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Review

Agile Methodology in Fixed Price projects

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Fixed price contracts are often considered very harmful and many agile adopters say that we should simply avoid them. But most of the time they cannot be avoided, so we need to find ways to make them work for the goal we have, which is building valuable quality software..

Keywords : Agile, fixed price, project, advantage, disadvantage, manage.

INTRODUCTION

In a world where the customer satisfaction is considered critical, the software development field is becoming more and more demanding. To retain and satisfy the customers we need to deliver the software in a lesser time, at low cost and good quality. The traditional approach has specific timelines for each life cycle of the project which may not be the best option to choose for some of the projects. To overcome this hurdles, different approach is required and Agile is one of the best approach for this.

Next Generation Software Engineering can be exercised in a very effective way if we can adopt a way of implementation which has solutions for almost all the problems that are experienced in the current and conventional methodologies. Agile Development sounds great, but if the implementation of this great invention is not exercised properly then it can ruin the execution of the project. We would require well defined testing methodology to cope up with this defined process. Such type of flexibility is seen in Agile Testing methodology.

There are two types of contracts - Time & Material and Fixed Price. Both are totally different in the way it is getting implemented in the project. Agile is typically suitable for Time & Material kind of contract. But by making proper plan and implementation, agile methodology can be effectively used in Fixed Price project.

The following points are detailed in this document which supports the effectiveness of Agile Methodology using Fixed price contract.

A. Different types of agile methodologies.
B. Agile vs Traditional methods of testing
C. Implementing Agile methodology fixed price
D. Pros & Cons of implementing Agile Methodologies in Fixed price projects

RESEARCH

The literature review revealed how to use the Agile methodology for fixed price projects by applying scrum practices.

In 2001 Agile Software Development Manifesto was published, this led to the “Agile” movement in software industry. The manifesto focused on the following points:

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

Agile Modeling (AM) is not a set of process that is implemented for the development of the project. It is more

like a methodology which uses a set of practices (approach) which is used for effective modeling and documentation of software systems. As with the points in the manifesto we can see that the approach of Agile testing is what in which it differs from the traditional testing.

"The Agile methods are primarily aimed at satisfying the customer with early and continuous delivery of quality software". Here the continuous delivery means that with the change in requirements at the various stages of the project are accepted and incorporated. This ensures that the project can be started with some requirements which can be refined over the process of development. Also, we follow an iterative cycle for development using agile methodologies i.e., one project may include the same stages of life cycle multiple times.

The following points illustrate how the agile methodologies are helpful and beneficent in development of projects with no well defined requirements:

Agile methods accept the changing requirements of the customer even at the later stages of development. This is very important for the project in which requirements are not well defined as it gives the scope for the later requirements that come up at a later stage in the life cycle.

In Agile methods, the life cycle stages are iteratively repeated. This means there will be a new iteration of life cycle for each new requirement coming up. This allows that the proper impact analysis of the new requirement is done. This ensures that less number of bugs is found during testing and thereby reducing the testing effort.

In Agile methods, the testers, developers and business team work together in coordination throughout the life cycle of the project. This ensures that the knowledge and requirements of the project are well communicated and ensure development of the right product. Also, the changing requirements can be well analyzed and communicated by each of the stake owners.

Agile methods measure the progress of the project by the working quality software. Thus the software at a given time is defined as good or bad based on the quality as per the requirements defined.

The approach of working incrementally to build the software reduces the cost of moving information between people. This also reduces the documentation effort.

HYPOTHESIS

Fixed price contracts are often considered very harmful and many agile adopters say that we should simply avoid them. But most of the time they cannot be avoided, so we need to find ways to make them work for the goal we have, which is building valuable quality software.

The following hypotheses were framed for the research study.

Hypothesis 1. Identify the estimation methodology for fixed-price agile projects

Hypothesis 2. To study the gap between classical functional requirements and User Stories

Hypothesis 3. To study the difficulty in handling change requests typical for agile projects with fixed budget

Hypothesis 4. To ascertain differences between document-oriented and communication-oriented practices

Hypothesis 5. To find the Complexity of embedding specific agile projects into traditional (waterfall) customer environments

Hypothesis 6. Measure the implemented scope and spent budget

FIXED PRICE PROJECTS – PROS AND CONS

For any contract, there should be minimum 2 parties get involved. Here in our case let us take it as Buyer and Seller. The below points describes the Pros and Cons of Fixed Price project for Buyer and Seller.

