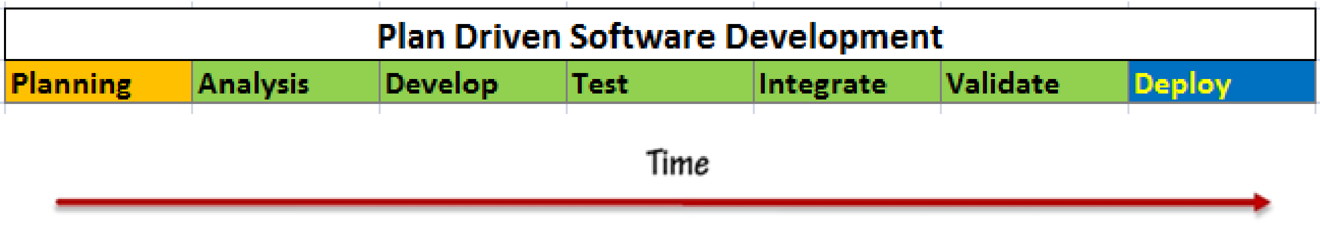
One is value-driven (agile) and another is plan-driven (traditional). This is not to say that plan-driven approaches have no values; it is to say that in agile, we make them explicit and discuss them often.

Both agile and plan-driven approaches have situation-dependent shortcomings that, if not addressed, can lead to project failure. The challenge is to balance the two approaches to take advantage of their strengths in a given situation while compensating for their weaknesses.

Plan vs. Agile

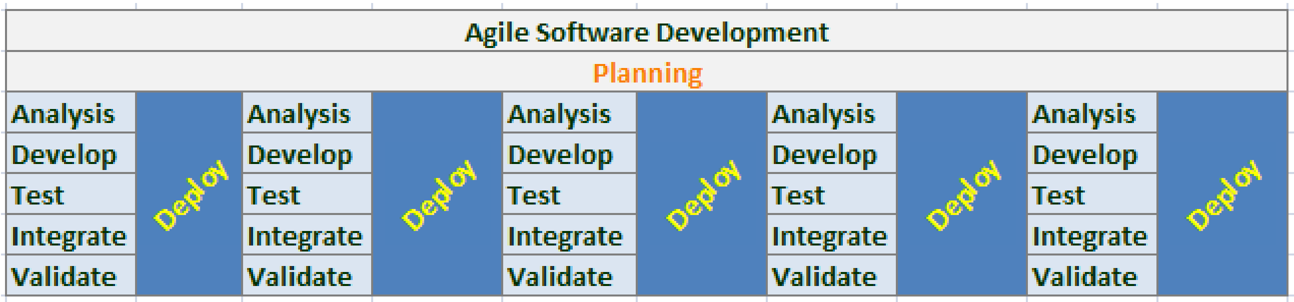
Fundamental difference between Plan driven development and Agile driven development lies between two significant differences. First one in the Plan driven model the team will deploy one increment of software at the significant differences. First one in the Plan driven model the team will deploy one increment of software at the end of the project. But in Agile we will deploy very small change of the software or more frequently. The second one is sequential verses concurrent activity. In Plan driven development one process starts after successful completion of another. But in Agile we plan all the time.

