Embedding Mobile Enabling Technologies (EMET) – Final Report

Contents

Introduction

The Embedding Mobile Enabling Technologies (EMET) project has investigated the use of various technologies that have not been previously considered by ALPS. A key question posed for the project is “Does increased desirability of a device improve engagement with mobile learning and teaching?” EMET participants, who trialled the technology were all students with disabilities; this decision was based on our belief that if it works for people with a disability it will also work for those without. The devices were all tested for use with the ALPS assessment suite and participants provided feedback on their experiences and impressions of the technology. The project team has used these insights to develop a number of recommendations for future device adoption and potential embedding models that make use of these technologies. We provide some example scenarios for their usage.

Scope

As these are new technologies that have not been previously looked at by ALPS there has been no ALPS client to test with them. Therefore the students’ experience of accessing the ALPS assessment with the devices has been entirely through the device web browsers and is therefore not comparable to students using the ALPS devices with the ALPS client. The project hasn’t focused solely on accessing the assessment suite from the device, but has also taken into consideration the devices form factor and other functionality to investigate the impact of desirability of the device and student engagement.

Disclaimer

Whilst the students who tested the technology had disabilities, our findings in no way guarantee the accessibility or usability for all students. The test group was necessarily small due to the time and funding constraints of the project. In most cases only one student was able to test each item of technology meaning our findings cannot claim to be representative of the wider student population.

1 Methodology

Accessibility of the ALPS Assessment Suite

A study was made of the ALPS assessment suite when accessed through a PC using a variety of web browsers. This was done in order to:

- Form a baseline for comparison between PC browsing experience and EMET device browsing experience.
- Assess how well the website could be customised and tweaked (e.g. linearised) which may be applied to devices that have difficulty accessing the website.
- Provide advice to ALPS and the developers for how effectively accessibility best practice had been built in to the website and guidance for how this could be improved.

The methodology and the outputs of this in investigation were covered in a separate report to ALPS, see ***Appendix 4 – Web Site Accessibility Study***.

Selecting the Technology

The technology selected for testing by students was a mixture of equipment that the project team already had access to, that it was believed might offer unique advantages that hadn't been considered (such as free mobile data), that may appeal to students or already be commonly owned. The equipment was all available through popular websites such as eXpansys and Amazon.

Four preapproved University suppliers were approached for quotes for each item in a competitive process. Rather than treating as a single order with one supplier, it was broken up and each item was sourced based on the provider of the cheapest quote.

Focus Groups

A group of participants were recruited and asked to attend a focus group every week for five weeks. At the beginning of the first focus group the research was explained to the participants and instructions were given on how to access the ALPS web based assessment tool. This was not required in subsequent sessions.

Each week the participants were given a new type of technology to evaluate. They were actively encouraged to 'play' with the technology. It is important to note that participants were unaware which technology they would receive each week. The purpose of this was to judge their initial reactions.

At the beginning of each session (with the exception of the first) members of the group gave feedback on the technology from the previous week in a focus group session, which was recorded and transcribed. They were then provided with new technology and their reactions noted. After 5 minutes of exploring the new devices the group was asked to provide individual data on the technology using the Microsoft Desirability Toolkit. This is a process in which participants are supplied with a list of key words and, in this case, asked to rank 10 of them in order of importance to them.

After a few days participants were emailed with their individual words, as a reminder, and asked to give more detail about why they chose certain words. It was also an opportunity for participants to change their minds after using the devices for a short period of time.

In the final meeting Repertory grids were used. Repertory grids were originally developed by Kelly (1955) as part of his personal construct theory of personality. The term personal constructs in Kelly's theory refers to the set of models / hypotheses or representations, which each person has made about their world. Kelly invented Repertory Grid interviewing as a way of getting people to reveal their own personal models. We hoped that issues such as desirability and engagement would be revealed via the grid. Each grid consists of four parts,

- A Topic – which was clear from the research proposal
- A set of Elements – these are instances of the Topic, in these case the individual types of technology.
- A set of Constructs and contrasts. These are the basic terms that the client uses to make sense of the elements. It is therefore essential that the individual understands these basic terms, therefore ours were taken from the Microsoft Desirability Toolkit responses.
- A set of ratings of Elements on Constructs.

	SCALE Contruct = 1 2 3 4 5 =Contrast		iPhone	iTouch	iTouch	HTC Hero	Nokia N97	HTC Touch Pro	ASUS	Ultra Tablet PC	Viliv s5 Premium 3G	DataWind Pocket Surfer2 L	DataWind Pocket Surfer3
	CONSTRUCT	CONTRAST											
Engaging	Engaging	Demotivating											
	Inviting	Overwhelming											
	Fun	Boring											
Desireability	Desirable	Undesirable											
	Attractive	Unattractive											
	Needed	Gets-in-the-way											
Pragmatics	Time-saving	Inefficient											
	Professional	Amateurish											
	Manageable	Uncontrollable											
Aesthetics	Simplistic	Complex											
	High-Quality	Poor-quality											
	Clear	Confusing											
Functionality	Responsive	Unresponsive											
	Usable	Difficult											
	Creative	Uninspired											
	Empowering	Disenfranchising											

Figure 1 - Example of a Kelly Grid

A more detailed dataset can be found in ***Appendix 1- Word Clouds***.

Embedding Models

The ALPS IT Group has previously produced embedding models (see ***Appendix 2 – Current ALPS Embedding Models***) for the Joint Management Group. These models are based upon the existing ALPS infrastructure and technology, and an objective of the project was to see if the new EMET devices presented any new choices for embedding models.

A new amended model was produced by taking the original ALPS model as a baseline and taking into account the specification and requirements of the new

devices, the students experiences and comments from the focus groups, as well as drawing upon the teams technical expertise.

	Student---------- Payment Options ---------- HE				
The mobile device	Student's own device	Student buys device from HE[1]	HE provides device (cost added to fees)	HE device loaned to student	HE provides device at no cost to student
The data costs[2]	Student	HE pays up to an agreed limit			HE pays total
The voice costs	Student	HE pays up to an agreed limit			HE pays total
	Individual HE ----------Payment Options ----------HE Partnership				
Support costs	Support provided at individual HE level			Continuation of shared support service	
Software costs[3]	Software bought at individual HE level			Software jointly purchased by Partners	

Figure 2 - Original ALPS embedding Model Presented to JMG

Scenario's for Use

ALPS have previously created a vision setting out how they see the technology being used (see ***Appendix* 3- *ALPS Student Story***). The new EMET devices would still have to roughly align with this vision in order to achieve ALPS goals but an objective of the project was to see if the students found any new uses of the technology that can be applied to teaching and learning.

During the focus groups, the project team asked questions about the students' use of the devices and any relevant response was fully explored and recorded. The team then applied their knowledge of pedagogy and students needs to develop a more complete teaching and learning scenario.

[1] Preferential deals set up with mobile providers

[2] Some more complex options were considered here, but these are likely to be less relevant as voice and data costs are likely to be one combined cost in the future, rather than separate costs.

[3] This covers the software that delivers and uploads the assessments and provides remote device management (Intellisync or an equivalent), the assessment software (ALPS assessment suite) and security software (SafeGuard or an equivalent).

2 Findings

Accessibility of the ALPS Assessment Suite

Although there were some issues around the website that would affect users with a screen reader, nothing was found that the team believed would impede the use of the planned technology with the web based version of the ALPS assessment suite. During the testing the site linearised sufficiently well that the team felt that the browser functionality of some of the devices (such as the Column view option) would work with the site.

As nothing was found that would affect the project a separate report on the findings of the website study was produced and submitted to ALPS (see ***Appendix 4 – Web Site Accessibility Study***).

