

BU

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University

**School of Design, Engineering
& Computing**

Report on Methodology

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Keith Amoah

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2 Methodology

2.1 Introduction

There were two aspects to this project

- Research Project for “content” development. This includes
 - Research
 - Taking measurements on Wi-Fi performance
 - Taking measurements on 3G performance
 - Testing the reliability of 3G /HSDPSA while travelling
 - Capturing results as on-screen videos, images etc.
- In the development of e-learning Tool, the methodology used is shown in the rest of this document.

2.2 Requirement Analysis

2.2.1 Interview with Client

An interview was conducted with Client Dr. Reza Sahandi in Nov 2010. Further correspondence was carried out by email.

The key requirements were

- The basis of the content of the learning aid should be what was available on MyBU under the Advance Network module. However, the content should be expanded by further research into Wi-Fi, WiMAX and LTE.
- The content should last about 30 minutes and students should be able to use it independently.
- The content should contain animation and illustrate concepts and ideas to the student.
- Students could be Advanced Network Students or any other students under software systems framework.

2.2.2 Student Questionnaire

A questionnaire was used to interview fellow students as they were also stake holders on this project. (*Answers are in italics*)

- What parts of the course did you find difficult?
 - *All of it was difficult. A lot of independent study was required. The exams were more in depth than what was presented in the lecture theatre.*
- Would animation help with these topics
 - *Yes, for the basic concepts.*
- Did you understand the principles of digital communications? For example did you understand why different modulation techniques improved throughput?
 - *We need for spectral efficiency, but not necessarily how it was achieved.*
 - *We understood the impact of noise and interference on transmissions*
 - *We know from practical experience that the further away you are from an access point, the poorer the performance.*
- Did you understand the mathematics involved i.e? Probability, Statistics, Fourier Transforms etc?
 - *The reason why probability and statistics are important yes but we were not to required to go into depth on these subjects*
 - *Fourier Transforms - not required*
- What prior knowledge would have helped you on the course?
 - *Basic Network courses in year 1 & 2*
 - *Basic Networks year 4*
- Please state what specific topics you found challenging.
 - *Understanding where the various technology were targeted at*
 - *Why the better technology did not always win out*
 - *Predicting the future*
- Would a web based multimedia learning aid be useful?
 - *Yes*
- How would you use such an application?
 - *Prior to a lecture*
 - *As a reminder of the lecture*
 - *And as a revision aid*
 - *From my flat.*
- Would self assessment be useful?
 - *Yes*
- Would you mind if your lecturer knew your scores?
 - *Yes*
- Even if the collection of these results was anonymous?
 - *Mixed response but more “No”s.*

2.2.3 My Own Experience

I am not a student covering the Advanced Network module so I did not attend any of the lectures. My learning experience was based on personal study of the on-line material and researching the topics of Wi-Fi, WiMAX and LTE in the library, in professional journals and on the internet.

The areas that I found challenging were.

- The sheer number of acronyms
- Various modulation techniques used to increase spectral efficiency.
- Terminology was used by marketing departments which was not strictly correct.
- The nuances of all the different standards and their updates.
- The politics behind the allocation of spectrum.
- Understanding the difference between standard setting bodies like the IEEE and the industry group like Wi-Fi Alliance and WiMAX Forum.

2.3 Specification

The system should be read-only with only the administrator being able to update it.

The system should run on the standard web browsers i.e. Internet Explorer 7, 8 and 9, Safari and FireFox 3.6, 4.0 etc.

Any plug-in required must be free and commonly available.

The WEB interface should be intuitive and suggest routes through the technical information for basic users while letter experts directly access the topics of specific interest.

The system should run satisfactorily over a 1Mbps-1 ADSL network to allow students to access the system remotely from their flats.

Video show should be held in compressed format to minimise storage and bandwidth requirements.

A variety of multimedia techniques should be used (i.e. video, audio, appropriate animations). This will allow the individuals to find a mode that suited their learning style.