“Plan your work, then work your Plan” by *Martin Fowler* and *Neal Ford*



Plan Driven Software Development

Planning	Analysis	Develop	Test	Integrate	Validate	Deploy



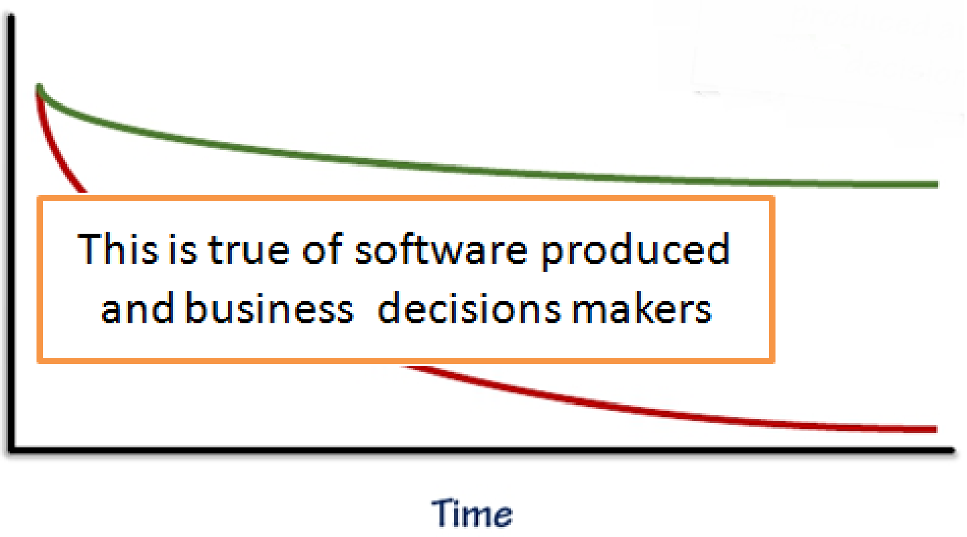
Agile Software Development

Planning

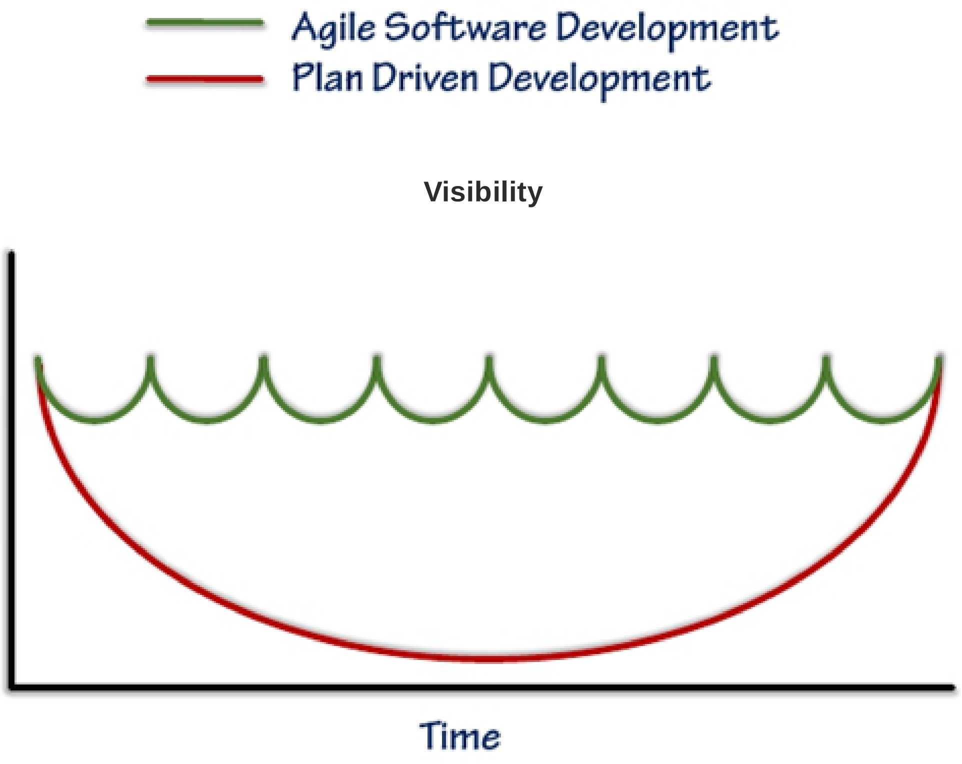
Analysis	Deploy	Analysis	Deploy	Analysis	Deploy	Analysis	Deploy	Analysis	Deploy
Develop		Develop		Develop		Develop		Develop	
Test		Test		Test		Test		Test	
Integrate		Integrate		Integrate		Integrate		Integrate	
Validate		Validate		Validate		Validate		Validate	

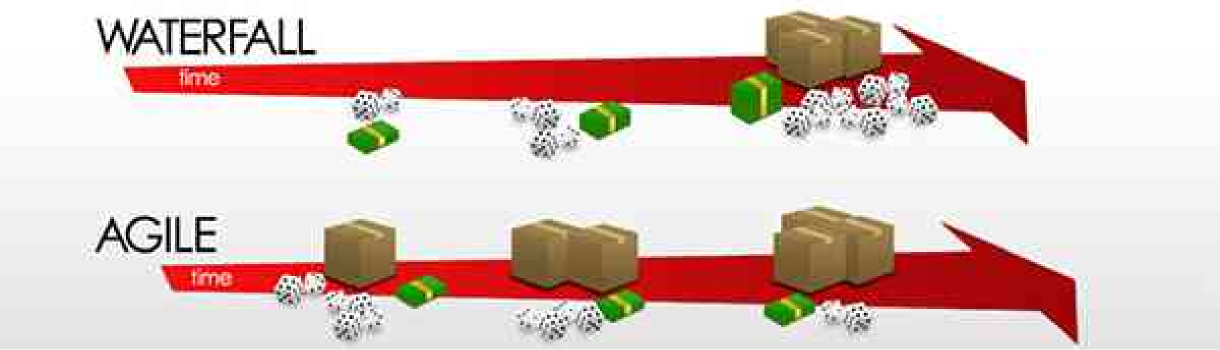
- Both provide processes, tools and techniques
- Both require disciplined approach to software development
- Each has strengths and weaknesses
- Agile methodologies address many situations for which Plan-driven methodologies are not well suited
- Agile is still a disciplined approach to software development but with an emphasis on different aspects of the process!
- Plan driven emphasizes formal communications and control
- Agile emphasizes continual communications and ability to changes and uncertainty
- Highly iterative to achieve quality over Lots of gates to control quality
- Inspect work as it is being done over Inspect product when it is complete
- Start with a goal of filling a need over Start by predicting what will be delivered

Ability to changes



This is true of software produced and business decisions makers





Customer satisfaction by rapid, continuous delivery of useful software.
People and interactions are emphasized rather than process and tools. Customers, developers and testers constantly interact with each other.
Working software is delivered frequently (weeks rather than months).
Face-to-face conversation is the best form of communication.
Close, daily cooperation between business people and developers.
Continuous attention to technical excellence and good design.
Regular adaptation to changing circumstances.
Even late changes in requirements are welcomed

Management teams that work well with Plan-driven approaches also tend to work well with Agile

Management teams that work well with Plan-driven approaches also tend to work well with Agile approaches

However, management teams that lack the ability to work well with Plan-driven approaches may lack the focus required of Agile

