**Module – 01**

**Introduction to SQA**

**\* What is Quality?**

**Quality** is meeting the requirements, expectations and needs of the customer is free from defects, lacks and substantial variants.

**\* What is Assurance?**

**Assurance** is provided by organization management, it means giving a positive declaration on a product which obtains confidence for the outcome. It gives a security that the product will work without any glitches as per the expectations or requests.

\* **What is Control?**

**Control** is to test or verify actual results by comparing it with the defined standards.

\* **What is Quality Control?**

**Quality Control** is known as QC and focuses on identifying a defect. QC ensures that the approaches, techniques, methods and processes are designed in the project are following correctly. QC activities monitor and verify that the project deliverables meet the defined quality standards.

Quality Control is a reactive process and is detection in nature. It recognizes the defects. Quality Control has to complete after Quality Assurance.

**Quality Control activities** include:

* Walkthroughs
* Testing
* Inspection
* Review

\* **What is Testing?**

**Software Testing** is the process of running a program with the intention of finding errors.

**Testing activities** include:

* Test planning
* Test case design
* Test execution
* Defect reporting
* Test reporting

**\* What is SQA?**

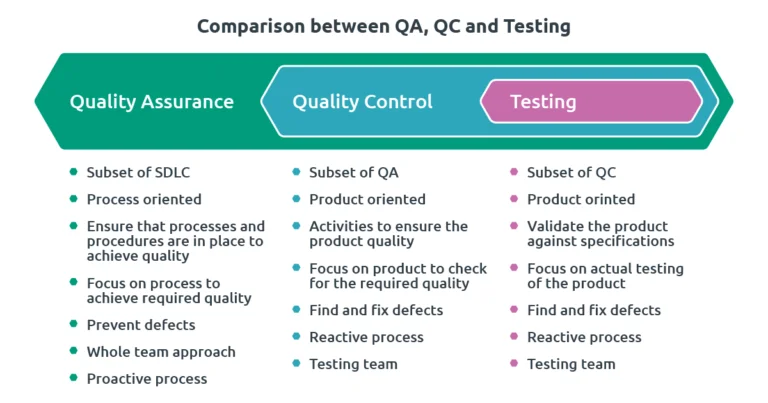
**Software Quality Assurance** is a method to check whether the actual software product matches expected requirements and to ensure that software product is [Defect](https://www.guru99.com/defect-management-process.html) free. It guarantees that the end user get a quality product that meets their expectations.

**\* Benefits of SQA:**

* SQA produce high quality software.
* Saves time and cost.
* Beneficial for better reliability.
* Improve the process of creating software.

A well-defined **QA strategy** should consider the following areas;

* Governance, financial reporting and stakeholder engagement and risk management
* Project team skill assessment and training requirements
* Communication and collaboration
* Methodologies
* Document control
* Requirements gathering process and definition of non-functional requirements
* Application / Service Architecture
* Testing strategy
* Test Environments (e.g. QA, Staging, UAT and production)
* Continuous integration and continuous delivery (CI/CD pipelines)
* Version control and branching strategy
* Design standards and reviews
* Coding standards, code quality checks and reviews



