IMPLEMENTING AGILE PROJECT MANAGEMENT (SCRUM) IN REAL ESTATE PROJECTS

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Abstract

At present, project management is a highly discussed topic. The way of project management methodology has not changed significantly from the 60's. in different sectors, construction market, technology, and the way project are procured today has changed. This situation leads to a problem, where a managerial perspective and how construction projects are executed has a large gap in between. This is the reason to change and looking for new project management approaches in the future.

Basically, the agile project management approach is adopted from the IT department, from where it has grown through empirical processes. It is mainly suited for complex projects, where it is difficult to specify requirement and final deliverables in advance. It is adopted by so many industries other IT department, where are able to detect the problems by repetitive tests and constant improvements. This thesis has researched, what are the opportunities and benefits to implement an agile project management approach in the construction phase (execution phase) of any building project.

There are many advantages found of implementing an agile approach to increase participation of each member of the development team in the project compared to the present situation. Moreover, it increases client's involvement and more focused employees group. On the other hand, it decreases delay, uncertainty, and risk involved during the construction phase. it is also focused on time management and regular meetings, that will be beneficial to keeping track of the project's progress.

Keywords: Agile project management, Scrum, Construction phase, Real Estate projects, Construction phase
JEL code: O22

Introduction
"Project management is today a current area undergoing intensive development."
(Tonnquist, 2006)

Project management is a key to finding the way of managing, controlling and co-ordinating any size of the projects by choosing working methods, defining project roles, simplifying project reporting and constantly following project planning from designing to completion of the project. Today, project management often affects the entire organization, be it a small company or a larger public company.

It's been half a century of managing projects with using traditional methods and on which the construction project relies. The actual way of managing projects have changed now. There is a gap between a traditional view on managing construction projects and new methods of managing projects that creates uncertainty within the company and the people working there (Owen, Koskela, Henrich & Codinhoto,2006). People today are sometimes aware that they are working in a way that does not always confuse the management view. Investigating and defining how projects are actually managed and executed today can reduce uncertainty and confusion (Streule, Miserini, Bartlomé, Klippel, & De Soto ,2016).

In the construction phase of a project, when all the things are designed and planned, a possibility of influencing design and planning is very low. Moreover, the amount of money spent increases constantly in this phase. Once the construction phase of the project starts, not recognizing the mistakes and errors may become very costly in term of time wasted and in money spent. So, it is necessary to observe these mistakes and errors to make them unrepeatable (Cervone, 2011).

Agile project management

"A traditional project manager focuses on following the plan with minimal changes, whereas an agile leader focuses on adapting successfully to inevitable changes."
(Jim Highsmith, Agile Project Management: Creating Innovative Products)

Agile project management has its roots in the software development industry, and it has developed through empirical progress. This methodology's uses are not limited to that industry. It defines values and principles, that can be adopted by other industry as well. Moreover, it includes different tools and methods of conduction a project, which will lead to follow its values and principles. The agile methodologies are widely used by the software development industry where the customer recognized his need and improving it by repeated tests (Owen, Koskela, Henrich & Codinhoto,2006).

"Agile is a substantial and nuanced change to the way you think about doing things. It's an organizational change."
(Justin warren, PivotNine, Melbourne, Australia)

Agile project management is majorly focused on two things: Adoption to change during the task and Collaboration between people within an organisation.

Introduction to SCRUM

Initially, the scrum approach was applied to software product management. Scrum was taught first time in mid 80's of 20th century, when two Japanese professors from management practices Hirotaka Takeuchi and Ikujiro Nonaka have published an article "New production development game". They wanted to improve production processes by working with people from different areas of an organization work together as a team. These teams conduct a complete development from the beginning to end. They have argued that this had a negative impact on the productivity and delivering quality within the teams. This approach to management is called "rugby" approach. Where the team works together, passes the ball back and forth and moves as a unit. That term is known as Scrummage & from that the word "Scrum" is derived. After some years, two American software developer Jeff Sutherland and Ken Schwaber jointly represented a framework for product development at a conference held in Texas in 1995, which they called Scrum and That was mainly focused on the software industry. After successful implementation, it gained knowledge and experience to work with it in other industries (Shwaber, 2004).

