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Abstract:

The primary function of software project management is in the software sector. It encompasses several procedures and subject areas of knowledge. The project's requirements directly affect the software project's three constraints, which are time, cost, and scope. An agile methodology is an iterative approach to software development that enables rapid delivery, frequent modifies and risk redacting. In agile software projects software project management is equally fundamental. Agile development (Scrum) is used by software companies and it benefits software project management.

Keywords: Software Project Management, Agile methodology and Scrum knowledge.

1. INTRODUCTION

Software company ups and downs are prevalent in the modern day. People who have succeeded in the past are those who have learned from their mistakes. New approaches and techniques are being developed due to technological improvement. With the advancement of technology and processes the software sector has also adopted new strategies. The agile methodology is one of the techniques that contribute to the success of any software [1].

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A lack of preparation and the absence of project management techniques and tools caused many software projects to fail in the past often before they even reached the completion stage. The success of software is always a result of effective project management. The knowledge domains, tools, and strategies that are included in software project management. It comprises ten knowledge domains, of which six are supporting and four are core. Project cost management, [2] project scope management, and project cost management are core knowledge areas. Project human resource management, procurement management, communication management, stakeholder management, risk management, and project management are supporting knowledge areas. There are five processes involved in integration management, which unifies various knowledge domains initiating, planning, executing, monitoring and management.

Agile methodology which is adaptable enough to manage software cost, scope, and quality, may accept changes in future needs. Scrum is the foundation for agile project management because it emphasizes ongoing project management and is the most extensively used agile project management technique. Since scrum is increasingly being used and [3] several software projects are being developed using scrum, we use the scrum framework to examine the effects of agile methodology on software project management in the Pakistani software industry. Growing interest and scholarly need for empirical studies using agile principles in globally distributed projects. The adoption of agile development methodologies is widespread and has grown steadily over the past couple of decades [4] producing software systems of excellent quality. Agile methods manage these needs effectively and efficiently to manage them iteratively as they change and evolve toward volatile behavior. Agile methodologies priorities people their communications with one another, operational software, and change over processes, tools, conventions, and goals. The requirement [5] combines project management methods for software development. Version control for maintenance change hunting is incorporated into the planning phase of the Scrum Software Maintenance Model. After planning the type of maintenance request is given particular consideration. Corrective maintenance is given priority and work has already begun on it by establishing a new code branch [6, 7].

2. BACKGROUND AND LITERATURE

There are four different approaches to software development in project management have been discussed. They include the agile approach, Extreme Programming (XP) approach, Kanban, and the Scrum methodology. The model is made up of 17 activities of agile or operations that are applied during the software development process (SDP) and are based on the most popular agile approaches. Although there are [8] variances between the many agile approaches, we have found a set of practices that are utilized by the majority of them. In literature we study that which included 11 activities that have been recognized, the chosen practices were based. Planning Game, Small release, straightforward design, testing, refactoring, pair programming, group ownership, continuous integration, forty-hour workweek, on-site client, and From an Extreme Programming (XP) perspective of quality management coding standards refers to these

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procedures. Daily standups and retrospectives are regarded as two of the top 5 agile approaches in accordance with the previous agile research. The following procedures were applied based on the same investigation. The importance of teamwork in the agile methodology is reflected in the small cross-functional teams, which we refer to as multifunctional teams, which are used for monitoring progress. All planning that is done for a project must be controlled, and this is why monitoring progress is taken into consideration. The Self-Organizing Teams method was chosen as a study subject based on the same criterion.

2.1 Agile

The agile method of project execution is based on an iterative process where requirements and solutions develop as a result of coordinated engagement amongst stakeholders. By fostering independent and cross-functional teams, the methodology is successful. Furthermore, it draws on the necessity of change and ongoing project fragmentation for improved quality and performance. The strategy emphasizes simplicity ongoing team [9] collaboration regular software delivery and having a highly motivated team with its 12 guiding principles. Agile ideals can be implemented by project managers through a variety of techniques [10].