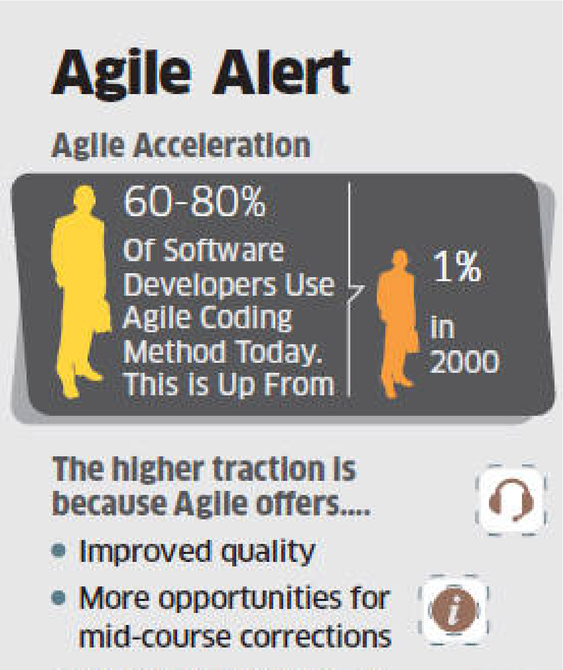
Agile

The principles and values of agile software development were formed as a way to help teams to break the cycle of process inflation and mainly focus on simple techniques for achieving their goals. The GOAL ?? What is the the GOAL?

OK, the main goal of every software developer and every development team is to deliver the highest possible value to employers and customers. Yet our projects fail, or fail to deliver value.

The key is in the Agile technique compressing the five sequences of the conventional software development method - called the Waterfall method - to a one-week cycle. It manages to do this by developing a system through repeated cycles (iterative) and in smaller portions (incremental), allowing developers to test and review during development. Speed, lower cost and flexibility are key benefits.

"Adoption rates among IT departments are accelerating," says Phil Murphy, vice president and research director at Forrester in a 2011 report.



Agile Alert

Agile Acceleration

60-80% Of Software Developers Use Agile Coding Method Today. This Is Up From 1% in 2000

The higher traction is because Agile offers....

- Improved quality
- More opportunities for mid-course corrections

Improved customer or business satisfaction
Better alignment between business & IT
Improved time to market

The participants in an agile process are not afraid of change. They view changes to the requirements as good things, because those changes mean that the team has learned more about what it will take to satisfy the customer. Agile team members work together on all aspects of the project. Each member is allowed input into the whole. No single team member is solely responsible for the architecture or the requirements or the tests. The team shares those responsibilities, and each team member has influence over them.

There are many agile processes : SCRUM, Crystal, Behavior-Driven Development (BDD), Test-Driven Development (TDD), Feature-Driven Development (FDD), Adaptive Software Development (ADP), Extreme Programming (XP) and more... However, the vast majority of successful agile teams have drawn from all these processes to tune their own particular flavor of agility. These adaptations appear to be come together with the combination of SCRUM and XP, in which SCRUM practices are used to manage multiple teams that use XP.

Extreme Programming (XP)

As developers we need to remember that XP is not the only game in town.- Pete McBreen

Extreme Programming emphasizes teamwork. Managers, customers, and developers.It improves a software project in five essential ways; communication, simplicity, feedback, respect, and courage.

So according to Wiki definition "*Extreme Programming (XP) is a software development methodology which is intended to improve software quality and responsiveness to changing customer requirements. As a type of agile software development, it advocates frequent "releases" in short development cycles, which is intended to improve productivity and introduce checkpoints where new customer requirements can be adopted*."

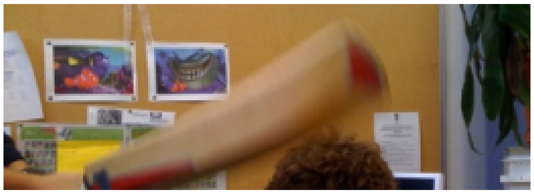
Extreme Programming is a set of simple and concrete practices that combine into an agile development process. XP is a good general-purpose method for developing software. Many project teams will be able to adopt it as is. Many others will be able to adapt it by adding or modifying
practices.

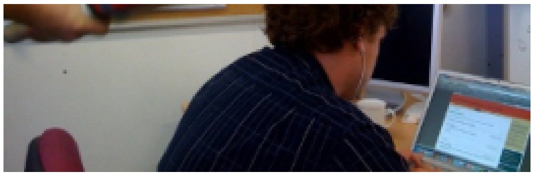
- The ancestor of most Agile methodologies
- Kent Beck created quite a buzz in the late 1990s and early 2000s
- Blends processes and practices

Kent Beck's basic idea

- Take observed effective team practices
- Push them to extreme level

What does that mean "*Push them to extreme level*"? Is that mean something like the following images ??

