



Syllabus Version 1.0_R

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0. Introduction to This Syllabus

0.1 Purpose of this Document

This syllabus defines the content of the international qualification scheme for the "Certified Mobile App Professional – Testing" Foundation (CMAP[®]-Testing). It is established by the Special Interest Group SIG of the International Software Quality Institute (iSQI).

CMAP[®]-Testing is an introduction to Mobile application testing. It provides an excellent introduction to mobile testing, the most relevant techniques and terminology.

The iSQI SIG CMAP[®]-Testing has created:

- The syllabus
- The Business Outcomes
- The Course Material

The Course Material can be licensed to training Providers. In order to license the Training provider must have at least two trainers that hold the CMAP[®]-Testing.

The SIG CMAP[®]-Testing qualification is Entry level certification aimed at anyone involved in mobile app testing: project managers, quality managers, software development managers, business analysts, developers, testers, IT directors and management consultants

Basic knowledge of concepts in software testing is required. It is recommended that the candidate holds a foundation level certificate as "ISTQB [®] Certified Tester" (CTFL) or has equivalent knowledge.

0.2 Cognitive Level of Knowledge

Detailed learning objectives are indicated for each section in this syllabus. These objectives identify what the trainee will be able to do following the completion of each module. They are classified as follows:

Level 1: Remember (K1)

Level 2: Understand (K2)

Level 3: Apply (K3)

The top-level heading for each chapter shows the highest level of learning objectives that is covered within the chapter. The definition of these cognitive levels matches the definition given in the ISTQB Certified Tester scheme to guarantee compliance with and thus integrability to this scheme. Please refer to [CTFL2011] for more details.

Note to training providers: The cognitive level K2 and above requires at least one example in the training material. The levels K3 and above require at least one practical exercise.

0.3 The Examination

The CMAP®-Testing Foundation Level certificate examination will be based on this syllabus. Answers to examination questions may require the use of material based on more than one section of this syllabus. All sections of the syllabus are examinable.

The exam is a 40 question, multiple choice exam. Examinations may be taken as part of a training course or taken independently (e.g. at an examination center or in a public examination).

0.4 Business Outcome

This section lists the Business Outcomes expected of a candidate who has achieved the CMAP®-Testing Foundation Level certification.

A Mobile Application Testing certified professional can...

- BO1 Assist in adaptation of existing testing processes for testing of mobile applications
- BO2 Support the requirements team in review of mobile application related requirements using knowledge of mobile markets and contexts
- BO3 Adapt existing testing experience and knowledge and existing way of testing web and other applications to mobile testing including user expectations
- BO4 Identify and apply appropriate methods for testing of characteristics unique to mobile technology
- BO5 Apply appropriate techniques for testing in a mobile application project
- BO6 Identify and use appropriate tools to assist in mobile application testing including emulators and simulators
- BO7 Assist the mobile application team in identifying potential test automation activities and corresponding tools
- BO8 Assist in identification of requirements of a test lab for carrying out mobile application testing

0.5 Specialization

CMAP® – Testing Foundation Level certification is a first step in a series of certifications with more specialization.

- Certified Mobile Application Professional – Test Automation
- Certified Mobile Application Professional – Load and Performance Testing
- Certified Mobile Application Professional – Security Testing

0.6 Introduction to Training and Certification – 15 minutes

An introduction to CMAP-FLT with a focus on both theoretical and practical examples

It is an entry level certification aimed at anyone involved in mobile app testing: project managers, quality managers, software development managers, business analysts, developers, testers, IT directors and management consultants

It provides an introduction to mobile testing, the most relevant techniques and tools and terminology.

Benefits of undergoing CMAP[®]-Testing Foundation Level training and certification are

- Participants receive information that is to the point, practical and relevant for today's professional tester
- Material developed by international team of experts
- Certificate issued by internationally renowned certification body
- Supported by important companies in the industry

1. Course Introduction - 30 minutes

Literature

- [KOHL 2013] Tap Into Mobile Application Testing – Jonathan Kohl
[HART 2010] A Practical Guide to Testing Wireless Smartphone Applications Julian Harty
[MILA 2011] Android Application Testing Guide Diego Torres Milano

1.1 Introduction to Mobile Application Testing Certification – 15 minutes

The certified Mobile Application Professional – Foundation Level Tester (CMAP[®]-FLT) certification helps a tester get an overview of important tools and techniques used in mobile application testing. The testers also get to understand the similarities and differences with respect to more conventional testing.

