

The Role of Software Test Management in Product Development

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Test management has got much significance in software product management. Every software product undergoes a specific life cycle. What is that product life cycle? What is a software project life cycle? What does a product engineering team do? What is the role of test team in product development? What are the different levels of testing? What does a support team do? How testing is significant in product development? We can find answers to all these questions in this article. This article also discusses unit testing, integration testing and system testing, bug tracking tools and testing tools, etc. It also explains the challenges faced by the test managers in product environment.

Software testing plays an important role in product development. The quality of a product depends on how we test the product and fix the defects in it. With the advent of automated test tools the job of finding defects in a product has become easy and efficient. Once we find the defects in the product it is the job of programmers to fix defects. In the next section, we will deal with the product life cycle.

Product Life Cycle

Every product undergoes certain life cycle. Software product is not an exception to this. This product life cycle is as shown in the following figure.

Similar to every traditional product, software products are also introduced into the market. Based on the market segmentation, geographic location will be chosen for product introduction into specific region or will be released worldwide. Once the product introduction is over, the product enters into the growth stage based on the sales growth. The growth in sales continues for some time and then the sales become stable. That is, the product enters into the maturity stage. The product spends some time in the maturity stage, and then it enters into declining stage. Every product has to undergo this life cycle. Netscape Navigator is an example of this. MS-DOS is another example, which has undergone this product life cycle. Similarly, there are many software products which undergone this product life cycle.

Based on the product roadmap, product development will be divided into phases. Each phase can become a separate project for the sake of execution purpose. And each project will have its own project development life cycle. In the next section, we will have a look at the software project life cycle.

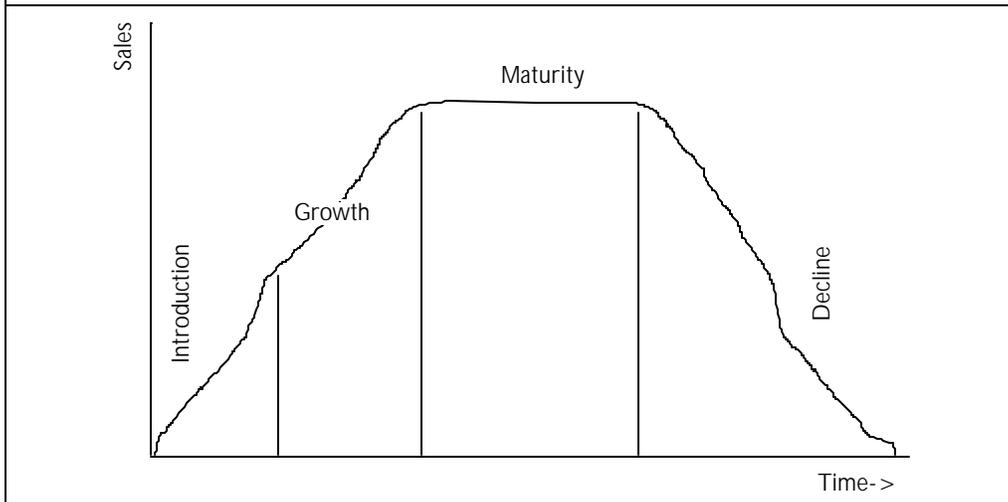
Software Project Life Cycle

There are different stages in a software project life cycle. The stages are shown in the diagram (Figure 2).

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Figure 1: Product Life Cycle