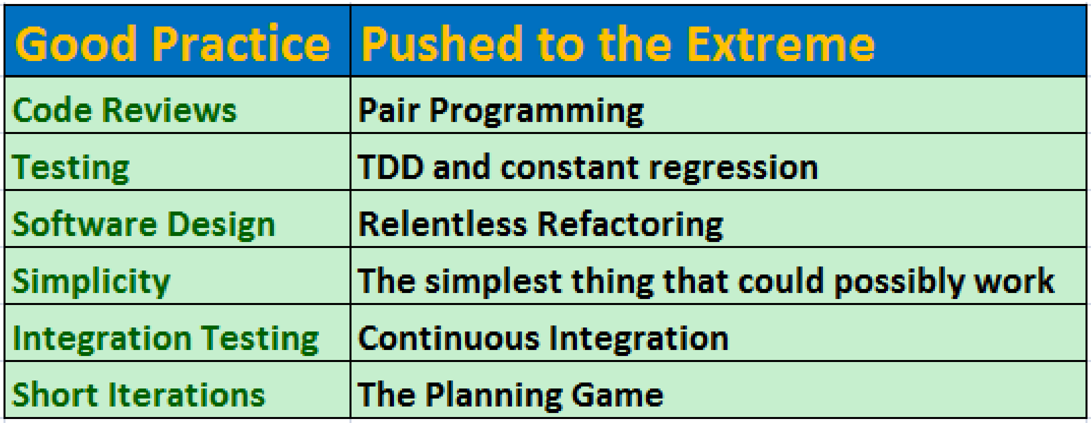




OR

WE NEED TO TALK ABOUT MY WORKLOAD.
OKAY. I JUST EMAILED YOU TWO MORE ASSIGNMENTS THAT I NEED FINISHED BY TOMORROW.
YOU ARE LITERALLY KILLING ME.
I CALL IT EXTREME MANAG-ING.
Dilbert.com DilbertCartoonist@gmail.com
1-19-13 ©2013 Scott Adams, Inc./Dist. by Universal Uclick

No, that doesn't mean XP. Lets us see what does that mean.

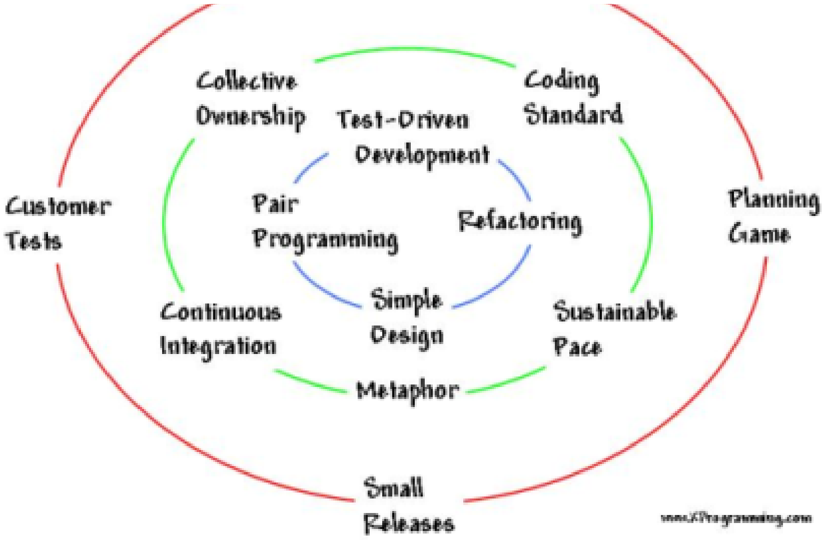


Good Practice	Pushed to the Extreme
Code Reviews	Pair Programming
Testing	TDD and constant regression
Software Design	Relentless Refactoring
Simplicity	The simplest thing that could possibly work
Integration Testing	Continuous Integration
Short Iterations	The Planning Game

XP is a set of practices that conform to the values and principles of Agile. XP is a discrete method, whereas Agile is a classification. There are many Agile methods, XP is just one of them.

Having said that, none of the other Agile methods are as well defined, or as broad in scope as XP. Scrum, for example, is roughly equivalent to XP's Planning game practice, with elements of Whole Team. While there are differences in the details, it is fair to say that Scrum is a subset of XP. Indeed, many Scrum teams augment their process by adding in many of the XP practices such as Acceptance Testing, Pair Programming, Continuous Integration, and especially Test Driven Development.

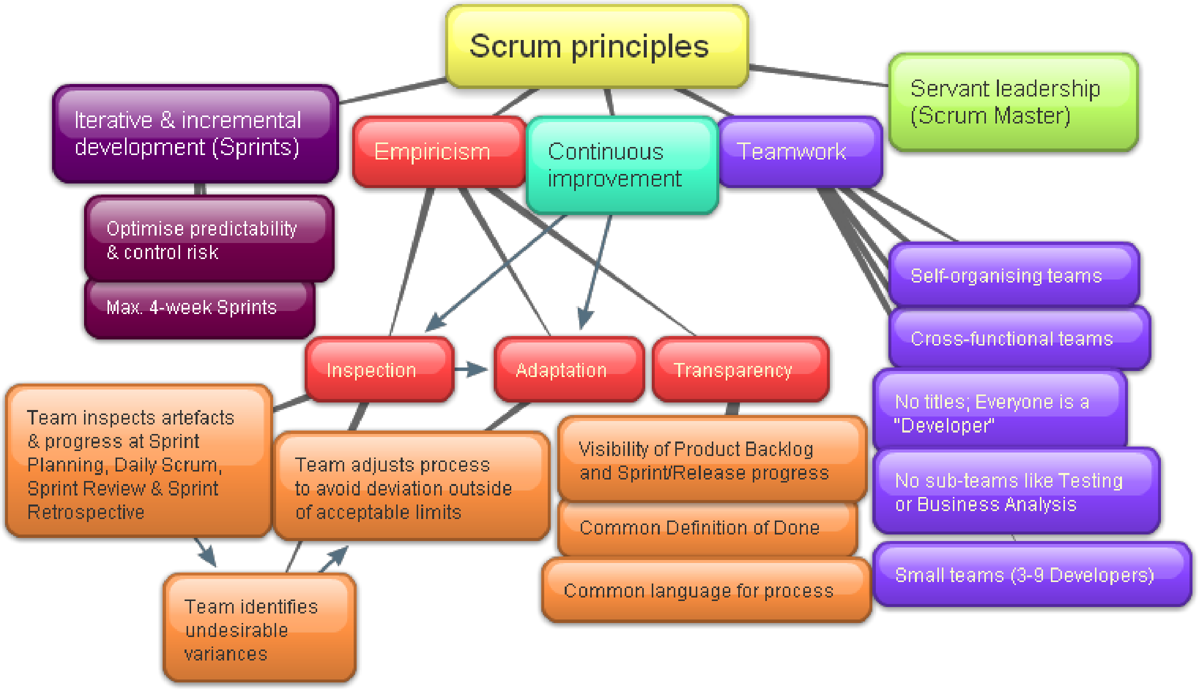
Of all the Agile methods, XP is the only method that provides deep and profound disciplines for the way developers do their daily work. Of those disciplines, Test Driven Development is the most revolutionary. Following are some good XP practices. I will try to write detail on each next time.



