A Review on Some Agile Project Management Techniques

Senthilkumar T. and Benruben R.
Under Graduate Student, Department of Production Engineering
PSG College of Technology, Coimbatore, Tamil Nadu 641 004, India

Sakthirajan T.
Under Graduate Student, Department of Chemical Engineering
Sri Venkateswara College of Engineering, Chennai, Tamilnadu 600 025, India

Sivaram N.M.
Ph.D. Research Scholar, Department of Production Engineering
PSG College of Technology, Coimbatore, Tamil Nadu 641 004, India

Abstract

During the past few decades, many researches were carried out by the practitioners and researchers in developing the managerial models to face increased competitions in the world. Likewise, for managing the projects effectively and to provide rapid response for customers, Agile Project Management (APM) was envisaged by the researchers and practitioners. Moreover, during the last two decades, the significance of the Agile Project Management have been unearthed and accepted by the project managers in various industrial sectors, predominantly by the Information Technology project managers. The recent APM techniques and the unconquered arenas of APM are notified in this paper.

Keywords
Agile Manufacturing, Agile Project Management, Project Management and Scrum.

1. Introduction

In the present competitive business world, the basic requirement of any organization is to keep its customers satisfied and delighted in order to sustain in the challenging volatile market. For this need, various managerial models have been evolved by researchers and practitioners in the past decades to reduce the production cost of the product, increase the quality and thereby increasing the revenue [1]. Also, for achieving the combined benefits of these managerial models to enhance the competitiveness, some of the managerial models have been integrated [1] and [2]. Among the integrated models, the well known models are Lean Six Sigma and Agile Supply Chain Management. Added to this, there are many other integrated models emerging and few of them are envisaged by theoreticians, researchers and practitioners [2]. Meanwhile, various improvement projects are carried out by the organizations to deliver quality products, preserve their competency and provide continual enhancement to augment their profit. In this direction of managing the improvement projects, the recent integrated model that aroused through research was Agile Project Management (APM) or Agile Management. APM ensures the management of projects in an adaptive conduct to the varying situation demanded by the customers [7]. Agile software development methods are very pragmatic in understanding the fact and the requirements of business environment which keeps on changing constantly day by day. Highly innovative people who have understood the shortcomings of traditional software management processes are started using the APM techniques in organizations. [19]. In the aim of exploring the unconquered arenas of APM, the literature arena in this particular course has been reviewed. Today, Project Management (PM) was required to be in rapid pace and APM makes the PM to be more flexible and agile.
2. Implementation Methodology

The PM involves various methodologies to be followed. The research methodology that is generally used for executing PM and APM is shown respectively in the Figure 1 and Figure 2 respectively. The progression steps involved is almost same for both PM and APM except its iterative nature of executing the project. As shown in the figure, the first stage involves the identifying and defining the objective of the project. The second stage involves the planning of project. It includes factors like selection of stakeholders, assigning the responsibilities to stakeholders based on their experience and skills, fixing deadline for project completion and selecting of engineering tools for conducting the project. The third stage is to develop the project by using the selected engineering tools and stakeholders, as planned in the previous step. All the stakeholders should be actively involved in the agile management planning and development.

![Diagram of Implementation Methodology for executing PM.](image)

Figure 1: Implementation Methodology for executing PM.

The fourth stage of the research methodology is organizing and monitoring of the progress of the project. This is the important stage of the project execution. The success of the project management depends on how effectively it is being monitored and how quick the feed backs for further development are reaching the (name of the team) like execution team. If the progress of the team is up to the expected mark, the team proceeds to the next stage, else the team has to start again from the second stage. The difference between the PM and APM exists at this stage. In PM, the team starts to propagate and document the project before closing up the project. But in APM, before heading to the final stage, in order to make the customers getting delighted, the team iterates the project by providing quality products on planned time. During iteration, if the anticipated output is reached, then the team proceeds to the final stage, which embraces propagation, documentation and closing of project. Moreover, this adaptive nature of APM distinguishes it from PM and attracts more project managers to implement APM for offering of products to surpass extreme global competition.
3. Agile Manufacturing – A Gist

Agile Manufacturing (AM) was invented by the researchers group of Iacocca Institute, Lehigh University at 1991 [3]. Today’s organizations are implementing lean manufacturing to improve their competence [3]. But in the recent times, the AM has been considered as substitute to leanness [4]. The AM concept is the manufacturing model, which will be dominating the manufacturing sectors competitiveness in 21st century [4]. Both the agile and lean paradigms have its own effectiveness on two different situations of demands. Lean manufacturing find its way first when the demands are predictable, while, AM is preferred when the demands are volatile [4].