A screen shot of a quality assurance

Description automatically generated

**\* SQA vs SQC**

|  |  |
| --- | --- |
| Quality Assurance (QA) | Quality Control (QC) |
| It is a procedure that focuses on providing assurance that quality requested will be achieved | It is a procedure that focuses on fulfilling the quality requested. |
| QA aims to prevent the defect | QC aims to identify and fix defects |
| It is a method to manage the quality- Verification | It is a method to verify the quality-Validation |
| It does not involve executing the program | It always involves executing a program |
| It’s a Preventive technique | It’s a Corrective technique |
| It’s a Proactive measure | It’s a Reactive measure |
| It is the procedure to create the deliverables | It is the procedure to verify that deliverables |
| QA involves in full software development life cycle | QC involves in full [software testing life cycle](https://www.guru99.com/software-testing-life-cycle.html) |
| In order to meet the customer requirements, QA defines standards and methodologies | QC confirms that the standards are followed while working on the product |
| It is performed before Quality Control | It is performed only after QA activity is done |
| It is a Low-Level Activity, it can identify an error and mistakes which QC cannot | It is a High-Level Activity, it can identify an error that QA cannot |
| Its main motive is to prevent defects in the system. It is a less time-consuming activity | Its main motive is to identify defects or bugs in the system. It is a more time-consuming activity |
| QA ensures that everything is executed in the right way, and that is why it falls under verification activity | QC ensures that whatever we have done is as per the requirement, and that is why it falls under validation activity |
| It requires the involvement of the whole team | It requires the involvement of the Testing team |
| The statistical technique applied on QA is known as SPC or Statistical Process Control (SPC) | The statistical technique applied to QC is known as SQC or Statistical Quality Control |

In the context of an **e-commerce application**, let's explore the definitions and roles of Software Quality Assurance (SQA), Software Quality Control (SQC), and Software Testing:

**1. Software Quality Assurance (SQA):**

**- Definition**: Software Quality Assurance is a set of activities and processes designed to ensure that the development and implementation of software meet specified requirements and standards. It focuses on preventing defects in the process rather than detecting them after development.

**- Role in E-commerce:**

- Establishing and enforcing quality standards for the entire software development life cycle.

- Auditing processes and methodologies to ensure compliance with quality standards.

- Providing guidance and training to development teams on best practices.

**2. Software Quality Control (SQC):**

**- Definition:** Software Quality Control involves the systematic examination of the software product to ensure that it meets the specified requirements. It is a reactive process that focuses on identifying and fixing defects in the developed software.

**- Role in E-commerce:**

- Conducting inspections, reviews, and testing activities to identify and address defects.

- Verifying that the e-commerce application meets functional and non-functional requirements.

- Collaborating with development teams to improve the quality of deliverables.

**3. Software Testing:**

**- Definition:** Software Testing is a subset of Quality Control and involves the execution of a software system or its components to evaluate one or more properties of interest. The primary goal is to identify defects and ensure that the software functions as intended.

**- Role in E-commerce:**

- Conducting functional testing to ensure that features like product search, checkout, and payment processing work correctly.

- Performing performance testing to evaluate the system's responsiveness and scalability during high traffic periods.

- Executing security testing to identify vulnerabilities and ensure secure handling of customer data.

**Relationships:**

**- SQA vs. SQC:** SQA is a broader approach that encompasses SQC. SQA focuses on process improvement and prevention, while SQC focuses on defect identification and correction.

**- SQC vs. Testing:** SQC includes testing but is not limited to it. SQC involves various activities like inspections, reviews, and testing, whereas testing specifically refers to the execution of the software to identify defects.

**- SQA vs. Testing:** SQA involves activities that go beyond testing, such as process improvement, training, and setting quality standards. Testing, on the other hand, is specifically concerned with verifying the functionality and performance of the software.

**Example in E-commerce:**

In an e-commerce application:

**- SQA:** Ensures that the development team follows coding standards, uses secure coding practices, and conducts regular code reviews. It establishes guidelines for testing and collaborates with teams to improve overall development processes.

**- SQC:** Involves activities such as code inspections, design reviews, and testing. For example, conducting user acceptance testing to verify that the e-commerce site meets business requirements and adheres to usability standards.

**- Testing:** Specific testing activities include functional testing to check the shopping cart and checkout process, performance testing to assess website responsiveness during high traffic, and security testing to identify and address potential vulnerabilities in payment processing.

**\* Some basic questions in test.**

**1. Project Time Frame:**

- **Definition:** The planned duration for completing the software project.

- **Example:** The e-commerce project aims to launch within six months to coincide with the holiday shopping season.