Scrum

Scrum is an iterative and incremental agile software development framework for managing software projects and product or application development. Its focus is on "a flexible, holistic product development strategy where a development team works as a unit to reach a common goal" as opposed to a "traditional, sequential approach“.

- Scrum was first defined as "a flexible, holistic product development strategy in 1986 by Hirotaka Takeuchi and Ikujiro Nonaka.
- In 1995, Sutherland and Schwaber jointly presented a paper describing the Scrum methodology. First public presentation.


Scrum principles
Iterative & incremental development (Sprints)
Optimise predictability & control risk
Max. 4-week Sprints
Empiricism
Continuous improvement
Teamwork
Servant leadership (Scrum Master)
Self-organising teams
Cross-functional teams
No titles; Everyone is a "Developer"
No sub-teams like Testing or Business Analysis
Small teams (3-9 Developers)
Inspection
Adaptation
Transparency
Team inspects artefacts & progress at Sprint Planning, Daily Scrum, Sprint Review & Sprint Retrospective
Team adjusts process to avoid deviation outside of acceptable limits
Team identifies undesirable variances
Visibility of Product Backlog and Sprint/Release progress
Common Definition of Done
Common language for process

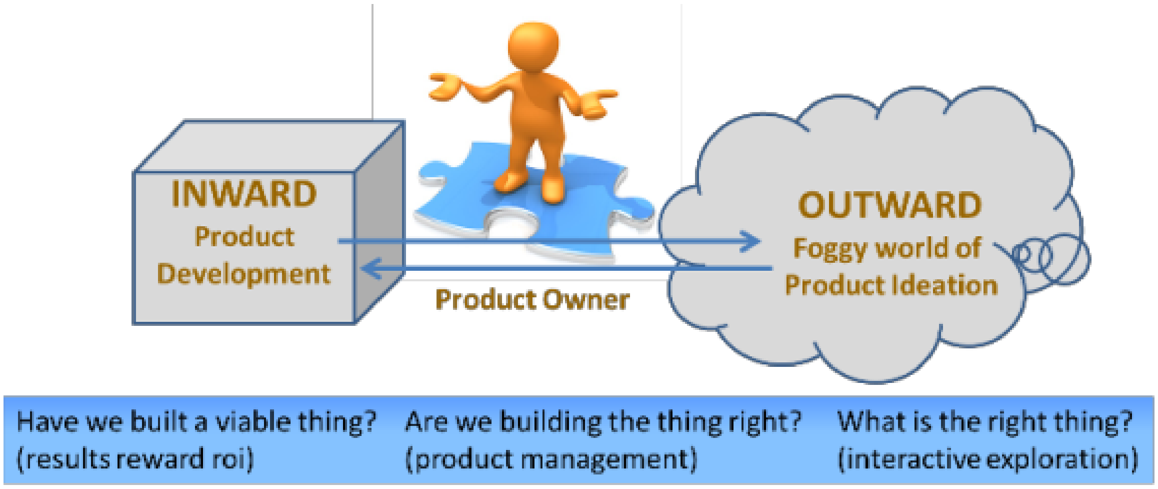
Scrum Roles

There are three core roles for producing the product.