Pros for Buyer:

- The total cost of the project is determined at the time of starting and hence contract cost can be managed effectively.
- Contract is having clear statement of work, there is very little or no ambiquity arises during execution phase
- As the budget is fixed, risk of increase in cost is borne by seller/vendor.
- More precise forecast and prediction is possible

Cons for Buyer:

- Fixed Price contract may cost more
- As everything is controlled by the contract, if the wording of the contract is not proper, it may ruin the purpose.
- Most of the time fixed price project will be executed in collaborative way between the buyer and seller. So considerable amount of work should be done from buyer side from the beginning till end of the project.

Pros for Seller:

- Contract value may not be depend on number of resources.
- If the seller is self sustained with right skilled resources, profit will be more
- Most of the time fixed price project will be executed in collaborative way between the buyer and seller. So Buyer will acts as a partner.

Cons for Seller:

- If the estimation is not done properly, will ruin the project to a great extent
- Overruns will cause a dent to the profit.
- As everything is controlled by the contract, if the wording of the contract is not properly framed, it may create adverse consequences.

TYPES OF FIXED-PRICE CONTRACTS

1. Firm-Fixed-Price (FFP) Contract

As name suggests, FFP contract will not allow any adjustment. This contract type will result in exposing maximum risk and full responsibility for all the costs that results profit or loss. This favours the buyer to control costs with minimum administrative overheadsFirm-Fixed-Price (FFP) Level-Of-EffortTerm Contract

This type of contract is nothing but FFP with some level of adjustments. It can be used for R&D kind of work where work cannot be clearly defined.

2. Fixed-Price Contract with Award Fees

In this kind of contract, incentives will be given if the criteria are achieved by the seller. This is mainly to motivate the seller to achieve the target.

3. Fixed-Price Contract With Economic Price Adjustment

Fixed-price contract with economic price adjustment provides for any change in the contract price due to certain specified contingencies like adjustments based on established prices, adjustments based on actual costs of labor or material and Adjustments based on cost indexes of labor or material

4. Fixed-Price Incentive (FPI) Contracts

This type of contract will provide the provision of profit adjustment. The final TCV will be calculated based on the final agreed TCV and the total cost incurred. This kind of contract is more suitable where Firm Fixed Price is not suitable.

5. Fixed-Price with Prospective Price Redetermination

As name suggested, this kind of project will be having fixed-price in the initial phase of the project. Usually these kind of the contract will be used where negotiation can be made only for the initial phase of work. The contract for the subsequent phases can be decided based on the initial phase.

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IMPLEMENTATION OF AGILE IN FIXED PRICE PROJECTS

Before finalizing the decision to implement the Agile methodology in fixed price project, we need to get the answers for the below questions.

1. Is team exposed to the similar kind of projects earlier?
2. What level of Domain knowledge the team is having?
3. What is the level of team's technical knowledge?
4. Any risks that makes the project failure
5. What approach we are going to follow in the Agile Methodology?
6. What level of conversion needed to change from legacy process and methodologies to Agile?

Depending on the answers to the above questions, decision can be arrived whether the project can be executed as fixed price using agile methodology. The above answers also determine what kind of fixed price contract is suitable for the project.

CHALLENGES IN IMPLEMENT FIXED PRICE PROJECT IN AGILE

The main challenges to successful delivery of agile projects under fixed-price contracts are as follows:

1. Correct estimation of fixed-price agile projects
2. Gap between classical functional requirements and User Stories
3. Difficulty in handling change requests typical for agile projects with fixed budget
4. Differences between document-oriented and communication-oriented practices
5. Complexity of embedding specific agile projects into traditional (waterfall) customer environments
6. Tracking implemented scope and spent budget

CASE STUDY

About Client

Client is one of the largest auto insurers in the United States, with over 10 million policies in force. Progressive primarily offers its services through the Internet or by phone and through independent insurance agents. Client's Agency business sells insurance through more than 30,000 independent insurance agencies and progressiveagent.com where customers can quote their own policies and then contact an agent to complete the sale.

