



# Using Wireless Technologies for Context Sensitive Education and Training

## WP6 Product Training Using Location and Context Sensitive Technologies

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## Summary

The main focus of this document is to outline the work conducted in Work Package 6, Product Training Using Location and Context Sensitive Technologies, at Ericsson Education Ireland. A description of the training package produced is outlined, followed by the evaluation of this package with users and the conclusions that can be drawn from it.

## Introduction

The RNC 3810 is the first product in the Ericsson RNC 3800 family, which is a part of the Ericsson WCDMA Radio Access Network (RAN) offering. This product family is developed upon worldwide experience obtained from building and deploying Ericsson mobile telephone systems.

### Radio Access Network Overview

The WCDMA Radio Access Network consists of Radio Network Controllers (RNC), Radio Base Stations (RBS), Radio Access Network Aggregators (RXI), the Operations Support System Radio and Core (OSS-RC), and tools for radio access management, design and optimization (TEMS). The RBS corresponds to Node B in 3GPP specifications.

Figure 1 indicates the relations and interfaces.

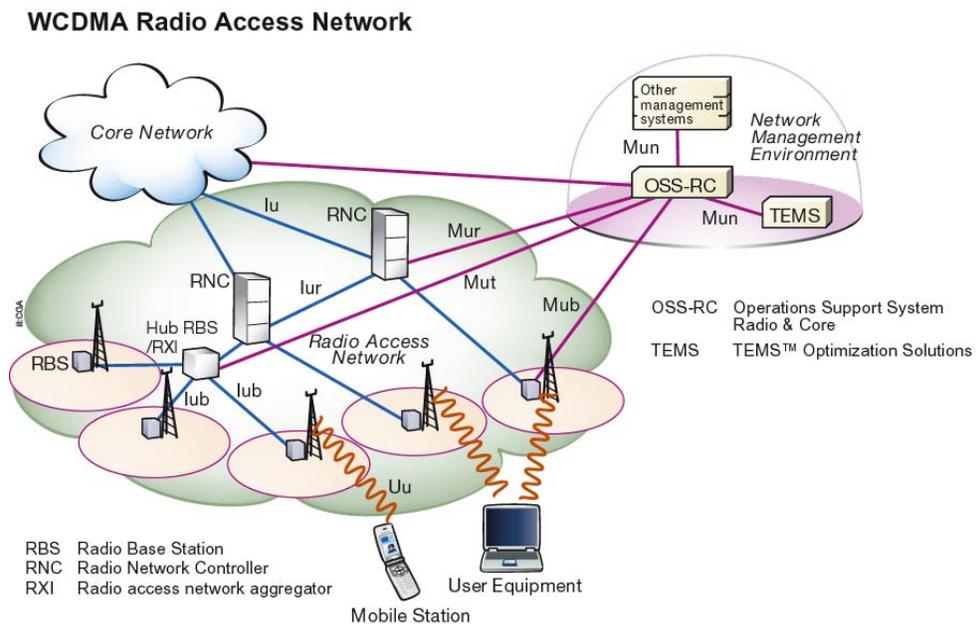


Figure 1 WCDMA Radio Access Network overview

The Radio Access Network handles all radio-related functions. It contains the physical entities that manage the resources of the access network and that provide the subscriber with the means to access the Core Network.

The main functions of the RNC are the following:

- Manage and secure an optimal usage of the radio resources of the radio access network
- Control the mobility and handover within the radio access network which also includes macro diversity
- Support Inter Radio Access Technology inter-working towards other radio access systems. The RNC provides Handover functions between WCDMA RAN and GSM, and Cell Change between WCDMA RAN and GSM/GPRS
- Support Radio Access Bearer (RAB) services with: Circuit Switched and Packet Switched data
- Provide a transparent bearer service for control messages between the Core Network and the User Equipment (UE) (direct transfer)
- Support control functions for paging of UEs, Signalling Connection handling, RAB service handling, and complementary services such as UE positioning functions
- Provide element management functions
- Provide transport network functions

The RNC is connected to the Core Network via the Iu interface. Internally within the RAN, the RNCs are interconnected via the Iur interface. The RBSs are connected to the RNC via the Iub interface. The UE is connected to the RBS via the Uu interface (the radio interface).



*Figure 2: Ericsson RNC 3810 Node*

## **Functional Role of an RNC Engineer**

The role of an RNC Engineer, in terms of the target group of support engineers for this course, is a very technically varied role which requires in-depth knowledge of configuration management, fault management, performance management and troubleshooting of the RNC as well as its associated RBS nodes. The engineers in question here also have to have a very good knowledge of mobile phone transmission networks and as well as numerous the network elements in the Core Network, and how they interact with the WCDMA RAN.

On a daily basis engineers will be confronted with a wide range of issues that will have a serious impact on the services provided to end-users in the mobile network. Some of the common tasks and faults that need to resolve on a daily basis relate to:

- Transmission faults that lead to a loss of services in the WCDMA network
- Configuration faults that result in degradation or loss of some, or all, services in the WCDMA RAN e.g. users unable to use mobile broadband in certain areas
- Performance drops in the network impacting the end-user experience
- Software, hardware and transmission upgrades to improve network performance

In order to be able to troubleshoot such issues and carry out relevant tasks, engineers need a high-level of experience and a wide range of training. The RNC engineers also need to liaise with numerous other groups to ensure the smooth running of the network, for example: Optimisation, Transmission and Planning departments.

## **Training Package – Work Package 6**

The training package developed is a process-based mobile instruction guide of how to solve advanced technical problems that an RNC engineer will encounter as part of their functional role. The package utilizes location firstly to identify what type of RNC node the engineer is working on, in terms of its hardware and software release, and context sensitive technologies to supply the engineer with a list of common troubleshooting processes to carry out for different types of common faults. The advantage of using such technologies is that the engineer does not have to be familiar with all the steps required to troubleshoot a problem before attempting to identify and solve common problems on the node.

The previous RBS course developed for Work Package 4 was developed for Field Engineers who do not require the same amount of knowledge and understanding as an RNC Engineer. Also the RBS Engineers carry out the same tasks on a day-to-day basis so the previous course was developed with task-based procedures for common activities in the operation and maintenance of the network. Due to the complexity of the RNC role, this course needed to be process-based rather than task-based as it deals with how an engineer should troubleshoot common problem types, outlining the steps that should be taken for each problem type, but not any one specific problem itself. This means that participant would need to use critical thinking on a much greater level than participants on the previous course

## Development of Training Material

As in WP4 the development software used for this project, *eXact Mobile* developed by Giunti Labs, enables access to a Learning Management System (LMS) with mobile 3G, Wi-Fi and GPRS devices. This allows the engineer to access Learning Objects (LOs) and learning paths specifically customized for the available peripherals and for the location of access. It is a module of learn eXact, that enables context-aware learning content delivery when the learner needs to access it.