The main motive of AM includes delivering the products of best quality at appropriate time in the right place at the reasonable cost [4]. The appropriate time is the time when the customer needs it and the reasonable cost is the cost which the customer thinks as a good deal to purchase. The AM is the improved concept of lean manufacturing, which assists the removal of waste along with the quick response to volatile demands [4]. AM is the concept which integrates the flexible manufacturing system (FMS) with lean manufacturing [5]. Thus, the ultimate goal of the implementing the AM is to respond rapidly to the necessities of the market [5]. Meanwhile, AM is not only meant for quick response to changes but also concentrates on the quality and price of the products and other forms of services that the customers are going to concede [6]. Also, for the successful implementation of AM, the top management commitment is vital. AM is also integrated with some other managerial models utilize its benefits and increase the competitiveness of the organization. Some of such models are Agile Supply Chain, Lean Six Sigma and Lean supply chain [2].

4. Literature arena of Agile Project Management

The PM tracks the pre-planned course for managing the projects. These results regarding the delivering of product would be considered as obsolete by the consumers in the market. In the 1950’s the PM techniques has been emerged from engineering, defense and construction industries [13]. APM extracts the principles of AM which makes it unique and diverse from PM. APM has its origin at 21st century when the software developers of IT and software industry had arrived with techniques of achieving successful results in software development process. The
originated Agile Software Development Manifesto has its motto as giving highest priority to satisfy the customer by early and continuous delivery of valuable software. By implementing the Agile Management techniques into projects, the focus on the benefits of each feature has been enhanced [13]. APM is the way of project management which facilitates, revitalizes and allows the project team to deliver the customer requirements swiftly and consistently. This is accomplished through continuous learning and adapting to the changing arena and also by the active involvement of customers in the project. Although APM primarily sets strategies and track for the project’s progress it does not follow the pre planned path. APM’s nature of being iterative and result oriented is to cope up with the customer’s need [7]. Furthermore, APM demands for the team work, excellent leadership role and ultimately focuses diligently on the project output. Some of the responsibilities of the project managers are listed below:

- Removal of barricades,
- The success of the project and to deliver the quality products on time
- Enhance the contemporary engineering practices and tools,
- Communicate with all the stakeholders and provide amicable environment to work, increase the efficiency of the team, provide continuous feedbacks and
- Lead and motivate the team and arrange the meetings and teach the stakeholders about APM during various phases of project.

The traditional PM was unable to adhere to the changes in the embedded software projects whereas, APM facilitates the project managers and their development team to manage the works, tackle the risks and create a successful and customer likely products. APM helps in preparing quick documentation and giving prioritizations and carrying out iterations and aids in scope and risk management. The key APM concept includes the definition of “customer”, “feature” and “done” [12]. Agile thinking has a sound basis in both project management and adoption of agile management that brings successful improvements in project management. The construction industries are practising ineffectual project management and so if they incorporate APM they would have the increased benefits. [14]. APM helps to improve the better understanding of project complexity through disintegration and emphasizes the adaptability of a project system to ever changing environments. Also, the Interface Management technique greatly helps in the effective implementation of lean production and APM in construction industries and also helps in optimizing the overall performance of construction projects [15]. The Agile manager visualizes the importance of interaction of various parts of project and guides them in the path of continuous learning and changing. The responsive APM framework demands the following features: 1. Able to manage and adaptive to change, 2. all members in the team should be skilled and contribute themselves to the valuable part in the team [16]. Agile Management & Development Method is one of the growing number of alternatives to traditional, process-centric software management methods with a focus on people, results, minimal methods and maximum collaboration. It has ruined the field of E business in a better enhanced way with its tremendous change [17]. A global survey has been carried out by agile software development community in order to determine the project management tooling of those companies that are practising this technique to support their agile processes. The ultimate objective of this survey is to appraise the types of PM tools used by agile organizations. The agile project management tool choices have been divided into the following six categories: 1. Manual cards, charts, etc. 2. Microsoft Office, 3. An internal Wiki, 4. An Internal custom tool, 5. Agile Tool includes ExtremePlanner, Rally, ScrumWorks, or XPlanner 6. Traditional tool used in non-agile processes like requirements management, workflow tracking, project management, etc [20]. The Project managers should be well aware of the agile methods in order to implement it and carry out the project management effectively. Also, before applying the agile principles in project management the impacts on people, process and project should be studied. This aids the project managers in taking a decision regarding agile project management [21].

