

White Paper

**The Use of Agile Development
In Software Outsourcing**

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As the need to bring software products to market faster increases and the business priorities driving software development change continually, Agile Development has become more practiced by developers, and it is maturing.

OVERVIEW

Agile Development has become quite popular in the software development community. Its benefits and ability to achieve results are well documented. However, the applicability of Agile Development to software outsourcing, especially to offshore outsourcing, has not been thoroughly examined. We all know that methods and processes that work well in a collocation situation do not necessarily succeed in distributed teams, let alone when the teams are separated by 12-15 hour time zone differences and significant cultural differences.

In this paper, I briefly explain Agile Development and its state of adoption in the industry, focusing on the two most popular methodologies – Scrum and XP. I then explore the special demands of software outsourcing. I map these demands to Agile methodologies and explain how teams can succeed in implementing Agile methodologies like Scrum and XP in an offshore outsourcing scenario. Finally, I explore the relationship between software development platforms like Agile and software process maturity as stipulated by the CMMi model.

STATE OF AGILE DEVELOPMENT

VersionOne conducts an annual survey entitled “The State of Agile Development” to report on the status of organizations currently implementing or practicing Agile methods. Survey results are based on those that have practiced Agile methods in some capacity within their organizations. The results of the 2008 survey were compiled from questionnaire responses from more than 2,300 participants in more than 80 countries. The following are the highlights of the results:

- More than 95% of the companies participating in the survey use Agile Development.
- More than 60% of these companies have been using Agile Development for more than one year.
- 57% of the organizations have distributed Agile teams.
- Scrum is the most popular Agile methodology (49.1%) followed by hybrid Scrum/XP (22.3%) followed by XP (8%).
- The two most important reasons for adopting Agile were to accelerate time-to-market and to manage changing priorities.

In the rest of this section we shall overview both Scrum and XP and explain why they are popular with software development companies.

AGILE DEVELOPMENT METHODOLOGIES

Agile Development is the collective term used to describe more than ten software development methodologies. A development methodology comprises the processes, tools and procedures used to develop software in a standard and consistent manner across an organization. Scrum, Extreme Programming (XP) and Crystal Clear are typical Agile Development methodologies. Their common features are lightweight, iterative development and incremental delivery, as well as the flexibility to adapt to the changes in requirements.

SCRUM

Jeff Sutherland and Ken Schwaber developed the Scrum agile methodology in 1995. Since then Scrum has become the most popular Agile methodology. Scrum depicts three main roles: the Scrum Master who manages the entire process, the Product Owner who represents the stakeholders and the Team the implements the product. The Scrum process comprises three major concepts:

1. Product Backlog, which defines all the features and functions expected to be implemented in a product. This backlog is prioritized and estimated at a high level. It is then divided among iterations called Sprints. Typically, each sprint lasts 2-4 weeks (decided by the team).
2. Sprint Backlog, which defines all the features and functions that need to be implemented in a sprint. The idea is to develop a potentially shippable product by the end of each sprint. The features are estimated at a more detailed level and a daily plan is defined to implement all the backlog features by the end of the sprint. Each team member commits to his or her work items at a sprint planning meeting before the beginning of each sprint.
3. Daily Scrum Meetings, which enable the project team to track their progress and adjust the plan on a daily basis.

Progress of the work plan is tracked on a daily, iteration, and project basis. Based on progress, the project plan is adjusted for future sprints. This effectively enables project plan adjustment on a monthly basis. The feedback from the daily sprint meetings is used by every developer to adjust his or her work plan to guarantee they can accomplish what they committed to at the beginning of a sprint.

EXTREME PROGRAMMING (XP)

XP is a methodology that was first introduced by Kent Beck in 1996. XP emphasizes shorter iteration cycles (1-2 weeks) and is better suited for risky projects with changing requirements (typical of new products). XP emphasizes customer involvement and

very tight team collaboration. XP is based on a few simple concepts and very detailed planning, programming and testing practices.

The main concepts of XP are the following:

- 1- User stories, which are equivalent to use cases and comprise the basis for requirements and development estimates.
- 2- Release and iteration planning: based on the estimates of the user stories, a complete release plan is created and then divided up into iterations. It is crucial in release planning to let the technical team determine the exact estimates and then let the business user define which stories they want implemented based on the estimates.
- 3- Project velocity, which measures how much work is being done on a project. This is calculated by adding the estimates of all the stories that were completed in an iteration.
- 4- Stand-up meeting: used to communicate problems, solutions, and promote team focus. Everyone stands up in a circle to avoid long discussions and ensure a short meeting. Follow up meetings are set up with subsets of team members.

