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Software Product Development—an Approach Using Scrum

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Introduction -- Defining Scrum

Scrum is an incremental framework or technique that helps is systematic commencement and development of various types of software products in an iterative fashion, and is a derivative of Agile Methodologies.

A Brief overview of Agile

Agile is a rapidly evolving software development methodology that is currently being made immense use of for several thousand projects across the globe. It has been specifically invented so as to accommodate change during the development phase of a software project. Over the years, the processes and practices employed to innovate and design high valued software projects have stopped being predictable. Requirements that were agreed upon at the beginning may change, technologies may change or evolve, team-logistics may vary, so on and so forth. Hence, in such a scenario where processes and practices are not static but highly fluidic, when requirements are fickle & subject to change and when results cannot be predicted within accepted levels of tolerance, predictable planning techniques don't hold good. Agile Methodologies modestly aims at addressing such shortcomings effortlessly while ensuring that quality in the product and customer delight are not only not compromised on but in fact, enhanced.

A few salient features of 'The Agile Manifesto' are:

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

Here it should be noted that while Agile emphasizes more on working software, it does not deem documentation any less important. It only implies that spending valuable time on documentation if and when not necessary can be avoided.

Introduction to Scrum

The term Scrum originally derived from the context of the sport rugby, was first mentioned outside of rugby by Hirotaka Takeuchi and IkujiroNonaka in an article published in The Harvard Business Review titled, "The New Product Development Game" in 1986. Originally, the context was manufacturing projects but later in 1993, John Scumniotales, Jeff McKenna and Jeff Sutherland brought out its relation to software projects and have adopted, implemented and documented the same for software project development at a company called Easel Corporation. In 1995, Ken Schwaber presented a research paper titled "Scrum Development Processes" at the prestigious technical conference, OOPSLA.

Salient Features of Scrum

- Iterative and Incremental.
- Focuses on teams and collectivistic work compared to individual contribution.
- Works in 'Sprints'
- Helps develop the system/product amidst rapidly changing/evolving requirements.
- Increased stakeholder communication and cooperation.

Scrum Components

Scrum as a framework can be divided into three components for convenience.

- Scrum Roles
- Processes
- Scrum Artifacts

Scrum Roles

A Scrum encompasses several roles across various business functionalities. All roles however can broadly be segregated as core and supporting roles or pigs and chickens respectively from the 'Chicken and Pig' fable that talks about commitment to a cause or project. This analogy works in such a way that pigs offer bacon which is a sacrificial gesture versus chickens which give eggs. The latter isn't a sacrificial gesture. Thus pigs are more committed to the cause.

Pigs (Core Roles)

They are the core that drives the project within the Scrum process that is deployed. They develop the product, represent the scrum team and are held accountable for its status and outcome. Pigs are committed to the project in the sense that "it is their bacon that is on the line". A few pig roles are:

Scrum Development Team

They are the people that develop the product. A scrum dev. team is a self-organizing team typically of 6-12 people that can design, develop, test and deploy the product. Although members of the team may hail from various different technologies, job titles and roles, while on the team, all of that would be insignificant. Every member in the team contributes in their chosen way so they can best complete a sprint though often individuals have to work outside of their preferred discipline for the greater good of the team and the product.

ScrumMaster

A ScrumMaster is but a facilitator whose aim and sole responsibility is to ensure smooth functioning of the scrum dev. team. Yet, he is not the leader of the team. A ScrumMaster differs from a project manager of a traditionally conducted project in a significant way such that he does not provide the team with day-to-day assignments or assigns tasks to individuals. An adept ScrumMaster shields the team from outside

interference, keeps them focused on the task at hand and pushes them to achieve and function at their highest level of performance.

Product Owner

Product owner represents the voice of the client to the scrum team. While it is the job of the ScrumMaster to keep the team focused, it falls onto the product owner to decide the list of jobs that the scrum dev. team must accomplish. He or she analyzes customer-centric items, prioritizes them and then creates the Product Backlog. A product backlog is the list of requirements from the product owner (client) to the development team (more on the product backlog will be discussed in Scrum Artifacts). The product owner must also be adept at envisioning the proposed product and then conveying that vision to the team members using the scrum product backlog.