2.2 Software Development of Agile practices

Being agile means being able to make and answer to change. It is a way of navigating a difficult and frightening situation and eventually succeeding in it. There are other approaches besides only outlines like Scrum, Extreme Programming or Feature-Driven Development (FDD). Agile software expansion is a procedure and software progress encompasses extra than just Pair programming, test-driven development, stand-up meetings, and sprint planning sessions are examples of effective methodologies. The saying "agile software development" refers to a variety of frameworks and procedures that are based on the ideals and guiding principles outlined in the Strategy for Agile Software Development and its supporting 12 Philosophies [11].

2.3 The 12 principles of agile methodology

- On-time and efficient software delivery with consistency is our primary goal is to please the client.
- Take adjusting even at the very end of the improvement process. Agile approaches manage revolution to preserve the competitive edge of the client.
- Bring working software frequently, ideally within a few weeks as opposed to a few months.
- The plan requires daily collaboration between business professionals and developers.
- Build initiatives around people that are motivated. Trust them to do the assignment, and give them the environment and support they need.

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- Direct discussion is the furthermost effective then well-organized means to communicate with and within a progress crew [12].
- The primary indicator of progress is functional software.
- Agile practices support maintainable growth. The supporters, programmers, and consumers presumably are intelligent on the way to maintain the current pace indefinitely.
- Nimbleness is improved when technological perfection and good design are continuously prioritized.
- The aptitude to exploit the quantity of work not done through straightforwardness is crucial.
- Self-start up teams produce the greatest constructions, conditions, and designs.
- The team tweaks also modifies his behavior through its considerations on how to be more active at regular intervals.

2.4 Extreme Programming (XP)

User stories derived from customer requirements must be used when developing in extremes [13, 14]. Developers create user stories on cards during project execution to specify the functional needs of the system. Additionally, the approach supports techniques like test-driven progress which calls for developers to have preconceived notions around a product beforehand ever writing any code. The project's beginning framework thus increases adaptability and emphasizes the significance of self-organizing squads that operate at a maintainable speed. Agile frameworks gained widespread acceptance within the software industry because to their emphasis on fast software delivery, product quality, and customer happiness for the completion. There are numerous agile frameworks available for selection depending on the requirements and demands of various software projects. Out of these [15] paradigms, Scrum and Extreme Programming are the most well-known and widely used frameworks. This study contributes by carefully examining these two frameworks. In order to identify their parallels, differences, and characteristics that complement one another, this paper compares Scrum and Extreme programming in great detail.

2.5 feature Driven Development (FDD)

The task of migration is seen as vital, particularly when dealing with distributed projects. One such example that involves massive volumes of data and transactions is the banking sector, which involves sensitive business procedures. Since the history of human transactions dates back to the beginning of banking, technical change is required to keep up. Using the most recent developments to give consumers better service. A single project management strategy may not be strategically effective for such a work, particularly in terms of upholding schedule and quality. For instance, two well-known and well-liked project management techniques, SCRUM and Feature Driven Development (FDD), each have advantages and drawbacks. Due to SCRUM's emphasis on deadlines,

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quality can frequently suffer [16] whereas FDD's emphasis on quality might result in project delays. For the first time, SCR-FDD, a deliberate fusion of SCRUM and FDD techniques, is suggested in this study. The suggested SCR-FDD is compared to SCRUM and FDD in a real-world project, and the findings reveal that it is 10% more effective in terms of quality and customer satisfaction than SCRUM, which is its closest competitor.

2.6 Kanban

Delivering clients with high-quality information technology projects is made possible by the simple methodology of Kanban. The approach [17] appears to be focused on ongoing enhancements to software and secondary infrastructure. The Kanban process also suggests breaking down complex team operations into smaller parts to make validation easier. Through task prioritizing, delivery timelines, and workflow, Kanban focuses on what has to be done and when. With Kanban, time wastage is eliminated because developers don't write more specifications than they can code and test [18]. Using workflow visualization as a tool to quickly identify and fix problems. Additionally, Kanban restricts the quantity of work that is in progress to meet the speed of the slowest step. By doing so, adjustments will have less overall impact while improving teamwork.