XP depends on detailed practices that team members have to follow, including pair programming, continuous integration, constant interaction with the customer, team ownership of code, extensive unit testing, and frequent refactoring of code.

From the above description, it should be clear why many organizations follow a hybrid of Scrum and XP. It seems to be the case that in many projects, Scrum project planning and sprint planning concepts work quite well, while XP programming and testing practices boost development productivity. The combination provides the best results in our experience.

SOFTWARE OUTSOURCING PARTICULARITY

Although the case for the success of Agile Development has been made numerous times, this success has not been equally explored in software outsourcing situations. Software outsourcing involves organizational and contractual delineation between the organization that is outsourcing its development and the organization that is providing the outsourcing services. When the service provider uses offshore teams for development, the divisions can be even greater. These include time zone differences and corporate culture/working style differences.

Having worked in the software outsourcing industry for almost a decade now, I have noticed that the trend among North American and European companies is to outsource longer-term projects and to use multi-year time & material (T&M) contracts

rather than shorter fixed price contracts. It seems that longer-term contracts suit their needs for confidentiality and are more cost effective for knowledge transfer, especially when the outsourced products are complex.

As the name implies, the price calculation of T&M contract is based on actual work time (person hour or person day). Intuitively one might think that because of that, the client would want to know exactly how much effort will go into a project and budget for that. This argues for a classical waterfall model where all requirements are defined ahead of time and the project is planned at the beginning with not much room for deviation.

However, the business reality dictates that many companies find themselves under severe time-to-market pressures. This results in the need to push products to market faster, even if these products are not very well defined. It is often the case that the company outsourcing development does not have clear requirements documentation, but instead they have high-level concepts and ideas that they want to materialize throughout the product development. This argues for a more iterative model where it is almost impossible to discern the exact work effort up front.

What complicates this even more is that clients often change their requirements significantly midway because of market forces. The push for time-to-market certainly has its price and clients often choose to take the risk of T&M contracts to make sure they have the flexibility of changing requirements. The service provider needs to be aware of this tension between flexibility and budgeting.

A good provider should help the outsourcing client by analyzing requirements as early on as possible and by developing software in a way that accommodates change without the need to sign new contracts every time requirements change. When requirements change, the provider can help the client by doing an impact analysis and re-doing the estimation to find the most cost effective way to accommodate the new requirements. This again argues for a more agile methodology of development but with an eye towards meeting budget and time constraints.

This mixed reality has resulted in the need for a much closer relationship between the client and the software outsourcing provider. Whereas it may be acceptable for small, non mission critical projects, to be “thrown over the wall” to a provider to finish, this certainly does not work for any important project. Instead, the client company and the service provider need to work as a joint team. Given the time zone differences and the corporate/working culture differences, it is prudent to adapt agile methods, which were primarily envisioned for collocated teams, to offshore outsourcing.

APPLICATION OF AGILE DEVELOPMENT TO OFFSHORE OUTSOURCING

As described above, the reality of most companies in North America and Europe creates a tension between needing a flexible development method where requirements change often and a planned method where the costs of development can be predicted and budgeted. Although a Waterfall model may be attractive because of its planned and rigid nature, which protects the provider from unreasonable requirements changes, it does not work in practice.

A modified Agile Development methodology can resolve the tension between planning and flexibility much better. Agile Development provides the flexibility through iterations and the ability to adjust the plan often, which are exactly what the client wants. The Scrum method, in particular, with its end-of-sprint demonstrations gives the client a clear idea of the progress and how the product is shaping up in a very incremental way. These demonstrations can be used for market validation of product functionality.

Another important pro for using Agile is that many client companies have started using Agile methodologies themselves, and thus they would rather that service providers use the same processes with which they are familiar. This makes the working relationship between client teams and provider teams easier.

However, the benefits of Agile Development can be achieved only IF (and it is a big "if") the client and the provider can structure a joint team that works closely together. As explained earlier, Agile methodologies stipulate that team members work much closer together than in a traditional Waterfall model. More importantly, they also require that the business owner (the client) and the team work closely together and interact often. This can be achieved relatively easily if the team is co-located. For example, having a short meeting that includes development, business owners and stakeholders every morning is not a problem in most collocated cases. But when there is a 12-hour time difference between the offshore team and the onshore team, this can be a major problem.

To solve this problem, I recommend an adjusted methodology based on the following main ideas:

- Project planning is done more rigorously than usual at the beginning of a project, with special emphasis on up-front requirements elicitation and analysis.
- The offshore development team follows Scrum and XP almost literally, with sprints, daily meetings, pair programming when applicable, etc.
- Provide client with daily reports that can serve the purpose of involving client teams in the daily sprint meetings. In addition, make the sprint backlog available to the client so that they can track progress on a daily basis.