According to Ken Schwaber, a convenient analogy to understand Scrum and the interlocking roles of the ScrumMaster, Product Owner and the Scrum (Development) Team is as a race car. The scrum dev. team is the race car itself, which is ready to speed away in whichever direction it is pointed in. While the product owner is the driver who makes sure that the car is always proceeding in the right direction, the ScrumMaster is the chief mechanic who keeps the car well-tuned and performing smoothly and accurately.

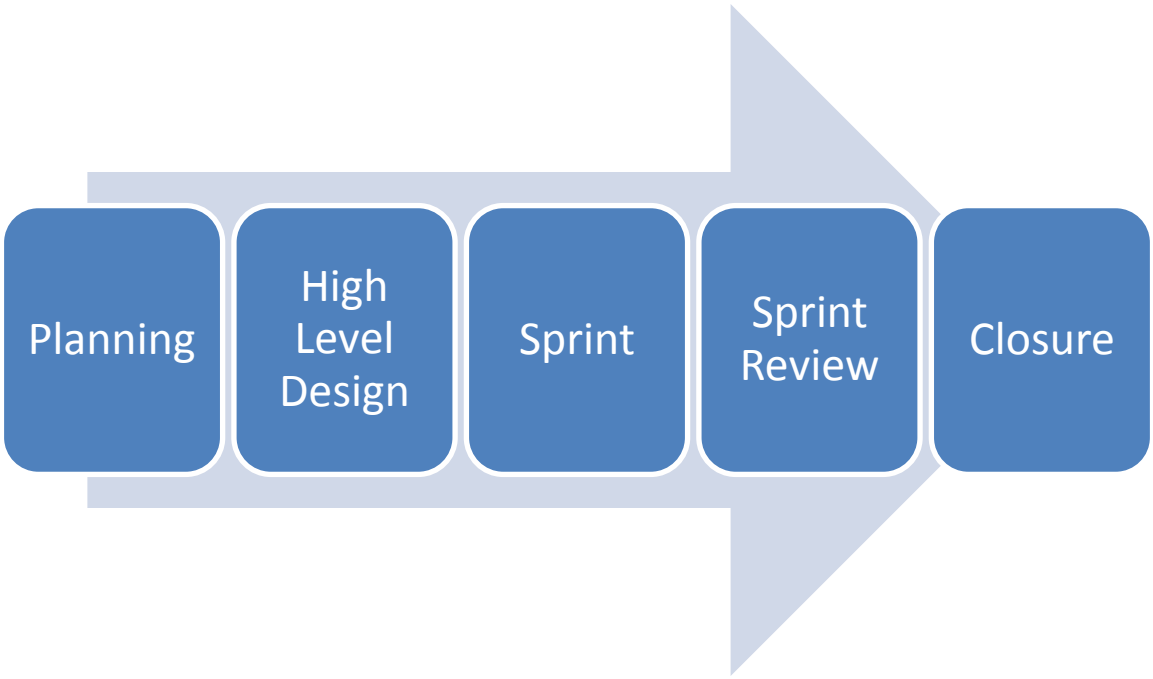
Chickens (Auxiliary or Supporting Roles)

Chicken roles do not directly influence the development of the product. They might not hold formal roles in the Scrum and their frequency with the scrum team is minimal and often null but they're still taken into account. An important aspect of Agile Methodologies is the practice that involves end users, related business groups (such as finance, legal, etc.) and other stakeholders at different junctures of the process of development. It is prudent and wise to involve such people in gauging the outcome of the project as they provide valuable insight into market standing, current needs and expectations of the user communities and other miscellaneous points, which will not only help the development team make better release decisions but also take better judgment calls on reviews and planning of sprints.

The Processes:

Sprint

Scrum projects make progress in many small units of time called Sprints. A sprint is a time-bound iteration that is typically 15-25 days but should not exceed a month. At the beginning of each sprint team members commit to delivering a specific number of features derived from the product backlog and at the end, these features must be done. It is to be noted that 'Done' as a definition has different interpretations and two scrum teams may vary on their definition of it but a standard interpretation could be that the features are properly designed, coded, tested and suitably integrated into the evolving product.