A Scrum project involves a collaborative effort to create a new product, service, or other result as defined in the Project Vision Statement. Projects are impacted by constraints of time, cost, scope, quality, resources, organizational capabilities, and other limitations that make them difficult to plan, execute, manage, and ultimately succeed. However, successful implementation of the results of a finished project provides significant business benefits to an organization. It is therefore important for organizations to select and practice an appropriate project management approach. It is one of the most

popular Agile methods. It is an adaptive, iterative, fast, flexible, and effective framework designed to deliver significant value quickly and throughout a project. Scrum ensures transparency in communication and creates an environment of collective accountability and continuous progress (Satpathy, 2013).

Need for Study
There is a large number of money invested in construction projects. These projects actually shape our city and surroundings. A traditional concept of management, the responsibilities and authorities are defined in a hierarchy, so if a middle level chain is broken than the ground level subjects are failed. In agile concept, the basic belief is to keep all responsibilities & authorities on the same level such that even if there is a failure in single subject, the remaining subject can work efficiently in their sectors. The basic concept of management is that the number of people & activities to be managed are directly proportion to the no. of problems and issues to be addressed in management. Agile management could be beneficial in minimizing the delays in construction sector such as faults in execution, hoarding of technical instructions, poor planning, misconduct in material usage etc.

The purpose of this research is divided into three parts: (I) To introduce the agile project management tools to construction projects. (II) To compare data with the traditional approach of construction industry to see what benefits are there. (III) To explore what PSP Projects Pvt. Ltd. might gain by implementing agile project management (Scrum) during the construction phase.

The scope of work is limited to the construction phase of projects. It also limited itself to comparing the agile project management approach with the traditional approach of the construction industry. However, changing a system and implementing a new management method is a big issue that needs to be further explored and that is discussed briefly in this research. Following is the research question and the topic of this paper:

What are the impacts of implementing an agile project management approach (Scrum) in the execution phase of real estate projects? Following question has to be investigated to get possible answers:

What are the odds to implement Scrum in the execution phase of real estate projects?

Research Methodology
Research method for this research is consist of two parts: Questionnaire survey form and Data analysis of scheduling for chosen case studies. As a part of quantitative research, Questionnaire survey form is designed in such a way that we might get ratings on factors identified during literature survey. However, these rating shows the value which can be used as a data to evaluate performance of agile project management systems. Hence, it is necessary to attach a logical qualitative analysis for evaluation by making this research using mixed method approach. While using mixed methods, the comparison of case studies should be contrasting to get the ultimate understanding. For qualitative part, Taking into consideration two case studies of building projects of Gujarat, India, where in Scrum is being used in construction phase of the projects and one case study is selected being managed by traditional/waterfall project management in the construction phase.

PSP Projects Ltd. is a multidisciplinary construction company offering a diversified range of construction and allied services across industrial, institutional, government, government residential and residential projects in India. They provide services across the construction value chain, ranging from planning and design to construction and post-construction activities to private and public sector enterprises. Historically, they have focused on projects in the Gujarat region. Over the years, They have successfully executed a number of prestigious projects across Gujarat. More recently, they have geographically diversified their portfolio of services and are undertaking or have bid for projects pan India. Since their incorporation in August 2008, they have executed over 71 projects as of November 30, 2016 (PSP Projects Ltd, 2017).

Data Collections
Questionnare Survey Form
Questionnaire survey form is prepared based on the literature study. While doing the literature study, some of the important questions, topics and data was observed. The data observed from literature study was categorised further into topics it belongs. Based on the data observed, the entire survey form was divided into two parts: (I) Respondent's personal details and project details, (II) Scrum survey

Respondents are limited to the people working in construction industry and has knowledge about an agile project management tools or Scrum.

The most important questions was about rating factors that are identified from literature study. The reason to include these 7 factor is, I have observed some statements that are supporting the agile project management approach and these factors were completely in contrast to the methodology of traditional/waterfall project management approach during the literature study. By rating these factors, we might get results about the importance of these factors as per the users. The factors that are identified from literature study are: (I) More communication within team, (II) Participation of each member, (III) Few levels of management, (IV) Widely shared information, (V) Adaptive to change, (VI) Continuous improvements, (VII) Self-controlled teams.

