

UMD Project Management Symposium
Testing Validity of Agile framework on
Construction Project Management in the Middle East

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ABSTRACT

Agile is spreading! Although its origin has been in IT but recently an increasing number of forward-looking companies in different industries adopted agile techniques responding to market trends to sustain their competitive edge.

This research paper aims to demonstrate the validity of implementing the agile framework in the construction industry in the middle east arena. It will begin by a brief basic definition of agile manifesto going through some values and principles for its use.

Also, one of the main objectives of this study is to understand the difference between being agile and doing agile in an iterative or sequential project management process - witnessed in the construction field. Among many agile tools, the scrum master, one of the prominent agile techniques in construction, will be taken as an example to test the validation in a construction project. This will be illustrated in a case study in Egypt, showing and accepting all the challenges, understanding the concerns and presenting the results.

After going through the example, the research will let us question the validation of the agile framework, should we go agile or stay by the waterfall process in the construction industry!

INTRODUCTION

“Agile”, one of the latest ideas in management, has its roots in IT, where it’s used as a method for developing software. In recent years it has spread beyond IT departments to become an operational mode for an increasing number of forward-looking companies that want to respond to market volatility in ways that create competitive advantage. With this background in mind, some construction companies are enhancing the performance of their project teams to improve their competitiveness and increase the added value to their clients and themselves.

This paper aims to look into the implementation of an agile tool like scrum framework from the IT sector into the construction industry. Conducting a case study, the implementation and application of Scrum was analyzed through the evaluation of its different artifacts. This research covers the following questions: Can Scrum be implemented in the design phase of the construction industry? What adaptations are needed to use Scrum to improve the design phase of construction projects? How and where could Scrum, or parts of it, be used by the design and planning departments of construction companies?

In the construction industry, one of the biggest challenges when creating a building is to account for the unforeseeable. In order to reduce the number of unforeseeable events, project managers typically use templates, checklists and often models with phases, sub-phases and sub-sub-phases, as indicated for example in. This so-called sequential project management approach aims to plan the project in detail and tries to carry it out without any deviation. The creation of this plan often takes up significant resources before the actual construction has even started. In many cases, these processes are so long that by the time the execution phase has started, the plan needs to be revised because of modified project requirements. Constant modifications of the project requirements coupled with occurring problems in defining the original product requirement causes cost overruns and schedule delay and lowers the product quality. As a countermeasure, agile project management was created, whereas agility is defined.

The results from this study show that Scrum has great potential in the design and planning departments of construction firms. From the analysis of the applications of Scrum in the case study, tangible benefits and weaknesses of the implementation, and its different artifacts, were identified. Finally, this paper gives recommendations about the use of Scrum in the design phase and proposes an outlook to implement Scrum in other phases of construction projects.

BASIC AGILE DEFINITION AND WHY WE USE IT

By definition, agile is an iterative approach to project management and software development that helps teams deliver value to their customers faster and with fewer headaches. And it was evolved due to the need for quick and responsive actions in order to adapt to change requirements. And change here can reflect risk or any unforeseeable events. The agile team delivers work in small, but consumable, increments.

More than fifteen years after its founding, agile practices remain as relevant as ever and the businesses that embrace agile continue to lead the pack.

AGILE MANIFESTO VALUES AND PRINCIPLES

Agile is the ability to adapt and respond to change. It is the way of handling, and ultimately succeeding in an uncertain conditions and turbulent environment.

It's really about thinking through how you can understand what's going on in the surroundings, identify what uncertainty you're facing, and figure out how you can adapt to that as you go through the process.

The Agile Manifesto incorporates 4 foundational values and 12 supporting principles which lead the Agile approach to software development. Each Agile methodology applies the four values in different ways. The 4 values are:

1. Individuals and Interactions Over Processes and Tools

Appreciating people more than processes or tools because it is the people who respond to business needs and guide the development process. If the process or the tools drive development, the team is less responsive to change.

2. Working Software Over Comprehensive Documentation

The list of documents was extensive and was a cause for the long delays in development. Agile does not neglect documentation, but it organizes it and summarize it to the developer to know what is needed without getting decelerated. Agile documents requirements as user stories, which are sufficient for a software developer to begin the task of building a new function. The Agile Manifesto values documentation, but also it values working software more.

