

have to communicate with internal organizational stakeholders like Chief technology officers, Software Architect, Project Managers, Business Analyst, Software Developers and Quality Assurance Professionals for technical discussions like system configurations, system test scenarios, technical issues and their resolution strategies, status of the projects, technical risks and concerns, software processes and software product features.

I have also been involved in taking technical interviews for human resource hiring in QA department for various Middle level and Senior level positions. All these roles and work required me to communicate effectively and appropriately.

Working with various technical and managerial positions in organizations, I have also interacted with other team members located in United States for which I developed good English writing and verbal communication skills. I have ability to interact professionally with a diverse group, executives, managers, and subject matter experts. I have extensive experience in executing meetings, coordinating technical effort and project status, project deliverables, technical issue escalation and status reporting.

I have attended following training that had added valuable input to my overall profile of communication skills.

- I have attended five full day workshop on **Communication skills, Presentation Skills, Interviewing skills and resume building skills** completed in Feb 2004. Career Planning and Placement Bureau, Sir Syed University of Engineering and Technology organized it.

Certificate from Sir Syed university (CEP)- Image Management Workshop

Engineering management principles and economic decision making:

Software Project Management:

I have studied following specialized course

- **Software Project Management**

MS (Computing) Transcript

Course: SE5201

The course has provided me in-depth Knowledge and understanding of the entire project lifecycle, covering process, project, and people. This course has provided additional value to my overall experience and knowledge about project management skills that I have utilized in various occasions of project management of software testing. In this course, I went through lectures, group discussions, and study of various research papers, case studies and course work assignments.

The summary of the course topics I studied are **Introduction: Software Project Management Competencies, Surveying the Foundations, Product Development Techniques, Project Management Skills, Customized Software Development Process, Software Project Management Organization Life Cycle.** **Software Development Life Selection:** It contained thorough study of Software Development Life Cycles, Its importance, Selection and Tailoring of Software Development Life Cycles, Quality Objective, Customizing the Life Cycle Model, Defining the Process Domain, Project Selection Models, Project Portfolio Management, Understanding Financial Processes. **Software Project Team Selection:** It contained thorough study of Selecting a Project Team, Team Main Parts, Team working, Team framework, How to provide total solution, Goal and Scope of Software project, How to know the current state of the Project, Project Planning. **Project Work Breakdown Structure (WBS):** It contained thorough study of Work Breakdown Structure, Approaches to Building a WBS, Defining Project Milestones, Creating Work Packages, Building a WBS for Software, Identifying the Tasks and Activities, Characteristics of Tasks and Activities, the Activity ID Process. **Software Size and Reuse Estimating:** It contained thorough study of SEI CMM and Estimating,

Problems and Risks with Estimating Software Size, Software Sizing, estimation in planning, The Effects of Reuse on Software Size, Estimating Duration and Cost, The SEI CMM and Estimating Effort Measures, The Steps in estimating, COCOMO Model for estimation, Slim Model. **Scheduling the Work:** How to know where the team standing in Product Development Life Cycle, The Uncertainty of Scheduling the Future, Scheduling Fundamentals, PERT and CPM Scheduling, Background for Requirements Management, Requirements Management and the SEI CMM, Critical Success Factors as Applied to Software Requirements, Software Requirement. **Project Risks:** Determining Project Risk, Risk Management Models, Project Risk and SEI (Software engineering institute), Risk Identification, Analyzing and Quantifying Risks, Developing and Controlling Risks, Risk Categories, Steps in Developing a Risk Management Plan. **Software Metrics:** Metric, Importance of Metric in Software Projects, Useful Metrics, The Basic Goal and Metric Paradigm, Measuring Aspects of Software Quality, The Metrics Plans. **Use of Tools in Software Projects:** Software Requirements Tools, Software Design Tools, Software Construction Tools, Software Engineering Management Tools, Infrastructure Support Tools, Miscellaneous Tools Issues, Minimal Tool Sets. **Project Tracking and Control:** Control Systems, Scope Management, Schedule Management, Cost Management, Quality Management, Progress Management, Risk Management. **Continuous Process Improvement:** Maturity Level Process Characteristics, Waste in the Software Development Organization, Six-Step Software Development Process Improvement Model, Applying the Software Development Process Improvement Model. **Reporting and Communicating:** Effective Communication, Communication Techniques, Communicating with Teams, Communication and Motivation Skills of a Software Project Manager, Behavioural Theory and Motivation, Communications Management Plan Template, Baseline Plans, Project Reporting. **Legal Issues in Software:** Product Development Techniques, Project Management Skills, People Management Skills, Legal Risk Issues

- Previously, I have also attended training on Microsoft Project 2003 course in 2007 (15 Credit Hours) from Karimabad Ismaili student welfare association. This course has provided additional value to my over project management experience and knowledge by providing practical exposure towards technology.
- After Master Program, I have also attended three months training course of Project Management with PMP Exam Preparation from 18th August, to 28th November 2010 from Sir Syed University of Engineering and Technology, Continuing Education Program Department. This course has added further value to my over all experience and provided in-depth understanding of Project Management body of knowledge and helped me to prepare for PMP examination.

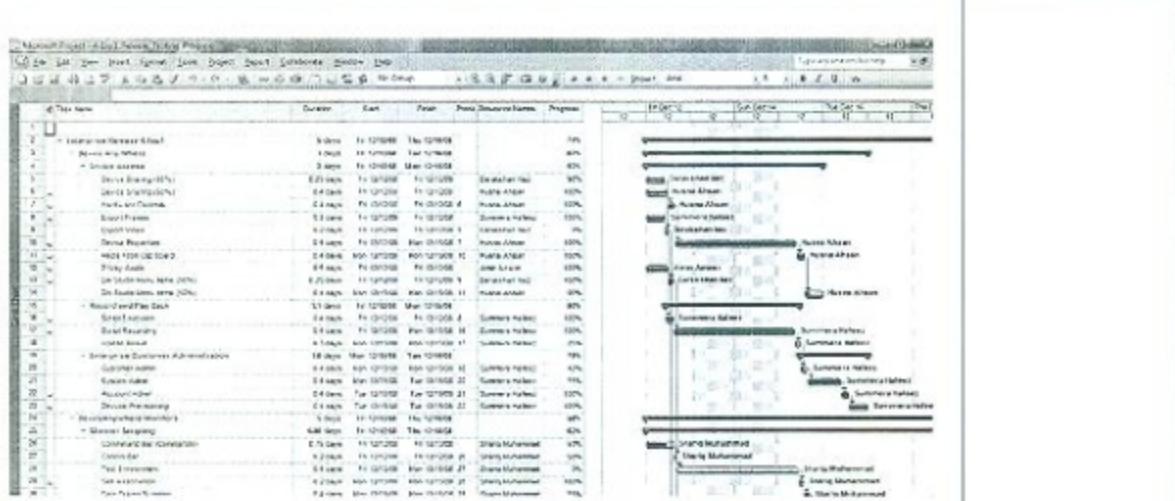
Certificate of completion- Microsoft Project 2003
Certificate from KISWA.

