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Journey of the Highly Effective Test Professional

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Practices Experience Knowledge Automation

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Abstract:

Software products are getting bigger in size and complexity day by day. At the same time, profit margins are under tremendous pressure due to increased competition. In addition, high quality products and timely delivery are demanded by every customer.

Test professionals are mostly involved with writing test cases, test execution and report preparation. Test schedules are always under pressure and hence test engineers are a very busy group. However, testing is becoming the focus of strategic importance. With ever increasing competition, cost is always under pressure. Organizations are looking for efficient processes for optimize testing. Process knowledge and maturity is becoming part of core competency. In addition, formal test techniques are gaining higher acceptance as it creates better coverage, higher reuse and more predictable. Test tools are also becoming very popular due to productivity gain. A good knowledge of a test tools is a necessary skill now.

Testing function, many a times is perceived, as a conflicting role with that of developers. Therefore, people skills are very much essential for effective test function. Good interpersonal skills are a sure success factor. Test professions can bring new insights via their test reports with proper pattern identifications of quality parameters. In addition, a positive attitude can bring a refreshing touch to the team as a whole.

This paper tries to capture various aspects of testing in a holistic way. It identifies different dimensions of the testing role for higher effectiveness and provides insight in each of these aspects.

As a whole, a roadmap is provided for higher impact and effectiveness of a test professional in the organization.

1. Introduction

As per Wikipedia, “Software testing is the process used to help identify the correctness, completeness, security, and quality of developed computer software. Testing is a process of technical investigation, performed on behalf of stakeholders, that is intended to reveal quality-related information about the product with respect to the context in which it is intended to operate. This includes, but is not limited to, the process of executing a program or application with the intent of finding errors. Quality is not an absolute; it is value to some person. With that in mind, testing can never completely establish the correctness of arbitrary computer software; testing furnishes a criticism or comparison that compares the state and behaviour of the product against a specification. An important point is that software testing should be distinguished from the separate discipline of software quality assurance, which encompasses all business process areas, not just testing.”

Today our life is surrounded by software all around. We wake up with our alarm clock which has software managing time; our kitchen refrigerator temperature is managed by software. The vehicle we drive has software application managing speed and control. All our reservation and banking systems are done via web applications. As a whole our life now has a large share of software. Since the era of mechanical computing machines to super computers to personal computers, the development of machines and the software is phenomenon. There is an interesting article assessing five decades of software development by Whittaker and Voas - “50 years of software: key principles for quality”.

In the days of mainframe computers in research labs, scientists themselves used to test and fix the bugs. With the arrival of personal computers and internet, applications were developed for business benefits – factory automation and finance. Possibly then the financial cost of a failure was felt by non-technical people. Hence the need of a structured test approach was felt and started emerging. Whole world became aware of software Y2K testing as the year 2000 approached. As component software development approach gained acceptance, applications became large and complex in nature. Simultaneous development across geographically distributed groups became a reality. And in due course, outsourcing model evolved for testing. And testing was accepted as a specialization. In the year 1979, the first book on software testing arrived (The Art of Software Testing - Myers).

India emerged as a key destination for both development and testing. As per an IDC report (<http://www.itbusinessedge.com/item/?ci=11726>), almost \$1 billion of the estimated \$13 billion global software testing market is accounted for by Indian companies. Meanwhile, India is becoming one of the leading destinations for offshore testing, with market opportunities for the offshore software testing companies currently at \$2 billion, and expected to rise to \$8 billion by 2008.

When you look around in the testing community, many happened to be in testing role rather than choosing it. Quality training availability is far and few even now. Dedicated university programs on software testing are still not easily available. And hence most people started without any formal training and received on job training on testing. Some organizations started in-house training to fill the knowledge gap.

Software has now become all pervasive and going through a rapid change. Internet has made it accessible to people in remote corners of the globe. And hence it has become a strategic importance to many organizations. As more and more common people use software, it is no longer sufficient to have a functionally and technically satisfactory product. Reliability, ease of use and seamless merging with existing workflows has become key differentiators. A deep understanding of various product quality characteristics has become a necessity for test professional.

This article describes various aspects of testing, beyond test specification and execution, in a holistic way for higher effectiveness.