3. Customer Collaboration Over Contract Negotiation

With development models such as Waterfall, customers negotiate the requirements for the product, often in great detail, prior to any work starting. This meant the customer was involved in the process of development before development began and after it was completed, but not during the process. The Agile Manifesto describes a customer who is engaged and collaborates throughout the development process making. This makes it far easier for development to meet their needs of the customer. Agile methods may include the customer at intervals for periodic demos, but a project could just as easily have an end-user as a daily part of the team and attending all meetings, ensuring the product meets the business needs of the customer.

4. Responding to Change Over Following a Plan

Traditional software development regarded change as an expense (change request), so it was to be avoided. It aims to develop detailed plans, with a defined set of features and with a large number of dependencies on delivering in sequence so that the team can work on the next piece.

In Agile process, the time taken in one iteration means priorities thus it can be shifted from one iteration to another with the addition of new features in the coming iteration. The agile view is that changes always improve a project; changes provide additional value.

Perhaps nothing illustrates the agile positive approach to change better than the concept of Method Tailoring, defined in An Agile Information Systems Development Method in use as: “A process or capability in which human agents determine a system development approach for a specific project situation through responsive changes in, and dynamic interplays between contexts, intentions, and method fragments.”

Here are some important agile 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.
5. Build projects around motivated individuals. Give them the environment, support and the trust they need.
6. The most efficient and effective method of conveying information is face-to-face conversation.
7. Working software is the primary measure of progress.
8. Agile processes promote sustainable development.
9. Continuous attention to technical excellence and good design.
10. Simplicity—the art of maximizing the amount of work not done—is essential.
11. The leading 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.

The intention of agile is to orient development with business needs, and the success of Agile is apparent. Agile projects are customer focused and encourage customer guidance and participation. As a result, agile has grown to be an overall view of software development throughout the software industry.

TYPES AND DIFFERENCES BETWEEN AGILE TECHNIQUES

Agile is everyone's favorite project management and delivery buzzword, but what agile techniques can you use to help successfully run an agile project? Is it Scrum, Kanban, Scrumban, or other hybrid agile methods? Here is a comparison between scrum and kanban, most common tools.

Comparative analysis between Scrum and kanban

	Scrum	kanban
What	a process that helps to deliver the business value in the shortest time. It rapidly and repeatedly inspects the actual work. It emphasizes on teamwork and iterative progress.	a visual system for managing work. It visualizes the process and the actual work. It identifies potential bottlenecks in the process and fix them. its goal is to handle the work process smoothly at an optimal speed.
Why	it addresses complexity in work by making information transparent. These help team to inspect and adapt based on current conditions, instead of predicted conditions.	designed to meet minimal resistance. It allows continuous small incremental and evolutionary changes to the current process to achieve improvements.
When	used in a project where the requirement is rapidly changing. It works on a self-organizing, cross-functional team principle.	help the team to understand complex information like processes and risks associated to complete work on time.

From this comparison, we can come up with the fact that, the construction industry by nature is very demanding in requirements and it happens to have many change requirements by various stakeholders and new conditions that may appear while doing the work. Accordingly, scrumming in construction is the best tool for using agile.

SCRUM IMPLEMENTATION IN CONSTRUCTION PM

Scrum is a framework for product development where different processes and techniques can be applied to complex projects. A typical Scrum framework is illustrated below. The Scrum framework consists of the Roles, Artifacts and Events.