It can be integrated with the learn eXact LCMS suite or interfaced with any 3rd party eLearning (LMS/VLE) solution. eXact Mobile provides access to the LMS through mobile 3G, Wi-Fi and GPRS devices providing a high level of flexibility in learning programmes planning. eXact Mobile also feeds tracking information back to the LMS allowing the learner or mobile worker to follow learning programmes using the most convenient device available.

The following outlines the steps to be taken to install eXact GEO on a mobile device

- Connect the mobile device to the computer.
- On the computer access a folder on the mobile device and copy over the two required application files (.jad and .jar).
- On the mobile device access the folder where the two files have been copied
- Select the .jad file and start the installation
- Select eXact GEO to start the application.

The application above was installed, run and tested on a W960i which has a 240x320 pixel, 2.6 inch display and runs on a Symbian Operating System.

### ***Course – RNC Troubleshooting***

In this scenario it is assumed that the engineer is working on an Ericsson RNC type 3810 and the troubleshooting guidelines are pushed to the phone based on the GPS coordinates.



Figure 3: Start page of Ericsson RNC3810 Troubleshooting course

After this, the engineer is asked to choose which area of troubleshooting they wish to perform from the following list (Figure 4):



Figure 4: Troubleshooting procedures for the Ericsson RNC3810 node

The procedures below should provide guidance when gathering information for a Customer Service Request (CSR) which is related to a suspected fault in the WCDMA RNC 3810 product. The troubleshooting procedures also assist the engineer in compiling the information required in the problem description in the CSR, such as:

- Technical problem and commercial effect
  1. Technical description of the problem including all symptoms
  2. References to exact places in the node logs where evidence of technical problem is seen.
  3. Commercial effect of the problem.
  
- System impact
  1. Description of technical impact of the problem on the system, including information on degradation of Key Performance.
  2. References to exact places in the logs where evidence of system impact has been seen.
  
- Conditions
  1. Known conditions existing at the time(s) of occurrence of the problem.
  2. Known or suspected triggers for the problem. This should include information on any configuration actions performed and any configuration scripts run.
  3. Even where activities performed prior to the occurrence of the problem are not suspected to have triggered the problem, they should be detailed along with a statement that they are not suspected to have triggered the problem.

The procedures below are used to provide guidance on suitable troubleshooting processes and helps engineers to gather/report faults correctly with the aim of optimising the time spent in fault resolutions. The most common troubleshooting problems found in the mobile networks were addressed as part of the course and these are as follows:

*1 – Board or Program Restarts*

*2 – Software Upgrade Failures*

*3 – Call Handling Problems*

*4 – Iu Interface Problems*

*5 – Iub Interface Problems*

*6 – IP Transport Problems*

*7 – Iur Interface Problems*

## Testing of Location and Context Sensitive Package

The testing phase took place in Dublin during October 2009. The participants were a mix of telecommunication engineers working for Ericsson within the following departments:

- Education (4 participants)
- Managed Services (2 participants)
- Core and Access Networks (6 participants)
- Enriched Communications (1 participants)
- Multimedia (2 participants)

All are involved in Life Long Learning as the technical environment within the telecommunications environment is continually changing. It is also the philosophy of Ericsson to support Life Long Learning as a highly educated workforce is vital to the success of the company worldwide. Ericsson Education in Ireland has 100 experienced learning consultants and instructors. There are 800 courses in the standard portfolio which is taught to the employees of Ericsson and customer organisation from over 160 countries which amounts to over 300,000 student days per year.

The test phase took place on a single site at Ericsson's Global Services Delivery Centre in Dun Laoghaire, County Dublin. The participants downloaded the appropriate material for the task at hand to their mobile phone.

## Evaluation and Analysis

### *Evaluation Methodology*

In total, a group of 15 participants in total took the context sensitive course in Dun Laoghaire. Each individual was given a short introduction regarding the purposes of the project and the reasoning for developing such a mobile based application for individual learning. A single mobile phone was used for testing purposes, namely the Sony Ericsson W910i.

Each student completed the tasks in approximately 10-20 minutes. The aim of the testing was to evaluate the "look and feel" of the application rather than the technical content, hence the participants were not required to physically carry out the tasks on a piece of network equipment. Also, not all of the participants would have had experience in the technical area for which the course was designed, so the time required to carry out the task is greatly reduced in this situation.

The following data has been gathered from the testing phase:

- Questionnaires completed by each student

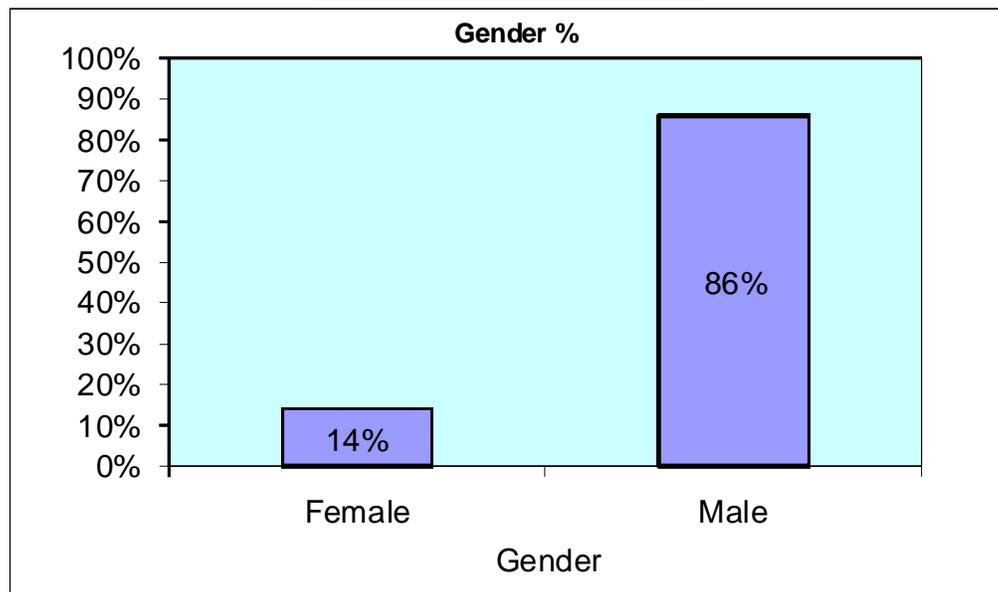
## Evaluation results

### Student questionnaire results

15 questionnaires were completed using the questionnaire in Appendix 1. The questionnaire aims to gauge the user experience of a variety of users of different age, gender and technical experience.