Certificate from Sir Syed University (CEP) Project Management with PMP Exam Preparation Certificate

Example of Using tools and techniques to Monitor Project Schedule and Cost:

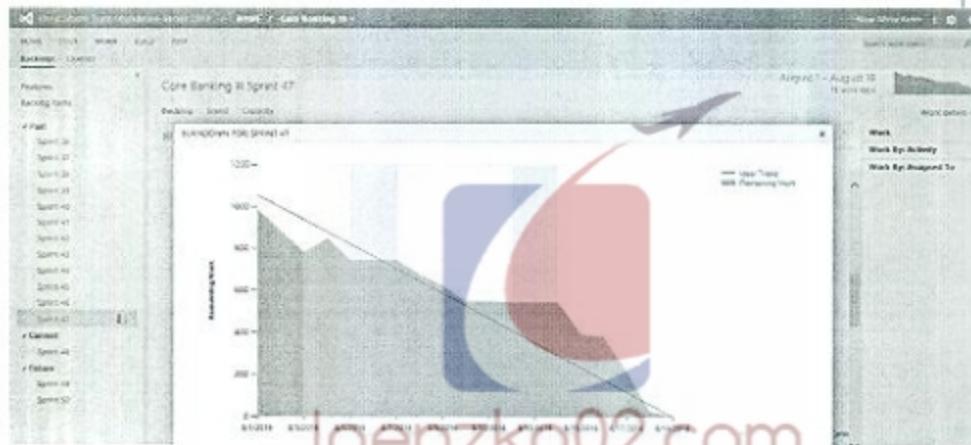
While working Mobile Complete, I have been involved in software testing project planning.

Following is the example of software testing project plan, I had created in year 2008 while working in Mobile Complete Inc, that shows overall testing effort required for a product release. The plan showing tasks assignment and dependencies of each task with predecessors that is also reflecting in Gant Chart. The plan also contained the overall progress.



I have exposure of sprint planning using Microsoft Team Foundation Server, where I have been engaged in capacity planning and task assignments.

Following is the example of burn chart of my team after completion of sprint



Following is the example of task assignment in above sprint

Core Banking in Sprint 47					
	Ranking	Score	Category		
1	1	100	Business Logic	Done	Assigned To: Seher Ahmed
2	2	95	Business Logic	Done	Assigned To: Seher Ahmed
3	3	90	Business Logic	Done	Assigned To: Mohammad Ali Za
4	4	85	Business Logic	Done	Assigned To: Mohammad Ali Za
5	5	80	Business Logic	Done	Assigned To: Mohammad Ali Za
6	6	75	Business Logic	Done	Assigned To: Mohammad Ali Za
7	7	70	Business Logic	Done	Assigned To: Mohammad Ali Za
8	8	65	Business Logic	Done	Assigned To: Mohammad Ali Za
9	9	60	Business Logic	Done	Assigned To: Mohammad Ali Za
10	10	55	Business Logic	Done	Assigned To: Mohammad Ali Za
11	11	50	Business Logic	Done	Assigned To: Mohammad Ali Za
12	12	45	Business Logic	Done	Assigned To: Mohammad Ali Za
13	13	40	Business Logic	Done	Assigned To: Mohammad Ali Za
14	14	35	Business Logic	Done	Assigned To: Mohammad Ali Za
15	15	30	Business Logic	Done	Assigned To: Mohammad Ali Za
16	16	25	Business Logic	Done	Assigned To: Mohammad Ali Za
17	17	20	Business Logic	Done	Assigned To: Mohammad Ali Za
18	18	15	Business Logic	Done	Assigned To: Mohammad Ali Za
19	19	10	Business Logic	Done	Assigned To: Mohammad Ali Za
20	20	5	Business Logic	Done	Assigned To: Mohammad Ali Za
21	21	0	Business Logic	Done	Assigned To: Mohammad Ali Za

Example of Economic Decision Making:

I have been involved in recommending open source software tools for software bug tracking process (Refer to Element-4) and saved the cost of the organization. I have also recommended best functional testing tool in Bank Al habib. For example, QFT (Quality First Test) whose cost was less than other recommended functional testing tools that I determined by doing comparative analysis on cost and features (Refer to Episode-2)

Team Work:

Being an IT Professional, I have worked in various projects comprises of different team members (male and females). I have been responsible for team building and managed QA team in offshore settings. I have been responsible for the professional growth of my team members. All these roles and responsibilities had required me to develop ability to work in team and lead the team to achieve common goal.

I have attended various Leadership development workshops and have studied various books and articles related to personal development and leaderships that have contributed significant value in my overall leadership abilities, knowledge and experience. Working with managerial position in various organizations, I have to play leadership and management role to manage projects, resources and recommend best strategies to roll out critical and complex projects. I have attended following training that had added valuable input to my over all profile of leadership management skills.

- I have attended four-month period workshop on **Leadership Enhancement and Achievement Program - Connecting Communities** organized by H.H. Prince Aga Khan Council for Karimabad - Human Resource Development Committee in collaboration with School of Leadership Karachi. The workshop started in April 2006 and Completed in July 2006. In this workshop, members from different communities had participated like (Hindus, Bohra's, Parsi's, Christians, Memon's and Ismaili's). This workshop has given me excellent exposure to work with different communities belongs to different religions and gave me inspiration of diversity and pluralism. This workshop has added great advantage to my overall leadership skills, critical thinking abilities, self-confidence and presentation skills.
- I have also attended three months period workshop on **Leadership and Management Program** organized by Aga Khan University Hospital, Karachi-Human Resource Division. The workshop was started in June, 2005 and completed in August 2005. This workshop has also added great advantage to my overall leadership skills and abilities. This workshop has provided me exposure to develop professional leadership skills.

Certificate of
Participation-
Leadership
Enhancement &
achievement
Program -
Connecting
Communities from
SOL

Certificate of
Participation-
Leadership and
Management
Programme from-
The Aga Khan
University

Element Seven

Comprehension of the role of engineering in society and identified issues in engineering practice in the discipline, ethics and the professional responsibility of an engineer to public safety, the impacts of engineering activity, economic, social, cultural, environmental and sustainability

Context

Engineers design artefacts (facilities, structures, systems, products and processes) that are intended to meet a societal need, but which typically impact on individuals or groups in different ways. As a result, design and decision making processes must take account of often conflicting stakeholder needs. An understanding of this societal context and the ethical obligations that the engineer has in service of society are critical components of engineering practice.

Washington Accord graduates are expected to be able to,

- Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice
- Understand and evaluate the sustainability and impact of professional engineering work in the solution of complex engineering problems in societal and environmental contexts.

Performance Indicators

Demonstration of ethical behaviour in accordance with ethical codes of conduct and established norms of professional conduct

Evidence of making ethical decisions and regulating one's own professional conduct in accordance with a relevant code of ethical conduct

Implementation of appropriate health and safety practices

Application of safe practices in laboratory, test and experimental procedures

Awareness of the social and environmental effects of their engineering activities

Awareness of sustainable technologies and sustainable development methodologies

Ability to identify risks as a consequence of engineering compromises made as a result of project or business constraints, and understanding of techniques to mitigate, eliminate or minimise risk

Knowledge of appropriate risk management techniques used to assess the accuracy, reliability and authenticity of information

Understanding of the role of quality management systems tools and processes

Summarise your knowledge of the role of engineering in society and how it has been developed through formal study, on-job learning and/or continuing professional development.

Note, please cross-reference to your academic transcript(s) and continuing professional development records, as appropriate.

As a part of engineering community I have been following ethics during my professional work,

1) I perform my duties and responsibilities honestly and with objectivity and diligence.