3. SCRUM

Scrum masters lead a small team whose main duty is to remove any obstacles to completing work in Scrum and an agile project management style. The Scrum methodology framework allows you the freedom to manage the both software development and requirements. A module can be produced in incremental, manageable chunks thanks to this iterative besides incremental foundation paradigm, which builds software through established procedures. Scrum was developed in order to enhance different development and session of life compatibility between individual and structural pronouncements define a culture focusing on [19] recital aid shareholder value construction and enhance the produce-skill of the growth process. Scrum is an extremely flexible framework that may be applied to any project in any sector. It can be used for both little and big undertakings. Additionally, scrum offers a time box-based methodology for executing information technology projects successfully. The time that set limits on the number of features a project team may complete. The team starts by developing a product accumulation that prioritizes altogether the necessary features. Before starting work on a sprint the team decides which topographies to comprehensive from this list during a preparation meeting. The sprint accumulation cannot be changed while being carried out. The progress team, stakeholders, scrum master, managers, and product owner are among the fundamental roles in the scrum. Additionally, the team meets every day for quick 15-minute scrums when members provide each other updates on the status of their respective tasks. In the scrum, queries like "What did you do yesterday?" and "What are you doing now?"

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3.1 Scrum appropriate

Scrum works best when the cross-functional team is employed on a creation progress project and there is an important amount of work that can be divided into multiple 2–4 week iterations.

3.2 Values of Scrum

There are five main values of Scrum

- **Commitment**
- **Courage**
- **Focus**
- **Openness**
- **Respect**.

3.3 Commitment to Scrum

Ndividual team members pledge to work toward reaching team objectives. [20] Each artifact now corresponds to a Scrum commitment since the “2020” update to the Scrum Guide. The standards by which a Scrum artifact is evaluated are called Scrum commitments. Scrum commitments increase transparency and sharpen a developer's focus as a project develops.

3.4 Courage of Scrum

When it comes to Scrum courage means that teams should feel secure when they refuse requests for assistance embrace challenges or try new things. If maintaining the status quo hinders their ability to achieve they should have the guts to do so. Members of the team act morally and tackle difficult issues. [21]

3.5 Focus of Scrum

The ability of the Scrum Team to maintain uninterrupted concentration on the objectives or tasks is referred to as their focus. Additionally, it shows that a Scrum Team works to finish any tasks or goals on which it embarks. When Scrum Teams are laser-focused they are tenacious in minimizing waste accomplishing the set goals in the shortest amount of time and finally improving their efficiency. Pay attention to the tasks assigned for the sprint as well as the team's objectives.

3.6 Openness of Scrum

The team's stakeholders and members are transparent about all the work they do and the difficulties they face.

And the purpose of the Scrum meeting is to solve the problems identification.

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3.7 Respects for Scrum

Each team member values the independence and competence of the others. The Product Owner, Scrum Master, Developers, and stakeholders should all see respect from the Scrum Team members and stakeholders for one another. Scrum Teams must be conscious of the fact that working together is what makes them most effective.

3.8 Principles of Scrum

Scrum uses an incremental iterative methodology Scrum brings together crews of folks who taken as a complete possess altogether the information and skills required completing the exertion also share before gaining further knowledge as required. Scrum merges four official events into one containing event, the Sprint, for review and adaption.

There are three main principles of scrum as fellow below:

- Transparency
- Inspection
- Adaptation

3.9 Transparency

Everyone on the side needs to be conscious of the challenges the other team members are facing for the group to function well. Teams identify organizational problems that hinder their success, often problems that have been around for a while. Both people doing the work and those being served by it must be able to see the emergent process and the resulting product. The perceived state of Scrum's three formal artefacts serves as the foundation for key choices. Low transparency in the creation of an artefact may result in choices that reduce value and raise risk. Enables Untruthful and wasteful inspection results from lack of transparency.

3.10 Inspection

To provide the team with a chance to evaluate how the process is running, frequent inspection points were integrated into the framework. These checkpoints include the Sprint Review Meeting and Daily Scrum meetings [22]. The Scrum artefacts and the advancement of the agreed-upon goals must be scrutinized carefully and frequently to spot any potential deviations or issues. Scrum provides a cadence through its five events to aid in inspection. Analysis facilitates adaptability. It is thought to be useless to inspect without adapting. The purpose of Scrum events is to inspire change.