#### Gender

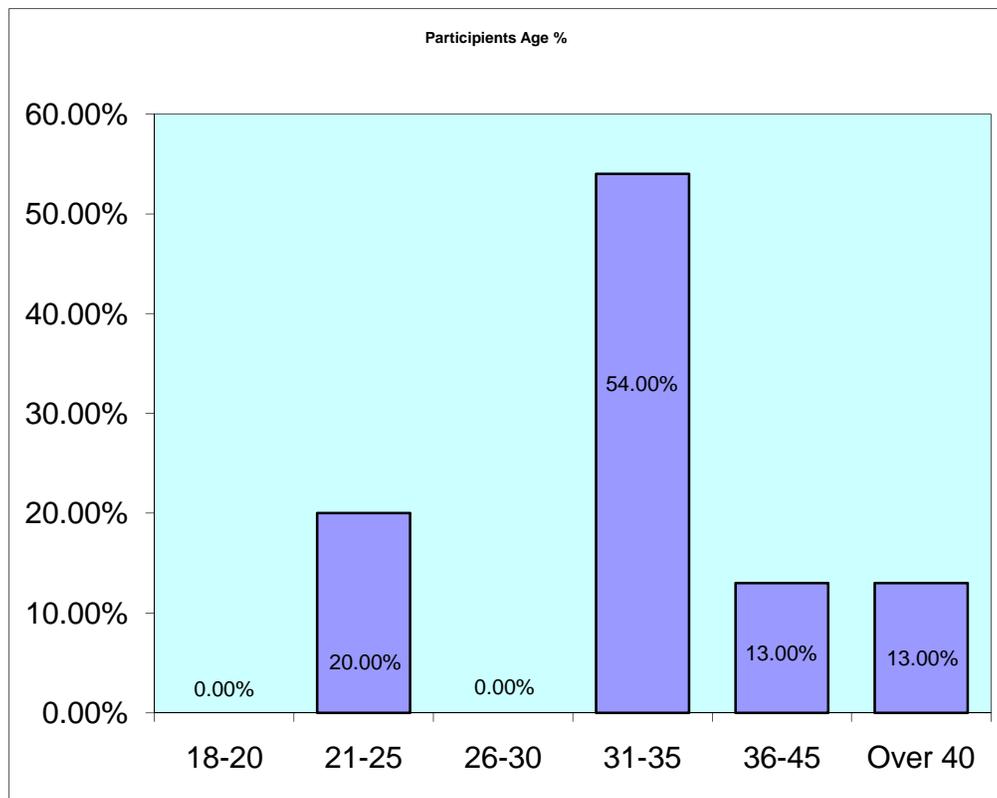
	Frequency	Percent (%)
F	2	14%
M	13	86%
Total	15	100%



The sample comprised 14% females and 86% males.

## Age

Age	Frequency	Percent (%)
18-20	0	0
21-25	3	20
26-30	0	0
31-35	8	54
36-45	2	13
Over 40	2	13
Total	38	100



The age range of the students spans from 21 to over 40. 20% (3) are aged 21-30, 54% (8) were between 30-35 and 26% (4) over 35. .

### 1 Which mobile phone do you own?

Sony Eriksson k800i	– 4 participants
Sony Eriksson k660i	– 2 participants
Sony Ericsson w910i	– 3 participants
Sony Eriksson w705	– 1 participant
Apple iPhone 3G	– 1 participant
Nokia	– 1 participant
Sony Ericsson k810i	– 2 participants
Sony Ericsson k750i	– 1 participant

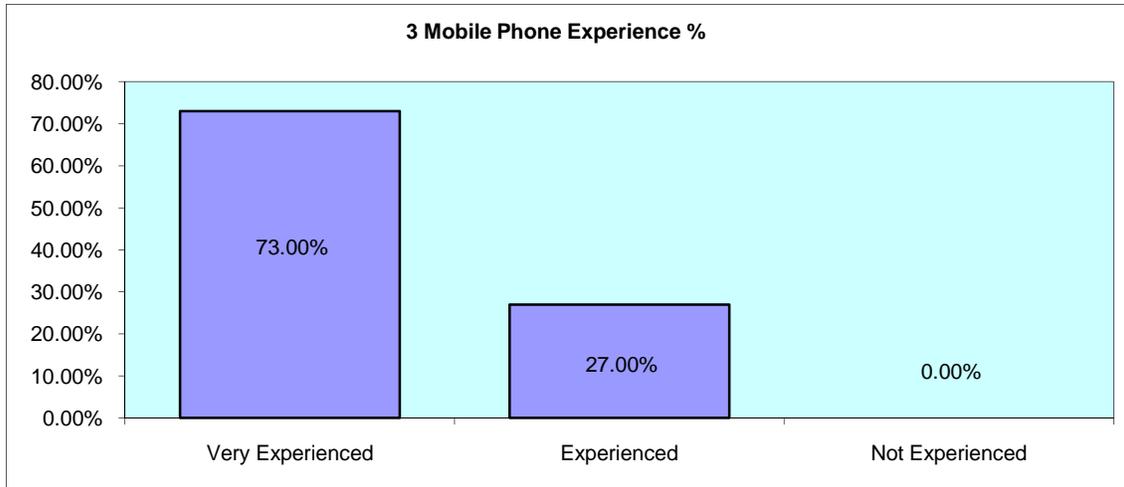
### 2 Does your phone have GPS?

Sony Eriksson k800i	-No
Sony Eriksson k660i	- No
Sony Ericsson w910i	- No
Sony Eriksson w705	- No
Apple iPhone 3G	- Yes
Nokia	- Yes
Sony Ericsson k810i	- No
Sony Ericsson k750i	- No

The Sony Ericsson w960i used by all participants for testing does not have built-in GPS capability but an external GPS device was used by the phone for location detection.