The system must run on any normal PC and laptops up to age of 3 years old. (i.e. no high power CPU or graphics cards should be required.

The system should try to be as modular as possible and re-use code wherever possible.

It should be possible to replay animation or video without having to re-load the page.

There must be a self-assessment quiz after each section.

Explanation of acronyms must be available on-line.

2.3.1 Specification Test Plan

Check on local laptop

Test	Success /Failure
Check for broken links	
Check results in different browsers	
Check Flash for voice / video synchronisation	
Check directory structure.	

Load to remote web-server

Test	Success /Failure
Check for broken links	
Check general performance and that streaming is acceptable <ul style="list-style-type: none">▪ Over 10Mbit ADSL▪ Over 3G dongle (1Mbit)	

End User Testing

Test	User Feedback
Look and Feel – intuitive?	
Logic and walk through	
Performance	

2.3.2 Software Tools to be used

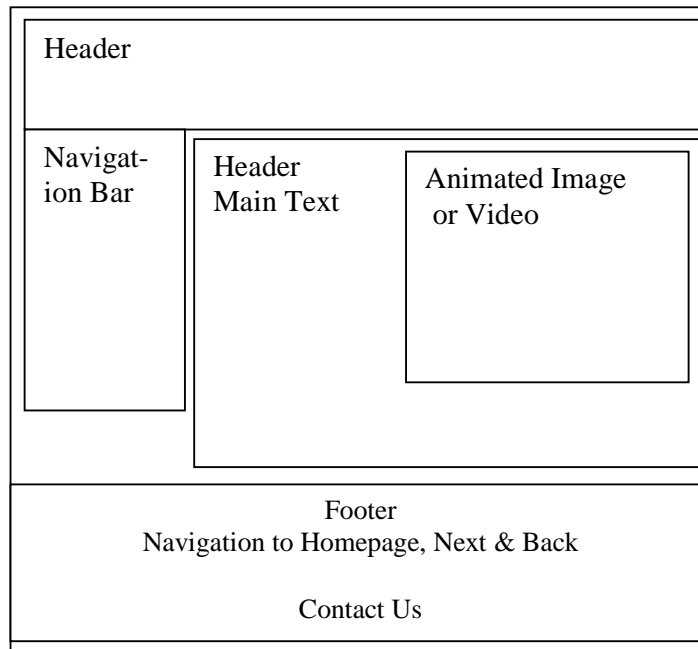
Software	Reason
Adobe CS5 Flash	<ul style="list-style-type: none"> • Leading animation software. • Ability to place items on different layers. Each layer can be locked so that when you are editing one thing, you don't accidentally edit another item. The ability to hide layers also helps this. • Ability to view animations from previous frames without being able to edit them. • Ability to include videos. • Ability to use buttons to play, pause or rewind animation and sound. • Player plug-in is free and is available from adobe.com
Adobe CS5 Dreamweaver	<ul style="list-style-type: none"> • Edit the source code while being able to see the end product. • Colour code of source code • View Line numbers • Ability to publish to web server • Recomputed directory structure when items are moved between release and development
Debut video Capture software	<ul style="list-style-type: none"> ▪ Capture and record areas of the screen
inSSIDer 2.0	<ul style="list-style-type: none"> ▪ Wireless LAN network analysing software. <ul style="list-style-type: none"> ○ Wi-Fi channels being used ○ Receiving strength signal indicator
Skype	<ul style="list-style-type: none"> ▪ Testing VoIP on 3G
Riva FLV Encoder	<ul style="list-style-type: none"> ▪ Converting Large AVI to smaller FLV files
MetLAB & SIMULINK with digital signal processing	<ul style="list-style-type: none"> ▪ Used to investigate modulation wave forms FSK,BPSK, OOK, QSPK

2.3.3 Other Resources required

Hardware	Reason
Sony Laptop VGN-FZ21M	<ul style="list-style-type: none">▪ Development environment
Sony Video Camera	<ul style="list-style-type: none">▪ Capturing Interviews
Huawei HSDPA Modem E160	<ul style="list-style-type: none">▪ Measuring 3G performance▪ Testing webpages over slow link
200Mbyte of Web Space	<ul style="list-style-type: none">▪ For testing and demonstrating solution