3.11 Adaptation

The team continually assesses how things are going and reviews any elements that don't seem to make sense. If a customer requests a change to the requirements scrum takes this into account and incorporates it in the following Sprint. Instances where a product inspection reveals only minor changes that need to be made are treated as feedback and incorporated into the following Sprint cycle. When an inspector finds that a few process variables are outside of what is considered acceptable the inspector must notify the

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company [23]. It remains required to modify the procedure being used before the constituents existence produced if any procedure variables decrease outer of allowed limits or if the close produce is inappropriate. To cut extra deviation and modification needs toward be complete as soon as possible. When the persons involved lack self-management or authorization reworking becomes more stimulating. When a Scrum Crew discovers anything new through observation, it is expected to adjust [27-39].

4 SCRUM PROCESSES

Scrum processes involve the product holder, the scrum team and scrum master. The shortest time frame a team can allocate work that will be finished in three to four weeks is called a sprint. The current sprint's requirements are all listed in the sprint backlog. Those that can change throughout development, determines the tasks for sprint. The software owner evaluates the product backlog, which is considered to contain the majority of the requirements. It is divided into sprints and after that, there is a sprint planning structure that describes different tactics for finishing a sprint on time. Each sprint aims to deliver a potentially organized and error-free product. A scrum master is present during the 15-minute meetings which can run longer. Software that is supplied in iterations and has the functionalities the customer wants might have the requirements changed at any time. Using the scrum approach makes handling the change requirements relatively simple. Scrum is a method for controlling the development process that applies the organizational process control hypothesis's notions of adaptability, proficiency, and litheness. Scrum focuses on teamwork and product quality in a flexible setting.

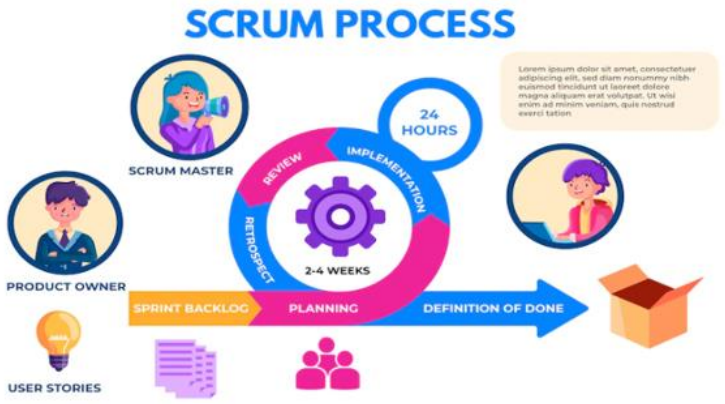

Figure 1 process of scrum [24]

4.1 Scrum Master

The Scrum Master remains the associate of the side tasked with ensuring that the team adheres to the agile ideals and principles along with the measures and practices that were decided upon by the team.

This is some consisting of Scrum Master:

- Removing constraints

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- Creating a setting anywhere the team can work effectively
- team changing aspects issues
- Ensuring a positive working connection amongst the team and the product holder along with other people.

Defending the group against disruptions and diversions from outside. Even by teams who do not formally use Scrum the title "Scrum Master" is frequently used to describe this position. Iteration manager, agile coach, and team coach are other uncommon terms.

Organizations all over the world are adopting Scrum as a method for developing software. But as businesses switch from conventional plan-driven development to agile development using Scrum, the question of which Scrum role Product Owner, [25] Scrum Master or Scrum Team Member relates to a project manager or, conversely, which Scrum role project managers should assume arises.

The actions that make up the Scrum Master role have been discovered through our study, as well as the additional duties that Scrum Masters really play in the real world. In particular, project supervisors play a important role in the exertion of scrum masters. These findings indicate that firms that use Scrum as a development methodology need to reevaluate the position of project managers. As some obligations of the latter role are more in line with the typical duties of a project manager, we predict that it could be better for project managers to transition into product owners. To get empirical data on the tasks Scrum Masters really carry out and the additional duties they assume, we first conducted a link to the Scrum Master position and then a case study. The job of the Scrum Master and the Project Manager are frequently merged in practice, and by integrating the findings from the literature with observations from medium-sized development organizations, we were able to identify tensions and conflicts between these roles. Managers take up the Product Owner job rather than the Scrum Master role.