### 3 How would you rate your experience in using mobile phones?

	Frequency	Percent (%)
Valid Very experienced	11	73
Experienced	4	27
Not experienced	0	0
Total	38	100

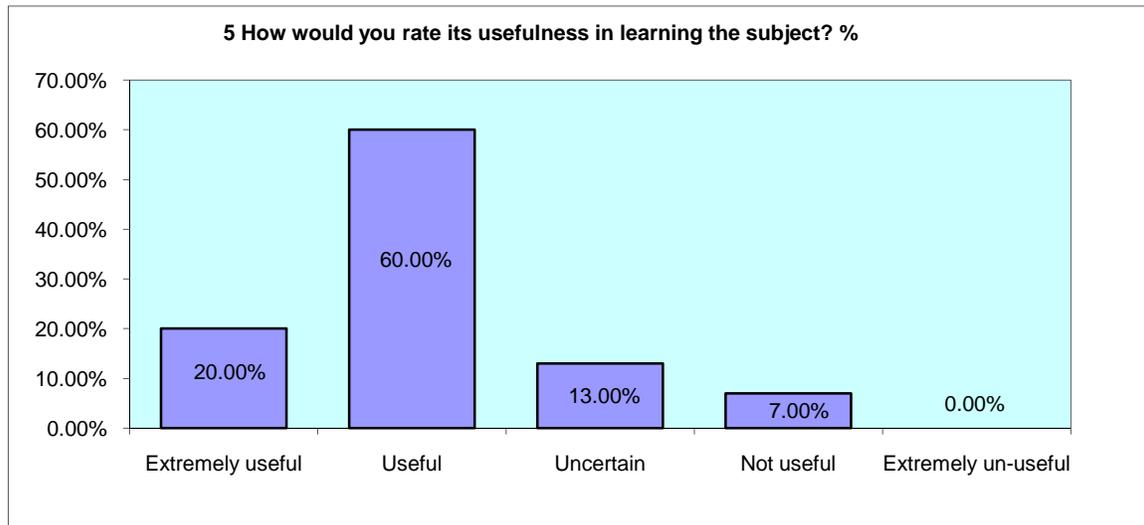


**4 What did you think of the mobile learning course you have just experienced?**

1. Would be really useful on site
2. Not great. It doesn't compare to web Based Learning. I could only see this as an application for Radio Engineers for example when they go on site – but then they would have ALEX
3. Concept is good and look/feel is good. Not applicable to advanced courses, more useful for task based roles such as Radio Engineers.
4. Ok, not bad.
5. A useful application that can be improved on.
6. Excellent – very nice add on system.
7. It was very good and useful delivering content when it was needed.
8. Excellent idea. Very well put together course.
9. Good concept but unsure whether mobile phone is good enough media to view on.
10. It could be very useful for troubleshooting bit it would probably not replace ALEX for more complicated tasks. It might need some form of search function available.
11. The mobile learning tool is an extremely useful tool in providing troubleshooting information.
12. Could be very handy to have – good addition to laptop if 'Search' function and context sensitive searching.
13. It was useful but feels a lot like an OPI from ALEX but with less functionality than PC based ALEX
14. Useful for minor, common tasks
15. Very innovative

**5 How would you rate its usefulness in learning the subject?**

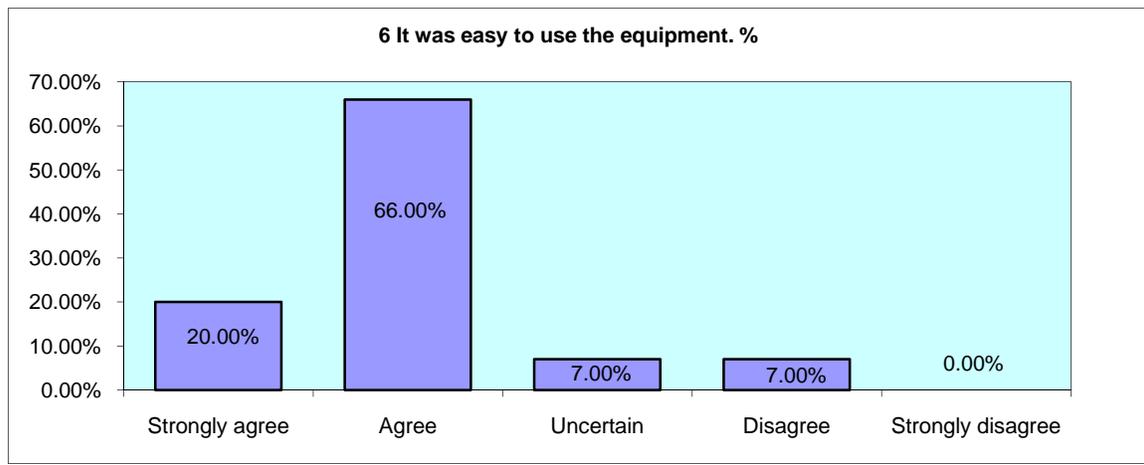
	Frequency	Percent (%)
Valid Extremely useful	3	20
Useful	9	60
Uncertain	2	13
Not useful	1	7
Extremely un-useful	0	0
Total	15	100



Only one negative rating was given concerning the usefulness of the course in learning the subject. 20% thought it was 'extremely useful' and 60% 'useful'.

**6 It was easy to use the equipment.**

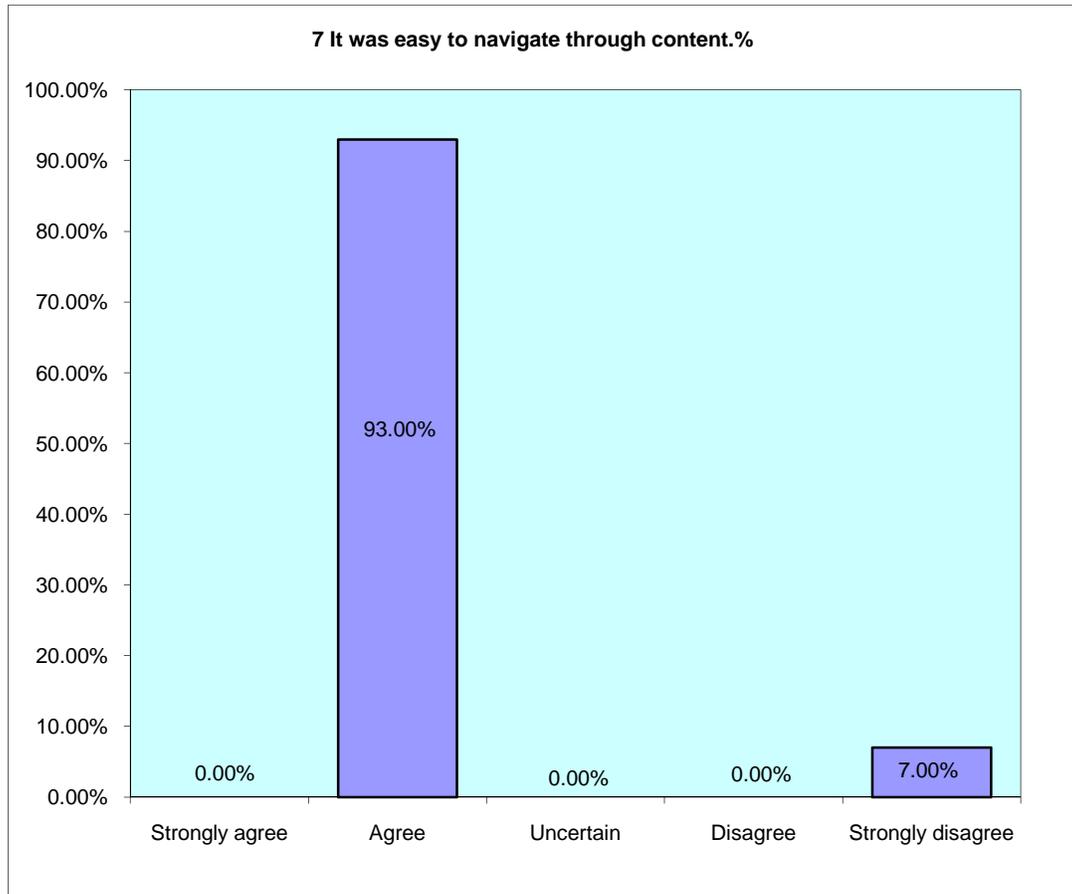
		<b>Frequency</b>	<b>Percent (%)</b>
Valid	Strongly agree	3	20
	Agree	10	66
	Uncertain	1	7
	Disagree	1	7
	Strongly disagree	0	0
	Total	15	100