The Technology

Item	Price[4]	Group	Qty	Reasons for Selection
iPhone 3G 16GB	£447.82[5]	Apple	1	The iPhone is generally viewed as a disruptive piece of technology that raised the bar in terms of user expectations for mobiles. There was / is a large amount of hype around the product and it was an aspiration for many consumers. This seemed to be the ideal product to test the hypothesis that desirability increases engagement.
iTouch 32GB	£230.43	Apple	2	Essentially a WiFi only version of the iPhone at a considerably cheaper price. This device allowed us to judge the impact that the lack of a 3G signal had on desirability and engagement whilst at the same time verifying other findings from the iPhone.
HTC Hero	£295	Smartphones	1	At the time the HTC Hero was the latest Smartphone running the Android operating system. This is still relatively new but it is seen by many in the mobile industry as a challenger to the iPhone.
HTC Touch Pro2	£369.87	Smartphones	1	This device runs Windows Mobile 6 and in many ways is a much later version of the Vario devices

[4] All price exclude VAT

[5] This device was more expensive as was imported from France 'unlocked' so that an ALPS data SIM could be used, saving money as at the time iPhone's were exclusive to O2 on contract.

				originally purchased by ALPS. This device will give some indicator to the ALPS partners as to what response to expect from students if they refresh their existing device pool with newer versions.
Nokia N97	£365.21	Smartphones	1	The N97 runs the Symbian operating system and currently has around 47% of the Smartphone market. Despite the hype around some of the other handsets it is far more likely that students will have a phone with this type of OS. At the time of order the N97 was the latest major release on the Symbian platform and was the follow-up from the hugely popular N95.
Samsung Q1 Ultra Tablet	£361.86	Ultra Mobile PC (UMPC)	1	One of the original 'Origami' UMPCs the Q1 is a Windows XP tablet in a form factor that is similar to a play station portable (PSP). There is a full QWERTY keyboard that is split up down each side of the screen although the buttons are rather small. It is one of the bigger and heavier UMPCs trialled. WiFi only (more expensive 3G version available).
Viliv s5 Premium 3G GPS	£590	Ultra Mobile PC (UMPC)	1	The S5 is a 15inch diagonal form factor with a 14inch screen. It's extremely small and light yet has a 1Ghz Atom processer and runs Windows XP. WiFi or SIM.
Asus Eee PC	£0[6]	Ultra Mobile PC (UMPC)	1	This Eee PC was one of the first, small, light weight laptops that went on sale at just over the £100 mark. To keep the costs low the laptop runs a Unix operating system and comes with open source software such as Star/Open Office. A major factor in its choice for selection was its affordability. Newer more powerful versions (some running Windows) are now available at

[6] Equipment from a previous TechDis project

				around £200. WiFi only.
DataWind PocketSurfer 2R	£149.56	Mobile Internet Device (MID)	1	The PocketSurfer is an unusual device in that it is cheap, small, light weight and when closed somewhat resembles a long makeup compact. When opened it the bottom half is a full QWERTY keyboard. The 2R version comes with 20 hours internet usage per month supported by advertising and upgradeable to unlimited. They use the Vodafone mobile network rather than WiFi so the devices are not dependent on hotspots.
DataWind Pocket Surfer 3	£220	Mobile Internet Device (MID)	1	As above but an improved version with better touch pad. Included in the price is 30 hours per month usage for the first year. The package can be renewed for £30 per year or £59.99 for unlimited surfing for life.
Nintendo DSi XL	£133.56	Console	1	Anecdotal evidence suggests that the use of handheld games consoles is more popular with males than females. However, the Nintendo DS does appear to be more desirable to females than other platforms in part probably due to targeted marketing. With this being the case, it's split screen support for internet browsing, it's non traditional nature, the team believed it may reveal a unique perspective not shared by the other devices.

Focus Groups Findings

Apple Focus Group

The words with the highest frequency were: Fast, engaging, High quality, Attractive and Impressive. Focus group feedback would seem to support this as students found them the most desirable devices and seemed to enjoy using them the most.

Students specifically like the icons on these devices, for example:

"*I think because it is a small screen so for me the icons stand out a little bit more where on the laptop because the screen is a bit bigger the icons are there but sometimes can be smaller but then you've just got like a big whole screen and sometimes looking at a big screen can be you know too much"*

And combining this with a reliable device seemed to have advantages for learning:

"There is an icon there for notes, you see you can just kind of press it so if you wanted to do a reflection you've just got it there to hand you don't have to think well I have to get me pen and then me paper or I have to go to me locker and get me laptop. You know there is no having to plug it in. When it is already charged it is just accessible"

Two significant differences were reported in the iPhone and iTouch: the iTouch was reliant on WiFi access and students reported constraints in this and benefits to the permanent connections of the iPhone; these included being able to be online whilst walking round campus and whilst on the bus or train on the way home. One student reported using the maps whilst on placement. The second difference was that the iTouch required an additional microphone to enable voice recording, this was deemed prohibitive in terms of capturing audio reflections. However, it has to be said, that few students in this study (and ALPS generally) have reported widespread uptake of audio reflection.

In terms of accessing the ALPS assessment suit, students reported that with these devices:

> *"It was much quicker than the older ones because the older ones you have to go, you do it and then you turn the page and then turn the page, it takes forever where this is just in line for you, you just click it."*
>
> *"It was quicker it was easier to use. Just scroll down you didn't have to change the page. It loaded quicker although you could confuse it. And it is much easier without using the stick. I thought it was much better without that."*

And

> *"The keyboard on this is better than the ones on the old one I thought. The layout was better."*

In terms of accessibility they reported:

"Easy, easy enough to access really quickly…..once you've been shown yeah fine"

So overall the iPhone and iTouch were well received. Whilst the iTouch did offer a cheaper version of the iPhone, and without the phone element potentially may be better received in practice settings, the lack of 3G connectivity and dependence on WiFi was seen as a drawback.

UMPC Focus Group

As more traditional and larger devices we suspected that these would not be at all popular. However, the words with the highest frequency were: Fresh, Engaging, Professional, Slow. While desirability did not appear to be a characteristic the larger screen and more familiar mode of input appeared to be appreciated. This appears to

suggest that “engagement” is more complex than the look and feel of a device. Though, following from the data from the apple devices, desirability clearly has an effect.

The following quote from a student adequately sums up a variety of positives and negatives and confirms findings from the week before that relying on WiFi access is currently problematic and that there remains an issue with legitimacy when students use mobile devices in practice – these students reported more positive use of the UMPCs in practice settings, one student said about the Asus laptop:

“And I really liked the fact that when you were on placement I could open it and it was really small and it meant I didn’t have to try and kick a member of staff off a computer which was really handy. But there wasn’t wireless internet there so I couldn’t actually get on the internet and my internet isn’t working at home so I couldn’t access the internet at all on it. And I didn’t like that it wasn’t Microsoft.”

She went on to make the following observations:

“But I did quite like the way it was set out. It had like all little sub headings and everything was categorised there but that took a bit of getting used to because it was so different. So positives, but if the internet *… had like a dongle attached or something and if the word documents worked it would have been really handy.”*

However size and mobility still do matter, one student said about the Viliv S5 that is the lightest of the UMPCs:

“A bit heavy to carry about and then the adapter is quite heavy as well so you would have to cart that to.”

The participant went on to compare the weight of the Viliv to the iTouch which she had used the previous week, throughout the session

And finally, with regards to the Samsung Q1:

“Just infuriating, I hated it. I couldn’t see the point of it because it didn’t have Word in it or anything that a PC would have.”

Of the three UMPCs trialed, the Asus Eee PC was the only one used successfully for accessing online assessments and this student reflected positively on this experience:

“I guess just because you are used to writing things up and also academic things are on a computer or laptop but it seems more legitimate in a workplace than a phone maybe.”

The issue with devices being legitimate / professional was a recurring theme throughout all of EMET. Participants were quite clear that they felt more confident when using devices that they believed colleagues would identify as being work related.

Smartphone Focus Group

This focus gave a very surprising result. The words with the highest frequency were: Dated, Useable, Old. These were the very latest smart phones and while participants appeared to engage with them it was not to the level of the Apple devices. This appeared to be due to the look and feel of the device, which appeared to be more conventional and phone like. For example:

"I had the HTC Touch pro 2. Um I quite like it. It is quite heavy, it is not as responsive as the iPhone you kind of press it a few times. Because it takes a long time to think you don't know if it is doing it or not and you kind of press buttons when you don't need to. But yeah it does everything it is meant to do. No problems with the internet or anything. It is alright yeah."

And

"I like it my Nokia but I find it really hard to use like but to push it open, it sounds silly but it is actually quite hard to open sometimes, it is really stiff and you have to like kind of get the angle right to open it."

So these devices were functional but failed to really enthuse or engage the learners. However, an interesting point emerged when the assessments were discussed; it appears that some of these phones and in particular the HTC Hero had a more effective predictive text than the Apple devices:

"Well the word actually came up spelt correctly so you didn't initially have to spell the word; you know type all the letters in for the word. You type maybe three letters in."