Business Need –Project

With the skyrocketing number of consumers using smart phones, Client wanted to extend their service to the customers using mobile applications. CSC as preferred vendor for Progressive, they selected us to develop a mobile solution. We have provided a rich suite of software combined with strategic consulting and managed hosting services to Progressive to develop and implement the right mobile strategy for them. With mobile solution (Mobile Quote & Buy 1X1), client unveiled new mobile offerings, giving consumers even more ways to buy and manage their auto insurance policies with the provision of adding 1 driver and 1 vehicle

About Project

This project is a kind of enhancement to the Mobile 1X1 project which will allow the user to add 3 vehicles and 3 drivers.

Type of Fixed Price Contact	Suitable for Agile	Comments
Firm-Fixed-Price (FFP) Contract	✗	High risk as it will not allow any adjustment
Firm-Fixed-Price (FFP) Level-Of-EffortTerm Contract	✓	Will allow some adjustment. used for R&D type of project
Fixed-Price Contract with Award Fees	!	Incentives will be given if the criteria are achived
Fixed-Price Contract With Economic Price Adjustment	✓	Will allow some adjustments based on specified contingencies
Fixed-Price Incentive (FPI) Contracts	✓	Will provide the provision of profit adjutment and hence risk of total failure of the project is reduced
Fixed-Price with Prospective Price Redetermination	✓	Can be used in initial phase to finalize the scope and based on the scope, subsequent phases can be re-determined.

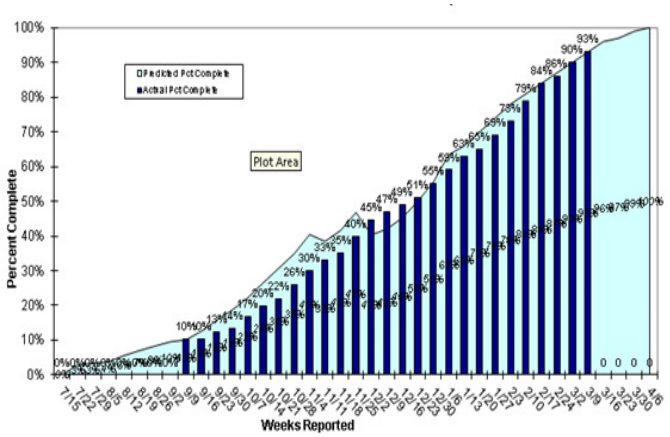


Figure 1. Actual vs. Predicted Percent Complete.

Before determining the contract type and execution methodology, we got the answers for the below questions.

1) Is team exposed to the similar kind of projects earlier?

a) Yes. Team already executed similar project earlier.

2) What level of Domain knowledge the team is having?

a) 50% of team is having domain knowledge.

3) Dedicated offshore BA is included in the project.

a) What is the level of team's technical knowledge?

b) 50% of team involved in similar project and having sound technical knowledge.

4) Any risks that makes the project failure

a) Identified the risks and came up with mitigation plan for that

5) What approach we are going to follow in the Agile Methodology?

a) Decided to execute in spirants

As all the above answer favors the fact that project can be executed with fixed price contract using Agile methodology, we have decided to go with the same.

Challenges

Although client is kind of enhancement to the existing 1X1 project, technically it is very challenging as there is an architectural level change. The requirement is to migrate from MVP pattern to MVC. This is almost like refactoring the entire 1X1 application.

To accommodate the above risk, we have increased the contingency reserve almost double that of normal limit.

While we have the scope fixed (in terms of points) we still want to embrace the change the agile way. We have the tools (user stories and points) which we can use to compare one requirement with another. This allows us to exchange requirements along the way within a defined scope limit. And if we can stay within that limit, we can also stay within the fixed price and time.