4.2 Pros and Cons

Pros:

- The role of a scrum master happening a side gives a self-organizing side continual access toward a person who must rummage-sale agile and Scrum in specific in another context and can comfort the team choose how to use it in their scenario.
- To free up the recreation of the side to distillate on forming output that will consequence in the intended goal, the scrum master is someone who can deal with interruptions, disturbances and barriers [26].

Cons:

- It is simple to transition project managers who are accustomed to top-down management styles hooked on a scrum master part and count on them to perform well.

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- Asking someone to take on the role of scrum master without any prior knowledge of working in an agile environment.
- Imagining the assignment of a scrum master to remain the similar across all teams regardless of how long the team has been working together, how well they grasp agile ideals and principles, or how much domain experience they have.
- An established team will probably require considerably less mentoring from a scrum master than one that is still getting to know one another and implementing agile values and its principles of scrum.

5 MANAGEMENTS OF PROJECT

5.1 Scope Management of Project

The most challenging and crucial responsibility is managing the project scope because requirements are constantly changing and sometimes those changes also affect the project's scope. Once a project has begun a written contract between the client and the software company is established requiring both parties to fulfill and respect one another [16]. Changes will occur in every project from the beginning to the finish and scrum offers a simple way to deal with them. The developer implements these needs after the requirement team analyses and determines their scope and relevance following the team lead's instructions. This remains the movement of one sprint and if somewhat changes are made we can quickly execute them by getting Change Control Board (CCB) approval.

5.2 Time and Cost Management of Project

The time and cost of a project are the next major challenge after determining the scope and then most IT projects have a bad way record of the cost it is particularly challenging to manage both at once. Projects may also have gone over budget or schedule. Because that work is broken down into close chunks and sprints are established developers may build their chunks on schedule and within budget utilizing agile methodologies which very gracefully addresses this issue. Because of this organizational growth and productivity are exceptionally high and economical.

5.3 Quality Management of Project

When a project quality or product has the entire features quality product. Quality project is clear as the requirement that a project is delivered on time within budget and with full coverage of its intended scope quality has a significant impression on Software Project Management (SPM). Because agile techniques place a high priority on creating fine excellence products they offer the top practices that container remain monitored to produce superior results. SCRUM offers the best ways aimed at saving time and if quality its concentration is on "Easy to use" then conformance towards supplies. All agile methods are effective in terms [16] of quality issues. Scrum masters set the quality standards for all software sectors and they must guarantee that any underdeveloped projects or products are simple to use delivered on schedule and adhere to the project's scope.

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5.4 Risk Management of Project

Most often, people are the project's assistants in organizations. Depending on the People's level of knowledge and competence in the subject. Because of this, agile techniques place a strong importance on team supervision and team development. A large team makes sure of not guarantee a successful product or satisfied customers, however. There are two competing hypotheses. While some organizations do not place a high priority on teamwork, the majority claims that SCRUM allows them to hire only individuals who are motivated by goals and able to work well in a group. Additionally, SCRUM emphasizes teamwork and collaboration amongst members. When using SCRUM as their project management (PM) methodology an organization's HR management had a significant impact on project management because tasks are distributed among the team and SCRUM methodologies mandate that team members assist one another after finishing separate duties.

6 CONCLUSION

The knowledge domains of software project management are positively impacted by scrum it has been determined. Scrum requires a favorable impact taking place the project's time, budget, scope, quality, risk, and cost. Scrum has a significant impact on Human Resource HR management as well because some organizations prioritize the goal of hiring while others do not. Scrum helps to decrease risk, control costs, and deliver high-quality products promptly. The application scrum rules in Software Project Management (SPM) is made possible by the agile style in the direction of agile project implementation which gives scheme managers in the software manufacturing a practical method for handling uncertainty.

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