Given that these were students with dyslexia, there was a general agreement that this was a key benefit; yet they still reported a preference for the iPhone and iTouch.

MIDS Focus Group

The participants testing the DataWind Pocket Surfers gave an interesting response. Though initially ie: within the first 5 minutes, they were given a very warm response, this appeared to be to the first look and feel. However, the response soon cooled when students began to use them. Thus, again desirability and engagement are more complex than we originally proposed.

A few comments:

"I had the Pocket Surfer 2. I didn't like it. It looks nice but it is not actually very good. It only lasts two hours the battery once it is fully charged. It is really slow and it is very confusing…. It didn't really spark excitement.."

The students struggled to use the devices finding the interface difficult to use for even simple things such as entering a web address. Upon discovering that the devices wouldn't allow them to log in to the ALPS assessment suite (see **Accessing the Assessment Suite from Device Web Browsers**), they totally disengaged with the devices.

Nintendo DS Focus Group

The first 2 words used to describe the device were "fun" and "engaging".
The device had been used to access the Brain Trainer, the Flip Notes Studio and the ALPS Assessment Tool online.
It was reported that with the internet it (the device) was ‘great’ for the Assessment Suite. It was easy to enter, clear and easy to operate. "You can use it like a book". It scrolls easily. Easy to use and one student thought the easiest of all equipment used. The touch screen can be used with a "pen" stylus and this was positively received as it offered more control, this seemed to be an important point and was repeated several times. Interestingly the iPhones/iTouches’ have moved away from the stylus, so this option offers students real choice.

Because the screen is bigger, this made a difference when doing the assessments as it magnified them. The on screen keyboard was ‘great’ as was the look and feel and the lighter weight of the device.

The voice activation on the Brain Trainer was reported as not very good, and it was felt that the device would be better if it had more apps. It was easy to turn on and use. It was reported that it was easy to move content about, especially with the reference point on the top screen to show page location.

One student reported having trouble getting online in the first week, this may have been due to the CAPS lock needing to be on and off in order to enter the password. She reported that it was hard to set up the device with WiFi and it would have been better if she hadn't had to mess about with that.

It was suggested that the device needs to look less like a gaming console (in order to be ok to use in the workplace). This supports concerns throughout this study, that there is still much work to be done in practice settings to gain acceptance of mobile technology for placement learning

Accessing the Assessment Suite from Device Web Browsers

The ALPS developers had previously reported to the ALPS IT Group that a client was necessary for use on the Vario devices due to caching issues when filling out assessments on the website. The EMET study did not include testing the Vario devices, but on all the EMET mobile phones the participants successfully completed an ALPS assessment and did not encounter any caching issues. The project team had anticipated having to install different web browsers and configure them in order to make the assessment suite usable from the devices but this proved not to be the case. In all, bar the PocketSurfers, students reported completing the assessments from the devices without encountering any major issues.

In trials using the PocketSurfers none of the students were able to access the assessment suite as the login box would not appear and that area was kept blank. It is not clear why this is the case as other login screens such as for the University VLE worked without issue. Unfortunately the PockerSurfer’s are a closed platform and it was not possible to install an alternative browser or to configure them in a way that would allow a user to gain access to the assessment suite.

With the Viliv S5 and Samsung Q1 the students were unable to successfully connect to a WiFi hotspot when they tried to complete an assessment. This hadn’t been

anticipated as both these UMPCs run Windows XP and it was envisaged that the students would be sufficiently familiar to be able to connect. Both students had difficulties using the touch interface on the devices but is perhaps an indicator in terms of the desirability of the devices in that the students were not engaged enough with the device to be motivated to persevere and overcome the problem. The same student who had the Q1 also had connectivity issues when she trialled the Nintendo DSi XL. With the DS she was much more engaged and overcame the difficulties and successfully connected and completed an assessment.

Whilst the above findings from the EMET trials have shown that a client is not necessary for accessing the assessment suite from a mobile device, it should be noted that the client provides useful additional functionality such as being able to store and access assessments when offline i.e. no 3G or WiFi signal.

Desirability

It appears from our study that although the Nintendo DSi XL offered a real challenge, the *Apple* iTouch and iPhone were the most desirable of the devices, with all three students very enthusiastic. The students engaged with the devices far more, with one participant pointing out that she had even signed up for an account with the App Store which is something that she would never normally do.

The desirability and the students had with the iPhone / iTouch may have been to the detriment of some of the other devices. As highlighted previously the students had compared the weight of the other devices to the iPhone / iTouch unfavourably.

Other Relevant Findings

The students found that when completing assessment on the web based version that it was possible to select multiple options on the radio buttons, whereas, when using the full ALPS client on a device these options are exclusive.

Amended Embedding Models

Devices and Air Time

Whilst the devices investigated in EMET in some cases can fall within the existing ALPS models (e.g. HTC Touch Pro 2) others present new options / changes that can be included in the ALPS models. We propose the following models based on devices. Partners may wish to implement a combination of devices / models.

iPhone, & Smartphone Model

	Student---------- Payment Options ---------- HE					New EMET Option
iPhone & Smartphones	Student's own device	Student buys device from HE	HE provides device (cost added to fees)	HE device loaned to student	HE provides device at no cost to student	
The data costs	Student	HE pays up to an agreed limit			HE pays total	University / NHS as supplier of WiFi, option to charge for access (e.g. Free Public or Charged Account)
The voice costs	Student	HE pays up to an agreed limit			HE pays total	

Justification Smartphone Model

All the phones and the iTouches tested successfully for using WiFi access. If there was provision of WiFi at the hospital that the students could use this would eliminate the need to pay for 3G data for either students of the HEI. The cost of providing the wireless Infrastructure would have to be met by either the HEIs (this could be done collaboratively due to the overlap of student placements), NHS Trust, charged user access or any combination thereof.

UMPC Model

	Student---------- Payment Options ---------- HE					New EMET Option
UMPC	Student's own device	Student buys device from HE	HE provides device (cost added to fees)	HE device loaned to student	HE provides device at no cost to student	Student rents device from HEI or 3rd Party
WiFi Data Costs	N/A	Some per MB user charges, to contribute towards costs			HE / NHS pays total	
3G Data Costs (not all UMPCs)	Student	HE pays up to an agreed limit			HE provides SIMs and pays total	
The voice costs	N/A	N/A			N/A	

Justification for UMPC Model

Laptop rental schemes have been common practice at many Universities. There is no reason why UMPCs cannot be rented out to students using similar methodologies. The cost of providing the wireless Infrastructure would have to be met by either the HEIs (this could be done collaboratively due to the overlap of student placements), NHS Trust, charged user access or any combination thereof. Some UMPCs support the use of 3G SIMs. If there is adequate provision of WiFi at the placement, 3G access would be an optional 'luxury' that students could opt to buy. However, for placements where WiFi may not be possible the 3G data connection would still provide the necessary connectivity which partners may wish to contribute towards.

MID Model

	Student---------- Payment Options ---------- HE				
DataWind Pocket Surfer	Student's own device	Student buys device from HE	HE provides device (cost added to fees)	HE device loaned to student	HE provides device at no cost to student
1st Year Data Costs	N/A	N/A Included in Device Purchase			N/A
Subsequent Data Costs at yearly Rate (£30)	Student	HE pays up to contribute set amount			HE pays full price

Unlimited for life (£59.99)	Student	HE pays up to contribute set amount	HE pays full price
The voice costs	N/A	N/A	N/A

Justification for MID Model

The Pocket Surfer devices come with 30 hours free usage per month for the whole of the first year. This should be sufficient for student ALPS usage so that no additional data costs would be necessary. A yearly renewal rate of £30 per year is then available, or the option of purchasing unlimited surfing for life at £59.99. If students are likely to make personal usage of the device as well then the £59.99 for unlimited lifelong browsing is recommended.

Nintendo DSi XL & iTouch Model

	Student---------- Payment Options ---------- HE				
DSi & iTouch	Student's own device	Student buys device from HE	HE provides device (cost added to fees)	HE device loaned to student	HE provides device at no cost to student
WiFi Data Costs	N/A	Some per MB user charges, to contribute towards costs			HE / NHS pays total
The voice costs	N/A	N/A			N/A

Justification for Nintendo DSi XL & iTouch Model

These devices are both WiFi only with no support for 3G connectivity, and as a result may not be suitable for all placement types. However, it is much more likely that students will already own these types of devices and they are amongst the cheapest trialled.