Initial Estimation

The hardest part in preparing a fixed price contract is to define the price and schedule that will be fixed based on

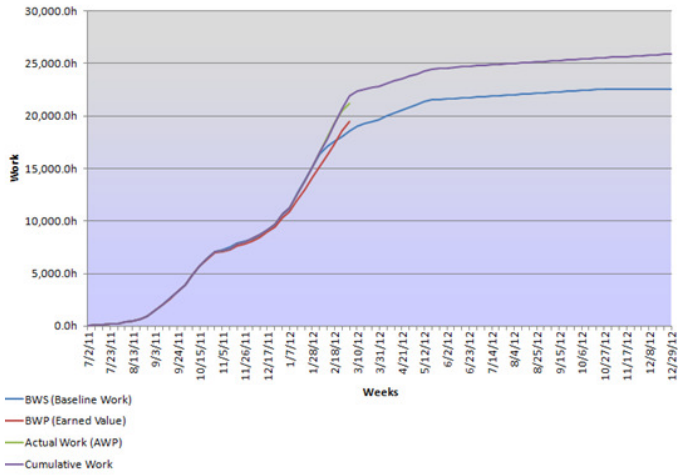
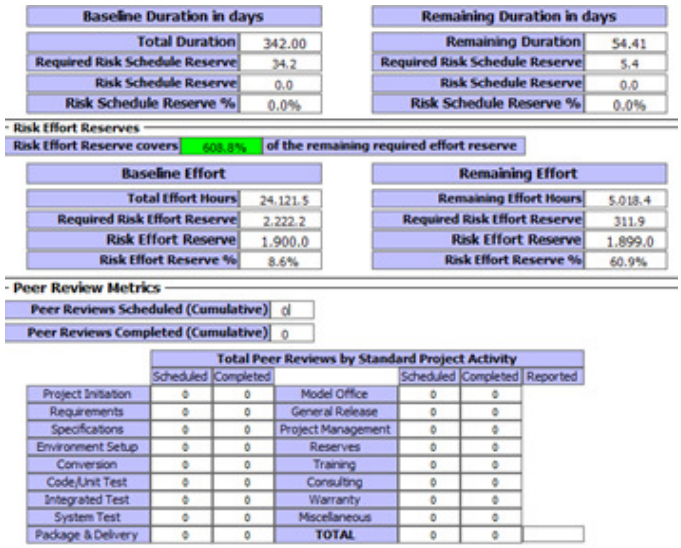


Figure 2. Time scaled Data Graph.



Baseline Duration in days	
Total Duration	342.00
Required Risk Schedule Reserve	34.2
Risk Schedule Reserve	0.0
Risk Schedule Reserve %	0.0%

Remaining Duration in days	
Remaining Duration	54.41
Required Risk Schedule Reserve	5.4
Risk Schedule Reserve	0.0
Risk Schedule Reserve %	0.0%

Risk Effort Reserves

Risk Effort Reserve covers 608.8% of the remaining required effort reserve

Baseline Effort	
Total Effort Hours	24,121.5
Required Risk Effort Reserve	2,222.2
Risk Effort Reserve	1,900.0
Risk Effort Reserve %	8.6%

Remaining Effort	
Remaining Effort Hours	5,018.4
Required Risk Effort Reserve	311.9
Risk Effort Reserve	1,899.0
Risk Effort Reserve %	60.9%

Peer Review Metrics

Peer Reviews Scheduled (Cumulative)	0
Peer Reviews Completed (Cumulative)	0

Total Peer Reviews by Standard Project Activity						
	Scheduled	Completed		Scheduled	Completed	Reported
Project Initiation	0	0	Model Office	0	0	
Requirements	0	0	General Release	0	0	
Specifications	0	0	Project Management	0	0	
Environment Setup	0	0	Reserves	0	0	
Conversion	0	0	Training	0	0	
Code/Unit Test	0	0	Consulting	0	0	
Integrated Test	0	0	Warranty	0	0	
System Test	0	0	Miscellaneous	0	0	
Package & Delivery	0	0	TOTAL	0	0	

Figure 3. Weekly Metrics.

the well-defined scope. -

We have split the complete requirement (user stories) into 10 sprints from Sprint 0 to Spint 9. Sprint 0 deals with requirement detailing and from Sprint 1 to Sprint 9 for development

We have taken up the plan to client and explain them how we are going to execute. The next step is to gather user stories. This is done by having s a time-boxed session. By this way we found - most of the stories forming the product

vision without falling into feature creep. At this we also discussed the definition of done for stories, iterations and releases with the client.