Process Flow Diagram of a Scrum

The essence of scrum is in the processes it deploys to ensure that the finest possible product is developed. For best results, following these practices with the least amount of contradiction is vital as scrum relies on its processes a lot more than other frameworks where a minute amount of laxness will not prove to be as fatal as it would be with scrum. The strictly-to-be-followed processes are mentioned hereunder.

Sprint Planning Meeting

This meeting is held at the commencement of a new sprint cycle, i.e. after the all the features in the previous sprint are 'done', agreed upon and closed. The agenda of this meeting is:

- The product owner and the team discuss and decide upon the highest priority features on the product backlog
- The scrum team decides on how many features to commit to, for that sprint
- A Sprint Backlog is created which contains the details about tasks to be completed during that sprint.
- As time is a key factor in a sprint, the sprint review meeting must not exceed eight hours.

Daily Scrum

Beginning with the first day, on each working day along the length of a sprint, a daily scrum meeting is held in the first working hour and it happens at the same location and time every day. Daily scrum is one of the most productive processes to ensure a smooth progression and completion of a scrum as this happens every day. Moreover, filtering out and eradicating obstacles on a daily basis ensures that no issues cumulatively grow large enough to affect the process flow, over time. A few guidelines of the Daily Scrum are:

- The Daily Scrum starts at a precise time with agreeable consequences for tardiness
- All stakeholders are welcome but only 'Pigs' are allowed to speak
- Limited to fifteen minutes

The agenda of the meeting is to discuss:

- What each team member has worked on, the previous day

- What each team member shall work on that day &
- If there are any obstacles that hinder or prevent any team member from accomplishing their tasks for the day.

Every member of the scrum team must address the above, successively while standing up (helps keep the meeting short), and it is the job of the ScrumMaster to get rid of any impediments that any team member might have which could prevent him/her from accomplishing his goals.

Sprint Review Meeting

This meeting is held at the completion of every sprint and it addresses the following issues:

- 'Pigs' analyze the completed sprint on a holistic basis by reviewing the complete and the incomplete work
- The team demonstrates the functionality that has been added to the product during that sprint from the end-product perspective to all the stakeholders present (commonly called "The Demo")
- The incomplete work is left out of the demonstration
- Limited to four hours

The need for this meeting is to obtain feedback from the product owner, end users and/or other stakeholders present in the meeting. The obtained feedback usually results in revising or adding things to the product backlog but it may often result in changing the freshly delivered features as well.

Sprint Retrospective

A Sprint retrospective as the name suggests mainly reflects back at the completed sprint to identify the strengths and weaknesses of that sprint so as to improve the next one. The greater goal of this meeting is to continuously streamline the processes used in a scrum. The time limit for a sprint retrospective is three hours.

Scrum artifacts

Every legitimate software development framework has its own artifacts and these artifacts are used by the processes involved in that framework to develop and maintain the product. The artifacts in question help not only for development and maintenance but are also vital for documentation purposes as they can be leveraged for further similar projects, training purposes, etc. Scrum also uses a set of artifacts, a few of which are commonly used across many frameworks while a few others are specific and unique to only Scrum. They are:

- Product Backlog
- Sprint Backlog
- Burndown charts

Product Backlog

A Product Backlog in layman's terms is a document of requirements containing the details of "what" is to be built, written as stories and ordered in the descending order of priority. In actuality, it is a high level document that contains the all the features of the product, starting with the most prioritized feature and proceeds downwards in a decreasing-priority fashion so the least prioritized features are at the end. The requirements/user-stories are put down on the product backlog after careful analysis regarding functionality, business value, dependency, finish-date, etc. The business value for features and the development effort are usually agreed upon, in a democratic fashion where everyone in the scrum team assigns a number to the feature on the Fibonacci sequence and the average or the most common value is assigned to that feature. The document is open to everybody but editable only by the product owner. While the product backlog contains tentative estimates of both business value and the effort by the development team, the latter cannot be decided by the product owner. As mentioned earlier, the scrum dev. team is self-organizing in a way that it not only reserves the right to state the tentative effort for each feature but also has the right to decide how many features it shall deliver in every sprint.