Infrastructure

Although perhaps beyond the intended scope of this project we believe the EMET project findings indicate the potential for different embedding options for the backend infrastructure. Based on our individual experiences we assume that the Joint Management Group and ALPS partners are only considering the following as potential infrastructure options, on the basis that they wish to maintain the mobile element:

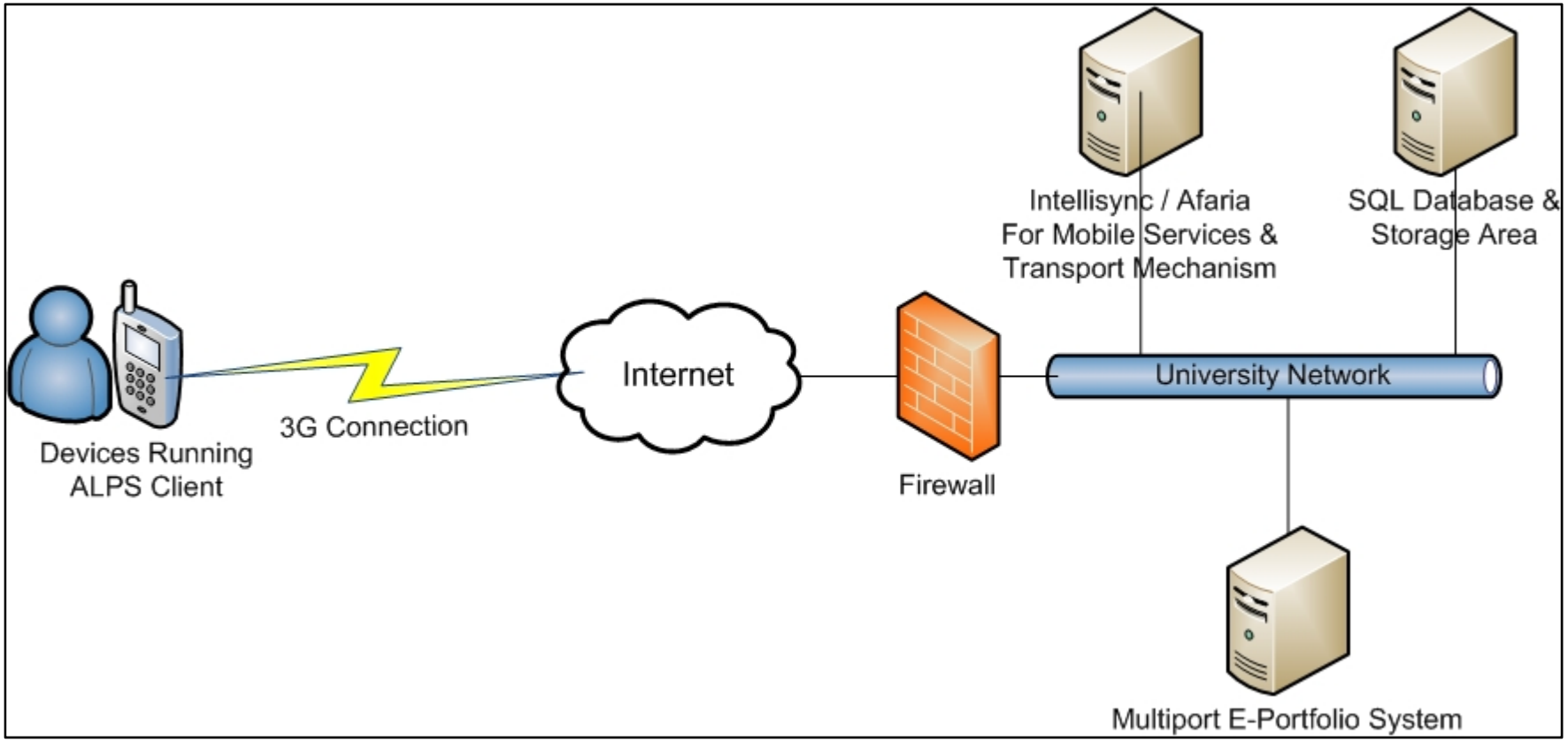


Figure 3 - Network Diagram of ALPS Infrastructure

Existing Infrastructure Solution

Using the architecture set out in ***Figure 3*** the component costs of the solution would be as follows:

- ALPS devices, cost options as previously set out by ALPS, see ***Figure 2***.
- Device line rental, data bundle and voice, cost options as previously set out by ALPS, see ***Figure 2***.
- Intellisync / Afaria which provides the mobile device management and file transfer services.
- Multiport E-Portfolio web server that runs the ALPS Assessment Suite.
- An SQL Database server and Storage Area Network (SAN).

Overall there are a number of servers, and licensing systems that add to the cost.

However, our findings are clear that direct web access is feasible from devices, so long as the user accepts that there will be limitations due to the device selection such as mobile signal strength or WiFi hotspot location. We therefore propose the following set of options for embedding the infrastructure.

Cheapest Infrastructure Solution

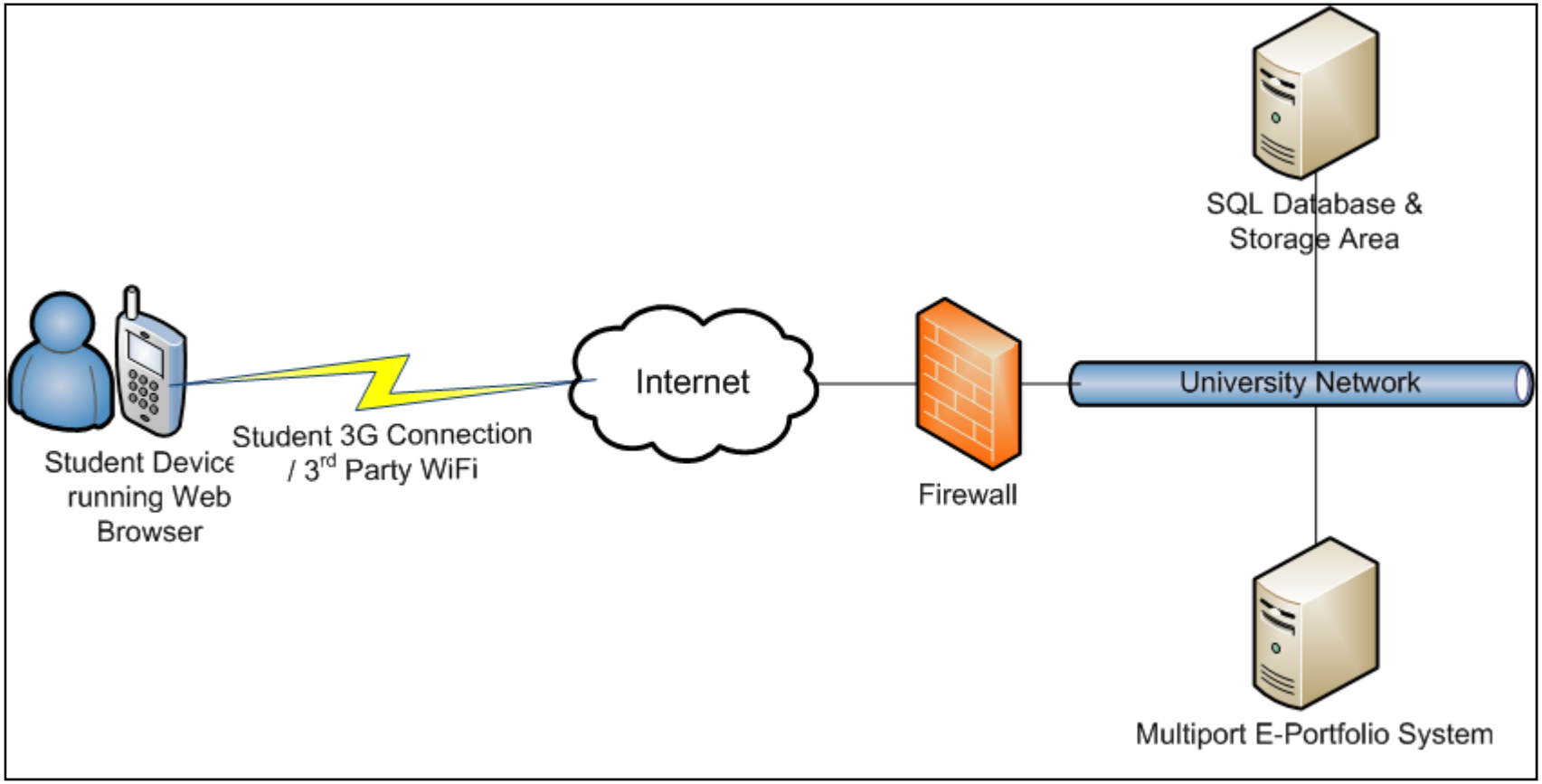


Figure 4 - Network Diagram for Cheapest Infrastructure

The solution shown in ***Figure 4*** eliminates the use the use of the ALPS Mobile Client, and makes the student responsible for providing the device (essentially anything with a web browser they can connect with) and the connectivity, be it 3G or WiFi. As the ALPS Mobile Client has been removed from the solution there is no longer any need for the Afaria server to act as transport mechanism. Therefore the only costs for this solution would be:

- E-Portfolio Web server – it's possible that partners may wish to choose a different E-Portfolio / Assessment Suite
- SQL Database & Storage area – this may be included on the same server as the E-Portfolio

The advantages of this solution are:

- Cheapest
- Allows students to connect with a variety of devices

The disadvantages of this solution are:

- Not all students will have 3G devices, and most placements do not have WiFi
- Will lose the offline functionality of the ALPS Mobile Client
- Will lose the rich functionality of the ALPS Mobile Client, e.g. Audio Record
- Will lose the accessibility functionality of the ALPS Mobile Client
- A greater range of devices in use may lead to support issues
- EMET participants were concerned that many possible devices may not be viewed as professional devices, e.g. Nintendo DSi

HEI WiFi Infrastructure Solution

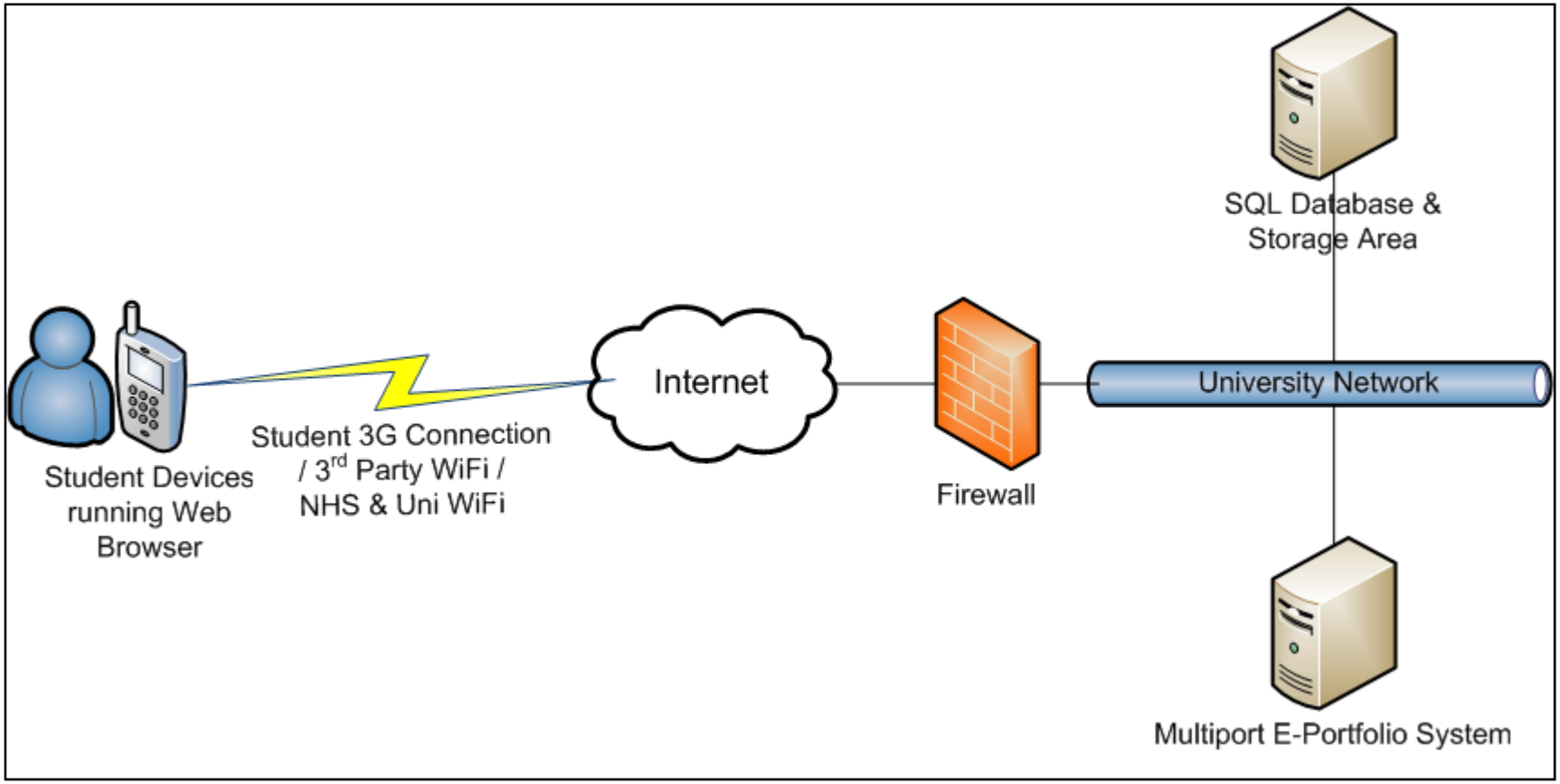


Figure 5 - HEI WiFi Infrastructure Solution

In the above ***Figure 5*** the solution is the same as before (***Figure 4***) but with the addition of University provided WiFi. The WiFi component will increase the cost of the solution, however, it will provide connectivity for students on placement who do not a 3G device and will work out cheaper than providing a large number of students with 3G connectivity. The downside to this solution is that putting in WiFi will not be practical for all placements still leaving a proportion without connectivity. All other costs, advantages and disadvantages are the same.