1. Product Owner
2. Development Team

2. Development Team
3. ScrumMaster
4. *Stakeholders*
5. *Managers*

Product Owner

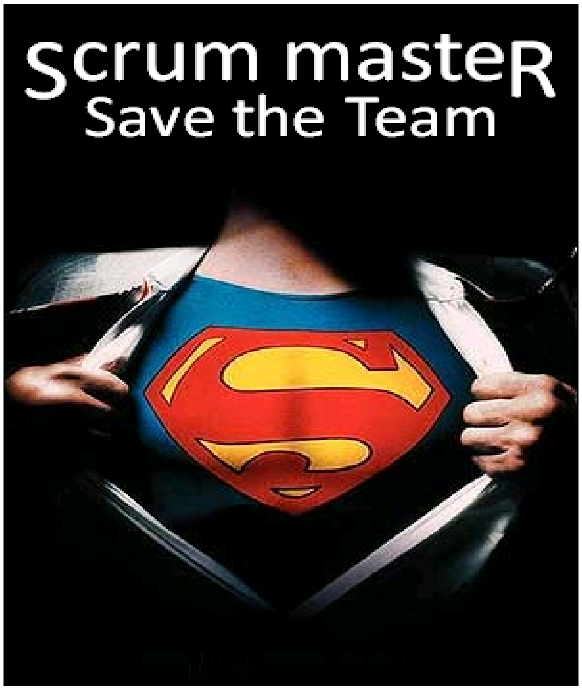

INWARD
Product Development
OUTWARD
Foggy world of Product Ideation
Product Owner
Have we built a viable thing?
(results reward roi)
Are we building the thing right?
(product management)
What is the right thing?
(interactive exploration)

- The Product Owner represents the stakeholders and is the voice of the customer.
- Accountable for ensuring value to the business.
- Writes (or the team) customer-centric items (user stories), prioritizes them, and adds them to the product backlog.
- Scrum teams should have one, may also be a member of the development team
- Not be combined with that of the ScrumMaster.

Development Team

- Responsible for delivering potentially shippable product increments at the end of each Sprint.
- Made up of 3–9 people with cross-functional skills who do the actual work (analyze, design, develop, test, technical communication, document, etc.).
- Self-organizing, even though they may interface with project management organizations (PMOs).

ScrumMaster

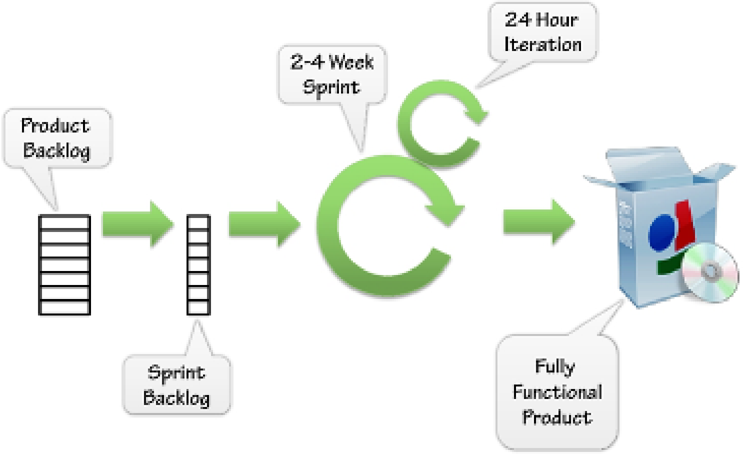


- Accountable for removing impediments to the ability of the team to deliver the sprint goal/deliverables.
- Is not the team leader, but acts as a buffer between the team and any distracting influences.
- Ensures that the Scrum process is used as intended.
- Enforcer of rules. Protector of the team and keep it focused on the tasks at hand.
- Also been referred to as a servant-leader to reinforce these dual perspectives.
- Differs from a Project Manager in that the latter may have people management responsibilities unrelated to the role of ScrumMaster.
- `Excludes any such additional people responsibilities.`

Backlog

The *product backlog* is an ordered list of "requirements" that is maintained for a product. It consists of features, bug fixes, non-functional requirements, etc. - whatever needs to be done in order to successfully deliver a working software system. In Scrum, it is not required to start a project with a lengthy, upfront effort to document all requirements. This agile product backlog is almost always more than enough for a first sprint. The Scrum product backlog is then allowed to grow and change as more is learned about the product and its customers

The *sprint backlog* is the list of work the Development Team must address during the next sprint. The list is derived by selecting stories/features from the top of the product backlog until the Development Team feels it has enough work to fill the sprint. This is done by the Development Team asking "Can we also do this?" and adding stories/features to the sprint backlog.

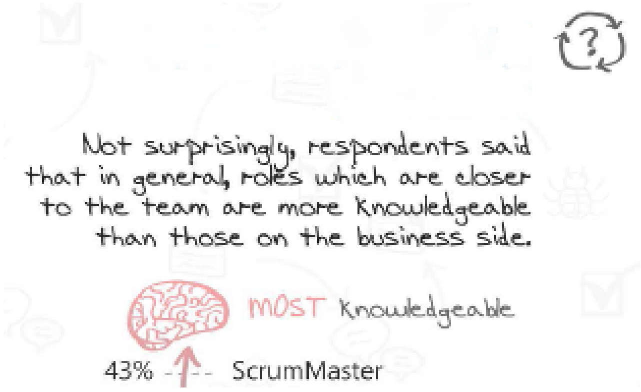


Conceptually, the team starts at the top of the prioritized Scrum backlog and draws a line after the lowest of the high-priority items they feel they can complete. In practice, it is not unusual to see a team select, for example, the top five items and then two items from lower on the list that are associated with the initial five.