2. Clear Business view

Organizations deploy IT solutions for higher productivity and efficiency. Cost of non-quality has a big business impact and hence testing has become focus of senior management. Test professional can ill afford to confine to the traditional boundaries of a few modules. People need to think beyond test preparation and execution. It's critical to understand various players in the domain and position of your organization. Most of the domains like healthcare, finance, insurance, telecom etc are going through an evolution due to new technology and market expansion.

In this scenario, test professionals need to scale up in the domain and general awareness of the business context. Quality is not just defects, but cost and schedule as well. When one reflects the purchase decision of, say a cell phone, you realize that the user experience and reliability play the critical role in purchase decisions. So direct exposure to the market and users are also critical components of test effectiveness.

3. Product Guru

Is it sufficient to know a few modules of complex products? Today very few applications are developed from scratch as the risk of quality and schedule is too much. A lot of third party software is used in many of the applications. With this being the fact, it's critical to understand the architecture and behavior models of the system very well.

Just functional testing, as mostly the case, is rarely sufficient. Various product quality characteristics (ISO 9126) like performance, reliability, security etc need to be focused equally well. It's a well know problem that performance and reliability testing happens very late in the life cycle. And these are the key contributors for blocking releases. In

addition there are severe cost factors associated with late releases as well both for the vendor and the clients.

Most of the software business from India caters to clients in North America and Europe. The users belong to a totally different culture and environment. The implicit assumption of the user as another human being like us is very inadequate. Simple things like color preference, language, time zones, regional settings, learning styles, training cost can severely impact a product's effectiveness.

Many of the application belong to verticals like CAD, banking, insurance, critical care, pathology, drug discovery, pattern search etc. Each has a core technology such as Windows, UNIX, Web, etc. However, as the market matures, there will be expectations for higher value contribution in domain knowledge and technology. This is an area currently not addressed well by most of the testing groups.

Majority of the test professions remain only with requirements and a few features set. Many have no clue about the product architecture and various design considerations. Though many organizations follow a V model, where we talk about global design and detailed design are test inputs, practice tells a different story. People are so busy execution and re-executing that they rarely consider the design as a key input and work on it. A good knowledge of the global design can help in deriving critical use cases and dramatically improve the visibility of test team in the project.

4. Process Mature

Many of the companies in India are CMM certified. So the basic process framework is available. Software development plans have some kind of SDLC – some variation of V model. However, it's a well known fact that CMM is more of software development oriented. Therefore test specific processes like TMM and TPI (Test Process Improvement - Koomen and Pol) have come into picture.

Process in any area improves the confidence of the user and customer. A defined test process can make the quality measure much more predictable and accurate. Besides, it can help in better output from test team. Test professions need to be aware of various process areas applicable to test function. As the test load increases like tidal waves, it's very easy to slip into “execute and complete” mode of working. And at this point, poor quality creeps in. Either critical elements are missed or an emerging pattern is lost.

Test metric can be very useful for higher effectiveness. Most software and test managers keep some metrics to help them. Early warnings can be received from the test metric patterns which can help the project steer away from trouble patches. A good metric can also be useful for the test team to illustrate the value contribution and help to demand much needed resources.

5. Method Expert

As we saw in the definition of software testing, it is an activity aimed at verification as well as validation (IEEE 1012-1986) of the product. It is a well known fact that the testing all the possible combinations of any real life software applications is impossible within the budget and time. And hence, each test project deals with the trade-off between cost and quality. So how does one decide the test scope and approach within the available budget?

The principles of software testing are well established now; however, it has a limited understanding by most of the test professionals. Majority of the software testers are either not aware of the many formal techniques or don't practice. General practice is FRS based testing without rigor of formal techniques; the practice is very much individual dependent in nature.

However, formal techniques are well developed and have a good theoretical basis. The books of Mayer-79, Bezier-90, Binder-99 and Pol-01 are excellent reference material to start with. Depending on the characteristics of the requirements, specific techniques can be used for higher effectiveness and better coverage. Many of these techniques are based on a model for the system under test. Each model does focus certain aspects of the system.