The majority said it was easy to use the equipment, 66% answered 'agree' and 20% 'strongly agree'. One person disagreed as he found that some of the buttons didn't work and added that this could be improved

**7 It was easy to navigate through content.**

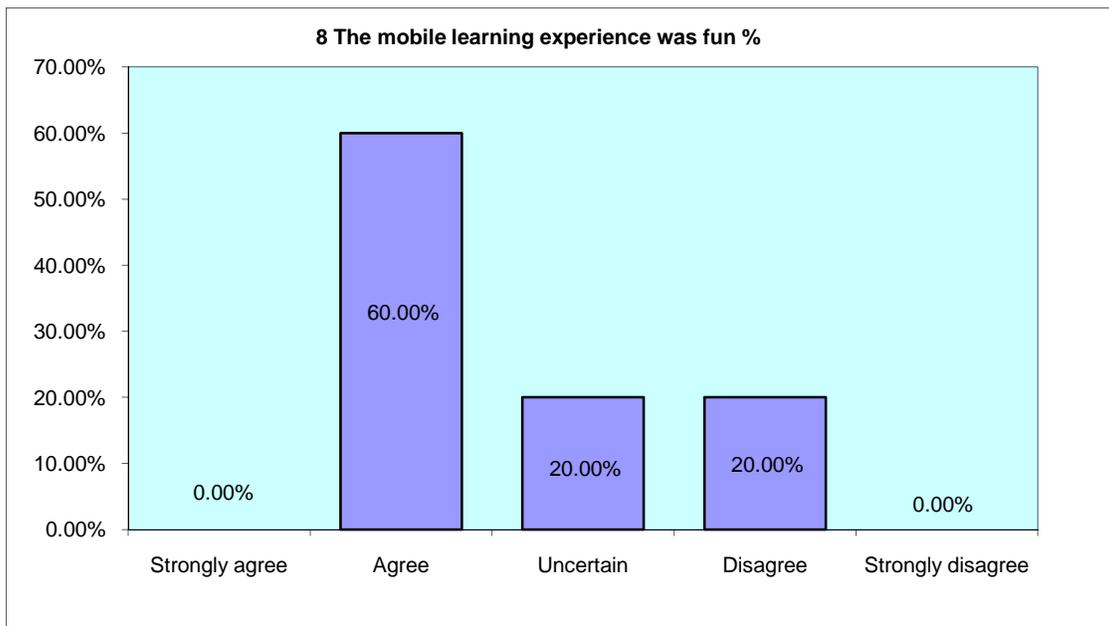
		<b>Frequency</b>	<b>Percent (%)</b>
Valid	Strongly agree	0	0
	Agree	14	93
	Uncertain	0	0
	Disagree	0	0
	Strongly disagree	1	7
	Total	15	100



The majority also found it easy to navigate through the content, with only 1 (7%) rating 'Strongly disagree' but did not state any particular reason for doing so. The remaining 93% rated 'agree' and found it easy to navigate through the content.

### 8 The mobile learning experience was fun

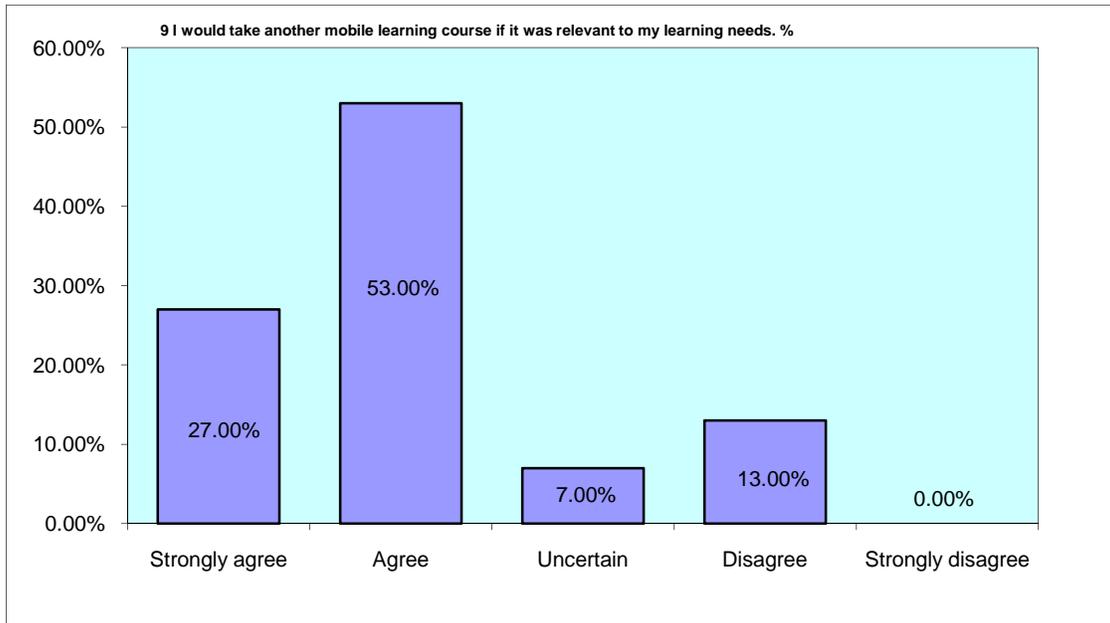
		Frequency	Percent (%)
Valid	Strongly agree	0	0
	Agree	9	60
	Uncertain	3	20
	Disagree	3	20
	Strongly disagree	0	0
	Total	15	100



60% of the students agreed that the mobile learning experience was fun. The fact that 20% would not agree that it was fun and 20% were uncertain could be expected from the nature of this advanced course. The advanced topics covered in this course, and the potential network problems surrounding them, would not be considered as very serious in terms of network performance and problem solving.