The syllabus has following sections -

- Overview of Mobile World
- Mobile Application Test Types
- Mobile Application Testing Process & Techniques
- Tools and Automation

1.2 Introduction to Mobile Application Testing – 15 minutes

There is a need to understand mobile market and its growth as compared to personal computers. Mobile phones and other smart mobile devices continue to grow at exponential rate with corresponding changes in mobile internet usage as well. There is a change in the way information is created, transmitted, transformed, stored and consumed. This means a shift in the way applications are created and tested.

To meet challenges such as smaller budgets, rapid changes in technology and also shrinking timelines mobile application testing requires changes in the way testing gets done for mobile applications.

Key Topics in Mobile Application testing are

- The challenges of mobile application testing:
 - Fast changing market with strong customers expectation
 - Frequent introductions of new devices and techniques
 - Wide variety of operating systems (Android, IOS, Windows, Symbian, Blackberry, and more)
 - Many network operators with different infrastructures and requirements
- Important aspects of mobile application testing such as performance including resource usage, functionality and increasing complexity of variety of sensors and sub-systems built into the mobile, and usability among others

2. Overview of Mobile World - 155 minutes

2.1 Overview of Mobile World – 20 minutes

2.1.1 Market size and figures

There is a need to understand mobile market and its growth as compared to personal computers. Mobile phones and other smart mobile devices continue to grow at exponential rate with corresponding changes in mobile internet usage as well. There is a change in the way information is created, transmitted, transformed, stored and consumed. This means a shift in the way applications are created and tested.

To meet challenges such as smaller budgets, rapid changes in technology and also shrinking timelines mobile application testing requires changes in the way testing gets done for mobile applications.

2.1.2 Players in the Mobile Space

There are a large number of players in the Mobile Space such as Apple, Google, Microsoft, RIM and various others. Some of these players and their platforms are more popular than others with similarities and differences in features and capabilities.

2.1.3 Target audiences and customers

There are many consumers of mobile applications. Professionals, enterprises, governments, educators and Individuals including children are some of these. They use different types of applications with different needs and usage patterns understanding which is very important for testers for “knowing your customer”

2.2 Business Model in Mobile Space 15 minutes (K2)

LO2.2-1 Compare various business models for mobile applications (K2)

There are various models for monetization of work done in creating mobile applications. Some of these include Free, Freemium, Advertisement based, Transaction based and Paid applications (including enterprise applications). There are certain advantages and disadvantages of these approaches.

2.3 Overview of Mobile Devices 20 minutes (K1)

LO2.3-1 Be able to recall different types of Mobile Devices (K1)

There are a variety of mobile devices available which support different types of applications. Smartphones, Tablets, Basic phones and feature phones are some of various types of devices. Each type of device is built for specific type of needs which are important to keep in mind while testing.

2.4 Different types of Mobile Applications 20 minutes (K2)

LO2.4-1 Compare different types of applications based on device types (K2)

LO2.4-2 Compare different types of mobile applications based on usage type (K2)

There are various types of mobile applications such as native applications, browser-based and hybrid mobile applications. Some of the applications come pre-installed and others can be downloaded and installed. Some applications can be downloaded from respective stores or marketplaces and some can be downloaded from the web and installed.

Some basic applications such as SMS, Voice calling, address book and some others are part of all mobile devices whether smart phones or others.

Each type of application has certain advantages and disadvantages requiring an engineering decision to be made before starting the application development. Testing of each of these application types necessitate a different approach.

2.5 Mobile Application Architecture – 35 minutes (K2)

LO2.5-1 Be able to understand the general architecture of Mobile Applications (K2)

There are multiple solutions to architect a mobile application. Some of the first considerations decisions such as the kind of application we want to build - a native mobile application or a web application, is the application meant to run across various mobile and non-mobile platforms also, who is the target audience for the application and other such things.