**2. Core Business:**

- **Definition:** The primary focus or industry of the organization.

- **Example:** The core business of the e-commerce company is online retail, selling a variety of products to consumers.

**3. Targeted Audience:**

- **Definition:** The specific group of users or customers the software is designed for.

- **Example:** The targeted audience includes online shoppers seeking a convenient and diverse range of products.

**4. Costs:**

- **Definition:** The financial resources allocated for the software development and testing.

- **Example:** The e-commerce project has a budget of $1 million for development, testing, and deployment.

**5. Subjectivity of the Application:**

- **Definition:** The extent to which user experience or interpretation may vary.

- **Example:** The color scheme and layout might be subjective, as different users may have preferences for a visually appealing website.

**6. Business Rules:**

- **Definition:** Specific guidelines or principles governing the behavior of the application based on business requirements.

- **Example:** The business rule might specify that customers must log in to access personalized recommendations and discounts.

**7. Test Time:**

- **Definition:** The duration allocated for testing activities.

- **Example:** Testing will take place over a four-week period, including functional, performance, and security testing.

**8. Test Members Involved:**

- **Definition:** Individuals or teams responsible for planning and executing testing activities.

- **Example:** Test members include QA engineers, test analysts, and possibly user acceptance testers.

**9. Number of Tests:**

- **Definition:** The total count of individual test cases or scenarios.

- **Example:** There are 500 test cases covering various aspects, such as login functionality, product search, and checkout process.

**10. Number of User Types:**

- **Definition:** Different categories of users interacting with the application.

- **Example:** User types may include guests, registered customers, and administrators, each with distinct permissions and interactions.

**11. Number of Platforms:**

- **Definition:** The various operating systems or environments on which the application will run.

- **Example:** The e-commerce platform supports multiple platforms, including Windows, macOS, iOS, and Android.

**12. Number of Devices:**

- **Definition:** The range of devices the application is designed to run on.

- **Example:** The application is compatible with desktops, laptops, tablets, and smartphones for a seamless user experience.

**13. Design and Flow:**

- **Definition:** The overall structure and user journey within the application.

- **Example:** The design and flow ensure that customers can easily navigate through product categories, add items to the cart, and complete the checkout process.

**14. Requirements:**

- **Definition:** Detailed specifications outlining what the software should accomplish.

- **Example:** Requirements include features like product search, secure payment options, and order tracking for customers.

**15. Release Plan:**

- **Definition:** A timeline and strategy for deploying the software to users.

- **Example:** The release plan outlines a phased rollout, starting with internal testing, followed by a beta release, and then a full public launch.

**\* Choice between Manual and Automated test.**

Considering all the variables, the choice between manual and automated tests usually comes down to a few key issues as follows:

**Number of Test Cases:** If the test case execution occurs a small number of times, manual testing would be better. For example, projects with a static page, with no database connection, and few elements interacting with the page.

**Number of Sub-Projects:** If the project is comprised of small projects of a similar type, automation can take care of the features they have in common and you can run a manual test after or before the automated test scenarios to complete the verification.

**Time Constraints:** Exploratory testing (manually-executed) + automated test are always a good combination for projects where we don't have much time or where requirement specification is poorly written.This type of testing technique requires experienced testers, with creativity and intuition. Automation comes in when we find the spare time to create regression tests for pre-existing features we need to keep an eye on.