Tiered Infrastructure Solution

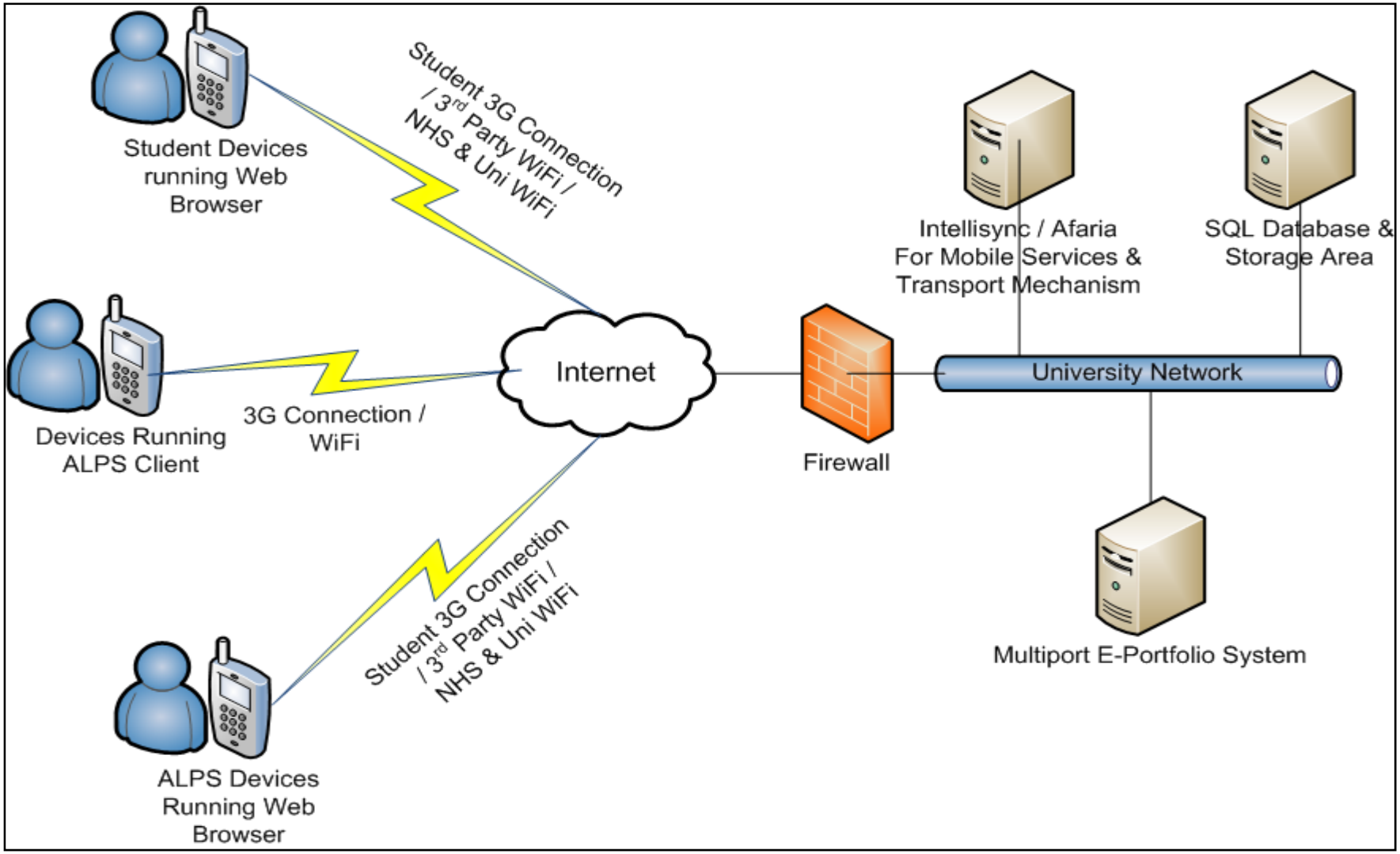


Figure 6 - Tiered Infrastructure Solution

In the tiered approach shown in ***Figure 6*** it is envisaged that the bulk of access will be via the web browsers on students own devices via either their own 3G connection or via 3rd party or University supplied WiFi. In some cases where students don't have appropriate devices with the required connectivity the University will loan some from a small pool. At times there may be an offline requirement or a need for the ALPS Client Functionality so there be a number of licenses available, but at a reduced user ratio than ***Figure 3*** thus saving money. Likewise less ALPS Mobile Clients would also mean a lower User License costs for the Afaria server.

Advantages:

- This solution offers the most flexibility and range of devices
- Caters for all users yet may be potentially cheaper than a full roll out of the current solution shown in ***Figure 3***.

Disadvantages:

- Range of devices, clients and connectivity will be very difficult to support
- Some devices may be viewed as unprofessional e.g. Nintendo DSi
- Will require careful planning to ensure that it is cheaper than simply providing 3G connectivity

Effect on Security of Proposed Changes

Intellisync / Afaria

It should be noted that all of the proposed changes to the IT infrastructure contain at least some (and some instances all) devices that do not have the Intellisync / Afaria software installed. As well as performing the transport mechanism to transfer assessments between the devices and backend servers, this software also provides a number of security functions that these devices will lack as a result:

- Encryption of data transferred over 3G and internet to servers,
- Encryption of device and SD card,
- Device access authentication,
- Remote lock and wipe.

Whilst removal of this software does increase the risk to security, Trusts and HEIs may find it acceptable when balanced againts the benefits of reduced cost, and students having access through a wider range of devices. Without this software users must complete the assessments through a web browser, the assessments themselves are never stored on the device but on the E-Portfolio server, so this does reduce the risk of data loss. In many respects there's little difference to the student completing the assessments on a mobile in this way, then on a traditional PC or laptop owned by the student. The only caveat to this is that mobile devices are more easily lost or stolen so the remote lock and wipe does offer some additional protection to abuse of the device and any data that the student has chosen to save on there. This can be mitigated however in that many devices do support password protection, and in some cases encryption through built in software provided with the device or as part of its core operating system.

WiFi Networks in NHS Trusts

There are a number of ways that wireless networks could be implemented within the various NHS Trusts. Each implementation would require a thorough investigation to assess its feasibility, any security risks, and appropriate mitigation.

It is strongly recommended that any WiFi network be placed outside of the NHS Firewall in order to safeguard the NHS network from Viruses and other security threats.

If the wireless network is implemented as an overlay on top of existing NHS infrastructure there is the potential for attacks targeted at the public access WiFi routers, such as a denial of service, to bring them down so that they also stop performing their private NHS network function. However, if properly configured this should be an acceptably low risk.

Due to the vital nature of the NHS IT network infrastructure, it is highly recommended that a full security analysis be performed before any wireless network implementation is considered.

Additional Scenarios for Use

During the course of the EMET trials, students developed the following unexpected uses of the devices.

iPhone / iTouch

In most cases the students downloaded additional software from the App Store. Whilst these were not educational in nature it does indicate the ease with which users adapt to this method of downloading. There are wide range of useful / educational apps on the store and it is inevitable that students will download these apps to help with their studies.

Nintendo DSi XL

The student trialling this device felt that the ‘Flick Pad’ program could be used to record notes.

3 Conclusions

- That the most desirable devices were the iPhone, then iTouch, followed by the Nintendo DS and other mobile phones
- There is a link between desirability and engagement with the clear case of a student persevering through technical problems with a device she liked in order to complete an assessment, and not completing under the same circumstances with a different device.
- There were no caching issue when using the web browsers on the EMET devices to access the ALPS assessment suite. Therefore:
    - Any caching on the Vario 1, which runs Windows Mobile 5, appears to be fixed on Windows Mobile 6.1 running on the Touch Pro2.
    - This problem doesn’t occur on other common mobile platforms, S60, iPhone, or Android.

    - The assessment suite can be accessed reliably by most device's web browsers whilst the device is online. Therefore in some situations a mobile client for the assessment suite may not be necessary."
    - Students are more likely to persevere with technical problems with a device they view as desirable / that they are engaged in.
- There are possible savings for the cost of infrastructure and increased simplicity of the solution, whilst at the same time opening the potential for a wide range of student owned devices. This may make eliminating the mobile services and ALPS Mobile Client a viable option for some institutions.
- Students are keen to be seen as professionals on placement and they are concerned that any devices that they use whilst on placement are viewed in this manner.
- Not all the devices strictly meet the traditional ALPS vision, e.g. PocketSurfer doesn't have audio record or a camera, and likewise with the UMPCs. However, they can still be used to complete ALPS assessments.

4 Recommendations

This project should only be viewed as a feasibility investigation. Anyone wishing to embed the technology described in this report or implement its other findings is strongly advised to first do a larger pilot for the devices / models that they are interested in. The EMET trial group was not large enough to be statistically representative of the general student population or students with disabilities. However, we do believe it gives sufficient indicators to decide on at least which technology can be looked at and to eliminate others in their current form.

- ALPS should investigate WiFi provision at placements as an alternative to providing students with 3G connections.
- That consideration be given as to whether a mobile client would offer value for money in all cases, or a tiered approach, or even completely eliminate the mobile client.
- As a client is not necessary for a device to access the assessment suite, the option to use student owned devices with their web browsers should be promoted to improve student engagement – it should come with the caveat that not all devices have been tested, and list formed of any that are not compatible.
    - That student owned / paid for option of each of the proposed models is presented as an option for access to each student.
- Inconsistencies between the web version and the ALPS Client should be eliminated where possible e.g. the ability to select more than one radio button.
- That greater consideration be given to the use of Apple iPhone and iTouch devices as we believe it will increase student engagement.
- That DataWind Pocket Surfers not be adopted at the current time due to compatibility issues.
- That DataWind Pocket Surfers and similar devices be reviewed on a regular basis as we believe they have potential to meet our requirements if the technology becomes sufficiently compatible.

5 Future Technologies

It’s not possible to future proof where educational technology is concerned. We have to use our experience to second guess. What’s been talked about for years – a device that does it all – phone, internet, email, office functions, camera, voice recorder, GPS, games, is well on the way. Don’t we have devices that do this already? Well yes, we do, but what would improve on the iPhone or Android based devices? A multi function ubiquitous device such as Apple’s latest production – the iPad?

What it won’t do - multitasking, Adobe Flash, camera, GPS or phone. “It's not just a scaled up iPhone or a scaled-down multitouch enhanced laptop – it is a whole new kind of device.” (Stephen Fry). Already there is evidence that the iPad when used by children becomes just another tool or object to be interacted with. “She (girl of 4) also uses them across the things that she does and by that she doesn’t seem to view it as a “computer or technology” session, she’s often combining activities with cutting up paper or drawing or playing make believe with toys.” (Graham Brown-Martin)

“The most surprising aspect of her immediate use of the iPad was an instantaneous understanding of how to operate it without any instruction at all. Of course, she’d had the experience of using Apps on her iPhone but that also required no instruction and the skills were completely transferable but how she used the iPad as a consequence of the size of the screen was different and noticeably better.” (Graham Brown-Martin) This looks and sounds like a properly usable device.