Risk analysis is the key activity during preparation phase. Test depth is decided based on the risk. Higher risk shall have higher depth. Test process like TPI – a model for test process improvement can be used as a reference framework. A test professional is expected to be an expert of various techniques and its usage context. Generally people are only aware of white box, black box, and equivalence partitioning and boundary analysis as techniques. Even the practice of these methods is limited to trivial cases.

6. Tools Proficient

Tooling is part of any software project. As manual test efforts keep increasing, many are looking at test automation tools. Project managers primarily look at the automation to save cost as well as protect quality. It's important for a test profession to be well conversant with at least one tool thoroughly. It is like – “understand one thing well, and you have arrived”.

There are also many scripting languages which can be handy for low cost automation at times. In addition, many open source tools (www.opensourcetesting.org) are useful for projects who can't afford commercial tolls. In spite of all this, the industry is full of test automation “failure stories”. One key reason is inadequate though process for test design which leads to maintenance nightmare and scripts migration problems for new

technology. The book – “Automated Testing Handbook – Linda Hayes” is one of the good reference material. The paradigm should shift from “use just as an automation tool” to “get it to do what you need it to do”. Test automation shall not be seen beyond “automating test execution”.

7. People Wise

People skills are an important aspect for a test professional. In a project, there are peers, developers, managers, customers and end users along with the testers. Each of them is playing a useful role, different from each other, in the life cycle of the product. However, the interest and focus of each of them is different. It is useful for the tester to understand these stake holders. The book- “Dynamics of Software development – McCarthy” provides a good view of the software development phases.

The project manager is mostly concerned with cost and schedule whereas the quality manager is concerned with product quality. The developer is busy with the feature she is implementing whereas the team lead is looking at the modules integration. The architect is concerned about design integrity. The end user is with his business problem and the internal customer is worried about market competition. However, everyone has an expectation from testing.

The awareness and understanding of various users will make you decide the nature and level of abstraction of information to be presented. This will make the test team better visible in the product lifecycle. There is a rich literature to understand these aspects in software. The classic – “Mythical Manmonth - Brooks” is a must read.

8. Continuous learning

Information technology is primarily a knowledge industry. Also this is a fast changing industry in terms of new domains, technology and people. As a test professional, one is busy with the project in hand with its features set. He lives in and around it all the time. The reading space of most of the test professionals is primarily confined to “FRS and emails”. The test exposure is mostly based on whatever in-house training program and in the job learning. The most common response for the question of what the person has read about testing is some vague reference to “Pressman” and some forgotten articles from the web. The general pattern seems to be – “I last read seriously in the last of term of my degree”. Stephen R. Covey presented a framework for personal effectiveness in the popular book “The 7 Habits of Highly Effective People”. In Habit 7: Sharpen the Saw, it explains the importance of renewal.

As the popular saying goes – “Learning is not mandatory, so is survival”. In the era of fast changing technology, the arrival of new challenges is no more of a “when” issue rather than “if”. In each new project, test professional will face new complexity of domain as well as technology. Proof of steep learning ability has become a standard check during recruitment. Employability is now closely related to quick learning skill.

And this gap can't be closed overnight; it's a "continuous" process. The feeling of "enough" knowledge is myth and lasts only for a couple of years.

How does one keep oneself updated? It's absolutely necessary to keep up in various areas like technology, domains, tools, methods; also soft skills like communication, time management, leadership are as crucial in the testing career. This is possibly the best investment you can make for your career. This will also help your manager to look at you as a potential candidate for future assignments.

Workshops and conferences are the places to be updated about various methods, best practice and new technology. A regular book and journal reading is an efficient way to keep the general awareness. Subscribing to various web journals and user groups can help you updated regularly (you may refer the web sites provided in the references). Technical writing for can be effectively used to learn new areas as well. Networking with experts can be immensely beneficial; what one may be struggling for years may have the solution in an hour from an expert. Networking with your peers is a way of motivating yourself and learn new experience.

Within the project, one can also write an overview report abstracting the key patterns from different data sources. This gives one a learning opportunity and value creation for the project. Coaching and training is another mechanism to keep up with learning. There is an interesting and useful title called – "Lifelong Learner" by Ronald Gross.

9. Communication Master

Effective communication is the key for an individual in an organization. And it's more so for the test professional involved with quality dimension of the product. Many a times our communication is either reactive or passive silence. All of us have seen in team meetings where some people will never stop talking and some others don't speak at all. In addition, test professionals always produce reports and specifications. For most, these reports represent you!

