Agile Modeling & EXtreme Programming

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ABSTRACT

Agile software development is an abstraction over the software process imposed upon rapid feedback. EXtreme Programming (XP) is a code-centric agile methodology based on the idea of using rapid feedback to its full capacity, thus applied to every single software principle, which has managed to prove itself as best practice based on the experience and commonsense of many software developers. Agile Modeling (AM) is a methodology for modeling and documentation, which can be used as an extension for almost any software process.

This paper shows how an already efficient software process, such as XP becomes even more effective when combined with AM. Although XP concentrates on a certain subset of software principles, it does not comment on the remaining ones. This fact makes a lot of room for extensions, such as AM, thus making the XP & AM combination appear very natural and appealing to all stakeholders.

1. INTRODUCTION

The software industry is a very young craft. Software is a very fragile artifact. The software process is unstable and software methodologies are controversial. Software projects contain many defects, do not accomplish the tasks they were meant to accomplish and are delivered late, when delivered at all. Every stakeholder of a software project is unhappy, loses money and this clearly has to change.

Over the years a lot of effort has been made to address these problems. Scrum, XP, Dynamic Systems Development Method (DSDM), or Feature-Driven Development (FDD) and many others are steps in the right direction. These methodologies vary in many aspects, but agree on the fundamental level with each other. On February 11-13, 2001 seventeen software professionals, among them Jeff Sutherland - the inventor of Scrum and Kent Beck - the inventor of XP met to find some common ground, which would lead the software industry into the future. Naming themselves "The Agile Alliance", these people handcrafted a document, which is by now known as "The Manifesto for Agile Software Development" or simply "The Agile Manifesto". Declaring a list of principles, this document has become a beacon of hope for the software industry. Years passed. The term "agile" is polluted by the smog of certification madness, overwhelming quantity of low quality information sources, religious ignorance and simple lack of understanding the simple principles those seventeen individuals put together over 10 years ago.

This paper revisits XP and augments its modeling part by explaining AM, which is used to reinforce the values of agile software development and clear the myth of extreme programmers being old fashioned, spoiled hackers, who just do not know better.

2. AGILE MANIFESTO

This section highlights the most important principles of the Agile Manifesto.

Individuals and interactions *over processes and tools.*[4] Developing software is an intellectual and creative process, which is challenging and spectacularly complicated. Managers do not make any differentiation between a software developer and a house builder. They assume they can plug and play people into a software project as they can in the house building industry, which is obviously not the same thing. Agile teams are most commonly compared to sports teams, which can only win if the team members play together. Teamwork requires by definition a great deal of communication skills. Processes are important, but not vital. If you had a choice between an NBA level basketball team and a group of very smart, athletic and toll people who never heard of basketball before, but got it explained in detail just prior to the match, on which team would you bet your money on? And always remember, that although tools are helpful a fool with a tool is still a fool.

Working software *over comprehensive documentation.*[4] The goal of software development is software, not documentation, otherwise it would be called documentation development.[1] Documentation is important, but not a priority. And why should it be? If you think about it, working software is even more explanatory than a technical, gibberish

document.

Customer collaboration *over contract negotiation.*[4] Developing software is a creative process and the fact that software developers are the only stakeholders in the software project is nothing more than an illusion. The customer *develops* ideas and the software developer implements them. Thus the customer becomes a vital part of the team and communication skills are required yet again. The customer has to be creative himself. Since creativity is an iterative process, there is just no way, the customer could communicate his wishes to the software developer upfront. And even if he could, would the software developer go ahead and build the whole system in one sit?

Responding to change *over following a plan.*[4] The fact that change **is** the state in the software world is undeniable. Technology, business environment, skills, domain understanding change over time and there is nothing you can do about it. In fact you should embrace change and act now instead of planning for tomorrow to paraphrase the surprisingly effective way of thinking: "Implement for today, design for tomorrow."[3]

3. EXTREME PROGRAMMING

This section introduces XP and explains the origins of the *extreme* part in its naming.