**9 I would take another mobile learning course if it was relevant to my learning needs.**

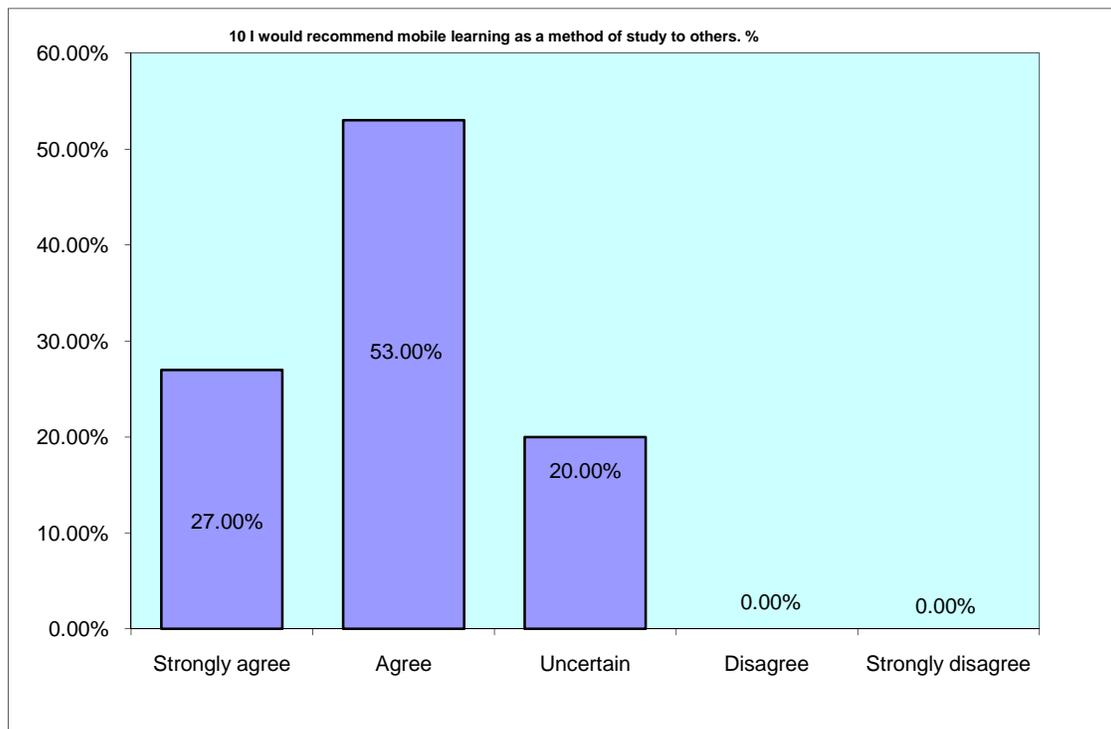
	Frequency	Percent (%)
Valid Strongly agree	4	27
Agree	8	53
Uncertain	1	7
Disagree	2	13
Strongly disagree	0	0
Total	15	100



A good indication that the students had a positive experience is that 80% agreed with taking another mobile course. 27% answered 'strongly agree' and 53% answering 'agree'. Only one person was uncertain and two people disagreed with taking another mobile course.

**10 I would recommend mobile learning as a method of study to others.**

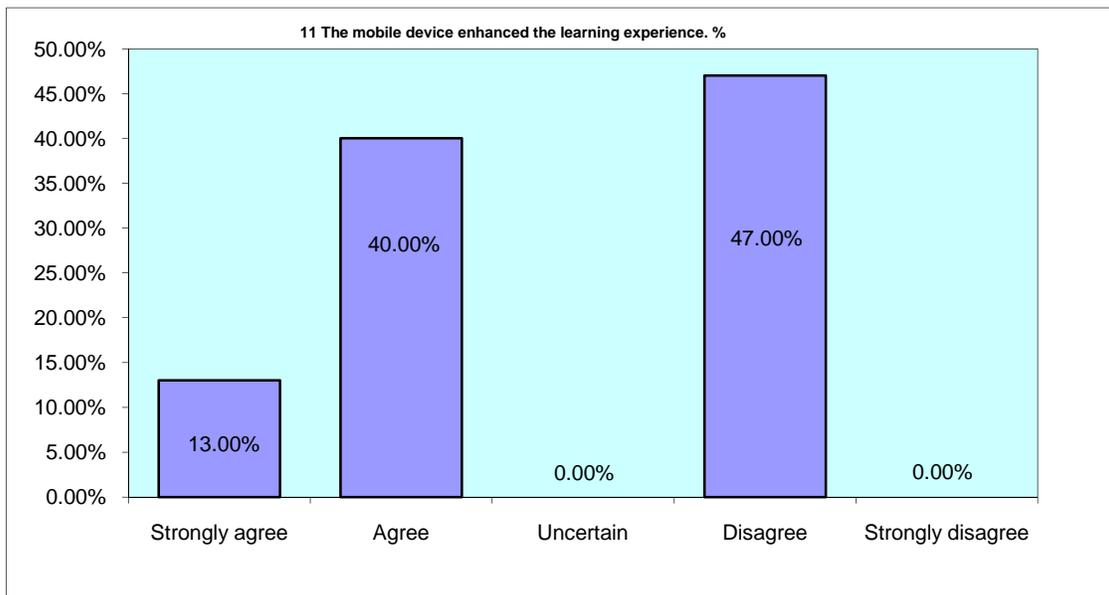
	Frequency	Percent
Valid Strongly agree	4	27
Agree	8	53
Uncertain	3	20
Disagree	0	0
Strongly disagree	0	0
Total	15	100



The majority of the participants (80%) would recommend mobile learning as a method of study to others, while 3 participants were unsure. Of those that agreed, 27% 'strongly agreed' and 53% 'agreed'.