Case Studies
The major reason of doing this research is to compare on-site scenario during implementation of an agile project management. As a part of quantitative research, selection of case studies was very difficult. The reason is there are only few companies in India, which are using Agile project management approach/Scrum in any phase of project. Propitiously, PSP Projects Ltd were using agile approach in some of their projects within Gujarat. Further, this research will represent project management approach in terms of progress, all data regarding project progress and schedule have been collected from respective site offices. *Table I* shows the project details and basic scrum details:

PSP Projects Ltd. is a contracting firm, therefore, execution phase was conducted by themselves on each project. From the above table, the management teams of One42 and IBIS Brigade hotel were managing their project using SCRUM in the construction phase and the development team of bSafal Seventy was managing their project by

following traditional project management approach. Number of labours and area of construction differs in terms of the scale of projects. Depend on the size of the project and development team, number of scrum master is being finalise. The ideal size of development team is 5-10 per scrum master. Whereas, planning engineers are playing the role of scrum master.

Table 1.

Project details and Scrum details

DETAIL	ONE 42 AMAYA PROPERTIES	IBIS BRIGADE HOTEL	bSafal Seventy
PROJECT DETAILS			
Location	Ahmedabad	GIFT city, Gandhinagar	Ahmedabad
Client	Farpoint Properties LLP	Brigade Group	Safal Engineers and Realties
Contractor	PSP Projects Pvt. Ltd.	PSP Projects Pvt. Ltd.	PSP Projects Pvt. Ltd.
Type of Project	12 storey Commercial towers	9 storey Hotel Building	18 storey Residential towers
Current PM methodology	SCRUM	SCRUM	Traditional/Waterfall PM
Project Start Date	28th April, 2017	30th April, 2017	8th June, 2016
SCRUM DETAILS			
Scrum Master	Planning Engineer	Planning Engineer	-
No. of Scrum Master	1	2	-
Development Team Size	10 Engineers	12 Engineers	10 Engineers
Daily Scrum meeting time	9:30 AM	9:30 AM	-
Duration of Daily Scrum Meeting	15 to 30 Minutes	15 to 30 Minutes	-
Date of Implementing Scrum	1st September,2017	12th September, 2017	-
Sprint Duration	Floor to Floor Cycle	Weekly cycle	-
Sprint Meeting time	Once in a Week	Once in a Week	-
Sprint Meeting Duration	1 to 2 hours	1 to 2 hours	-

Source: *Author construction*

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Daily scrum is the most important aspect for a systematic follow up Scrum. Sincerity and regularity is must in terms of daily scrum. One of the directors of PSP Projects Ltd. introduced Scrum to the planning head and project manager in mid 2017. The planning head and project managers were told to implement Scrum in ongoing project to see the results in terms of progress. So, after researching and knowing Scrum properly, they have short-listed two projects to implement this new methodology. Both of the projects were delayed in their initial stages. Moreover, we can see the difference between two projects in terms of documentation, reporting and for proper follow up. Both the projects had their individual daily scrum formats and sprint review methods.

Format of Daily SCRUM and Sprint Review

The format was prepared to keep track on daily scrum meetings. For One42 project situated in Ahmedabad has no such format for daily scrum meeting. On the other hand, IBIS Brigade hotel have prepared a format to document daily scrum meetings. Format is shown in *Annexure 1*. In which, the presence of each member is marked by scrum master and detail of work is being written in front of their names every day. Whereas, On One42 project, development team prepares a sprint review files which gives details about the particular sprint or duration of activity. Format of sprint review document is given in *Annexure 2*.

Data Analysis

Questionnaire Survey Responses

The questionnaire survey form was only for targeted group of people only, as mentioned in chapter *Data collection*. As very few people were aware about this topic, numbers of respondents were comparatively low. The questionnaire was sent to 35 respondents. From which, 26 people read the questionnaire, but only 23 people have actually completed the questionnaire form. Therefore, the total number of respondents are 23, resulting in a good response rate of 65.7%. Out of those 23 successful respondents, their roles on projects were, 7 project managers, 4 scrum masters, 4 planning engineer, 3 quality engineers, 3 site engineers, 1 development engineer and 1 electrical engineer.

As mentioned above, respondents were chosen as per their knowledge about an agile project management/scrum. Despite having knowledge about scrum, 3 respondents were using traditional/waterfall project management on their project. While, rest of the 20 respondents were using Scrum on their projects. Ultimately, the implementation rate of scrum is 87% and from them, **100% respondents have agreed that scrum is successfully working on their project**. They were asked to rate the success factor for scrum on their own project between 0 to 5. **The average success factor for scrum were derived from all the responses and the success factor was about 4.26 out of 5**. They also agreed to implement scrum in more projects of their organisation/company.