The main purpose of XP is to reduce project risk, making everyone happy on its way. The programmers work on tasks that really matter. These tasks bring joy and joy is the reason why they got into programming in the first place. In addition to that, they never have to make important decisions on their own and therefore become fearless of change. The customers and managers receive rapid feedback, which gives them the ability to steer the project in the right direction or even entirely change the course of action.[3]

XP maximizes agile principles and practices buy boosting them to extreme levels and this is where the name comes from:

- If code reviews are good, we'll review code all the time (pair programming).
- If testing is good, everybody will test all the time (unit testing), even the customers (functional testing).
- If design is good, we'll make it part of everybody's daily business (refactoring).
- If simplicity is good, we'll always leave the system with the simplest design that supports its current functionality (the simplest thing that could possibly work).
- If architecture is important, everybody will work defining and refining the architecture all the time (metaphor).
- If integration testing is important, then we'll integrate and test several times a day (continuous integration).
- If short iterations are good, we'll make the iterations really, really short - seconds and minutes and hours, not weeks and months and years (the Planning Game).[3]

4. AGILE MODELING

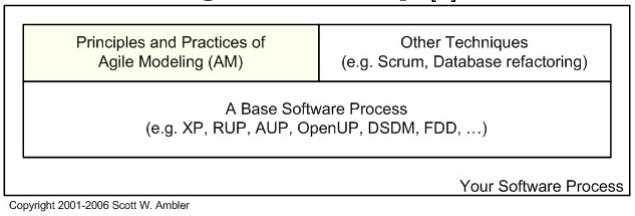
This section introduces AM and explains its goals, but before jumping into AM we discuss why bother with modeling at all.

Models are artifacts, which help you understand what you are building or aid the communication with your team. And since communication is so important to an agile team (or any team for that matter), modeling is also important.

4.1 What is AM?

AM is not a complete software process like XP. Instead AM is a modification for a software process as presented in the following figure. AM is all about modeling and documentation. AM does not show how to create new models, but how to apply existing modeling techniques. Am values content over representation. AM

Figure 1: AM Scope[2]



- is an attitude, not a prescriptive process
- is a supplement to existing methods; not a complete methodology
- is complementary to other modeling processes
- is a way to work together effectively to meet the needs of project stakeholders
- is effective and is about being effective
- is something that works in practice; isn't an academic theory
- is not a silver bullet
- is for the average developer, but is not a replacement for competent people
- is not an attack on documentation
- is not an attack on CASE tools[1]

4.2 What makes models agile?

AM does not take the model driven approach. The audience for models are people, not computers. Therefore neither models on top of models nor a perfect specification is required. So what is an agile model? "An agile model is a model that is just barely good enough."[1] It does not even have to be graphical. The following list helps you to determine whether your model is good enough.

Agile models fulfill their purpose. Examples for purposes include: communicating the scope of your effort to a stakeholder or understanding architecture or design of a part of an application.

Agile models are understandable. The notation of your model should conform to the skills and expertise of your audience.

Agile models are sufficiently accurate. An imperfect model is better than a non-existent one. If the navigation system in your car misses a street you have a choice to either update the map or to ignore this fact if you never drive nowhere near that street anyway. But you would never throw your navigation system away because of it or would you?

Agile models are sufficiently consistent. The audience for models are people. The world is not going to come to an end if you use a dotted arrow instead of the continuous one in your UML class diagram.

Agile models are sufficiently detailed. The level of detail should be chosen carefully. Remember, *just good enough* is perfect for an agile model.

Agile models provide positive value. This one is very important. If you do not know why you are creating a model or the person who requested it could not explain why he needed it, than you probably should not bother modeling. It is a business after all. Everything you do should add positive value to the project.

Agile models are as simple as possible. Many factors contribute to complexity of a model. Among them are: the level of detail or the comprehensiveness of the notation.

4.3 What makes documentation agile?

The fact, that agile developers produce as less documentation as possible is very far from the truth. Yes, agile folks travel light, which means that not every document is made persistent and maintained until the end of all eternity. But this also means that being agile means manufacturing even more documentation as you would do when following any other methodology. Documentation is a very important part of any system, which has to be maintained for a given period of time and agile developers realize that fact.