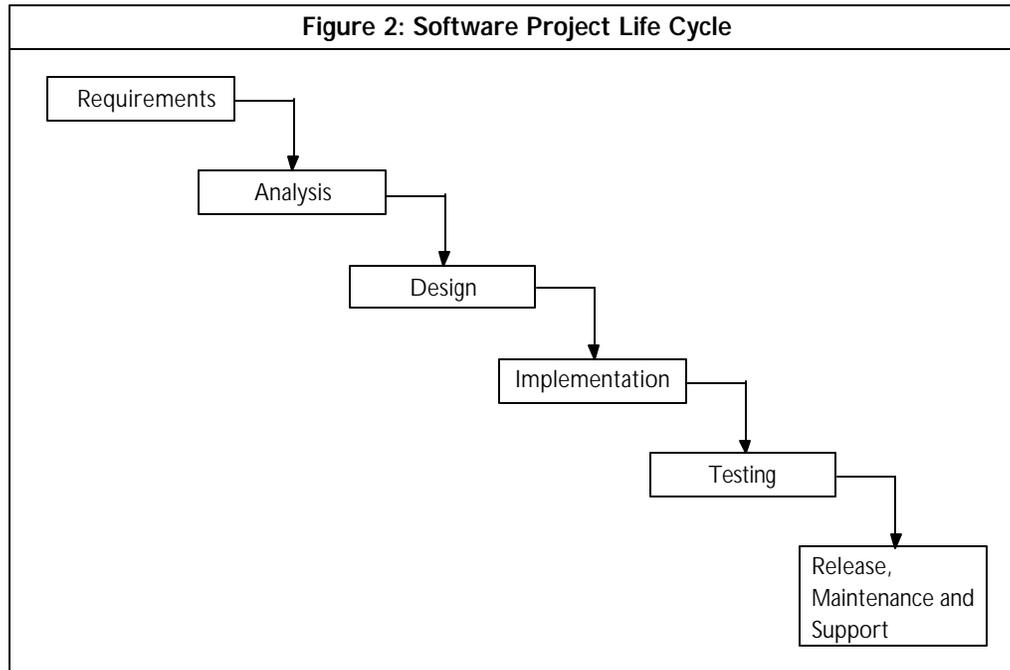


A software project starts with gathering requirements from the customers and users of the systems. These collected requirements will be analyzed and then the design of the software system takes place. During the design stage many organizations use design tools such as Rational Rose and case tools as well. In case object-oriented approaches, classes and objects are identified and their relationships and interactions will be designed during the design stage. Usually, the design stage can be divided into two stages known as high-level design and low-level design. During the design stage, notations such as Unified Modeling Language (UML) are widely used.

Once the design engineers give the classes and objects of the systems and its interactions and low-level design, the programmers start coding those classes and functions. That is the implementation stage of the proposed system. Once the modules are implemented, testing of the system starts. Testing can be carried out at three stages. They are unit testing, integration testing and system testing. Usually, unit testing is carried out by the programmers who have written those units such as classes and methods or functions. In most of the cases, separate system test teams will carry out system testing.

Once the through testing of the system is over, software product will be released to the users and the product is handed over officially to the support team in the performing organization. It is the support team's responsibility to respond to customer queries and if the support team is not able to solve the customer issue, it will be passed on to the engineering team. This customer issue may result in the bug in the product or a new feature for the product. Usually, support from the organization to the customer is provided at different levels such as Level 1, Level 2 and Level 3.

With the bug fixes and new features the product enters into the maintenance stage. It is the job of engineering and maintenance teams to release the different versions of the product.



In some companies there are separate product maintenance teams other than the product engineering teams. In the next section we will have a look at the job of product development engineering team in the organization.

Product Development and Engineering

Usually, in a majority of the organizations, there are separate product engineering, support, testing and Quality Assurance (QA) (process-related) teams. All these teams work together and interact with each other to deliver the product into the market. It is the job of product development team to gather requirements and do requirements engineering on it. The product development team is responsible for gathering requirements (sometimes marketing team provides requirements), analyze the requirements, design the system and implement the system.

Building and Packaging

Once the development team does the code freeze in the version control system, it is the job of build engineer to build the product from version control system using the source code files. The build engineer will be able to build the specific version of the product using version control system. Once the build is ready, it will be passed on to the packaging engineer. It is the job of the package engineer to neatly pack all the applications and make user-friendly installable package for the product.

Product Testing

Once the product-installable package is ready, it will be delivered to the testing team. It is the job of testing team to do the system testing of the product. The system test team should install the product, configure it and run the system test cases on the product.

There are three stages where we can do testing for the product. They are unit testing, integration testing and system testing. In the coming sections we will see what each of these testing means and how to do each of these testing stages and their role in stabilizing the product.