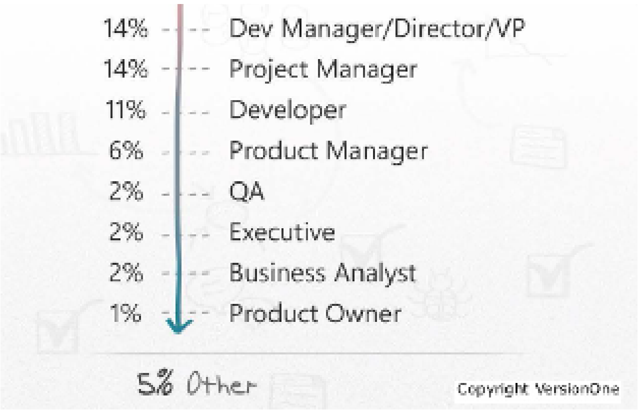
Agile Development Survey

The survey was conducted between August 9th and November 1, 2012. Sponsored by VersionOne, The survey polled 4,048 individuals from various channels in the software development communities. The data was analyzed and prepared into a summary report by Analysis.Net Research, an independent survey consultancy.

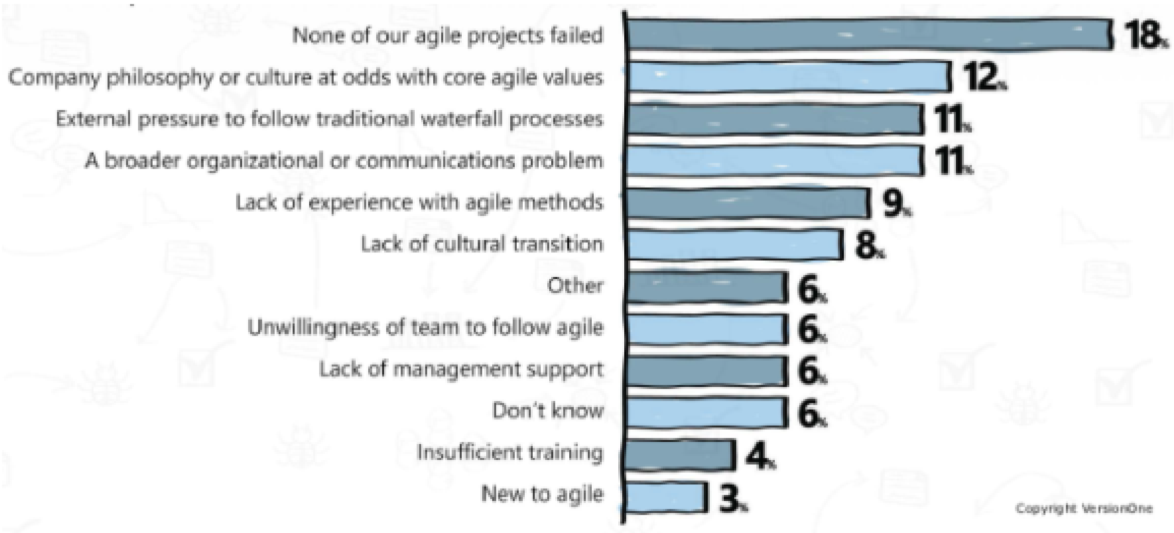
Who Knows Agile ?



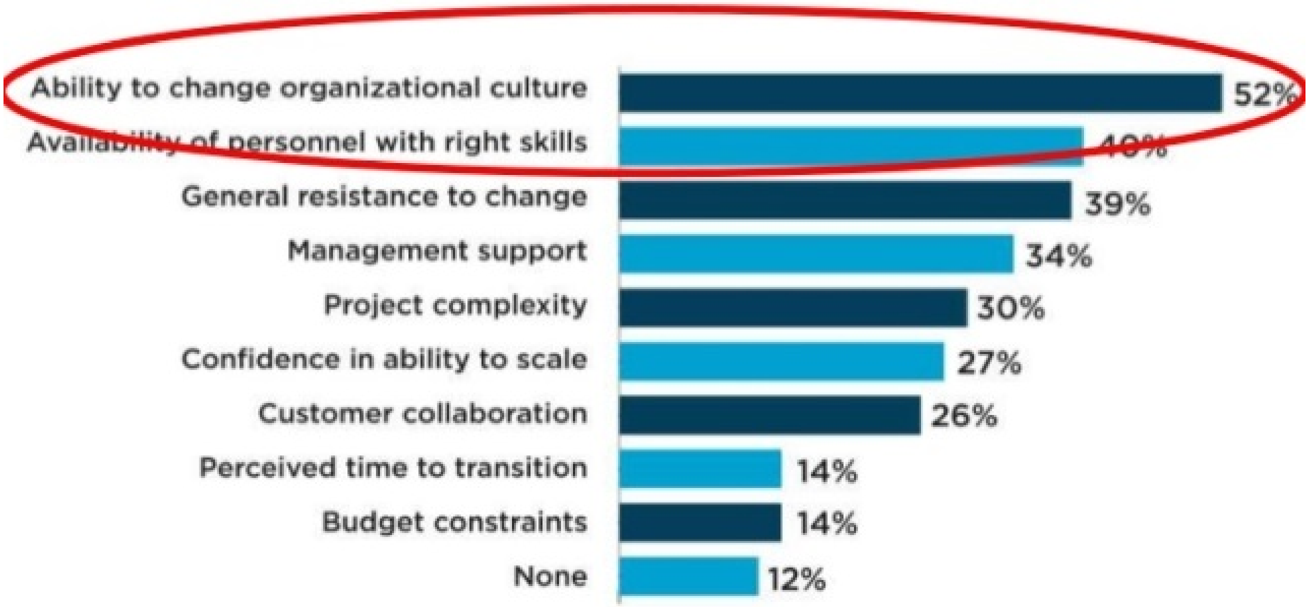
Not surprisingly, respondents said that in general, roles which are closer to the team are more knowledgeable than those on the business side.