Gartner predict that by 2013, mobile devices will overtake PCs as the most common web access device worldwide.

Near Field Communication (NFC) is a short range (4cm) wireless communication technology that sits somewhere near to Bluetooth and RFID (Radio Frequency ID). This technology is much easier to use than Bluetooth and possible applications include data transfer, mobile ticketing and payment. It can also work with tags to display enhanced information. An example would be that by holding a mobile device within 4cm of a reader, the car park ticket would be paid. Transaction completed.

Therefore, if we have a mobile or Smart or iPhone that has NFC capability, and an iPad or similar (Google’s version already on the way) then we are an awful lot nearer to one device!

What can we do in health care education with this combination? We have to provide device agnostic services that will allow students to bring their own devices, be they Apple, Nokia, Windows etc. As an HEI, we no longer have to control all the systems our students use, much data is now stored in the cloud and more content is open. We can deliver content to students that is location and user aware. This opens up possibilities for creating context and user dependent content and delivering a truly personalized educational experience.

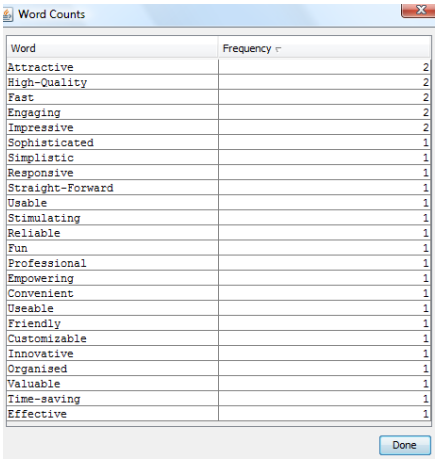
Brown-Martin, G. (2010) *Game Changer: Is It iPad?,* [online]. Available from: *http://www.handheldlearning.co.uk/content/view/64/* (Accessed 13/05/10)

Educause. (2010) *The Future of Higher Education: Beyond the Campus*, [online]. Available from: *http://net.educause.edu/ir/library/pdf/PUB9008.pdf* (Accessed 13/05/10)

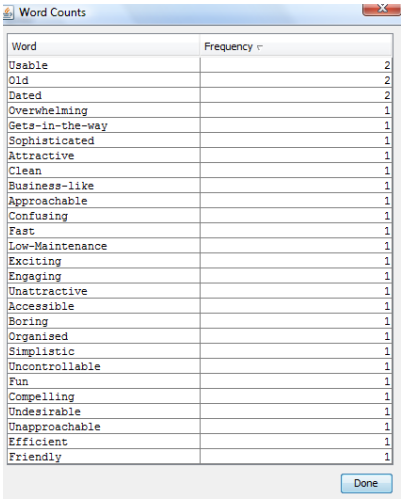
Fry, S. (2010) *Why the Apple iPad is here to stay*, [online]. Available from *http://www.guardian.co.uk/technology/2010/jan/29/stephen-fry-apple-ipad* (Accessed 13/05/10)

Appendix 1- Word Clouds

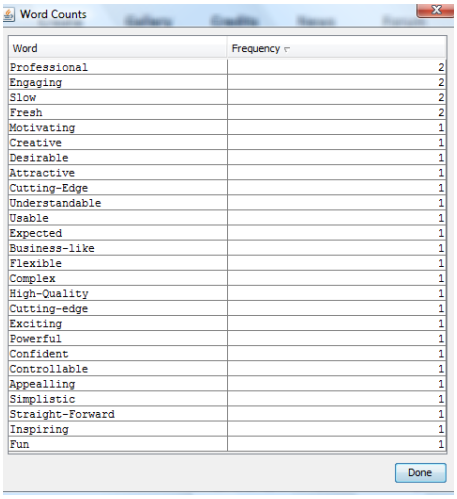
WORD CLOUD FOR: iPhone & iTouch



WORD CLOUD FOR: Smart Phones



WORD CLOUD FOR: UMPC's

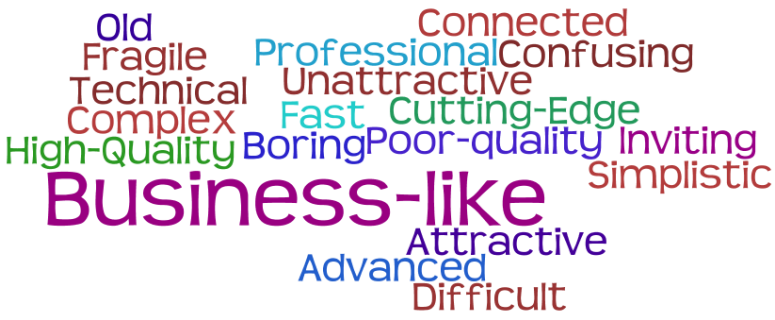


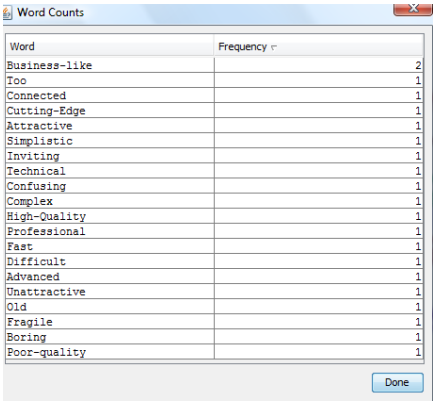
Word Counts

Word	Frequency
Professional	2
Engaging	2
Slow	2
Fresh	2
Motivating	1
Creative	1
Desirable	1
Attractive	1
Cutting-Edge	1
Understandable	1
Usable	1
Expected	1
Business-like	1
Flexible	1
Complex	1
High-Quality	1
Cutting-edge	1
Exciting	1
Powerful	1
Confident	1
Controllable	1
Appealling	1
Simplistic	1
Straight-Forward	1
Inspiring	1
Fun	1

Done

WORD CLOUD FOR: Pocket Surfers





Word Counts

Word	Frequency
Business-like	2
Too	1
Connected	1
Cutting-Edge	1
Attractive	1
Simplistic	1
Inviting	1
Technical	1
Confusing	1
Complex	1
High-Quality	1
Professional	1
Fast	1
Difficult	1
Advanced	1
Unattractive	1
Old	1
Fragile	1
Boring	1
Poor-quality	1

Done

Appendix 2 – Current ALPS Embedding Models

Assessment and Learning in Practice Settings (ALPS)

Centre for Excellence in Teaching & Learning (CETL)

IT Group Meeting, 9th November 2009

ALPS Mobile Technology Models for 2010 onwards - Review

ALPS Mobile Technology Models for 2010 onwards – Paper presented to JMG January 2009

ALPS partners will need to decide how to continue to provide the ALPS mobile assessment to their students after the end of the ALPS programme in 2010. The IT Group has been tasked with investigating different models for this provision and support post 2010.

Various questions have been considered, with the basic options shown below.

	Student---------- Payment Options ---------- HE				
The mobile device	Student's own device	Student buys device from HE[7]	HE provides device (cost added to fees)	HE device loaned to student	HE provides device at no cost to student
The data costs[8]	Student	HE pays up to an agreed limit			HE pays total
The voice costs	Student	HE pays up to an agreed limit			HE pays total
	Individual HE ----------Payment Options ----------HE Partnership				
Support costs	Support provided at individual HE level			Continuation of shared support service	
Software costs[9]	Software bought at individual HE level			Software jointly purchased by Partners	

[7] Preferential deals set up with mobile providers

[8] Some more complex options were considered here, but these are likely to be less relevant as voice and data costs are likely to be one combined cost in the future, rather than separate costs.

[9] This covers the software that delivers and uploads the assessments and provides remote device management (Intellisync or an equivalent), the assessment software (ALPS assessment suite) and security software (SafeGuard or an equivalent).

Following discussions over earlier this autumn, two overall models have been identified as worth exploring in more detail. These are:

- Student's Own Device
- HE as Technology Provider

These two models are described in the next two pages and the assumptions, issues and benefits outlined.