**\* Manual VS Automated**

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| --- | --- | --- |
| Parameter | Automation Testing | Manual Testing |
| Definition | Automation Testing uses automation tools to execute test cases. | In manual testing, test cases are executed by a human tester and software. |
| Processing time | Automated testing is significantly faster than a manual approach. | Manual testing is time-consuming and takes up human resources. |
| Exploratory Testing | Automation does not allow random testing | Exploratory testing is possible in Manual Testing |
| Initial investment | The initial investment in the automated testing is higher. Though the ROI is better in the long run. | The initial investment in the Manual testing is comparatively lower. ROI is lower compared to Automation testing in the long run. |
| Reliability | Automated testing is a reliable method, as it is performed by tools and scripts. There is no testing Fatigue. | Manual testing is not as accurate because of the possibility of the human errors. |
| UI Change | For even a trivial change in the UI of the AUT, Automated Test Scripts need to be modified to work as expected | Small changes like change in id, class, etc. of a button wouldn’t thwart execution of a manual tester. |
| Investment | Investment is required for testing tools as well as automation engineers | Investment is needed for human resources. |
| Cost-effective | Not cost effective for low volume regression | Not cost effective for high volume regression. |
| Test Report Visibility | With automation testing, all stakeholders can login into the automation system and check test execution results | Manual Tests are usually recorded in an Excel or Word, and test results are not readily/ readily available. |
| Human observation | Automated testing does not involve human consideration. So it can never give assurance of user-friendliness and positive customer experience. | The manual testing method allows human observation, which may be useful to offer user-friendly system. |
| Performance Testing | Performance Tests like Load Testing, Stress Testing, Spike Testing, etc. have to be tested by an automation tool compulsorily. | Performance Testing is not feasible manually |
| Parallel Execution | This testing can be executed on different operating platforms in parallel and reduce test execution time. | Manual tests can be executed in parallel but would need to increase your human resource which is expensive |
| Batch testing | You can Batch multiple Test Scripts for nightly execution. | Manual tests cannot be batched. |
| Programming knowledge | Programming knowledge is a must in automation testing. | No need for programming in Manual Testing. |
| Set up | Automation test requires less complex test execution set up. | Manual testing needs have a more straightforward test execution setup |
| Engagement | Done by tools. Its accurate and never gets bored! | Repetitive Manual Test Execution can get boring and error-prone. |
| Ideal approach | Automation testing is useful when frequently executing the same set of test cases | Manual testing proves useful when the test case only needs to run once or twice. |
| Build Verification Testing | Automation testing is useful for Build Verification Testing (BVT). | Executing the Build Verification Testing (BVT) is very difficult and time-consuming in manual testing. |
| Deadlines | Automated Tests have zero risks of missing out a pre-decided test. | Manual Testing has a higher risk of missing out the pre-decided test deadline. |
| Framework | Automation testing uses frameworks like Data Drive, Keyword, Hybrid to accelerate the automation process. | Manual Testing does not use frameworks but may use guidelines, checklists, stringent processes to draft certain test cases. |
| Documentation | Automated Tests acts as a document provides training value especially for automated unit test cases. A new developer can look into a unit test cases and understand the code base quickly. | Manual Test cases provide no training value |
| Test Design | Automated Unit Tests enforce/drive Test Driven Development Design. | Manual Unit Tests do not drive design into the coding process |
| Devops | Automated Tests help in Build Verification Testing and are an integral part of DevOps Cycle | Manual Testing defeats the automated build principle of DevOps |
| When to Use? | Automated Testing is suited for Regression Testing, Performance Testing, Load Testing or highly repeatable functional test cases. | Manual Testing is suitable for Exploratory, Usability and Adhoc Testing. It should also be used where the AUT changes frequently. |

**\* The Testing Team**

**From Slide:**

**Program Manager**

* The planning and execution of the project to ensure the success of a project minimizing risk throughout the lifetime of the project.
* Responsible for writing the product specification, managing the schedule and making the critical decisions and trade-offs.

**QA Engineer**

* A QA engineer oversees the testing and quality management of software prior to the release of the product or application. To find and identify bugs and possible problems with new software, they plan and perform testing at different stages of the development process. They work closely with the software development team with testing and documentation of the application to confirm it is working properly before releasing it to the public. The QA engineer must also ensure the software meets or exceeds both company and regulatory standards.