So when is a document agile?

Agile documents maximize stakeholder investment. Although documentation is important it has a very low priority in an agile software development process. This means, that if there is an alternative, which would provide more value to the project, than you should choose it over documentation. Use the best tool for the job. Examples of alternatives include: cleaning the code or communicating face to face instead of writing emails and documenting every single design decision.

Agile documents are "lean and mean". "An agile document contains just enough information to fulfill its purpose."[1] Agile modelers value content over representation. If you are writing a document in prose and need to add a diagram to it, consider a handwritten document over a perfectly generated colored artifact produced by a Computer-Aided Software Engineering (CASE) tool.

Agile documents fulfill a purpose. As with models, you always need a very good reason for creating a document. Make sure, that every second you invest in creating a document is worth it.

Agile documents describe information that is less likely to change. Things that change a lot are hard to document and make any documentation effort unmaintainable. Chances are, you do not need such a document at all.

Agile documents describe "good things to know". The information in an agile document requires a right to exist. Perfect candidates are: the reasoning behind a design decision, usage procedures or operational procedures.

Agile documents have a specific customer and facilitate the work efforts of that customer. Know your audience, even if your audience is you. Consider different types of documents, which are suited best for the job.

Agile documents are sufficiently accurate, consistent, and detailed. "Agile documents do not need to be perfect, they just need to be good enough."[1]

Agile documents are sufficiently indexed. Time is money. You cannot afford looking over 2000 pages Software Architecture Document (SAD) to find out which signature a certain method has. "Your indexing scheme should reflect the needs of a document's audience."[1]

Being an agile modeler is not an excuse for creating sloppy documentation. Sometimes documentation needs to be perfect. Always remember the purpose of the documentation you are creating and be aware of your audience.

5. AM & XP

Although AM can be tailored to any software process, it was not only designed for but is also based on XP.

5.1 Values

XP follows a simple set of values:

communication - Most problems in any project can be traced back to someone not talking to someone else about something important.

simplicity - Simple and easy are two different concepts. As developer you are confronted with complexity on a day to day basis creating things, which are easy to use for others. Being easy to use does not mean that the thing you are using is simple. In fact it is quite the opposite. "XP is making a bet. It is betting that it is better to do a simple thing today and pay a little more tomorrow to change it if it needs it, than to do a more complicated thing today that may never be used anyway."[3]

feedback - "Concrete feedback about the current state of the system is absolutely priceless."[3] The more you have, the better.

courage - Courage is the most intriguing one. You should not be afraid of trying out new things, throwing code away, throwing design decisions away after trying them out, doing major refactoring if they need to be made. Courage by itself would not make much sense, but combined with communication, simplicity and feedback, courage gives you a major boost comparable to the nitrous oxide injection of a car.

AM adopts all theses values and adds another one - *humility*.

5.2 Principles

XP has principles, which are more concrete, than the high-level values.

- Rapid feedback
- Assume simplicity
- Incremental change
- Embracing change
- Quality work[3]

AM adopts most of those and adds few of its own.

- Software is your primary goal
- Enabling the next effort is your secondary goal
- Travel light
- Assume simplicity
- Embrace change
- Incremental change
- Model with a purpose
- Multiple models
- Quality work
- Maximize stakeholder investment[1]

5.3 Practices

Here are all XP practices:

The Planning Game Quickly determine the scope of the next release by combining business priorities and technical estimates. As reality overtakes the plan, update the plan.

Small releases Put a simple system into production quickly, then release new versions on a very short cycle.

Metaphor Guide all development with a simple shared story of how the whole system works.

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.

Testing Programmers continually write unit tests, which must run flawlessly for development to continue. Customers write tests demonstrating that features are finished.

Refactoring Programmers restructure the system without changing its behavior to remove duplication, improve communication, simplify, or add flexibility.

Pair programming All production code is written with two programmers at one machine.