Cause Of Agile Failure



Barriers to Further Agile Adoption



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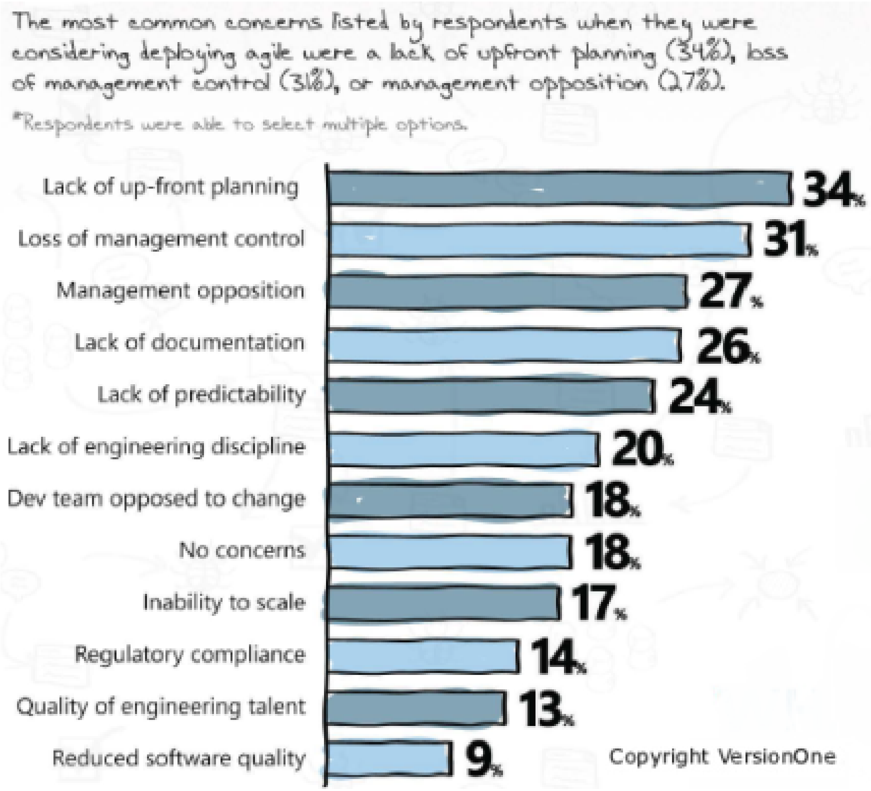
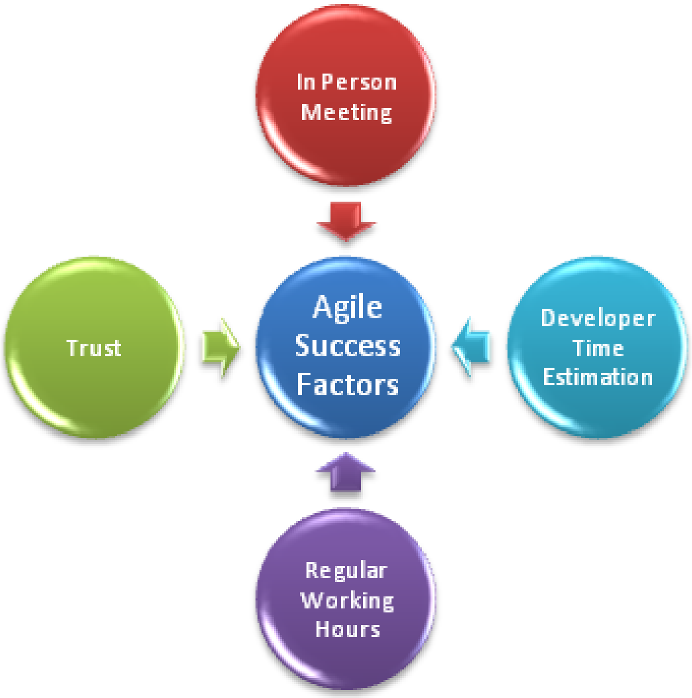
Greatest Concerns about adopting Agile



Conclusion

A good agile team picks and chooses the management & technical practices that best work for them.When trying to adopt Agile practices, there will be a ton of excuses as why it won’t work. Those who understand the real benefits of the approach – and genuinely want to make the transition – will likely have success. Those who are searching for reasons why it will fail – well, they will likely find them and either abandon the effort entirely or end up practicing what Elisabeth Hendrickson calls “fake agile.”



In support of this conclusion, let me leave you with some words (*Collected from Robert C. Martin*):
"In preparing for battle I have always found that plans are useless, but planning is indispensable." - General Dwight David Eisenhower

It is better not to fixate on any given methodology, because the needs/conditions of the company and project are likely to change regularly, and you need to be flexible in how you approach managing projects if you want them to be successful. **`No single methodology is a silver bullet`**, so the trick is to determine which methods work for you and tune your methodology to suit your individual needs. This is what being "**Agile**" is fundamentally about.

References

- Manifesto for Agile Software Development
- Agile Principles, Patterns, and Practices in C# Robert C. Martin, Micah Martin
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Next Article

I will try to focus on the Requirements, Estimation, and Planning.

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