2.4 Design

2.4.1 Standard Page Layout



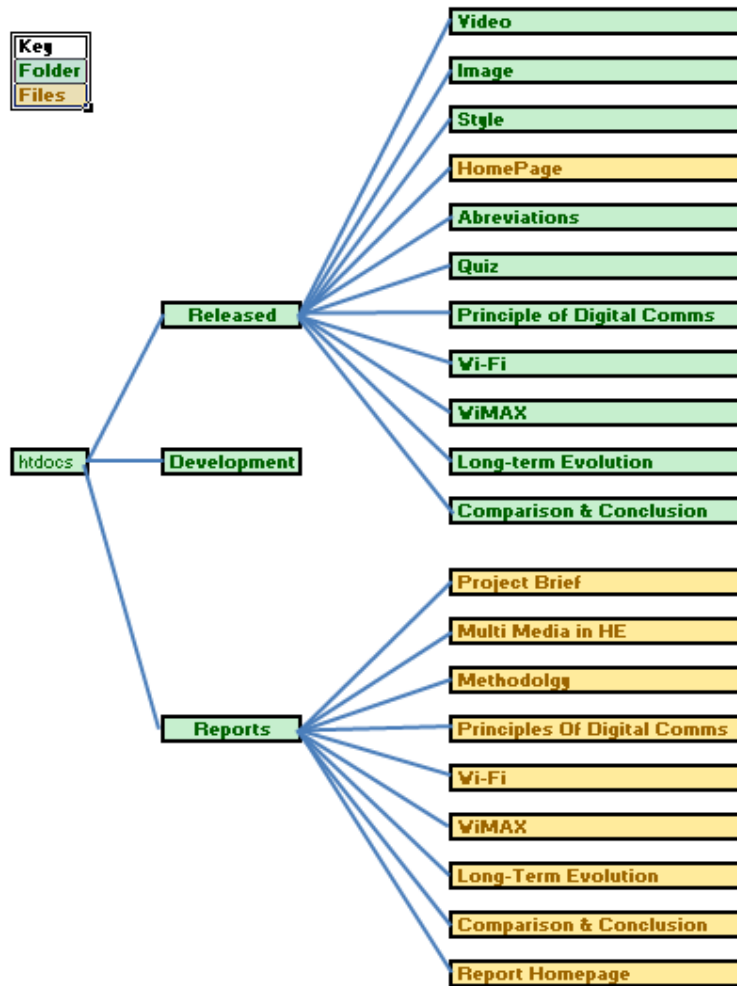
To keep the size of the webpages on the screen, images would be designed to enlarge when the cursor is over the image.

The minimum screen size the webpage is designed for is 1080 by 1024.

2.4.2 Design constraints

In Xhtml, the use of tables and frames has been deprecated. Therefore no tables or frames will be used in the solution.

2.4.3 Directory Structure



Note the “development” directory structure is the same as “Release” directory structure. Details of development directory structure are suppressed for clarity.

2.5 Implementation

The early versions of e-learning aid were loaded up to

<http://www.keith-amoah.webspace.virginmedia.com/Mainpage.html>

where I have 200Mbyte of webspace. This was in order to prove the concept of e-learning tool.

The implementation was done using wherever possible re-usable code. This was to

1. Keep it structured
2. Limit the amount of time spend on development.

The animations were developed in Flash and all video were converted from various formats (.avi, .mov etc.) to FLV to limit the size and to allow streaming.

2.6 Testing

2.6.1 System Testing

Testing according to test plan as declared in specifications

Test results.

- No issues with links within Html
- However, problems were detected with links between Flash animation files and over-laid audio – corrected issues discovered on local tests
- On web server performance was inconsistent over 3G modem. Intermittent hesitation rather than an out-right performance. (Reduce the encoding of FLV files to reduce size)

2.6.2 End User Testing