**11 The mobile device enhanced the learning experience.**

		<b>Frequency</b>	<b>Percent (%)</b>
Valid	Strongly agree	2	13
	Agree	6	40
	Uncertain	0	0
	Disagree	7	47
	Strongly disagree	0	0
	Total	15	100



53% thought that the mobile device enhanced the learning experience: 13% 'strongly agree', 40% 'agree' while 47% were uncertain or disagreed. The advanced nature of this course might explain this response.

## 12 In what ways did it (or did not) enhance the learning experience?

1. Limited screen space makes it more appropriate to troubleshooting tasks than learning
2. I didn't think it enhanced the learning experience compared to PC based and web learning
3. Add search and index – table of contents functions. Shortcuts also nice to have.
4. Informative based on location and node is useful but should allow user to select other information. Images and text should scale to device.
5. It is very difficult to present content on a mobile device. Only relatively short pieces of data can be shown.
6. Small screen with limitations. Return to main menu option not working.
7. Enjoyable and informative. Would definitely like to see similar courses for other nodes/products.
8. The content can be delivered as and when needed in the right place at the right time. This will greatly enhance the learning
9. Easy access
10. Was not easy to scroll through the material
11. Being able to get relevant content whenever/wherever I require it.
12. Screen is too small.
13. The easy access to information at any time.
14. The mobile added a new method to the learning experience but it did not enhance it. It would be an alternative to other methods.

## 13 Which functions of the device did you use most?

1. All of them
2. The scroll button to move through the pages
3. The forward button. There are no other functions
4. Up/Down keys; Page forward/Page back
5. Scroll wheel
6. Step by step instructions
7. The scroll functions
8. Next key
9. Scroll and forward keys
10. Backwards and forwards functions
11. Navigating through pages
12. Bullet point info is clear and easy to read which makes it easy to navigate
13. Scroll up/down and changing pages
14. Scrolling, navigation between menus

#### 14 What did you think about the look and visual design of the course?

1. Too many pages. Look was basic
2. Clear and easy to read
3. Design was simple and easy to use. This is good as it does not need to be complicated as it is simply displaying text
4. Excellent
5. Was good
6. Good
7. Quite concise and relevant
8. It was simple and precise
9. Very good. Easy to read and diagrams were quite clear.
10. Visual design good but mobile phone limits the page size.
11. Pages are well laid out but it could be hard to find relevant info.
12. When highlighting a topic it needs to be more visible, maybe change background to blue?
13. Look and feel is good but for a small mobile device. The SW lacks lots of functionality
14. Simple, clean, appropriate.

#### 15 The course used location-based technologies to provide relevant learning materials to your phone. How did you find this?

1. Location based technologies would be useful as it would automatically provide only relevant information to the engineer
2. May be helpful if signal strength could be detected. Unsure if location based would help though
3. It was clear and easy to read
4. I think using the location based features is unnecessary. Users could just search by name/number to get the details. Also GPS doesn't work indoors.
5. Not relevant for RNC
6. Very useful. Good idea. Well put together course.
7. Excellent. Deliver content as needed.
8. Yes, worked very well.
9. Not sure
10. N/A
11. Worked well
12. Good for moving between locations and dealing with different problems for troubleshooting.
13. ?

**16 Did you encounter any technical problems? If so, what problems did you have?**

1. Some buttons didn't work such as Home, Next/Previous chapter
2. No
3. None
4. No
5. N/A
6. Not sure
7. No problems
8. Just the phone lock
9. No
10. Home return function not working
11. "Home" menu doesn't work. Returning to the main menu doesn't always work
12. Touch screen is too sensitive
13. N/A
14. No
15. The 'option' menu was inclined to blink a lot

**17 What did you like most about the mobile learning course?**

1. The simplicity of navigation and layout
2. The idea that if you do not have a fixed or wireless connection to e.g. the ECN, you get very useful info over a mobile device
3. Pocket-sized tool to supplement laptop when engaged
4. The short simple text. The adaptive
5. Could be useful for troubleshooting on site if the correct data could be found easily
6. Concept
7. Easy to read instructions and directions. Would be very useful on site.
8. The relevance of the material
9. The instruction directions
10. Always available in my pocket
11. Compact
12. Presentation of content
13. It's a great idea to have access to the course info on site
14. Te guideline format
15. Nothing. It was just flicking from page to page. Not interactive. Not mind stimulating.

### **18 What did you like least about the mobile learning course?**

1. So basic. Every page looked the same. Not interactive. Not like WBL
2. Sometimes missed some of the text when moving down through pages
3. Not able to skip to certain page or skip info that was not relevant.
4. Lack of functionality – no links or search function to make it more user friendly
5. Navigating. Wasn't easy to read material. Page scroll was not fluid, more choppy
6. Needs improving
7. All was ok
8. Size of screen
9. No link back to main menu from each page
10. Mobile phone hardware – again screen size limitations
11. It can be difficult to return to the homepage
12. Difficult to see images
13. Screen size
14. Lack of search functions and links
15. Small screen space, touch screen can be difficult

### **19 Do you have any suggestions for how we could improve the mobile learning course?**

1. Larger device (iPhone?). Faster scrolling.
2. Search engine, links
3. Maybe include animated pictures
4. It is a good idea to have documentation on a phone but the method of delivery appears to be too complicated. Documents could be requested by the RE on site from the NOC. The location based feature is unnecessary
5. Laptop or notebook more relevant for viewing. E-book could also be viewing media possibility
6. Link back to main menu from each page
7. It was good as is
8. Not at this stage
9. Browsing through content
10. Needs to be more user friendly e.g. easier navigation, search function
11. A search function would be very useful
12. Menu at the start to go to specific section
13. Too many. I don't think mobile learning is the way forward for telecoms. Re the application, there is little functionality.

## Synthesis of the evaluation results

15 students completed the training course. Each student completed a paper-based questionnaire after complete the course

The responses to questions in the student questionnaire are synthesized below.

### Learners

14% of the participants were female and 86% were male. The age range of the students spanned from 21 to over 40; of this 20% (3) are aged 21-30 and 80% (12) are over 30, reflecting the maturity of the organisation and it's commitment to Life Long Learning. All participants owned a mobile phone and all considered themselves to be experienced users, 73% as very experience and 27% as experienced.

### Student feedback

#### Q4 What did you think of the mobile learning course you have just experienced?

Of the 15 learners who responded to this question 9 (60%), stated the experience was useful and 1 (7%) were not particularly positive,

Two participants felt it was excellent and commented that it *“was a very nice add-on system”* while the other stated that it was an *“excellent idea”* and *“very well put together”*.