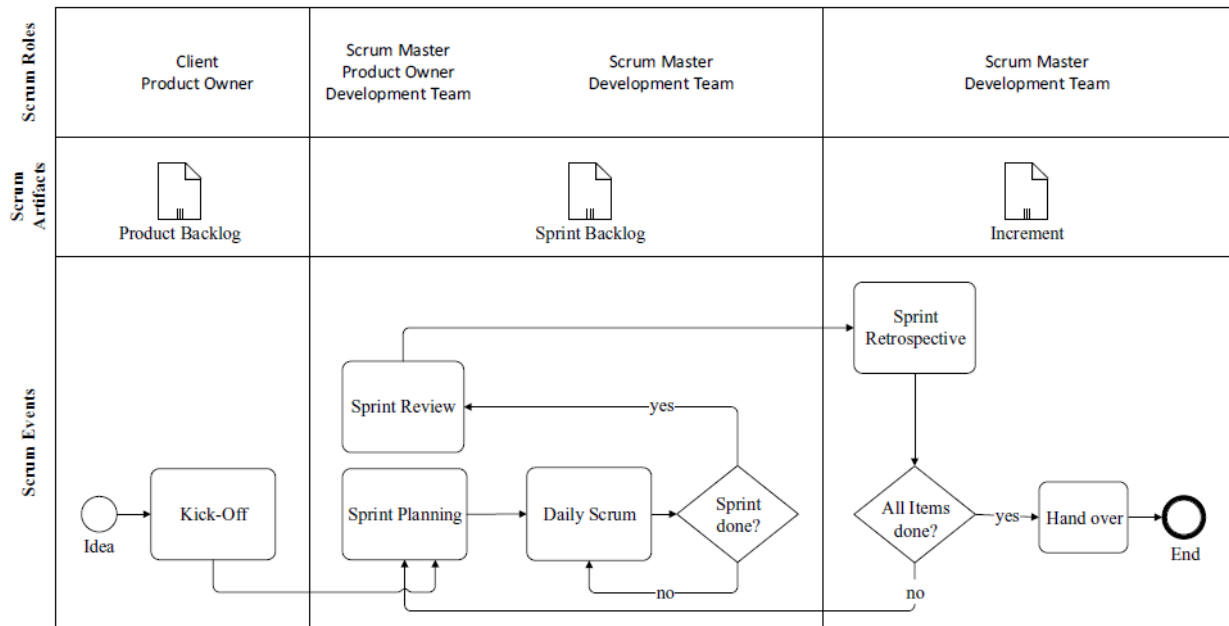


Figure 1. Scrum Framework

Scrum Roles: simply, roles are mainly the key project’s stakeholders which consists of the client (product owner), scrum master and the development team.

The product owner, is the one representing the client and he is responsible for maximizing the project value. He is in charge of creating, updating, and prioritizing the Product Backlog Items. In addition, other responsibilities include optimizing the work performance of the Development Team, to ensure that the Product Backlog Items are clear, transparent and understood by everyone. Also, he takes into account other stakeholders’ interests and is the only one who can make changes to the Product Backlog Items.

The scrum master, is the one who sets all the Scrum Events and demonstrates to individuals outside the Scrum Team how they can / can’t interact with the development Team. He is mainly in charge of removing any obstacles brought to the Scrum Team so that the Development Team can focus on their work and are not slowed down by insignificant changes. He also enforces the framework given by Scrum and the changes made considering new information.

The scrum development team, are the individuals who actually do the work. All team members are all equal (no project manager), self-organized and cross functional.

The number of team members varies depending on the area of operations, but a size of seven (\pm two) members has proven to be successful.

Scrum Artifacts: these are mainly the documents issued by the scrum roles and they are described as elements within the scrum framework. These elements as shown in the figure above are as follows

The product backlog: issued by the product owner in which you can find all the various items categorized by priority. These product backlog items are then sliced up into tasks. These tasks as defined by the PMBOK as the work packages addressed by the development team member and ideally it should take from one to two days to be submitted.

The sprint backlog: this contains a list of some items that are selected by the product owner and the development team from the product backlog. The team choose these items according to their beliefs (planning poker) that they can reach the state of done during a Sprint. When an item is checked as done, it is then moved from the sprint backlog to the increment section. Hence, the increments part is a total of the checked as “done” items.

The Development Team approximates the amount of work needed using points instead of time (ex: man-hours). This is done because Gantt-Charts are never accurate so there is no point to assume a number of hours for a task if it is not going to be met. For example, these points merely stipulate that an Item with an eight is more work than an Item with a three or five. However, this information could be used at a later time by the Product Owner to estimate project durations (ex: completion dates).

Scrum Events: its main objective is to uphold to the scrum keys factors mentioned earlier, transparency, adaptation and inspection.

Normally, a Kick-Off meeting is held – based on the client’s demands – and the Product Owner documents the Product Backlog to fulfil all requirements.