Collective ownership Anyone can change any code anywhere in the system at any time.

Continuous integration Integrate and build the system many times a day, every time a task is completed.

40 hour week Work no more than 40 hours a week as a rule. Never work overtime a second week in a row.

On-cite customer Include a real, live user on the team, available full-time to answer questions.

Coding standards Programmers write all code in accordance with rules emphasizing communication through the code.[3]

AM practices are categorized into four groups:

1. Iterative and incremental approach to modeling:

   Apply the Right Artifact(s)

   Create Several Models in Parallel

   Iterate to Another Artifact

   Model in Small Increments

2. Effective teamwork and communication within your team and with your project stakeholders:

   Model with Others

   Active Stakeholder Participation

   Collective Ownership

   Display Models Publicly

3. Enabling simplicity within your modeling efforts:

   Create simple content

   Depict models simply

   Use the simplest tools

4. Validation:

   Consider Testability

   Prove it With Code[1]

5.4 The potential fit between AM and XP

In this section we compare how AM practices fit to XP.

Active Stakeholder Participation is simply a new take on XP's *On-cite customer* practice. AM uses the term project stakeholder in place of customer and focuses on the concept of their active participation, hence Active Stakeholder Participation and not On-Site Stakeholder.

Apply Modeling Standards is the AM version of XP's *Coding Standards* practice.

Apply Patterns Gently reflects the You Ain't Gonna Need It (YAGNI) principle to the effective application of patterns within your system, in conformance to XP's practice of *Simple Design*.

Apply the Right Artifact(s) is not explicitly described by XP principles and practices although is very much aligned with XP philosophies of *"if you need it do it"* and using the most appropriate tool or technique for the job at hand.

Collective Ownership has been directly transfered to AM.

Create Several Models in Parallel is a modeling-specific practice. XP developers can clearly work on several models - such as CRC cards, acceptance test cases, and sketches - if they choose to do so.

Create Simple Content is complementary XP's *Simple Design* practice that advises to keep your models as simple as possible.

Depict Models Simply is complementary XP's *Simple Design* practice that suggests that your models do not need to be fancy to be effective, perfect examples of which are CRC cards and user stories.

Discard Temporary Models reflects XP's *Travel Light* principle, which AM has adopted, explicitly advising you to dispose of models that you no longer need.

Display Models Publicly reflects XP's (and AM's) value of *Communication*, principle of *Open and Honest Communication* (adopted by AM), and reflects its practice of *Collective Ownership*.

Formalize Contract Models is not currently reflected within XP, well perhaps in its "if you need to then do it" philosophy. This practice was included in AM to provide guidance for how to deal with the very common situation of integrating with other systems.

Iterate to Another Artifact explicitly states, in a general form, the practice of XP developers to iterate between working on various artifacts such as source code, CRC cards, and tests.

Model in Small Increments his practice supports XP's iterative and increment approach to development. Both XP and AM prefer an emergent approach to development and not a big design up front (BDUF) approach.

Model With Others is the AM version of XP's *Pair Programming* practice.

Prove it With Code is the AM version of XP's *Concrete Experiments* principle. In fact, it was originally called Concrete Experiments although was renamed when it was evolved into a practice.

Reuse Existing Resources is not explicitly included in XP, although it clearly isn't excluded either. XP developers are practical, if there is something available that can be appropriately reused then they will likely choose to do so.

Single Source Information reflects the XP concept of *traveling light*.

Update Only When it Hurts reflects AM and XP's *Travel Light* principle, advising that you should only update an artifact only when you desperately need to.

Use the Simplest Tools This practice reflects AM and XP's *Assume Simplicity* principle and is consistent with XP's preference for low-tech tools such as index cards for modeling.[2]

6. CONCLUSION

"Modeling and documentation are important aspects of XP, just like they are important aspects of any other software development methodology. However, XP explicitly advises you to minimize the effort that you invest in these activities to be just enough. Luckily, the focus of AM is to make you as effective as possible when you are modeling and documenting."[1]

7. REFERENCES

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