**QA Lead**

* Coach and mentor other team members to help improve QA effectiveness Work with other department representatives to collaborate on joint projects and initiatives
* Implement industry best practices related to testing automation and to streamline the QA Department.

**Test Engineer**

* Writing and executing test cases and Reporting defects.
* Test engineers are also responsible for determining the best way a test can be performed in order to achieve 100% test coverage of all components.

**Test Analyst / Lead**

* Responsible for planning, developing and executing automated test systems, manual test plans and regressions test plans.
* Identifying the Target Test Items to be evaluated by the test effort.
* Defining the appropriate tests required and any associated Test Data.
* Gathering and managing the Test Data.
* Evaluating the outcome of each test cycle.

**Software Tester**

* Software Tester is the one who performs testing and find bugs,Take care all of other issues, if they exist in the tested application.
* Monitor and report it. He/She is responsible for taking care of all the software issues.

**From Other Sources:**

**Software Testing Team Roles Explained**

**Seniority Levels:**

1. **Leadership:**
   * **Project Manager:** 
     + Oversees the entire testing process, setting timelines, budget, and resources. In an e-commerce project, they might define testing phases, allocate resources for testing different features, and ensure adherence to deadlines.
     + The Project Manager is responsible for planning, executing, and closing projects. They ensure that the project meets its goals, stays on budget, and is delivered on time.
     + Oversees the entire testing lifecycle, managing resources, budget, and timelines. (Think: Captain of the ship)
     + Example (E-commerce Project): Overseeing the entire e-commerce development project, setting timelines, and coordinating with various teams to ensure seamless execution.
     + Secures funding, defines project scope, and tracks progress against deadlines. (e.g., Secures budget for website launch, ensures features are delivered on time)
   * **Test Manager:** 
     + Manages the testing team, assigning tasks, monitoring progress, and ensuring quality. They might assign specific features for testing to different engineers, track bug reports, and report progress to the project manager.
     + QA manager acts a little like a project manager. Design test strategy, organize test processes, track test progress and supervises the teamwork through test planning.
     + A test manager is responsible for planning, coordinating, and overseeing the testing activities and resources for a software project or product. A test manager defines the testing strategy, scope, schedule, budget, and quality criteria, and ensures that they align with the project goals and stakeholder expectations. A test manager also manages the test team, assigns tasks, monitors progress, resolves issues, and communicates the testing status and outcomes to relevant parties.
     + The Test Manager oversees the testing team, ensuring that testing processes are effective and align with project objectives.
     + Leads the execution of the testing plan, managing test teams and ensuring quality deliverables. (Think: First Mate, navigating the course)
     + Example: Developing the overall test strategy for the e-commerce platform, managing resources, and reporting testing progress to the project manager.
     + Creates the test plan, assigns tasks to teams, and monitors test execution. (e.g., Plans testing for product pages, assigns checkout flow testing to a team)
2. **Technical Expertise:**
   * **QA Engineer:** 
     + Performs manual testing, identifying bugs and documenting issues. In an e-commerce project, they might test checkout functionality, product search, and user login/registration processes.
     + Determines test procedures that can enable to test of a particular software app in the beat particular manner. Designing test suites, create test cases and test documentation. Executes all levels of testing. Run tests according to the test standards within various testing techniques. Analyzes and reports test results. To help troubleshoot errors, before the product will be pushed into production.
     + QA Engineers are responsible for testing software applications to identify defects and ensure the overall quality of the product.
     + Executes test cases manually or through automation, reporting bugs and documenting results. (Think: Line Cook, following recipes and ensuring quality)
     + Example: Conducting comprehensive testing of payment gateways and checkout processes in the e-commerce platform.
     + Executes test cases manually or through automation, reporting bugs and documenting test results for features like product search, reviews, and order tracking.
   * **QC Engineer:** 
     + Focuses on quality control, ensuring adherence to coding standards and best practices. They might review test scripts, code reviews, and ensure adherence to company testing frameworks.
     + The term comes from the manufacturing industry. QC in the software industry is responsible for testing new products and determining whether those products meet business requirements in reliability and functionality. Implements the test program established by QA procedures, testing efforts are concentrated on finding defects.
     + QC Engineers focus on controlling and maintaining the quality of the deliverables, ensuring that they meet specified standards.
     + Focuses on quality control, ensuring adherence to coding standards and best practices. (Think: Health Inspector, ensuring food meets safety standards)
     + Example: Performing regular checks to ensure that the e-commerce website adheres to design and usability standards.
     + Reviews code for adherence to coding standards, ensuring code quality improves website performance and stability.
   * **QA Lead:** 
     + Guides and mentors other QA team members, providing technical expertise and ensuring efficient testing practices. They might train new engineers, review test plans, and identify areas for improvement in the testing process.
     + The QA Lead is responsible for guiding the quality assurance team and ensuring that the testing processes are followed consistently.
     + Provides technical expertise and guidance to the testing team, ensuring adherence to best practices. (Think: Head Chef, crafting the testing strategy)
     + *Example*: Leading a team of QA Engineers to develop and execute test plans, identifying and addressing quality issues.
     + Reviews test cases, advises on test strategies, and mentors junior testers. (e.g., Reviews test cases for product search, suggests automation for repetitive tasks)
3. **Specific Skillsets:**