2) I demonstrate my all relevancy with my organization with loyalty in all matters or any other who may be representing a service, and do not engage myself in any acts or activities that are dishonourable to the profession of Information technology, quality

Provide annotations to your supplementary evidence (document and page number)

assurance and organization.

3) I do not allow myself in entering to any activity that may be in conflict with the interest of my organization or any activity that may cause unfairness with organizational ability to achieve its objective. I do not accept anything of value from an employee, client, customer, supplier, or business associated with my organization that may impair or cause harm to professional judgment and integrity.

4) I undertake only those tasks that can reasonably expect to complete with professional competency while performing job work. I continuously strive for improvement in my proficiency and effectiveness in the quality of the service I provide to my organization.

5) I don't use confidential information neither for any personal gain nor in any manner that would be against the rules and regulation of organization.

6) I strive to practice my profession with high standards of competence, morality, and dignity. I keep improving and maintain my professional competency through studying, researching and continuing education.

7) I share knowledge, experience in collaboration with other team members and peers for professional benefit. I strive to maintain high personal standards of moral responsibility, character and business integrity.

Example 7(a): Demonstration of ethical behaviour in accordance with ethical codes of conduct:

The organizations in which I have worked in past or currently, I signed the document of code of conduct and zero tolerance every year and adhere to them strictly and ensure the team members and peers are also adhere to them.

Exception of Zero Tolerance from Bank Al Habib Ltd duly Signed

Example 7(b): Evidence of Making Ethical Decision by Recognizing Peer for extra ordinary work:

The organization in which I am currently working is going through technological advancement and has various challenges of work. We had a project named CIF (Customer Identification Folio) mechanism in our system that was highly complex software feature to test. My subordinate has contributed extra effort and delivers high quality of work meeting tight time lines. As a team lead, I made an ethical decision by recognizing my subordinate, for the extra effort he put and met the team objective.

Certificate of Recognition I gave to my sub ordinate

An Another Example,

In my previous organization Mobile Complete Inc, the software engineers were use to download unlicensed software from internet and use it for the day-to-day work in office. Management was not aware with such un-ethical act because of poor network infrastructure and lack of competent network person who could monitor such activity.

As a professional engineer, I discouraged that habit and made serious action by complaining to management about such act. I also provided suggestions to management that organization should pursue to buy proper license for such software's that are extensively used in office or otherwise recommend open source software to be use in office. After this management took the action by taking zero tolerance undertaking from each employee and took steps to buy license software's for office use.

Example 7(c): Application of Safe Practices in Software Test Lab:

I maintained inventory of each hardware component and servers that arrive in test lab for various software testing projects and after completion of project, I again hand over to relevant stakeholder on time by following the same inventory and log the information.

Following is the sample Inventory

A	B	C	D	E	F	G	H
QA Test Lab Items Inventory							
S.No	Items Received	Purpose	Date Incoming	Date Out Going	Received from	Handover to	Status
1	Hard Drive Added	Hard Drive Added in Test Server to Increase Capacity	8-Jul-15	NA	Ammad Ali	NA	Completed
2	Bio Metric Devices	Bio Metric Feature Testing	2-Nov-15	2-Feb-16	Ali Abid Raza	Ammad Ali	Completed
3	Samsung Tablet Device	For Testing of Bio Metric Offshore Testing	20-Nov-15	29-Jan-16	Ali Abid Raza	Ali Abid Raza	Completed
4	QA Server CPU Data	For Testing WHT budget Functional Changes	13-Sep-16		Ali Akber		In Use
5	QA Server Branch Data	For Testing WHT budget Functional Changes	13-Sep-16		Ali Akber		In Use

Example 7(d): Awareness of Social and Environmental Effects:

I worked in Mobile Complete Inc, during 2006-2010. At that time in our office, there was extensive use of papers for software projects related discussions like drawing system diagram, class diagram, understanding of software architecture , software requirement etc. After this, we were discarding the papers in office surrounding outside building. Every day we were using bunch of papers for such activities and discarding on daily basis. This was also causing us to create those documents again to recall those discussions. I as professional engineer realized that such habit is not ethically correct and it is affecting our environment producing garbage papers every day. In addition, we were using disposable glass for tea and drinking water. This was also producing a lot of disposable garbage on daily basis.

I raise this concern to management and gave suggestion to buy white board and encourage team to use it for project discussion purpose. This approach had cost the management initially with considerable amount money to buy number of white boards for each team, but gradually management realized that they were saving lot money by not buying papers. Management also realized that use of white board is also quite effective.

For tea and drinking water, I suggested to management to buy glass cups instead of buying disposable cups. Management realized this suggestion and bought number of glass cups for each employee. Glass cups required extra effort to wash it repeatedly but it was decided that each employee would maintain its own glass. That way we discouraged to use papers, paper based products, and ultimately we were not producing garbage that was previously affecting adversely to our surroundings.

Example 7(e): Awareness of Sustainable Technology:

In today's world, there are thousands of computer research labs having thousands of computers running in it, thousand of Office Computers being used on daily basis, large Scale server rooms existing around the world with their specific need and purpose. Uncountable computers, Practical labs, Large-scale test labs pose countless heavy computers. All these machines used significant source of energy and cause greenhouse gas emissions, especially during the stage of its production, its transportation, when they are used and when they are disposed. Computer Generate heat and use much energy to cool equipment of component it used. Here we need to think and work to increase IT infrastructure efficiency, use of computers. This way we can reduce greenhouse gas emissions.

Example 7(f): Awareness of Sustainable Development Methodology:

Sustainable development is that technologies that can be used to assist people meet their developmental needs. It is often referred to as appropriate technology. Today appropriate technology is often developed using open source principles, which have led to open-source appropriate technology (OSAT) and thus many of the plans of the technology can be freely found on the Internet.

Open-source appropriate technology (OSAT) has been proposed as a new model of enabling innovation for sustainable development. Open-source-appropriate technology (OSAT) refers to appropriate technology designed in the same fashion as free and open-source software. OSAT refers to, on the one hand, technology designed with special consideration to the environmental, ethical, cultural, social, political, and economic aspects of the community it is intended for.

On the other hand, OSAT is developed in the open and licensed in such a way as to allow their designs to be used, modified and distributed freely. Open source is a development method for appropriate technology that harnesses the power of distributed peer review and transparency of process. Appropedia is an example of open-source appropriate technology. There anyone can both learn how to make and use AT free of concerns about patents. At the same time, anyone can also add to the collective open-source knowledge base by contributing ideas, observations, experimental data, deployment logs, etc. It has been claimed that the potential for open-source-appropriate technology to drive applied sustainability is enormous. The built in continuous peer-review can result in better quality, higher reliability, and more flexibility than conventional design/patenting of technologies. The free nature of the knowledge also obviously provides lower costs, particularly for those technologies that do not benefit to a large degree from scale of manufacture. Finally, OSAT also enables the end to predatory intellectual property lock-in. This is particularly important in the context of technology focused on relieving suffering and saving lives in the developing world.

Example 7(g): Risk as a consequence of Engineering Compromise and Mitigation and Minimization of that Risk:

In Bank Al habib Ltd we have our in-house developed Core Banking System. The system is highly complex that requires extensive functional testing in each release. In this situation, we have to test various scenarios using customer actual data for which we receive bank branch data in test environment. In this situation, the customer data we received contained customer information with their financial and personal details, that data is accessible to Engineering team to carry out development and testing tasks. In this case, there is a risk that customer data may be leaked or comprised intentionally or unintentionally.