2.5.1 Client-side architecture

Client side application can be Thin-client or Fat-client. Thin client applications do not have customized application code and these make minimal use of the features provided by the mobile operating system whereas Thick/Fat Client applications may have multiple layers of application code and may make use of mobile OS provided features. Communication and data storage needs between client and server also plays a role in choosing appropriate type.

2.5.2 Server-side architecture

Server side architecture can be a single-tier or multi-tier. In single-tier architecture all server side components like application server, database server etc. are clubbed into one unit, whereas in n-tier architecture they are spread across various units.

2.5.3 Connection Types

There are various types of connections such as Wi-Fi, 2G, 3G, Bluetooth etc. and data access method such as push and pull. The devices can operate in one of the three modes – Always connected, never connected or partially connected, each mode being useful in certain situations.

2.6 Development Platforms for Mobile Applications 45 minutes (K2)

L02.6-1 Be able to identify the development environment for mobile devices (K1)

L02.6-2 Be able to describe the processes for publishing mobile applications for Android and iOS (K2)

All the operating systems have different set of tools for developing mobile applications. It is useful to know which OS/platform uses which tools and also what host operating system can be used to install and use these tools.

There are two major players in the smartphone market currently that provide mobile operating systems. Google which has **Android operating system** and **Apple which has iOS**. Two other popular operating systems by **Research In Motion which has Blackberry operating system** and Microsoft which has **Windows Mobile operating system** are not covered.

Understanding the platform greatly helps testing of applications on that platform. It is important to get an overview of architecture, storage used, and available tools for major mobile operating systems namely, iOS, Android, Windows Mobile and Blackberry.

Mobile applications typically need to be published in the respective stores before these can be downloaded and used by users. It is an important step to test the publishing and subsequent download the application from the respective stores.

3. Mobile Applications Test Types 350 minutes (K3)

3.1 Challenges of mobile application testing 30 minutes (K2)

LO3.1-1 Comprehend the challenges in mobile application testing (K2)

Mobile application testing has a set of the challenges related to variety of devices, screen sizes and resolutions. There are three categories of challenges:

- Hardware – challenges related to multiple manufacturers and compatibility of applications with all the devices, multiple input methods such as keyboard, touch, motion and light sensor among others, and multiple resolutions
- Software – challenges related to operating system and user interface compatibility as well as browser compatibility
- Network – challenges related to multiple network operators and network types such as Wi-Fi, GSM, 2G,3G, 4G

A tester has to test the application to ensure that application works on multiple devices with different specifications, backward compatibility to OS versions and so on. Apart from this major application stores have their own compliance guidelines which need to be adhered to thus complicating the testing.

3.2 Emulators & Simulators 10 minutes (K2)

LO3.2-1 Understand application of emulators and devices for mobile application testing (K2)

Emulators are very useful in the early stage of development as these typically integrate with development environments and allow quick deployment and testing of applications. Emulators are also used to reduce the cost of test environments by replacing real devices with emulators. However an emulator can't replace a device because the emulator may behave in a different manner than a mobile device. Emulators may not support all mobile device features. In addition some hardware types may not be supported such as touch, accelerometer and others.

Simulators work independent of the real operating system and can be used for a variety of purposes such as easily capture screenshots or perform functional testing which does not require hardware etc.

3.3 Differences in Mobile & Conventional Application Testing 15 minutes (K2)

LO3.3-1 Be able to explain with examples additional tests that need to be done for mobile apps (K2)

Testing of mobile application poses a range of challenges not found in conventional application testing. Some of these challenges are - sheer variety of types of device and mobile platforms, network providers, mobility which means potentially intermittent nature of connections, less powerful hardware, constrained resource, rapid changes in technology and demand for solutions on multiple platforms, among others. Variety of sensors available on the devices and their

3.4 Mobile Testing Types 290 minutes (K3)

LO3.4-1 Be able to understand and implement different test types related to the mobile devices (K3)

LO3.4-2 Demonstrate principles used for testing mobile applications on multiple device types (K3)

LO3.4-3 Understand the differences in testing for different connectivity modes of mobile device (K2)

LO3.4-4 Describe challenges involved in multi-platform application testing (K1)

LO3.4-5 Demonstrate different types of testing specific to mobile applications (K3)

LO3.4-6 Understand the differences in testing for different types of mobile applications (K2)

LO3.4-7 Identify various types of common tests that can be applied to mobile testing as well (K1)

LO3.4-8 Describe field testing and various factors to be taken into account for performing it (K1)

There are some types of testing which are specific to mobile devices because of unique nature of mobile applications, devices and platforms.