Test Plan

Usually, each software product will have test plan for the product. This test plan consists of the hardware, software requirements for the product, the sequence of needed installations, any other third party tools needed for the installation, configuration of the machines, and specific versions of the software, etc. This test plan also consists of how many test cycles will be made, test cycle duration, entry criteria and exit criteria, etc.

This test plan should be aligning with project plan. While preparing test plan we should keep in mind the project plan for schedules and time lines. Testing durations should be mentioned in the project plan. Once the test plan preparation is over, it needs to be approved.

Testing Process

Unit Testing

This is the first level in the testing process. Usually, the programmer who has written the source code carries out this unit testing. It is a best practice to document the unit test cases written for testing a specific unit of the module. The unit test cases consist of test condition, input values and expected output. If the source code does not give the expected output for the given input value, it will be treated as a bug and the programmer has to fix this bug in the source code. Like this the programmer tests all the source codes he has written. This is very much required for the good quality of the product. If the bugs are not found at unit level, they become more at integration and system test levels.

Integration Testing

Separate integration team for the product carries out integration test. Its job is to integrate some of the modules and see the functionality whether it is able to achieve the needed functionality or not. Some of the programmers in the engineering team may be part of this team as well. Usually well-written integration test cases will be run on the modules and the interaction between the modules is observed. If the expected behavior is not found, it results in a defect and the respective module owner needs to fix this reported defect. The integration test cases are prepared based on the high-level and low-level design documents.

System Testing

System testing starts with the proper installation and configuration of the product from the installable package given by the package engineer. The system tests the product in its entirety. Using the system test cases, it tests the entire product. These system test cases are prepared based on the requirements of the product. Usually, multiple rounds of testing and bug fixes are done for the product before its release into the market.

Once the system tester finds the bug in the product, he enters it into the bug-tracking tool. This bug-tracking tool is available to all development team members, testers, support engineers and product management team. Each bug in the bug-tracking tool changes its state such as open, fixed, verified, accepted, rejected, closed and reopen, etc. Each bug will be tracked from open state till it reaches closed state. Based on the state of the bug in the bug-tracking tool, the respective programmer or tester takes necessary actions like fixing the bug or verifying the fixed bug, etc.

Product Test Management Challenges

It is the duty of the test manager to ensure that the product is being tested thoroughly. The following are some of the challenges the test manager faces.

- Non-availability of sufficient time to test the product
- Non-availability of well-written test cases which cover the entire functionality
- Missing the testing of some functionality
- Difficulty in traceability of requirements
- Setting severity level of the bugs
- Setting the priority of the bugs
- Checking the correctness of the installable package
- Test plan preparation
- Finding the third party dependencies
- Tracking the progress of the testing
- Setting entry and exit criteria for testing.

Testing Tools

In the present days, there are many test management tools available in the market. For example, Test Director is one such tool available commercially in the market. For performing the automated testing on the product, there are tools such as Mercury's WinRunner, QTP and Silk Test available in the market.

Product Quality

Majority of IT organizations has quality departments, which take care of the process, related quality factors for the products and services. These organizations even have quality certifications such as ISO 90001:2000, SEI-CMMi and Six Sigma, etc. The quality department conducts the audit periodically and gives the Non-Conformances (NC) to the product/project management team. It is the responsibility of the product or project manager to close these NCs raised and comply with the organizational quality processes.

Product Release and Support

After a few rounds of system testing and bug fixes, the product will be in a stable position to be passed on it to the customer. Then the product engineering team gives the stable product to the customer and also hands over the product to the support team in the organization with the known issues (if any). Then it is the job of the support team to respond to the customer queries and apprise the engineering team.

Conclusion

In this article, we saw every stage of product development and the importance of testing and test management in the product delivery. The product needs to be stable before delivering it to the customer. It is the job of engineering and test teams to make the product stable. Once the product is released, it is the support team, which comes into the picture and interacts with the customer. Hence, all these teams in the organization have got importance in the product launch from the product development point of view.❖

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