This was not an easy task, I had to discuss with management who were quite pleased that a very important technical compromise had been identified and it was decided that a comprehensive process would be implemented to safeguard the customer confidential information during software testing process. Later on, this task was given to small team of three engineers who implemented that process in whole organization.

Process: This process was implemented by replacing customer data with dummy data following different methodologies for example data masking. Data masking is a technique used to create a structurally similar but inauthentic version of customer's data for purpose such as software testing and training.

This process was implemented successfully in one month across all IT organization and engineering teams who had to interact with customer data for daily operation.

Following is the example of replacing customer name, address and other details with dummy data.

Example 7(h): Risk Management Technique in SQA:

Risk means a potential problem that has not yet occurred. Risk management is a critical activity in software testing. Risk management in software testing comprises of following activities:

1. Risk identification
 2. Risk analysis
 3. Risk mitigation
 4. Risk monitoring

1. Risk Identification:

Risks are always identified within the scope of the software project. Normally a risk list is created along with project plan. If any risk identified, it should be updated in risk list.

For example, if certain areas of the software system are unstable and further development occurs on those areas then it should be added in list of risk. It is always good to document the risk, if it is identified; so that it remains intact with project and could be clearly communicated to the relevant stakeholders on time. I have used this practice while practicing software testing in projects. I have been maintaining a list of risk related to software testing that has always helped me to highlight during meetings and status reporting. For example risk of lack of resources i.e. Shortage of QA Servers, lack of test automation tool to minimize the manual effort etc.

2. Risk Analysis:

Risk are analyzed in order to identify the probability of their occurrence. It also involve the analysis of the impact if it occur. The magnitude of probability of occurrence and impact is called overall risk. Risk analysis is the activity in which the level of risk is identified. The risk is quantified and then based on it , the level is assigned. The level may be low, medium or high. Considering the example of risk identification above, if further development occur against unstable code, then there is high chance of code getting more unstable. It mean if testing started later, then high costly bugs may appear later in development cycle for which high cost of fixing occur.

3. Risk Mitigation:

Risk mitigation is decided based on the level of risk. It describes the action that will be taken to tackle that risk. The risk identified in list of risks is subject to following treatments.

- a) **Avoidance of Risk:** If there is a risk that new component code is being developed, it may be possible to postpone it to future release. Because the project deliverable with new features that is fully tested may be impacted due to new component code development. As an experienced QA lead, I have been taken decision to postpone the low priority feature development and fixes in later releases to avoid any impact in stable release going to dispatch soon.
- b) **Transfer of Risk:** If there is a risk of insufficient security testing of the system, then a specialized company may be hired to perform security testing. In this way, risk may be transferred to vendor for accountability. Normally risk transfer increases the project cost.
- c) **Risk Mitigation:** It is considered as most common risk treatment technique. In this activity, risk is reduced by reducing impact or its probability of occurrence. If a new testing team is hired and they do not know the existing system knowledge, the risk mitigation technique is to train new resource with system understanding or include more knowledgeable resources with the team, so that they could share knowledge rapidly to new inductees. This technique also increases project cost. I have been practicing this technique and have reduced risk of meeting project timelines by adding experienced software testers in projects.
- d) **Risk Acceptance:** If the risk is not treated, it should be accepted. It normally occurs when there is no way available to mitigate, transfer or avoidance. If the test environment is only one, and no backup environment is established, it means that if the testing server crashes, there will be downtime and it will cause delays in testing timelines and ultimately impact project timelines. Rather than accepting the risk, I always prefer to reduce the risk as much as possible if it cannot be mitigated.

4. Risk Monitoring:

Risk mitigation actions and level of risk occurrence are closely and continuously monitored throughout the project life cycle to ensure that the overall risk levels remain acceptable.

I have faced all above risks during my professional career and have been involved in mitigating those risks appropriately.

Example 7(i): Understanding of the role of quality management systems tools and processes;

Quality Management System:

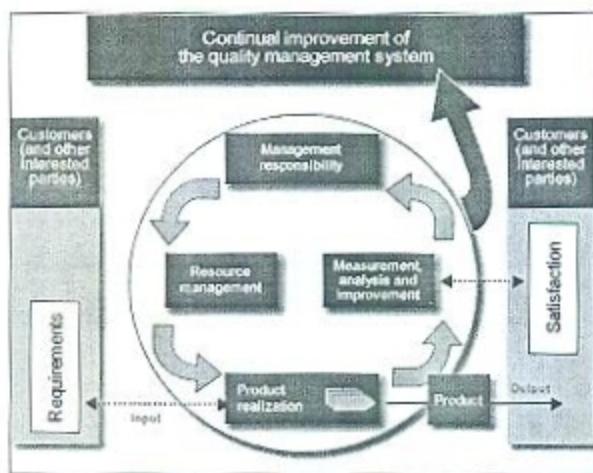
A quality management system (QMS) is considered as formalized system that documents processes, procedures, and responsibilities to achieve quality policies and objectives. It helps to coordinate and direct organizational activities to meet customer and regulatory requirements and continue to work to improve its effectiveness and efficiency. It comprises of business processes focused on consistently meeting customer requirements. It is always aligned with company's strategic direction.

Quality Management System tools:

Quality management tools that integrate with the company's system for quality management are always critical such as Corrective and Preventive Action, Deviations, and Non-conformance, Customer Complaints, Employee Training, etc. Quality management tools ensure quality products, and also ensure that processes are more efficient and accelerate the time product takes to get to market.

Quality Management System Process:

It is observed that designing of quality management systems focus on customers' satisfaction, procedures, processes, organization, and organizational resources and that keep the organization to focus on the activities and its goals and they are all put in place in the direction to achieve those goals. These techniques often lead to higher level of customer satisfaction because organizations who have developed product, service and programs work to satisfy the customer; along with that it also ensure the consistency in delivering of what they have promised.



There are various steps found to implement Quality Management System, but following are the most essential steps must be followed.

Step 1: Organizational Goals Identification:

In this step it is identified that how employees job responsibilities are aligned with the company's or organizational goals. It is ensured that employees of the organization must know the organization's mission, vision, values, and their relations with the company and their roles it. The newly inducted human resources must be provided with the detailed orientation with the vision, mission, values and goals of the organization, determining how individual goals and company's goals are aligned is the first step towards implementation of quality management system.

Step 2: Critical Success Factors Identification:

In this step all those factors are identified that can make an organization quality management system successful. These factors may related to production processes, the product that company developed, the technical support it provide, the customer support it provide, financial security, human resource satisfaction. In this step a list of the primary factors is developed. The list actually influences the process of quality management and continuously and consistently works to manage those factors.

Step 3: Internal and External Customers Identification:

In this step, key groups of customers that make quality management system work are identified. Knowing customer and their need is always very helpful that make organization develop programs and services for them. In this case, customers may be vendors, employees, volunteers, suppliers, or direct customers.