People come from diverse background – some urban and some from rural. There are many a languages, cultures and sects with their special patterns. It does reflect in the work place. This diversity can be effectively used to create new ideas to solve problems around testing. As test persons, we attend overview meeting; these are great opportunity to gather valuable information by active listening. Many a times, we notice complete differ understanding of the group of the same topic. Summarization is a critical skill to check your understanding and to reach an agreement.

Written communication is another key aspect of the test professional. We write many defect reports – the most common content is the steps to produce and reference test id. How about the impact of this issue on the product and the user? Also help with useful

hints from the log to isolate the problem. A gentle persuasion to fix the problem will make the problem report a perfect piece of art.

A test professional has a unique position in the project like no other. You can view the product from various angles – marketing, end user, developer, quality, management. This can be used effectively for the benefit of the project which can in turn make you visible. However, if you are not effective in communication, your idea will not be appreciated. Mostly people just bang the “send” button (at the point of inspiration or frustration) to the reporting manager about the “great” idea and wait. Speaking to any senior manager will make you realize that her mail box is full of “great ideas” mails! The common expectation of follow up actions, recognition and your reward rarely happens.

An idea is just another dream at the point of emergence. For any manager, who is eternally worried with cost and quality, this provides little solace. Is the communication done in the medium most appropriate for the receiver (graph, chart, bullet etc)? It shall address, with enough detail, some key concern (and solutions) of the project. A small experiment and its result can help and motivate the recipient. In the era of information overload, it can happen that your mail is lost or not opened for a long time. A gentle reminder (not too soon) or a small discussion can help both. However, don't be surprised to hear a piece of similar failure in the past and hence reject. This can be an opportunity for doing better next time!

Another invisible aspect of communication is body language. In fact, most of the first time perceptions are made based on the body language. Do you look interested, energetic, listless, motivated, or lazy? Is the person looking scarred or confident? Your physical well being is a critical part.

Most of the human beings are very uncomfortable to tell “NO”. With common delayed builds and schedule, many a times we face absolutely unreasonable requests; and most of us tell YES even though we hear the loud inner voice telling NO. This leads to poor quality output without commitment. There is an interesting title called “Don't Say Yes When You Want to Say No” by Fernsterheim which you may find useful.

10. Positive Attitude

Testing hours in release phases can be long and tiring without much appreciation. Long hours and stress also creates severe burnout and RSI problems. It's very easy to slip into a complaining and victim frame of mind. This typically leads to a “ghetto” attitude among testers.

Software production is still an intellectual activity dealing with ideas and feelings. Critical information may be available in pockets. A tester needs quality information for higher effectiveness which is easy to get via a good rapport with developers. A

lighthearted attitude will make the environment lively and refreshing. Empathy for others will win you friends easily.

In testing function, at times opinion differences can lead to non-cooperation from others. It is useful to have conflict resolution skills to break the barriers; and a positive outlook is certain come very handy at this time. Feeling of well being is also an out put of a positive attitude. A very popular title which may come handy for test professionals is “How to win friends and influence people” by Dale Carnegie.

Self esteem is another area for a tester which can get a beating; this could be due to insufficient domain knowledge or a strong difference of opinion with development team. Peer group and a strong positive attitude is the need of this hour. “Self-Esteem” by Virginia Satir is a useful book to keep in your bookshelf.

11. Summary

Testing function is currently playing a supporting role to software production and follows development in most of the cases. Majority of the test professionals are spending their energy in functional test development and execution. And this happens mostly pretty late in the life cycle. Some others are involved in test automation using popular tools which works mostly solve the problem today rather than having a good design for ease of maintainability and technology migration.

In this paper we tried to discuss the alignment of test function from last gate keeper to critical stake holders in the product creation & management process. Elements like business objectives, product portfolio awareness and process maturity are discussed as key factors for effectiveness. In addition, importance of formal method and tools training and use are discussed. Critical skills like collaboration, cultural sensitivity and effective verbal and written communications are emphasized. Also testing professional’s need of a positive attitude, time management and continuous learning are discussed as key ingredients in the fast changing world of software.

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