Model A - Student's Own Device

	Student---------- Payment Options ---------- HE				
The mobile device	Student's own device	*Student buys device from HE*[10]	*HE provides device (cost added to fees)*	*HE device loaned to student*	*HE provides device at no cost to student*
The data costs	Student	*HE pays up to an agreed limit*			*HE pays total*
The voice costs	Student	*HE pays up to an agreed limit*			*HE pays total*
	Individual HE ----------Payment Options ----------HE Partnership				
Support costs	*Support provided at individual HE level*			Continuation of shared support service	
Software costs	*Software bought at individual HE level*			Software jointly purchased by Partners	

Assumptions

- Mobile learning is one of several ways of accessing learning materials.
- Students can access material this way (and will get some support from HE) but it is not a requirement
- The majority of students arrive at HE with mobile devices that meet the minimum specification to allow use of the ALPS mobile assessments.
- Most students will arrive at HE with mobile contracts with unlimited access (data+voice combined) by 2010 and so it will not be necessary for the HE to pay towards these costs. If students do not have unlimited access contracts then they can be advised on using hotspots and wireless networks as a way to connect and receive services.
- The ALPS Core Team can work on putting costs to the shared services and software costs model above. We are unable to provide cost models for the purchase of these services at individual HE level as this will vary across institutions.

Issues

- Will need to let students know the minimum specification for mobile devices[11] that can access the ALPS mobile assessments.

[10] Preferential deals set up with mobile providers
[11] This specification should cover laptops and ultra-mobiles as well as mobile phones and PDAs

- Equity issue - students who don't have a device that meets the minimum specification will have to be provided with (or loaned) a device through the HE if use of the mobile assessment tool is expected.
- Is mobile ownership a requirement? Are other routes to learning material or assessments provided?
- Cross platform issues – ALPS mobile assessments and associated software will have to work across a range of platforms. May need to specify a recommended platform, but that would detract from the benefits of this model.
- Infection issue – ALPS is developing guidelines on infection control and cleaning the ALPS devices. These protocols may vary for different devices.
- Security issue – will need to insist that students install and use security software on their devices. How can this be monitored and guaranteed to Trusts?
- Device management – software such as Intellisync provides us with some ability to control and monitor the students' use of their device. Can we insist that students have this software put on their own phone?
- We have already experienced the difficulties of installing software onto devices that have already been in use (rather than installing software on new, clean devices and then handing them over to students). Similar problems could be encountered with this model and they may be more difficult given the range of devices and platforms that students will arrive with.
- Informal feedback is that students are not keen on using their own devices or having software put on their own devices. But potentially could convince students of the benefits of the security software.

Benefits

- Students only have to carry one device.
- Students are already familiar with device itself.
- Training and support can concentrate on the ALPS assessment suite and associated software. Device support will be covered under the students' existing contracts.
- Lower costs to HE than other models.

Model B - HE as Technology Provider

	Student---------- Payment Options ---------- HE				
The mobile device	*Student's own device*	*Student buys device from HE*[12]	HE provides device (cost added to fees)	*HE device loaned to student*	*HE provides device at no cost to student*
The data costs	Student	*HE pays up to an agreed limit*			*HE pays total*
The voice costs	Student	*HE pays up to an agreed limit*			*HE pays total*
	Individual HE ----------Payment Options ----------HE Partnership				
Support costs	*Support provided at individual HE level*			Continuation of shared support service	
Software costs	*Software bought at individual HE level*			Software jointly purchased by Partners	

Assumptions

- Mobile learning is an expected provision within HE
- Cost can be passed to students either through fees or by the student buying the device from the institution.
- Students will be expected to use mobile learning within their studies
- Students will buy airtime from the institution in the same way that they currently buy printer credits. Students can be advised on the use of wireless networks and hotspots to reduce their airtime costs if necessary.
- Agreements can be set up with mobile providers that will allow us to sell airtime to students in this way.
- The ALPS Core Team can work on putting costs to the shared services and software costs model above. We are unable to provide cost models for the purchase of these services at individual HE level as this will vary across institutions.

Issues:

- No student choice in device – students may still end up carrying two devices if they prefer their own device.
- Accessibility problems if use of mobile learning is a requirement – other routes should be provided.
- Potential high costs to HE (less if multiple HEs bulk buy)
- Extra costs and perceived technical focus could put some students off joining the relevant course - but could appeal to others
- NHS staggered payment of fees means that students may leave before HE recovers cost of the device through fee payments.
- If use of a mobile device is required for assessment (and a student could be disadvantaged if time is lost when the mobile is unavailable) then clear insurance

[12] Preferential deals set up with mobile providers

agreements must be put in place. A model used in the US requires students to either take out insurance through the University or sign to say they have their own insurance policy or will replace the device themselves if it is lost/stolen/broken.

Benefits

- Only have to support one device / platform (or a limited number if a choice is offered)
- ALPS assessment suite and associated software can be developed for one platform
- Installation of all required software can be done on a clean device before handing it over to the student (reducing the chances of logistical or technical problems)
- HE recovers cost of device through fees

The IT Group also considered two other models (Personal Mobile IT Suite and Technology Provided When Needed), but decided that these were not workable or achievable within the next 2 years.

Tamsin Treasure-Jones

ALPS Mobile Technologies Project Manager

January 2009

Appendix 3- ALPS Student Story

Taken from ALPS publicity materials produced by Nancy Davies

The ALPS story from a student perspective- the year is 2013

Dan is a nursing student currently on a practice placement at a local hospital. He arrives at the ward and the senior nurse asks him to go any carry out some routine observations on a stroke patient.

When he arrives the stroke patient is talking to a physiotherapist, Margaret. Dan asks if he can carry out his observations and Margaret agrees. She then tells him that she is about to try and get the patient out of bed and asks Dan where the hoist is on the ward.

Dan, thinking back to his introductory interprofessional education module; sees an opportunity to be assessed on his communication skills by Margaret the physiotherapist, whilst revisiting a practical skill i.e. using the hoist. Dan asks if he can help get the patient up using the hoist, and if Margaret will use his **PDA** to fill in **a communication assessment**.

Margaret agrees and the student goes to find the hoist while she tries out some exercises with the patient. On the way he checks with the senior nurse to see of she is ok with him doing this. She is very encouraging. When he finds the hoist he realises he has not used this type of hoist before. Using his **PDA** he logs into the **digital repository** and downloads a **reusable learning object**- a **video clip** of a student using the hoist he finds in front of him. He takes a **photo** of the hoist to post on the message board later and then watches the video clip. He then pushes the hoist to the patient's bedside.

Dan uses his **PDA** to access the **common competency map** on the **internet**. He then **emails** this link to Margaret to view later if she wishes. He then opens a **new assessment file** on his PDA and hands it to her. Dan uses the hoist to get the patient from the bed into a chair. Margaret scores the way he communicates with the patient.

After the patient is in the chair Dan asks Margaret if she would feel comfortable getting some **audio feedback** from the patient. Margaret agrees to this, provided the patient gives his consent. The patient had already heard of patients being asked for assessment feedback as there are **leaflets and posters** around the ward, and another patient showed him the statement on their **admission letter**. He agrees.

Margaret holds the **audio button** on the PDA down and asks the patient to score the students skills on a scale of 1-5 and explain why they made that decision.

When she has finished she goes to find Dan, who is now performing other routine observations and gives the PDA back.

Dan listens to the feedback over his lunch break and reads the assessors comments.

Whilst waiting for the bus home he records a **MP3 sound file** of his reflections on the assessment that day. He then **emails** the file to his **e-portfolio** for his tutor to review later.

Later on he uses his PC to log into his **e-portfolio** and selects the **Nursing & Midwifery Council (NMC) Continuing Professional Development framework**. Here he ticks the communication skills he has evidenced by completing the common competency assessment, knowing that this portfolio will be supported by the NMC after he has graduated. He then does the same for the **NHS Knowledge & Skills Framework** in preparation for when he is in practice. He then accesses his course **message board** and posts a note to his fellow students regarding the type of hoist used at the hospital and a link to the video clip he viewed earlier.

All this will be feasible in 2010, but by 2013 this should be common practice across the 16 professions involved in ALPS. Digital stories will also be available of actual student experiences.

Complementary versions of this ALPS vision are available from the perspective of a service-user, an assessor, a partner HEI, an employer and practice.

Appendix 4 – Web Site Accessibility Study

Accessibility Analysis of ALPS Assessment Suite by Jacqui Cuthbert & John Fairhall

(This is an embedded Word document, double click the object to open report.)