Step 4: Continuous Improvements Implementation:

In this step, the results from organization's survey and customer feedback tools are used to make necessary changes in quality management process. This step create

more options for leadership development, customer service training occurs, recruitment of high level of staff occur, improvement in process of production occur, change in manufacturing of product or service occur, change in its delivering mechanism occur. In this step, the main actions taken are the study of the feedbacks received and use those feedbacks to improve the organizations processes and continuously deliver better products and services to their customers.

Step 5: Quality Management Software:

In this step, Quality Management software is selected to implement quality management process. It also helps to maintain and improve those processes.

Step 6: Measurement of Results:

In order to ensure that organization is aligned to achieve its goals, then it must ensure that goals are measurable. When organizational goals are not reached, then it becomes hard to justify Return on Investment (ROI) and ultimately the organizational existence is brought into question. From the first step above, organization ensure that measurable goals are identified and everyone in organization who is part of achieving those goals are well aware about them.



Element Eight

Engagement with selected knowledge in the research literature of the discipline

Context

Research and broader lifelong learning capabilities are essential if the engineer is to remain up-to-date with rapidly evolving scientific knowledge, technology and engineering tools critical to engineering practice

Washington Accord graduates are expected to be able to use research-based knowledge and research methods as part of the investigation of complex problems in their discipline

Performance Indicators

Advanced knowledge in at least one area within your discipline, to a level that engages with current developments in that area

Understanding of how new developments relate to established theory and practice and to other disciplines with which they interact

Describe advancements in engineering research and technology and science in a particular area of engineering practice,

Review research articles pertaining to a project component typically encountered in a specific area of engineering design,

Choose topics most appropriate for continuing education to increase depth of technical knowledge pertinent to the specific area of engineering practice.

Commitment to lifelong learning.

Summarise your research knowledge and how it has been developed through formal study, on-job learning and/or continuing professional development.

Note, please cross-reference to your academic transcript(s) and continuing professional development records, as appropriate.

Advance Knowledge (Example):

The reason for adapting agile software development methodology is to produce high quality software. The most crucial aspect comes along the way of agile development methodology is the software testing. If we imagine, testing for Large-scale software projects, the integration of Agile Software development and testing becomes more challenging for organization to find suitable testing technology and best practices.

Agile Methodology accept requirement change during software development life cycle. Here change in requirement means, it will also impact the test case and its execution. Agile, requires strong communication among developers, testers and users of the application in order to overcome the problems and make flexible and optimized software solution. In agile a very strong collaboration between teams is required; creating better learning environment for new members to learn from experienced professionals.

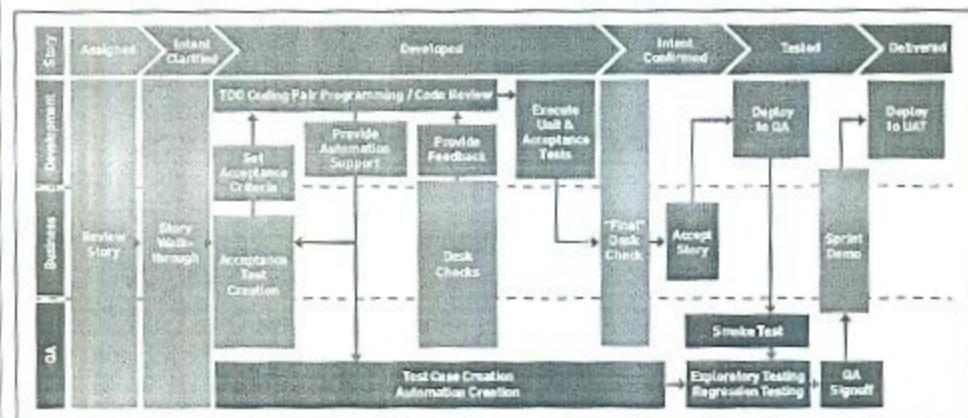
For Large Scale software projects, multifunctional teams follow iterative development practices. Here testing process need to be more efficient, in which test cases creation activity should be started early, by ensuring clear definition of the test results. It mean results of the test must be accurately imagined before the project implementation is started in each sprint. In Agile methodology, testers should be part of the development team and all activities should be executed parallel. For example, testers are working

Provide annotations to your supplementary evidence (document and page number)

on creating test cases analyzing the user story while developers are constructing the code as per user story.

In Agile, iterative development focus on providing new working software at the end of each iterations, and the working software must have new software part with intended functionality. The time required for each of the iteration depends on project size. In Agile, software testers express their creativity; and think in different directions that help development process to work efficiently and effectively ensuring end user satisfaction.

Following chart shows how quality software product is produced when development team, business people and QA people work together in an Agile project.



Agile Software Testing for Large Scale Software Projects:

In agile development process, software testing methods play crucial role in making high quality software products. In this process, testers must have knowledge and vision about the desired results they want to achieve. In order to achieve it, there are some principals for testers in agile methodology that must be followed.

- 1) Software testing should be starts in early stage in parallel of software development process.
- 2) Software tester must adapt rapid change in requirement.
- 3) During testing process, customer (end user) must be added, so that new changes added in system could be accepted.
- 4) Testing should be executed thoroughly in each iteration against new software part being added in system along with regression testing of previous iteration parts.
- 5) Each iteration must provide working software.
- 6) The testing activities must be in close interactions between customer and software developer to avoid unnecessary re-designs and modifications in code.
- 7) The progress of the work should be calculated by reviewing planned and accomplished activities for the current sprint.
- 8) Software should be continuously integrated in order to produce a clean and working product several times a day.
- 9) Automation of testing process should be incorporated ensuring faster testing results and efficient work progress.
- 10) Change in process must be accepted by customer.

Best Practices of Agile Software Testing:

In order to make software testing more efficient and accurate, the first thing to acquire is the professional testing service by hiring professional testers. In Agile development, every one thinks and write software test case, but the professional software tester identify more precise and inventive test case. They also add value to increase coordination between developer and other testers.

Efficient and Speedy Test Execution:

To execute software test more efficiently, software tests should be automated. It requires selection of right automated testing tool that could meet software testing need of the project saving time and money. It is always recommended to buy the tool immediately that can meet the requirement of testing.

Balance Between Automated and Manual Tests:

In Agile, not every test is automated and it is well known by tester, which tests repeat aggressively and which tests execute some time. It is very important to balance between automated test and manual test.

Also the type of tests is important to know like functional test can be executed manually or automatically but on other side, performance test cannot be executed manually and there must be some performance testing tool to execute it. The automation of tests should be occurred, if there is any repetitive task or regression task. The test to be executed only one time should not be automated and same time should be utilized to make other important tests.

Planning of Quality Activities:

It means, appropriate time should be allocated for feature testing and regression testing and separate time should be reserved to fix the bugs and their verification. For large scale projects, it is recommended to provide equal time for coding and testing. Time required for regression testing and fixing of the bugs should be allocated as global time, because regression testing is done at the end of each iteration and time required for regression iterations and fixing of complex bug is unpredictable. Therefore in Agile, it must be insured that bugs are identified as early as possible in order to avoid any unpredictable time.

Automation in Agile Testing:

In Agile testing, higher test coverage with greater number of test execution by automation is always a primary objective. Writing of tests almost take 1/3 of the testing time, but its importance cannot be ignored. There are various test generation tools available, for example a requirement engineering tool name InteGREAT, but some time such tools generate too large test set which are not usable to automate. However, there are many good techniques available that are considered as fine methods for test execution and it is very essential to understand them and apply accordingly.