We also gathered the below information

- The environment in which stories should be tested (like the mobile device models/ mobile platforms/ operating systems)
- What kind of documentation is required
- Where should finished stories be deployed so that the client can take a look at them
- Expectations from client
- How often do we meet and who participates

Having discussed with the client a set of stories and a definition of done, we started the estimation. We have engaged all the key team members so that the estimation is done collectively. We ensured the estimation is done by the people who will actually implement the system that the stories are estimated by the people who will actually

implement the system.

For estimation the stories in points, we have used the Fibonacci-like scale (1, 2, 3, 5, 8, 13, 20, 40, 100). Relative estimation starts with finding a set of easiest or smallest stories. They will get 1 or 2 points as a base level for further estimation.

In fact during the initial estimation it was hard to estimate stories using the lowest values like 1 or 2. The point is, the higher the estimation, the less we know about the story. This is also why estimating in points is easier at this early stage, because it is far easier to tell that a story A is 2x as complicated as story B than to tell that story A will take 25 man-hours to get it completed and the story B will take 54 hours.

The result of the estimation is a total number of story points describing the initial scope for a product. We have fixed the total number of story points in terms of scope for the contract

Based on the initial estimation, we got a total 104 story points for the current release.

Fixing the Price and Time

Total number of points estimated based on the initial set of stories will not provide the TCV and timeline directly. To come up with the TCV and schedule we determined the below items

- The team's capacity on earlier projects (1 activity/week)
- The number of activities involved in the iteration – (identified as 7)
- Communication Channel with customer – Daily Standup meeting planned and who are all will be part of this meeting.

The following are the some of the challenges to come up with the timeline,

- The client wants the software as fast as we can do it. - Speed
- The client wants as much as we can do by the 6 months - Quantity

Scenario 1

In the first scenario determined the predicted time to finish using the formula:

Time = (<points> / <velocity>) * <Items in each iteration>

So in our example it would be:

Time = (104 pts / 1- pts) * 4 7 = 728 weeks

With 28 team members, we calculated the predicted time to complete the project as 6 months (26 weeks)

As 6 months duration is what client looking at, we have decided to go with these stories and came up with the budget calculations with the above numbers.

Tracking Progress and Budget

Tracking of the project schedule is done using MPP. The actual and ETC is captured in the project plan.

As of last week, SPI is 1.04 and CPI is 0.94 for this project.

Some of the metrics are given below:

CONCLUSION

The primary focus of software development is providing the customer the right software in lesser time. Also customer satisfaction plays a vital role. The project with the requirements not defined clearly may require an approach which address the various issues associated with it. Here, agile methodologies help us. Implementing Agile methodologies require due diligence, careful planning and helping the test team to integrate with dev and business analysts to work as a single entity.

The methodology presented in this paper may not address every software development problem, but it is a very profound step in the right direction. Based on the Agile Manifesto in fixed price presented in the paper, it makes a serious attempt at addressing many of the key problems with current software development processes by empowering and respecting the people who are part of the process and by taking a pragmatic and realistic approach to the software development business.

The reason behind the success for agile projects in fixed price mode are that we have all the developers, testers and business analysts in one place, contributing to the delivery for quality software in a very short time. Communications between the development and testing teams are more important. Discussions, both formal and informal, form the backbone of agile testing. Hence, given the right kind of work environment, it will be exceptionally beneficial to follow agile testing methodologies especially in projects where the requirements keep changing and the time to live is short.

Fixed price contracts are often considered very harmful and many agile adopters say that we should simply avoid them. But most of the time they cannot be avoided, so we need to find ways to make them work for the goal we have, which is building valuable quality software.

Actually, some aspects of fixed factors are even better for agile teams since we are used to working within time boxes and that is exactly what the fixed date in the contract (and also fixed price) are — just time boxes and boundaries. The only thing that actually bothers us is the scope and with this article we tried to gather together ideas on how to deal with that limit.

The intention of this article was not to suggest that agile is some ultimate remedy for solving the problem of fixed price contracts but to show that there are ways to work in

this context the agile way.

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