Development team plays the most important part in success of any project. They have to be more focused and productive towards the project. For that, scrum suggest to employ more qualified and experienced team members from various departments for better understating of project. Another important process that scrum defines is "Daily scrum meeting". Daily scrum is all about regularity, sincerity, more communication and to keep everyone updated about the project. Scrum defines the size of development team should be between 6-10 for better implementation. As per the responses, 16

respondents had the size of development team between 6-10, 5 had between 11-15, 1 for more than 15 and less than 5 each. So, 69.6% users were following ideal scrum development team size. They were also asked questions about daily scrum meetings to know the regularity of users. And the response rate was quite good as 95.7% (22) users were conducting daily scrum meeting on regular basis, majorly in the morning time. which is the best time for daily scrum meetings in construction projects.

7 Factor's Analysis

This question was focused on user's perception about these factors and they had to rate each factor. The scale ranged from 1 to 5 wherein, 1 indicates 'not at all important' and 5 indicates 'extremely important'. The outcome of the survey would highlight perspectives of individuals regarding the kind of environment the development team would like to work within. Along with that, it would also hint on the satisfactory levels of the respondents regarding the traditional project management or they want to improvise/ suggest changes in the existing management approach. Figure 1 shows a list of factors identified during the literature study.
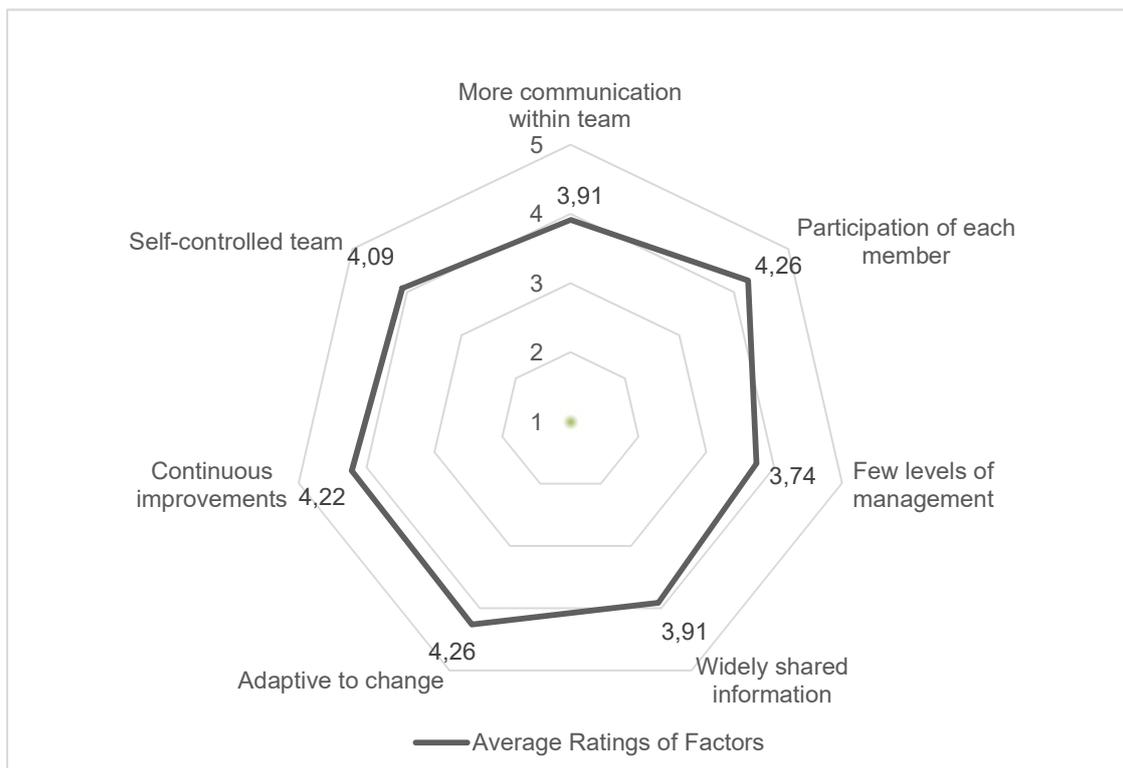
Fig.1 **Average ratings of 7 factors**

Source: *Author's construction*

Anyone can extrapolate by seeing the result of this survey, the positive responses might lead people to adopt agile approach and negative responses leads people to follow

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existing waterfall project management approach. The above figure shows the average rating that all 23 respondents gave to each factor. As per this graph, we can assume that every factor gets the ratings between 3.5 to 4.5. We can assume from the results that all the 7 factors play very important role in successful implementation of agile project management/scrum as a project management methodology in construction industry.