3.4.1 Testing for the devices

Different types of devices and differences in capabilities of these devices mean that testing has to be conducted on a large number of devices. This means that for a given application the target devices must be prioritized and tested for.

3.4.2 Testing for the connectivity

Mobile devices typically operate in one of the three modes – always connected, never connected or intermittently connected. This has an impact on the way data is synchronized between Client and Server requiring local data storage and a Store and Forward approach when connectivity is not there.

3.4.3 Testing applications on different platforms

Each mobile operating system has its own limitations. Even testing a single application across multiple devices running on the same platform is a challenge because of shorter release cycles of platforms and issues of compatibility. Testing across every platform multiplies the challenge involved.

3.4.4 Mobile specific testing

There are various other types of tests specific to mobile applications. These are

Functionality Testing – Functionality testing as usual but in mobile application context.

Input Methods Testing – Testing of data input using all supported input methods such as physical Keyboard, virtual keyboard, touch screen, motion sensors, voice, gestures, camera and sound inputs (if applicable), light sensors, acceleration, gravity, magnetic field, pressure, temperature sensors input and others.

Testing for UI & Guidelines: User Interface must be tested against guidelines as provided by each platform.

Orientation testing – Testing for the orientation to ensure that application UI is rendered correctly.

Testing for Interrupts – Testing various types of interrupts such as voice calls, SMS, charger, low memory Notification and others while application is running.

Testing for different Networks - Testing the application behavior with different connection types (Wi-Fi, GPRS or phone data connectivity etc.) under data transfer conditions.

Testing for Preferences – **Testing** impact of preferences on the application. Test whether app allow to change the preferences or not.

Power Consumption/Battery Life testing – Testing impact of application on battery life and impact of battery life and status on application

Widgets Testing– Testing various types of widgets

3.4.5 Testing different types of mobile applications

Mobile test applications can be classified as native, web and hybrid applications. The testing strategy changes based on the type of the application involved and the tools that would be used for automating testing activities.

3.4.6 Common test types applied to mobile testing (K1)

There are many types of tests conducted for testing conventional applications and many of these are valid for mobile application testing as well. Some of the these test types are - Installation, User Interface, Functional Testing, Security, Performance, Stress, Usability, Database, Compatibility, Memory Usage Testing, Certification testing and others.

3.4.7 Field testing (K1)

Mobile applications needs field testing to ensure that applications are working as per the requirements on different Service Providers and on different types of communication technologies. Field testing requires careful planning and identification of types of tests to be performed in the field. One of the challenges of field testing is availability of various types of connections and plans from the service providers especially when remote or off-shore application development and testing is carried out.

4. Mobile Application Testing Process & Techniques (150 minutes)

4.1 Mobile test Process and Strategy 30 minutes (K3)

LO4.1-1 Be able to understand the implementation of the required testing process in mobile application projects (K2)

Mobile application testing requires a process to be established like any other software testing project. One of the key points to consider in this activity is the different levels at which the application would be tested and the focus for each level.

4.1.1 Test Process

ISTQB defined testing process is applicable to mobile application testing as well. ISTQB defines following steps to testing process -

- Planning and control
- Analysis and design
- Implementation and execution
- Evaluating exit criteria and reporting
- Closure

4.1.2 Test Levels

Identify various test levels for mobile application testing projects (K1)

Mobile application testing includes activities to be performed by developers and testers. Determining appropriate intensity of testing for these levels namely Unit, Integration, System, User Acceptance and Field testing is important for delivering good quality products.

4.1.3 Agile and Mobile Application Development

Understand how mobile application testing fits into Agile methods (K2)

Short development lifecycle of a typical mobile application and quicker releases, mobile application testing fits very well the Agile Methods.

This means that project management processes like Scrum and Kanban, Xtreme programming methodologies like Test Driven Development (TDD), Acceptance Test Driven Development (ATDD) are suitable for mobile application projects.