* **Test Architect:**
  + Works with the project infrastructure, prepares test strategy and implements test automation tools to support product code and test code. Sometimes performs low-level testing like unit testing, module testing, performance testing, acceptance testing. Should have strong knowledge of backend services.
  + **Test Analyst:** 
    - Analyzes requirements, designs test cases, and documents test plans. They might analyze e-commerce features like payment gateways, user interactions, and security aspects to create comprehensive test cases.
    - Focuses on the business problem. Should have the ability to see the big picture, good planning and organizational skills. Analyzes requirements and acceptance criteria, designs software testing documentation including test plans, links tests to req, run tests, analyzes and documents results.
    - A test analyst is responsible for analyzing the requirements, specifications, and design of a software product and creating test cases, scenarios, and scripts that cover the expected functionality and behavior of the product. A test analyst also executes the test cases, reports the results, and logs any defects or issues that arise during testing. A test analyst may use manual or automated testing tools and techniques, depending on the project and the testing methodology.
    - Test Analysts analyze requirements and design test cases to verify that software meets specified requirements.
    - Analyzes requirements and designs test cases, ensuring comprehensive coverage of the system. (Think: Food Critic, tasting and identifying potential flaws)
    - Example: Analyzing user stories and creating test scenarios for new features in the e-commerce platform.
    - Analyzes user stories and requirements to design comprehensive test cases for all e-commerce functionalities. (e.g., Creates test cases for adding items to cart, applying discounts, and completing checkout)
  + **Test Engineer:** 
    - Executes test cases, automates tests where possible, and reports bugs. They might automate repetitive tests for product search, shopping cart functionality, and use automation tools like Selenium.
    - A test engineer is responsible for designing, developing, and maintaining the testing infrastructure, tools, and frameworks that enable efficient and effective testing of a software product. A test engineer may also create and execute test cases, but their main focus is on ensuring the quality and reliability of the testing environment and processes. A test engineer may use various programming languages, technologies, and platforms to create and support testing solutions.
    - Test Engineers execute test cases, report defects, and collaborate with the development team to resolve issues.
    - Example: Actively participating in the execution of performance testing to ensure the e-commerce website can handle peak traffic loads.
  + **Test Automation Engineer:** 
    - Develops and maintains automated test scripts, improving test efficiency and coverage. They might build automated tests for API testing, regression testing, and performance testing in the e-commerce project.
    - Primarily is focused on coding test framework and then quality. Set up a test environment, and develops test scripts using the testing tools like Selenium, [Codecept](https://codecept.io/) or others to design and run automated test cases.
    - A test automation engineer is responsible for creating, executing, and maintaining automated test scripts that simulate user actions and verify the functionality and performance of a software product. A test automation engineer may use various tools and frameworks to create and run automated tests, such as Selenium, Cucumber, TestNG, JUnit, etc. A test automation engineer may also integrate the automated tests with the continuous integration and delivery pipeline, and generate and analyze test reports.
    - Test Automation Engineers develop and implement automated test scripts to improve testing efficiency.
    - Develops and maintains automated testing scripts, optimizing test execution efficiency. (Think: Pastry Chef, automating repetitive tasks for consistency)
    - Example: Creating automated scripts for testing product search functionality and order processing in the e-commerce application.
    - Develops automated scripts for repetitive testing tasks like login, product filtering, and checkout flow, improving efficiency and coverage.