In Agile software testing of Large-scale projects, automated testing tool add great value to overall testing strategy. It is highly important to know that automated tools must be simple and easy to learn i.e. It must be user-friendly providing simple user interface. If tools are used to write test scripts, it should be ensured that scripts are prepared well and provide right results on execution. It means script should be itself tested to know that it produce desired results. It is recommended that if the script is too large, then it must be maintained in smaller and meaningful scripts because independent small scripts are easy to maintain.

Here choosing the right tool for automation is also a crucial step. There are many tools available in market. Here team knowledge and experience can put additional value to choose the right one. It is all depend on the project size, time and its cost. It is always recommended that if a tool is available then it is best to use that tool rather than making it internally.

Focus on One Story at a Time:

In Large scale Agile-testing project, there is great chance of success, if testing is focused on one story at a time. In this case, functionality is build with systematic process and continuous integration helps to build the working solution as fast as possible. It also improves the automation process for the tests for next sprint.

Automation for regression testing not for Performance testing:

Automation is not suitable for performance tests; because performance test required massive amount of data and more time. If any change occurs in data model, then it must be propagated to test conditions. It becomes very difficult, if the size of the tests conditions is several Giga bytes (GBs). The real benefit of Automation is for regression testing. Because once the tests are automated, they are repeatable in execution and produce speedy results. If results are, found positive then it mean all functionalities are correctly implemented.

Optimization of Agile Testing:

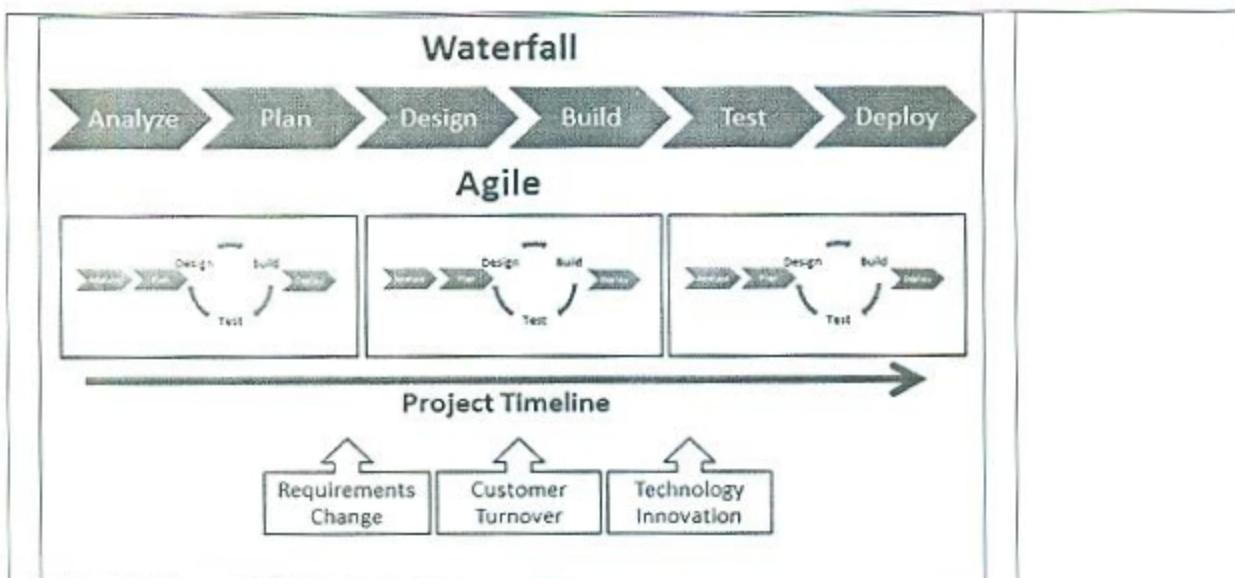
Following are some of the important steps that can make agile software testing method more optimized

- 1) When client provides the functional requirements, it must be reviewed by Engineering team, especially Quality Engineering Team.
- 2) During design and implementation phase, customer must review the user stories that are written.
- 3) Any update in requirement should be considered as new change.
- 4) Customer must have reviewed Test Plans, Test Cases and Test strategies before starting construction phase (development). In this case all these artifacts should be properly documented.
- 5) During implementation, testers determine if the code in testing environment can be considered as final code for deployment or not. This approach decreases the potential bugs at the start of each iteration. This process repeats in each iteration until the software is stable and fully accepted by customer.

Example of New Development Relate to Established Theory:

In software development, organization 'Water Fall' is a well-known methodology used for software development, in which scope of requirement definition, construction, testing, implementation and maintenance occur in sequential steps. This causes problems in terms of software quality. Because when testing start at the end, it increases more possibility of software defects, found at that stage. It also causes a lot of time to spend in order to re-evaluate the development work done; hence, it increases the overall cost and laps time lines.

Recently Agile methodology is considered more convenient and flexible approach of software development that accept continuous change throughout development life cycle, insist rapid delivery of the working software, continuously improve and empower engineering team that include all the members of agile team (Dev, BA, QA), insist on close collaboration among them and business stake holders.



Advancement in Software Development Methodology and Tools/Technology:

Following Agile methodology, software test engineers have struggled to use the traditional test management and automation tools but found inappropriate, rigid and inflexible. Traditional test tools were developed as per the waterfall methodology, now they are not usable with agile methodology, as agile expect continuous testing model due to fast pace delivery of the product with high quality and working software in every iteration.

For example, if traditional test tools are used to test UI of the application in Agile, they do not work, because those tools were designed in such a way that UI should have completed before execution of automated tests or it should be relatively stable before test automation can begin. On the other side, if scripts are programmed the cost of the scripts get too high, therefore the delay due to this constraint can make agile sprint impossible to complete.

Based on the above facts, research and development is going on to enhance technology that supports agile methodology. Agile methodology has continued to grow and mature in last decade. Software organizations are constantly looking for various ways to improve their Agile environments, specially focusing on minimizing bugs. The core principles of Agile methodology cannot be fully realized without implementing a repeatable process of ensuring that code is bug free in each iteration.

For example there are various tools available that can be used for automated static code analysis (SCA) technology that helps to locate and describe weak areas in software source code for example security vulnerabilities, logic errors, defects of implementation, concurrency violations, rare boundary conditions, or any type of problem causing code. Here SCA technology can enhance the Agile development process and empower Agile teams.

Example of Advancement in Tool:

A popular tool for agile methodology is a tool named 'Clover'. A code-coverage analysis tool improves overall quality of the software by identifying the areas in the code that have not tested or which pose the most risk to the quality of the software. It is not technically a quality assurance and test management tool but provide many features that not only streamline testing, but also significantly improve developers testing. It is highly useful for organization following agile methodologies that focus on continuous integration, continuous development and continuous delivery of working software.

Example of Participation in Research Work:

I participated in National Research Conference on Computer, Management and Social Science organized by Shaheed Zulfiqar Ali Bhutto, institute of science and technology, and presented research paper on 15th December 2007.

***Research Paper Presented, Industrial Challenges of Software Test automation
(15th December,2007)***

In this research paper, I presented the facts about the industrial challenges of software test automation and their possible solution strategies. I also explained the reason behind the failure of automation projects. The aim of that paper was to stimulate the benefits and costs of automated testing and discussed the question, that when a test should be automated and the trade-off between automated and manual testing.