The Sprint Planning has a maximum duration of 8 hours for a Sprint. During this Planning phase, the Development Team guesses the amount of work for the most important Items of the Product Backlog with Planning Poker. After that, they choose the Items they think can be done in the Sprint, starting with the most important one; this list is called the Sprint Backlog. While considering all the Items from the Sprint Backlog, the Sprint goal has to be defined. This enables the Development Team to

always ask themselves and inspect: Is this work I am currently doing really necessary for this Sprint to reach the goal?

After finishing the sprint planning, the Development Team can start working on the Items during the Sprint in a fixed timeframe in which it aims to reach completion for each Item. During the Sprint no changes are permitted to the Items, unless the value or the scope of the items is increased, and this has to be consulted with the product owner. By the end of the Sprint, the items that were not completed are moved to return back to the Product Backlog and will be re-assessed in the next sprint.

The framework displayed in the above figure uses incremental steps on a daily basis which we refer to it as Daily Scrum, to finish the sprint and corresponding Product Backlog. The key advantage of this progressive approach is that focusing on one task always leads to speeding up the process of work completion.

The use of Scrum has proven treasures in projects with high complexities especially those where the requirements are not yet very mature as will be elaborated in the following case study.

CASE STUDY IN EGYPT – SUEZ CENTRAL HUB

In Sinai - Egypt

Briefly the project was about creating a new canal, parallel to the existing one, to maximize benefit from the present Canal and its by-passes, and double the longest possible parts of the waterway to facilitate traffic in the two directions and decrease the waiting time for transiting ships. This will certainly reduce the time needed for the trip from one end of the Canal to the other, and will increase the numerical capacity of the waterway, in anticipation of the expected growth in world trade.

The Egyptian armed forces helped in digging and designing the canal. The enlarged capacity allows ships to sail in both directions at the same time over much of the canal's length. Beforehand, much of the canal was only one shipping lane wide, with limited wider basins for passing. This is expected to decrease waiting time from 11 hours to 3 hours for most ships, and to increase the capacity of ships to pass along the Suez Canal from 49 to 97 ships per day.



Figure 2. Suez Canal Master Plan – before and after

Project Initiation: On August 5, 2014, with no previous planning or studies; Egypt president announced the actual start of constructing a new water channel 72 km long branching from the already existing Suez Canal, deepening the current shipping lane and developing the entire Suez Canal axis, with the objective of developing and broadening the role of the whole area economically, urban and environmentally integrated global logistical and industrial center and seeks to make a central hub in that area. This project will sustainably compete globally in the field of logistic services, trade and tourism. Normally, a big project like this should take three years on average in excavating the new water channel and developing the surrounding area, but due to the complex political situation at the time, it was announced by the President that this project should not take more than one year, so it has to be submitted around the same time in 2015. As the revenues of the canal will increase from 5 billion dollars to 12.5 billion dollars annually. Therefore, on August 7, 2014 (2 days after the announcement) they started the dry drilling phase. This is the point where technical problems started to arise due to the type of soil and no soil samples were taken to be examined before excavating. Further difficulties were like seepage of the old canal to the new one which led to flooding!

At the end the project was submitted on two phases. Phase one was in February 2015, it includes constructing the city, industrial zone, technology valley and fish farms.



Figure 3. Building Phases

Then phase two in July 2015, it includes the new water channel and deepening the old one with a total cost of 30 Billion Egyptian Pounds.

CONCLUSION

I believe that Scrum could also be applied in the construction phase with Daily Scrums on-site to reduce waste of time. For example, Daily Scrum could be useful to inform construction companies about the work progress and the daily goal (Sprint) of other construction companies also working on site.

Agility in mindset is a key strategy going forward. And the ability to manage that change successfully separates good organizations from ones who are not competitive. If you take these three foundational tenets; change management, innovation and organizational alignment and you blend them together along cultural aspects, that basically is the foundation for a successful project management, explained by Prof. Paul Tumolo, MBA, Harvard University

Needless to say, that it is useful to study new tools and techniques but also its more important to learn best practices because being agile when it comes to construction or any sequential projects is not any more about applying the tools, however it's about adapting the mindset to continuously improve and develop the process.

KEY TAKEAWAYS

Hence the case study was extremely challenging yet it was delivered successfully, here are the takeaways

- Learn the difference between being agile Vs doing agile
- Mindset flexibility and tailoring are significant factors in the construction field
- Innovation & tailoring is a key point in project management

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