Analysis of Case Studies

Types of quantitative analysis to be performed on the data are : (I) Progress using SCRUM vs. Actual planned progress (Burn-Down chart), (II) How to reduce delayed work over given execution time period? (III) Comparison of Case studies in term of following methods, tasks for reducing delay and progress.

BURN-DOWN CHART

In construction industry, there are multiple ways to keep record of project progress. Generally, Planning team generate Daily progress reports and S curve graphs (Burnup charts) for scheduling. Daily progress report gives information about the progress going on projects for a particular day and S curve gives information about Planned progress to Actual progress of the project. S curve generally starts from zero to the amount of work done. So, we can know the amount of planned work to the amount of actual work done till the date. However, Scrum suggest to prepare a burndown chart.

The main function of burndown charts are as similar to S curve. Burn down chart are also prepared to keep track of planned versus actual work done on site. However, burndown chart shows the amount of work remaining over the particular time. The burndown graph is an excellent way to visualize the correlation between the work remaining at a given time and the progress of project teams in reducing that work. The intersection of a trend line for the remaining work and the horizontal axis indicates the most likely completion of the work on planned period of time. The burndown chart helps planning and execution teams with "what if" project by adding functionality and removing it from the version to get a more acceptable date or to extend the date with more functionality. The burndown graph is the collision of reality (the amount of work done and how quickly it is done) with what is planned or hoped for.

As shown in Figure 2, sprint is prepared from the Microsoft Project file. Planned data was taken from the Microsoft Project file and Actual data was taken from daily progress reports. By using given data, two lines are generated in the graph. Which are, planned burndown and actual burndown lines indicating work remaining in the project. If planned line is below actual line than the project is delayed or behind planned dates and if planned line is above actual line than the project is ahead of time or planned dates. Formulas for calculating planned and actual burndown lines are as follows:

Planned Burndown = (Total Quantity - Cumulative Planned Quantity)
Actual Burndown   = (Total Quantity - Cumulative Actual Quantity)
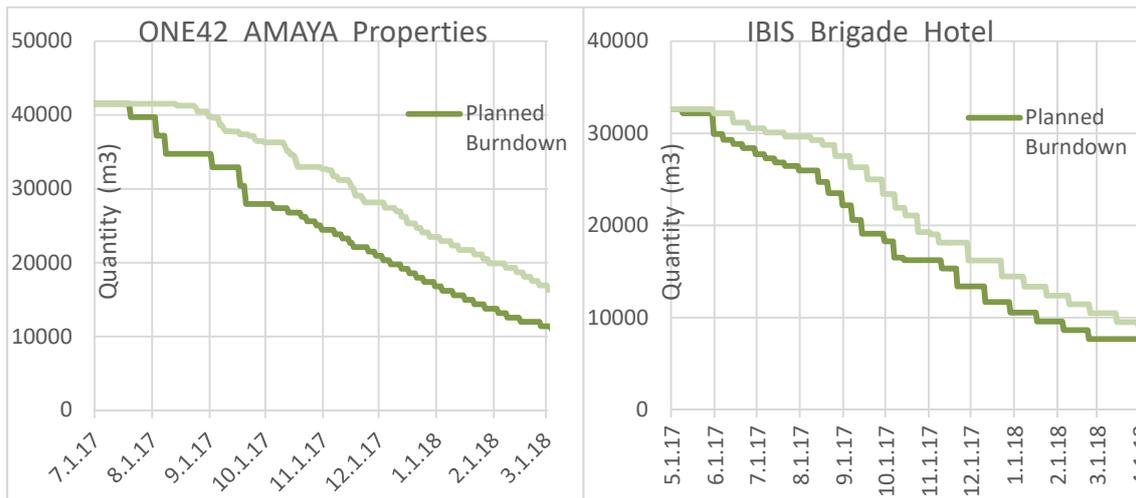
Fig. 2. Burndown charts for ONE42 AMAYA Properties & IBIS Brigade Hotel