Certificate of
Participation In
National Research
Conference

Examples of Reviewing Research Papers:

I have studied various research papers related to Software Test Automation and have gained knowledge, and understanding about practices and advancement going on. Studying these search papers have benefited to my over all knowledge and experience in practicing test automation and in designing relevant framework.

Example-1, Study of Research Paper 'Seven Steps to Test Automation Success'

By Bret Pettichord, published in 26th June,2001

In this research paper, I studied about the best practices that can be followed while implementing test automation. This paper also described that how test automation projects could be route to success, if software development rules are followed.

This paper has helped me to apply knowledge while Implementing Test Automation Framework design process.

Example-2, Study of Research Paper 'Designing a Software Test Automation Framework'

By Sabina Amaricai, published in January,2014

In this paper, I studied about the importance of test automation framework for large-scale application, some test automation framework designs and their advantageous and disadvantageous. I also studied a customized automation framework model that is suited for application with very complex business requirements.

This paper has helped me to gained knowledge about various test automation framework designs and explained how a customized framework can be design.

Example-3, Study of Research Paper 'A Structured Approach for Software test Automation'

By Shripad Hebber, Adobe Systems India Pvt.Ltd, Published in December,2008

In this paper, I studied about the importance of delivering software product with rapid application development and how the challenges of good software quality and reducing time to market can be addressed by adapting structured test automation approaches. I studied that how Re-usability, Maintainability, Flexibility, Reliability, Robustness and Portability can make the automation framework a success factor.

This paper has helped me to gained knowledge and understanding about the approaches in test automation designs and development and how it can make the test automation projects successful.

Example-4, Study of Research Paper 'Comparative study of test Automation Framework ROI'

By S.K. Muthusundar, Bharath University, Chennai published in September, 2011

In this paper, I studied about the need of enhancing the potential benefit of project by robust strategies that reduces the execution time of testing cycle and maintenance effort with the help of Test automation framework. I also studied how test automation helps to achieve high returns on investment based on time and cost.

I gained thorough knowledge and understanding about the advantages in investing in automation effort for longer period. This paper has broadened my perspective on automation and given me confidence for adapting test automation while performing testing and facing challenges.

Topic for continuing education:

Agile software development methodology is a set of principles for software development under which software requirements and solutions evolve through the collaborative effort. It works with adaptive planning, evolutionary development, early delivery and continuous improvement. Agile methodology is seeking alternative to traditional approach of software project management. Since industry is going toward adapting agile methodology in order to keep them self competitive in terms of time to productivity and time to market.

I have chosen software-testing practices in Agile Methodology for my continuing education to gain in depth knowledge in the area of my specialized engineering field. It will also allow me to adapt face pace agile culture and will help me to introduced agile practices while working in industry.

I have started to gained knowledge, understanding and practical exposure in agile methodology while working in Bank Al Habib - IT Innovation. In our organization we follow agile best practices in terms of sprint planning, fast paced delivery of the product, collaboration in team and with stakeholders, focus on continuous improvement. We all team leads participate in DevOps meeting held every week, where we present our sprint progress and challenges in front of other teams. This platform provides awareness about other team projects, goals and achievements. Our IT head, also organize, a monthly town hall meetings where entire IT team leaderships present their departmental plans, progress and share ideas to achieve IT goals and objectives.

Commitment to Life Long Learning:

I am committed to continue further study and research in Agile Methodology; and committed to study and research how software quality engineer roles can be further improve following this methodology. It is continuously evolving and facing increased challenges and have many areas of improvements. More and more research, development and advancement in relevant tools and technologies are being happening day by day. I want to keep myself engaged in Agile methodology and relevant tools and technologies; and want to contribute my knowledge and experience to make this methodology more acceptable to the organizations.

I have also attended training in Agile development while working in Bank Al habib - IT Innovation. It was organized by IT-Governance and was comprised of (21 PDUS). The training was held on 20th, 21st and 22nd September 2013 having total 24 credit hours.

Certificate of
Attendance of Agile
Development training
from Bankalhabib

That training had broadened my knowledge in Agile Methodology and rich of practices it contained. It has also helped to adapt this practice smoothly in our current Agile Development environment, where I follow pure agile practices. As a Scrum Master, I assist to develop collaboration between Quality Assurance Professionals and Developers to speed up the progress and remove bottlenecks in requirement understanding by establishing coordination with Business Analyst. I also provide my

technical service to my peers in order to understand the system and in developing test execution approaches.



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Section Three - Evidence of Application of Knowledge

In this section you are required to provide evidence of the application of your engineering knowledge using 3-4 engineering projects or activities (Work/Study Episodes) that you have been involved with.

Provide a general overview of the scope or parameters of each project or activity, your role in it and the particular challenges or complexities involved. Then describe, in narrative form, how it provides evidence of the application of different aspects of your engineering knowledge. Cross reference to the relevant elements of the knowledge profile in the right hand column.

You are also required to complete the Knowledge Matrix to summarise the contribution to knowledge demonstration made by each project. The work/study episodes are expected to provide at least 2 examples of the application of each knowledge element.



Work/Study Episode 1
(April-2010 to June-2010)

Overview of the project

In Device Anywhere Enterprise Suite, user could interact with real and live mobile devices (placed physically in different labs) and control those devices using Device Anywhere Studio. The studio was the client application that was primary interface where user could interact with devices and define, manage and run test scripts. The scripting mechanism used was part of the product.

In 2009 Company was going to revolutionize the way of test automation scripting to interact with real devices in DeviceAnywhere Studio by introducing New Dynamic Scripting Mechanism. In old scripting mechanism, the scripts were developed as inflexible, device dependent and created by drag and drop commands in sequence, and basic conditions could only be applied. While in new mechanism, there were new concepts of action, state, test case and test cycle going to introduced in product, and those components were modular in nature and device-independent.

That project was consist of two parts

1. Deployment and configuration of product core components services and Execution of Integration Testing.
2. Testing of New Dynamic Scripting Mechanism introduced in DeviceAnywhere studio.

Your role and responsibilities

- To perform deployment testing of the core components of system.
- Perform Integration testing of core service components.
- Develop understanding of New Scripting Mechanism from product requirement document.
- Identify functional test specifications and perform Exploratory Testing of New Scripting considering user scenarios in mind imagining how user would use that unique product.

Complexities (using the complexity definitions) and challenges of the project

There were various challenges and complexities describe below.

1. The product was comprises of various windows based services and they were highly complexities in deployment, configuration and setup.
2. To analyze product requirement, develop understanding of New Dynamic Scripting Mechanism with its key concepts, and perform exploratory cum functional testing, considering user scenarios rather following conventional method of product testing.

How does this project demonstrate application of your engineering knowledge?

As a QA team lead of the product, it was very challenging for me to own the product quality assurance and ensure its functional stability to meet customer expectations. Working with this product, I also gained knowledge and experience in product quality assurance and testing of the product in different dynamics.