5. PM and APM – A Comparison

The disparity between the PM and APM are shown in the Table 1 and the difference shows the characteristics of the APM that makes it accommodative to the needs. Moreover, APM has been developed since the PM’s pace has been increasing these days and there is a need for the PM to be flexible and at rapid pace without giving up the quality and customer value. Besides that, PM controls many projects simultaneously, whereas, APM says not more than one project at a time. Also, APM collects feedback at every time before having further move. Therefore, the prowess of APM is focusing on each step towards adapting the project management to the capricious nature of consumers [8]. APM concentrates on the skills of the team members and shapes the operations
accordingly, thus providing advantage to the workforce too. Additionally, the evolution of the APM aids the project managers to make their operations flexible, achieving agility and thereby learning endlessly for satisfying the demands of various market sectors.

<table>
<thead>
<tr>
<th>Attributes No.</th>
<th>Attributes</th>
<th>Project Management</th>
<th>Agile Project Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Concentration</td>
<td>Project outcome</td>
<td>Customers demand</td>
</tr>
<tr>
<td>2</td>
<td>Model used</td>
<td>Conventional</td>
<td>Iteration</td>
</tr>
<tr>
<td>3</td>
<td>Engineering tools used</td>
<td>Any</td>
<td>Tailored to target</td>
</tr>
<tr>
<td>4</td>
<td>Customer’s role</td>
<td>If needed, at initiation and delivery phase</td>
<td>Active involvement</td>
</tr>
<tr>
<td>5</td>
<td>Output</td>
<td>Target achievement</td>
<td>Adapting to incertitude of market</td>
</tr>
<tr>
<td>6</td>
<td>Leadership</td>
<td>Leader alone</td>
<td>Leader and motivator</td>
</tr>
<tr>
<td>7</td>
<td>Strategies involved</td>
<td>Constant</td>
<td>Varies until adaption occurred</td>
</tr>
<tr>
<td>8</td>
<td>Corroboration</td>
<td>Done comprehensively</td>
<td>Done optionally</td>
</tr>
<tr>
<td>9</td>
<td>Appraisal</td>
<td>After development phase</td>
<td>After iteration phase</td>
</tr>
<tr>
<td>10</td>
<td>Team work</td>
<td>Responsibilities differs for individuals within team</td>
<td>Whole team have unique responsibility</td>
</tr>
</tbody>
</table>

6. Recent trends in Agile Project Management

APM has been increasingly getting recognized for the past two decades, even though the origin of various agile methods has been tracing its origin even much back [9]. APM aids the Information Technology and software development project managers to learn continuously and improve their product and delivering continual quality outcomes. The various agile project methodologies that developed so far includes SCRUM, eXtreme Programming (XP) and Dynamic System Development Methodology (DSDM) Crystal, Feature Driven Development (FDD), and Adaptive Software Development [9]. Even if, all of these techniques differ in their prerequisites they share a same aim of responding rapidly to the conditions. It is obvious that software keep on changing forever in this rapid technology development world.

6.1. Scrum

The scrum, an agile project management technique, consists of key constituents of project proprietor, scrum master, team members include 5 to 9 members, sprint Backlog, daily meetings with the SCRUM Team, a Burndown Chart and an Incremental Delivery. Scrum raises the whole business conceptions on 30-days learning cycle. Scrum urges the team to test and integrates the improvements into the production release within 30 days time. This helps to achieve a improved concept within a period of 30 days. This learning cycle is repeated for the betterment of the project. Scrum helps in delivering the highest priority demand that the product owner defined in the statement. [9]

Product backlog consists of all the known requirements for a product and it is controlled by the product owner. Sprint backlog contains the set of critical product backlog items that are presently at work. These should not be changed during the progress of sprint. Basically, Sprint is a fixed period time of development and testing phase that results in an incremental delivery of serviceable product. Usually, sprint lasts for about 2 to 4 weeks. Daily meetings with the SCRUM Team include the brief ‘Stand-up’ meeting each day at their convenient time only with SCRUM Team. The agenda of the meeting would be: 1. What significance did you add yesterday? 2. What significance will you add today? 3. What will impede you in making progress? And, burn down chart compares the delivery of the sprint backlog with the sprint duration. It should be easy to keep updated about scrum. Finally, the incremental delivery which is the output of the Sprint. This output of working functionality can be deployed for working and production release. Basically, scrum is delivered every 2 to 4 weeks after it is being undergone for testing and finally ready for working [10].
6.2. eXtreme Programming (XP)