- Conduct weekly meetings with the client to go over sprint details and any adjustments that need to be made.
- Conduct formal sprint demonstrations with the client at the end of each sprint and ship the sprint release to the client as if it were a finished product to enable the client to examine it and use for market validation.
- Provide client with weekly and monthly metrics to effectively measure productivity and progress.

In essence, I am advocating an Agile methodology with some additional Waterfall-like planning and status reporting.

We, at Objectiva Software Solutions, have used such a methodology on more than 80% of our projects with good results. Initially, there were challenges to get the client teams and our teams to internalize the methodology, but later on it became like second nature to them. We still find that we need to follow a more traditional methodology on some of our projects where requirements are much better understood.

THE INTEGRATION OF CMMI AND AGILE DEVELOPMENT

One of the major methodologies that outsourcing providers pride themselves on following is SEI's Capability Maturity Model Integration (or CMMi). According to the SEI, "CMMi is a process improvement approach that provides organizations with the essential elements of effective processes. It can be used to guide process improvement across a project, a division, or an entire organization. CMMi helps integrate traditionally separate organizational functions, set process improvement goals and priorities, provide guidance for quality processes, and provide a point of reference for appraising current processes."

In our view, CMMi and Agile Development are not contradictory, but instead can be combined in our adjusted methodology to achieve higher productivity, better quality, and more transparency. Objectiva Software Solutions has been certified at CMMi Level 5 for a few years now and we have been following CMMi's process control and improvement procedures. At the same time, our development teams have mostly followed Scrum or XP, as explained earlier. What CMMi5 brings to Agile Development is not only comprehensive documentation and strict process adherence, but it also adds quantitative metrics and methods to achieve higher customer satisfaction through the process of continuous improvement.

Let's take a real-life example from one of our projects at Objectiva. We will call this Project X to keep our client's identity private. The team implementing Project X inputted all the project's requirements, data and information into our corporate-level software management tool. From the tool, which is a result of us following CMMi 5

practices, we were able to produce daily, weekly, iteration (sprint) and project milestone cycle reports, and send them to the client. The generated reports included rate of progress, quality, productivity and other quantitative data that had been automatically generated by the central software management tool. Based on the quantitative indicators and the communication result with the client, we were able to fine-tune development process to improve all aspects of our process. After several years of experience integrating CMMI practices with Agile Development, we have proved that the combination helps organizations to monitor and manage projects more effectively, resulting in improved customer satisfaction.

DEVELOPING AN AGILE CULTURE

Introducing Agile Development into an organization is not a simple matter. At Objectiva, we have organized a series of training courses on Agile Development and how it works with the company's CMMi 5 processes. Every project team must take the training courses.

In addition to training, we altered our organizational structure to enable Agile Development. We created three bodies across the delivery organization:

- 1- Project Management Office (PMO), which oversees every project undertaken by Objectiva to ensure strict adherence to CMMi 5 practices. The PMO issued guidelines for Agile Development and integrated agile project management practices into its processes.
- 2- Technology Excellence Committee (TEC), which ensures technical excellence across the organization and is in charge of XP-inspired design, programming, and testing practices. It is the TEC that has lead the organization and all its projects to implement these practices until they became the mainstream.
- 3- Delivery Operation Office (DOO), which oversees all quantitative aspects of projects and all organizational metrics. The DOO enables project teams to use the central software management tools to develop comprehensive metrics that can be communicated to clients.

Having centralized bodies within Objectiva with the mandate to implement an Agile Development methodology that integrates well with our CMMi 5 practices was the crucial factor in our success. It is helpful to train the organization on a methodology but it is critical to have the organizational structure with the mandate to make it happen. Otherwise, one risks inconsistency in the implementation of Agile Development. Whereas this may be acceptable in regular software development organizations, it is detrimental in the software outsourcing industry because it affects the ability to improve customer satisfaction, a key success criterion for any service provider.

CONCLUDING REMARKS

Agile Development grew from the needs of software organizations to develop software products in a flexible manner that enables time-to-market and changing requirements. Since its introduction in the early nineties, it has been widely adopted by many companies worldwide. Scrum and XP have emerged as the two most popular methodologies and many organizations implement one or the other or a hybrid of both.

Although the benefits of Agile Development to a software vendor are clear, they are less clear for a software outsourcing provider that is accountable to a Time & Materials contract with a client. A natural tension exists between wanting maximum flexibility and needing to implement a project within strict budgetary and time constraints. To overcome this tension, we have adapted Agile Development to CMMi 5 practices, enabling us to provide not only the flexibility to our clients but also the strict process adherence and the quantitative metrics to provide the client with maximum transparency and oversight. In the end, the combination has improved customer satisfaction and resulted in higher quality and productivity.