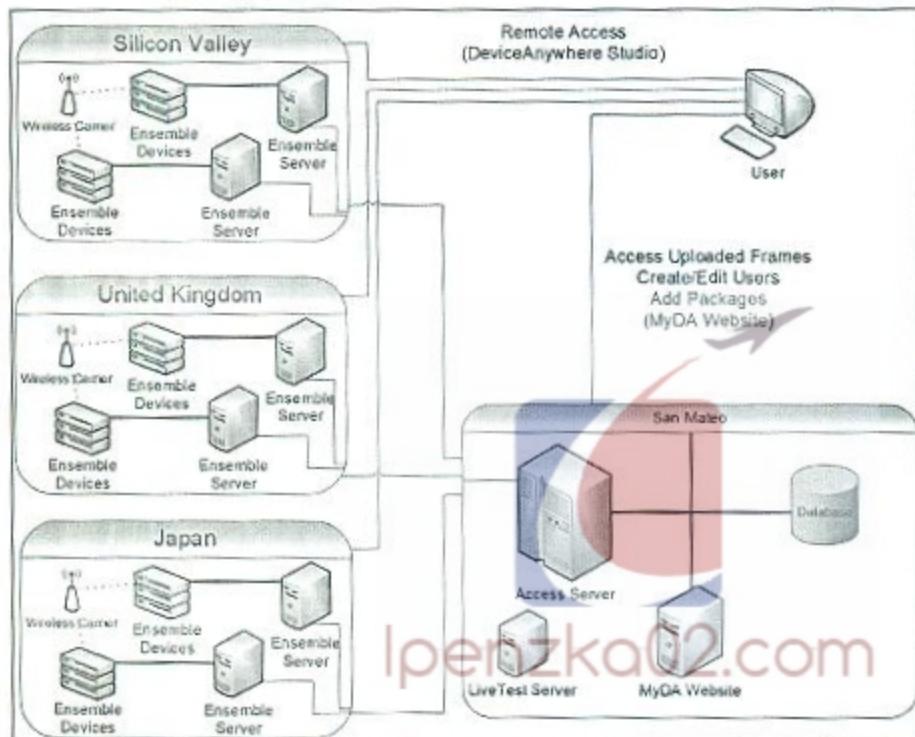
Part-1, Device Anywhere Enterprise Product Components Deployment Testing and Integration Testing

Product Components Ports Requirement and Connectivity Tests

There were following Product Server Components

1. DeviceAnywhere Enterprise Portal (MyDA Website)
2. Access Server
3. Ensemble Server
4. Live Test Server
5. Live Monitor Server
6. DeviceAnywhere studio

Following is the diagrammatic representation of DeviceAnywhere Enterprise Product



Following were the port requirement of each server components. Here my fundamental knowledge of Data Communication and Computer Communication and Network has helped me to understand and carry out the connectivity test and solve the problems.

Element 3

S.No	Device Anywhere Server Components	Component Servers Communication Requirement	Open Ports
1	SQL Server 2005 Database	The Access Server and the DeviceAnywhere Portal communicate with the database while default SQL Server port was 1433.	1433
2	Access Server	All DeviceAnywhere Studio clients and the DeviceAnywhere Portal server must be communicated with the Access Server over TCP/IP on port 443 while client users were authenticated through the Access Server.	443

	3	DeviceAnywhere Enterprise Portal	The DeviceAnywhere Enterprise Portal was a web portal for system administration and for viewing test results. It was Web application running on the standard Web port 80	80		
	4	Ensemble Server	The Ensemble Server was dedicated to communicate with mobile devices. Users who were interacting with devices in DeviceAnywhere Studio were communicating on port 443 with the Ensemble Server. The Ensemble server was accepting inbound traffic on port 443. The Ensemble Server was also handling outbound communication to the Access Server on same port 443. Both Access Server and Ensemble Servers were needed to install on separate server machines.	443 Both for Data In and Data Out		
	5	DeviceAnywhere Studio	DeviceAnywhere Studio was the client software used to access devices and creates test assets. All server components above, with the exception of the Database Server, were accessible from DeviceAnywhere Studio.	NA		

Before deploying Product Components, I had to verify the server connectivity Tests as given in below table.

S No	Connectivity Tests	Expected Results
1	Open a Telnet session from one of the client machines to port 443 on the machine that host the Access Server using command, telnet <Access_Server_IP> 443	DOS command prompt window was appearing blank.
2	Open a Telnet session from one of the client machines to port 80 on the machine that host the DeviceAnywhere Enterprise Portal using Command, telnet <Portal_Server_IP> 80	DOS command prompt window was appearing blank.
3	Open a Telnet session from each Ensemble Server machine to Port 443 on the machine that host the Access Server using Command, telnet <Access_Server_IP> 443	DOS command prompt window was appearing blank.
4	Open a Telnet session from the Access Server to port 1433 on the machine that host the database server using Command, telnet <DB_Server_IP> 1433	DOS command prompt window was appearing blank.
5	Open a Telnet session from the DeviceAnywhere Enterprise Portal to port 1433 on the machine that host the database server using Command, telnet <DB_Server_IP> 1433	DOS command prompt window was appearing blank.

After successful testing of Connectivity, I pursued to deploy the product components.

Product Deployment Testing

1) DeviceAnywhere Enterprise Database Creation and Restoration:

- 1) Creating and Restoration of DeviceAnywhere Enterprise Database in SQL Server 2005.
- 2) Database Configuration by enabling the protocol from configuration manager.

Here I used my fundamental knowledge of database management system to carry out the work, in which I had to interact with database schema, data files and database creation and restoration techniques.

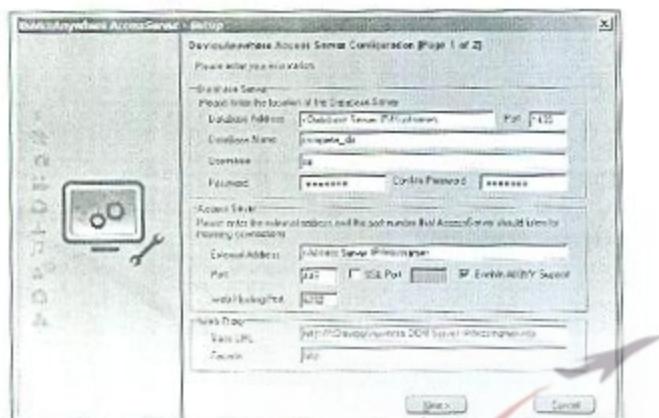
Element 3

2) Installation and Configuration of Access Server Installation Testing:

Access Server was the main server component that controlled the DeviceAnywhere Enterprise environment by controlling all communication between other servers and the database. The Access Server was also managing the data generated from DeviceAnywhere Studio and stored in the SQL Server database. There was only one Access Server per DeviceAnywhere Enterprise environment; and all users and servers in the environment were able to connect to the Access Server. The Access Server was acting as a thin layer providing authentication and synchronization mechanism between the other servers and the central database. In this step, I had to test the installation of Access Server and its connectivity and integration with other component servers. Here I used my knowledge of system architecture and design to develop understanding about the integration of core components.

Element 4

Sample of Access Server Configuration Screen



3) DeviceAnywhere Enterprise Portal Installation Testing:

In order to setup DeviceAnywhere Enterprise Portal, I had to install

- IIS Web server 6.0 and configure it to run on system.
- Install DeviceAnywhere Enterprise Portal Setup

DeviceAnywhere Enterprise Portal was also use to provide access to test results to users, beside administration of users and device packages creation. In this step, I had to test the installation of DeviceAnywhere Enterprise portal and its connectivity and integration with other component servers.

Element 4

Sample of Enterprise Portal Configuration Screen