1. **Supporting Roles:**
   * **Test Lead:**
     + Leads specific testing efforts, like performance testing or security testing, within the project. They might lead the testing of load capacity during peak seasons in the e-commerce project.
     + A test lead is responsible for leading a team of testers and ensuring that they deliver high-quality testing results within the given time and budget constraints. A test lead may also perform some of the tasks of a test analyst or a test engineer, depending on the project and the team size. A test lead may also act as a liaison between the test team and other project stakeholders, such as developers, business analysts, project managers, etc.
     + The Test Lead is in charge of a specific testing phase or aspect, coordinating activities and ensuring that testing objectives are met.
     + Oversees a specific testing area (e.g., functional, performance), managing tasks and reporting progress. (Think: Section Chef, leading a specific kitchen team)
     + Example: Leading the functional testing team to validate and verify features of the e-commerce website.
     + Manages the testing of a specific e-commerce module (e.g., shopping cart) and reports progress to the Test Manager. (e.g., Tracks bugs identified during payment gateway testing)
   * **Test Consultant:**
     + Provides external expertise and guidance to the testing team. They might be brought in to review specific aspects of the e-commerce project testing, like security vulnerabilities or mobile app testing.
     + Involved in all (SDLC) phases of an IT project where they can improve all needed aspects of software development. They ought to be interested in the current trend in software development (including Agile and DevOps). Should own an analytical mindset and of course excellent communication skills.
     + A test consultant is an expert in software testing who provides advice, guidance, and support to clients or organizations on various aspects of software testing, such as testing strategy, methodology, tools, best practices, standards, etc. A test consultant may also conduct audits, assessments, or reviews of the existing testing processes and practices, and suggest improvements or recommendations. A test consultant may work independently or as part of a consulting firm or agency.
     + A Test Consultant provides expert advice on testing strategies, methodologies, and tools to improve the overall testing process.
     + Provides external expertise and guidance, recommending best practices and tools for specific projects. (Think: Guest Chef, offering specialized skills for a limited time)
     + Example: Offering guidance on implementing automation tools for regression testing in the e-commerce project.
     + Provides expertise on specific e-commerce testing tools or methodologies, advising on best practices for the project.
   * **Software Tester:**
     + Entry-level role, assisting with basic testing tasks under the guidance of senior engineers. They might perform basic manual testing on e-commerce features like content updates or product descriptions.
     + Software Testers are responsible for executing test cases and reporting defects, ensuring that the software meets quality standards.
     + Entry-level role, assisting with manual testing tasks and learning the ropes. (Think: Apprentice Cook, learning kitchen basics and assisting with tasks)
     + Example: Conducting manual testing of different functionalities like product browsing, adding items to the cart, and order processing in the e-commerce application.
     + Assists with manual testing tasks like verifying product descriptions, testing error messages, and reporting bugs.

Remember: These roles can overlap and vary in titles and responsibilities depending on the organization.

Bonus: This structure is just a guideline. In agile environments, roles might be more fluid, and team members might wear multiple hats.