4.1.4 Test Coverage

Explain to business stakeholders how to define testable acceptance criteria (K2)

Defining appropriate acceptance criteria for mobile applications is a difficult task because of the wide variety of devices, platforms and networks. Complete coverage of the combinations in such situations may not be feasible. This means that strategies of Combinatorial Analysis, for example Pair-Wise testing or Orthogonal Arrays might need to be employed to get good enough coverage for the combinations.

4.2 Experience Based Testing Techniques 45 minutes (K3)

LO4.2-1 Apply experience based techniques (K3)

Exploratory testing, error guessing, fault attacks etc. are some of the experience based techniques. These techniques complement other test design techniques. Key elements of exploratory testing are Product exploration, Test design and execution and learning from the execution. Exploratory testing can make good use of heuristics and tours.

Tours can be used to explore an application from a specific point of view and focus. Tour based testing in mobile applications can be performed to understand how an application works and also to create models on how an application works.

5. Tools and Automation 135 minutes

Quick release cycles and large number of devices require ability to do certain amount of regression testing in automated manner to reduce the effort and time to release. Need for applications to be made available on multiple platforms require tools that are cross-platform.

5.1 Automation Approaches 30 minutes (K2)

LO5.1-1 Compare code-based and non-code-based automation approaches (K2)

There are two approaches to automation – using application source code and automating using the APIs or using other approaches such as GUI automation when the code access is not there. In some situations automating testing using code may not be feasible. In such cases also GUI automation can be performed.

All Automation approaches used for conventional applications are applicable to Mobile applications as well i.e. Record/Playback, Data-Driven, and Keyword/Action Based automation.

Automating mobile application also depends on type of application i.e. if its mobile web application user can choose user agent-based approach, if its native & hybrid application user can choose remote/cloud based approach and lab based automation can be used for all types of applications.

5.2 Automation Solutions 45 minutes (K1)

LO5.2-1 Describe various automation solutions for mobile applications (K1)

To automate a mobile app, tester needs to understand the automation script recording or creation mechanism and also how to access application's objects such as buttons, list box, edit box, etc., There are varieties of access methods used for mobile automation such as Image recognition, OCR/Text recognition, Web-based recognition and native object recognition.

There are three main ways to record an application - Native, Dynamic Native and Visual.

5.3 Automation Process 10 minutes (K1)

LO5.3-1 Describe various steps of automation process (K1)

Functional automation of mobile applications can benefit from a well-defined process for automation.

5.4 Exploring Mobile Automation tools 30 minutes (K1)

Mobile testing is a new field and many automation tools are available in the market and many tools are released every month. It is important to evaluate tools appropriately in order to choose and deploy one.

LO5.4-1 Describe various mobile test automation tool evaluation parameters (K1)

LO5.4-2 Enumerate existing tools and salient features of the same (K1)

5.4.1 Tool Evaluation Parameters

There are various parameters which have to be potentially fulfilled by a tool. These parameters need to be prioritized before starting tool evaluation. Some of these parameters are -

- Platform support
- Instrumentation needs
- GUI/CLI/API level automation
- Record and play feature
- Learnability
- Reporting features
- Costs
- Vendor Support
- Maturity of tool
- Various costs associated with the tool

5.4.2 Existing Automation Tools

There are a number of tools available in the market and the list is ever-increasing. Some tools are platform specific whereas others are cross-platform. Some tools are open-source whereas others are commercial. Some work on devices and others on emulators. Some of the existing tools are SeeTest Automation (Experitest), Perfecto Mobile Android Testing Cloud, Monkey Tool, Robotium, T-Plan Robot and others, Eggplant, TestQuest, Test Droid, Meux-QTP, Sikuli. There are many other tools also available in the market.

5.5 Test Environment and Test Lab 20 minutes (K2)

LO5.5-1 Compare various approaches of creating test labs (K2)

Mobile application testing adds a further challenge to the test lab infrastructure management because of mobile nature of the devices and the sheer variety of devices available. While building and maintaining a mobile application test lab, at least following factors need to be considered:

- Platforms the customer is using or is targeting in the near future
- Most popular devices in the market
- Cost of owning and maintaining a lab
- Requirement for access to various networks and service providers, locally or globally

The lab could be built by procuring physical device, by using emulators, by using a combination or using a Remote Device Access Service.