Source: *Author's construction*

PSP Projects implemented scrum on two of their projects, One42 Amaya properties. Located in Ahmedabad, Gujarat and IBIS Brigade Hotel located in GIFT City, Gandhinagar, Gujarat. Scrum was introduced to the planning team in mid-august of 2017. At that time, both the projects were delayed by one and half month as per the planned schedule. In above figure, the gap between planned burndown and actual burndown is comparatively high. It was mainly due to the heavy rain conditions during the monsoon in Ahmedabad and Gandhinagar. On 1st of September, both the project teams formed a dedicated development team and started following Scrum artifacts. Sooner, they started preparing burndown chart for their projects. Regarding that, they were using the planned schedule from the Microsoft Project file comparing it to the actual progress of the site. The graphs were generated, based on the planned data and actual data entered in the excel sheet. The development teams have adopted and understood scrum very well that it was became a part of their daily routine. Fortunately, They were able to solve so many problems from the initial stage of the project. Somehow, they were about to cover up the delayed work after 6 months from starting of the project.

In above figures, we can assume that the gap between planned and actual progress is narrowing down over the time. The reason behind that was, proper follow up of scrum on both the projects. The development team have adopted scrum completely by doing daily scrum meetings and sprint retrospective meetings. They were able to solve the major problems just by conducting daily scrum meetings on the regular basis.
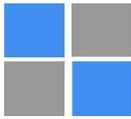
If we compare both the above projects to third project of PSP Projects, where development team were still using traditional approach of project management. They have faced multiple difficulties in terms of managing delayed work and communication gap within the team in compare to other two projects.

Percent Delay

Percentage delay graph was generated for a precise analysis about project progress. Percent delay is also prepared in term of reducing delay, The inclined line denotes constant reduce of percentage delay over the time to cover up the delayed work as per project completion date. Below formula is used to prepare percentage delay graph,

Percent delay(%) = 100 - (Actual Cumulative/Planned Cumulative) * 100

As shown in Figure 3, Percentage delay graph for ONE42 Amaya Properties is reducing over the time as per the estimated reduce percentage. In February end, project was facing some problems due to material unavailability and tower crane breakage. So the percentage delay line is again above the approximate reduce line.

As shown in Figure 3, Percentage delay graph for IBIS Brigade Hotel is reducing
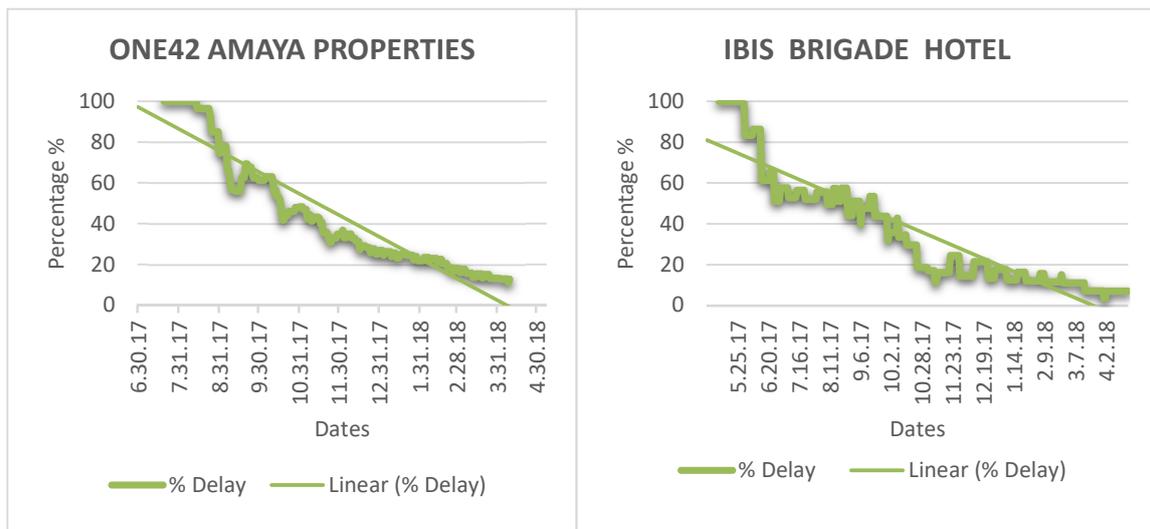
Fig.3 Percentage delay graphs for ONE42 AMAYA Properties & IBIS Brigade Hotel

over

the time nearly the estimated linear reduce. It is decreasing constantly. In the march end, the project was on the verge of reaching the same quantity as planned progress. Percentage delay graph is generated to know, the remaining amount of delay in the project and how one can reduce this delayed work over the remaining time for on-time completion of the project. By generating these graphs, any member of development team or client can see the performance of a development team and current status of projects.