XP was developed by Kent Beck and it is getting a good recognition from the enterprises. The phases involved in XP are: Exploration, Planning, Iterations to Release, fabricating, Maintenance, and Death. At the exploration phase the project team explore the engineering tools and practices and will be familiar with them which they have to use in that particular project. This phase continues for the time period of few weeks to few months. In the planning phase, the team analyzes the important potentials with the customers and finalizes the priority list of first release. This is done within a time of two months. In the Iterations to Release phase, the iterations are repeated several times to produce the first release. In this, every iteration takes place from one to four weeks, and at the end of each iteration, the functional tests are accomplished. After the final iteration it marks ready for the fabricating phase [11]. In fabricating phase, the team executes more performance testing to meet out the customer requirements. New changes may be introduced for the next release. The Maintenance phase implements changes, corrective, perfective, and adaptive changes and new attributes developed in the preceding phase. In the final death phase, the functions involved are: completing all necessary documentation and the temperament of the system is considered. The overview of eXtreme Programming is depicted in Figure 3.

![Diagram of eXtreme Programming Phases]

Figure 3: Phases involved in eXtreme Programming (XP)

6.3. Dynamic System Development Methodology (DSDM)

The main characteristic of the DSDM is that it fixes the resources first and then accordingly fixes the working nature. This process consists of five phases: Practicability study, Business study, Functional model iteration, Design and build iteration and Implementation. In the first phase the project assessment is carried out in order to find out whether DSDM usage is appropriate or not. If it is feasible then the development report will be prepared or else vice versa. In the second phase, the main features of the business have been analyzed for preparing the architecture and outline of the prototype. In third phase, since the project develops through functional iterations where in every new iteration some improvements are added and the final system is developed. This phase entails four products that reflect the process: prioritized list of functions, functional prototype(s) review documents, non-functional requirements and risk analysis for the further development are carried out [9]. Through the fourth phase, the iterations for design and build are done from the customer’s comments. In the final implementation phase, the system is transferred to the final design where the actual product is being produced. The phases in DSDM is presented in Figure 4.
6.4. Feature Driven Development (FDD)

FDD is proposed by Jeff De Luca and Peter Coad in 1997, is used for object-oriented software engineering. As usual like the other adaptive methodologies, it does iterations and delivers substantial working. In FDD the iterations are carried out for the time period of two weeks. Also, FDD includes five processes in it. The first three processes are usually done at the beginning of the project for developing an overall model, and build a plan of features list. The last two processes are done within each of the iterations for achieving the design by feature and the build by feature options. Each of these processes is split into small tasks and they are given for further verifications.

6.5. Adaptive Software Development

Adaptive software development has been originally created by Jim Highsmith. It is a method used for building the intricate software and structures through the human collaboration and self-organization of team members. The adaptive software development uses mission statement for its progression. The cycle of this method includes: assumption, collaboration, learning and release. In assumption phase the time based plans are released. The collaborations are needed in order to collect the gatherings [10]. In learning phase the components are implemented and tested based on the formal feedbacks. During release, software increment adjustments are done for next cycles. The Adaptive Software development phases are pictorially depicted in Figure 5.
7. Unconquered arenas of Agile project management

The detailed study about the APM has been done on the preceding sections of this paper. From this study, it is apparent that the APM is dominating the interest of all the project managers of software development. Even though only a few applications of APM are being implemented by the project managers of manufacturing related organizations, they are not profound in the usage. The basic thought that exist is that in software development alone changes are present [10]. But in various manufacturing and service industries also, changes are available based on customer requirements. The research about why the APM is used mostly in software industries would be an interesting research direction in the mere future. Also, the envisaging of models, research methodologies and roadmap for successful implementation of APM in manufacturing, service and other sectors form a new direction of research. This is necessary for expending the benefits that are achieved through the APM. Although few models already exist, they are not accepted widely. Hence, a detailed study is needed in creating a better model and that would be new trend of research by iterating it till it achieves an improved stage. A survey has been carried out for identifying the frequency of PM projects carried out in various industries. Results show that the manufacturing sectors carry out very few PM techniques when compared to software and IT sector industries [18].

8. Conclusion

The detailed study about the APM was carried out and the details are reported in this paper. It started with discussing the benefits achieved by integrating the managerial models. The values of AM are studied and the limitations existing on the traditional PM techniques are also discussed. The research methodology for implementing the APM and by what means it is differing from PM is shown. From the discussion it is clear that, the APM extracts principles from the AM for managing the projects in a better way [10]. And, the literature arena of the APM has been discussed. Then, the various agile methodologies that developed hitherto were listed with the discussion about each method’s unique way of managing the project and the unconquered arenas of the APM are discussed in the preceding section. Besides that, the new research directions were suggested, since the benefits of APM have to be extended to the various disciplines of industry and hence adapting to diverse market sectors. Thus, this paper is concluded by stressing on the futuristic capabilities of APM.

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