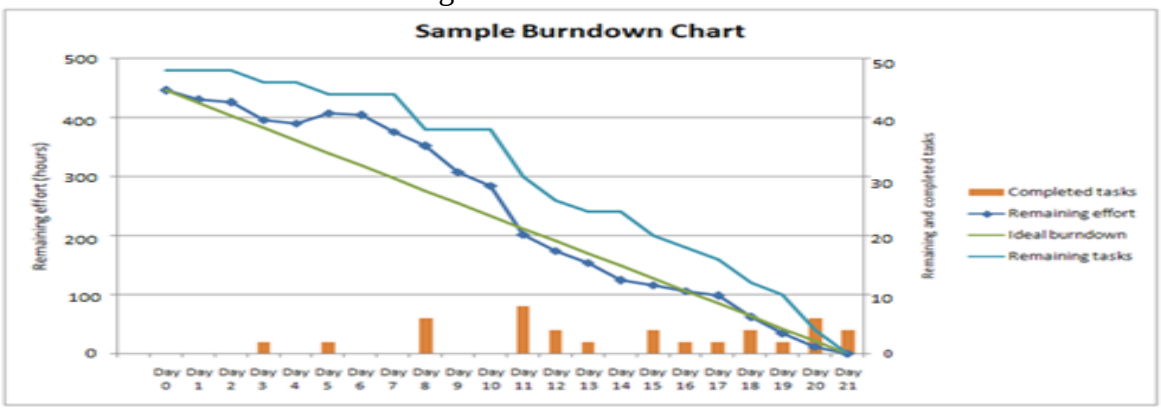
Also, when two or more features have the same business value, the feature with the least development effort attached to it is considered. This is a suitable move because, while the two or more features have the same business value or importance, the feature that requires lesser time or effort to develop possesses a greater ROI (Return on Investment) factor.

Sprint Backlog

A Sprint Backlog for any sprint is a scrum artifact that contains information about tasks to be completed in that particular sprint. Unlike the product backlog, the propriety of a sprint backlog lies with the scrum dev. team. The material on a sprint backlog is derived from the product backlog, which means that the team decides how many features from the product backlog can be addressed in a particular sprint and they divide the feature into smaller tasks typically estimated at 6-8 hours. The tasks are then taken one after another by the team and completed successively. The team members are not assigned tasks but they sign up for them during the Daily Scrum, thus empowering their self-organization. For this practice to work out, ideally the tasks on a sprint backlog must be uniformly gauged on effort as there should be no motive for a team member to gain extra credit or to use the level of difficulty as an excuse for not completing the task.

Burndown Charts

A Burndown chart is a simple graphical representation of the status of the project. In other words, it is a publicly displayed chart that shows the number of tasks completed, remaining, number of hours remaining and the ideal burndown pattern. It is a simple Cartesian graph with the length of the sprint in calendar-days depicted on the X-axis and two separate Y-axes one showing the number of hours remaining and the other showing the number of tasks still remaining that are to be completed. The burndown chart is updated on every day of the sprint. A sample burndown chart is shown below:



Conclusion

Scrum is an iterative framework that is derived from Agile Methodologies by selecting a few suited best practices and helps in delivering software products in a cumulative fashion. It ensures frequent immediate deliveries with working functionalityjust like any other Agilederivative, by embracing change and enabling developers to incorporate the changes in the product effortlessly and efficiently.

Scrum, for convenience can be categorized into three modules. Roles, processes and artifacts. Pigs or core roles i.e. Scrum Development Team, ScrumMaster and the Product Owner, are those that affect the product directly and stand to bear responsibility for its status and outcome. Chickens or auxiliary roles i.e. end users and other business departments are those who don't affect the product directly but they're still valued and their opinions are taken into consideration as

they enable the core team to make better implementation and release decisions. Scrum processes such as Sprint, Daily Scrum, Sprint Planning Meeting, Sprint Review Meeting and Sprint Retrospective help in delivering the product in a standardized and systematic manner by enabling the stakeholders to remove any obstacles and ensuring that the progress of the project is smooth and following a plan. Scrum artifacts such as Product Backlog, Sprint Backlog and Burndown Chart help not only for development purposes but for documentation and further use and reference.

4.

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