Roadblocks of implementing Agile project manegement in construction industry

Everything depends on the suitability of the project. Some projects also fail because of the requirements have taken too long. Today cultural differences are the biggest obstacle to the agile management approach. There is also a risk with mindsets that the client / contractor does not want to work with Agile but wants to keep the traditional approach (Rasnacis & Berzisa, 2016).

I. **Cost of Change-** It would be relatively cheap to make changes to a project that aim to deliver quality while it would be very expensive to change it. For Example, it would be very expensive to redesign the road after laying concrete.

II. **Lack of knowledge** in construction industry.

III. **Complexity perception-** Many client/contractors finds it difficult to understand as they have to modify the mind sets of development team.

IV. **Resistance to change-** As stated before, Agile principles can be fully implemented only if all parties get focused towards one goal.

V. **Management pressure-** One of the major drawbacks of implementing Agile principles because failure or success of implementation lies largely on the management. The top management is expected to provide the necessary resources and guidance on how to implement these principles.

VI. **Time consuming-** Similar to latest new technologies or approaches of implementing a project, Agile principles can be quite time consuming especially during early stages of implementation.

Conclusions

The major advantage of implementing agile project management in construction phase of the project is to increase communication within development team. It will give them a freedom to think individually and to work as per their own. As the agile project management/Scrum follows the bottom-up project management approach, that leads lower level employees to think independently. Agile approach will also motivate their personal experience as they are given more responsibility and a higher level of authority. This will lead them to deliver work as best as possible.

Through the way of execution methodology, the client will be forced to increase their participation more or less for better delivery of work. Implementing agile project management will also result in client's satisfaction in the end of the project. This is because this approach manages the product backlog, including the customer's requirements for the project. The way Scrum approach uses time management, it will provide the industry a proven tool to track the progress and status of any type of project. It is one of the easiest to implement in compare to other tools. Since one can start with a small project and can implement it in any big or complex projects possible. And it will constantly add the improvement in current project management process and other tools.

To summarise the conclusion, the implementation of agile project management approach in construction phase of project will decrease uncertainty and risk. It will help with planning activities during the construction phase and how one can decrease delay by scheduling, using time management, daily scrum meeting, sprint retrospective meetings and increasing both employees motivation and client's involvement.

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ISSUE

The construction phase is different from design phase and planning phase in some relevant way.

PROBLEM

We have to be aware that the construction phase is causing a bigger gap between employers and employees, the number of people working in this phase is much more than other phases. This workforce is also one of the least skilled workers and is among the lowest earners.

SOLUTION

The attempt to apply new management methods in construction. We are currently facing a major cultural issue that needs to change to enable education and learning, to achieve multi-skilled teams and self-management. This is an important gesture to instil a strong loyalty to workers.

Recommendations

First, I will recommend to educate more people in construction industry about agile project management tools and Scrum by organising introductory sessions and training workshops. Construction companies should educate key persons of development team like project managers and scrum masters. These roles are playing important part in development since they are the people being together can adopt a method and replace the current project management method. While implementing for the first time with Scrum/Agile project management approach, the team members should not consider this project as a trial project or pilot project. It can be an excuse for failing at the end. They may not embrace this new approach properly if they will take it as a trial project. The organisation has to say that we are going to implement Scrum properly and we are going succeed this in our projects. Any company has to start using this approach in discipline. They have to take regular follow up with daily scrum meetings and to keep burndown chart updated every day. They have to build an environment where the team can discuss and work together. There should be a white board, where all the team members can keep track of prioritized activities and tasks by using notes.

The major advantage about implementing this approach, is that anyone can start it with a small change and can adopt it as per they convenience. Other benefit is, we can improve the progress by using hybrid scrum, using scrum functions with other agile project management tools like Kanban, Lean and others.

Acknoledgement

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