One participant did have a reservation in that the course is *“not applicable to advanced courses”* and *“more useful for task-based roles such as Radio Engineers”*. The only negative comments again related to the usefulness of the course for advanced topics: *“I could only see this as an application for Radio Engineers for example when they go n site – but then they would have ALEX.*

Two of learners in the very good category remarked that the material would be useful highlighted the need for a search function as part of the mobile application needing improvement.

As an overall majority of the group viewed the experience as good or better, it can be stated that the concept is acceptable to the learners albeit with some reservations which will be discussed in more detail below.

**Q5 How would you rate its usefulness in learning the subject?**

Only 2 (13%) were uncertain of the usefulness in learning whereas 20% thought it was 'extremely useful' and 60% 'useful'. One participant felt that it was not useful but did not indicate any particular reasons for this.

**Q6 It was easy to use the equipment.**

The vast majority said it was easy to use the equipment: 66% answered 'agree' and 20% 'strongly agree'. Two (13%) were 'Uncertain' while one (7%) answered 'disagree' and stated that some of the buttons for navigation did not work.

**Q7 It was easy to navigate through content.**

The majority also found it easy to navigate through the content, with only 1 (7%) rating 'disagree'. All other participants felt it was easy to navigate with 93% rating 'agree'. The person who disagreed felt that it was not easy to scroll through the material.

**Q8 The mobile learning experience was fun**

60% of learners agreed that the mobile learning experience was fun, but no one answered 'strongly agree'. 40% were either uncertain or disagreed which would reflect that the advanced content of the course, in particular the types of advanced technical problems faced by RNC engineers would never be considered regardless of how they are presented.

**Q9 I would take another mobile learning course if it was relevant to my learning needs.**

A good indication that the students had a positive experience and felt that they learned from the experience is that only one person (7%) was uncertain about taking another mobile learning course while two disagreed. Overall 80% (12) of participants found it useful and would take another mobile learning course.

**Q10 I would recommend mobile learning as a method of study to others.**

80% would recommend mobile learning as a method of study to others while 3 were 'uncertain'. Of the rest, 27% 'strongly agreed' and 53% 'agreed'.

**Q11 The mobile device enhanced the learning experience.**

53% thought that the mobile device enhanced the learning experience: 13% 'strongly agree', 4% 'agree' and 47% "disagree". This is not reflected in the preceding questions but will be answered through the responses to question 12.

**Q12 In what ways did it (or did not) enhance the learning experience?**

14 (93%) participants answered this question. On the positive side learning anywhere at any time, ease of access, informative content and enjoyment were cited as enhancements of the learning experience by 6 (40%) of learners. On the negative side screen size, lack of search function, lack of index, text size, image size and problems with navigation were mentioned as aspects which did not enhance the experience for (40%) of the participants. This explains the reaction to question 11 above. The majority of the negatives could be addressed through course and software design.

**Q13 Which functions of the device did you use most?**

14 (93%) participants answered this question. All stated that the main functions that they used were the navigation functions:

- *Scroll functions using scroll wheel*
- *Up/down keys*
- *Forward/Back buttons*

**Q14 What did you think about the look and visual design of the course?**

The reaction to the look and visual design was very positive. Some of the comments were very positive pointing to aspects such as:

- *“excellent”*
- *“Clear and easy to read”*
- *“Quite concise and relevant”*
- *“Simple and precise”*

12 comments stressed positive features such as clear text, clear images, easy to read, well laid out, good design and layout. 4 pointed to areas that could be improved such as phone limiting the page size, text needs to be more visible, hard to find relevant information and lack of software functionality.

One person commented that there were too many pages which points to a possible limitation of such courses, in that they may not apply to longer advanced courses and may be more suited to shorter task-based courses.

**Q15 The course used location-based technologies to provide relevant learning materials to your phone. How did you find this?**

Of the 13 people who answered this question, only 6 (40%) were positive towards the material being relevant to their location with comments such as *“Good for moving between locations with different problems for troubleshooting”*. 3 learners (20%) were less than positive; the following comment captures the issues:

- *“Unsure if location based would help”*
- *“I think location based features are unnecessary”*
- *Not relevant for RNC*

As expected, having to download the appropriate material outdoors is an issue with GPS and this was again reflected in the questionnaire response.

**Q16 Did you encounter any technical problems? If so, what problems did you have?**

Among the 15 responses, the majority feedback was that there were no technical problems while taking the course. On the course design side, getting back to the main menu and not being able to return to the Home page were cited as problems. These can be easily addressed as part of future course design.

**Q17 What did you like most about the mobile learning course?**

Among the 15 responses, the majority feedback (13 or 87%) was very positive with participants pointing to the following advantages the technology such as:

- *“Simplicity of navigation and layout”*
- *“Concept”*
- *“Easy to read instructions and directions”*
- *“Relevance of the material”*
- *“Compact” application*
- *“Presentation” of material*

Only one participant was negative stating: there was nothing they liked about it as it was *“just flicking from page to page. Not interactive and not mind stimulating”* but this may be down to personal preference in terms of learning media.

**Q18 What did you like least about the mobile learning course?**

The majority of comments received concentrated on the design of the course and limitations in the current application. The main areas that were mentioned were related to the following:

- *Screen size*
- Navigation e.g. “no links, search function” and “no link back to main menu”
- “Not able to skip to certain pages or skip info that is not relevant”

**Q19 Do you have any suggestions for how we could improve the mobile learning course?**

The majority of suggestions received concentrated on the design of the course and how it could be enhanced.

The majority of comments received for this question related to the user friendliness and navigation of the course with common points made through the responses, such as:

- The need for a “Search” function
- “Link back to the main menu from each page”
- “Needs to be more user friendly e.g. easier navigation and search function”

By and large the elements least liked by the participants could be addressed by designing the courseware differently.

There were two negative comments received:

- “The location based feature is unnecessary”
- “Too many. I don’t think mobile learning is the way forward for telecoms. Regarding the application there is little functionality”

**The benefits of context aware content:**

As the courses were aimed at very specific processes for very specific versions of telecommunications equipment, the participants welcomed the benefit of the context aware content.

There is a notable difference between the RBS course developed for WP4 and this course developed for WP5, in that the trend among the responses seems to point to the fact that Context Sensitive Learning may not be suitable for more advanced technical areas such as RNC Troubleshooting. Also the longer duration of the course would seem to have reduced the overall impact of the learning situation which suggest that these type of courses are more suitable to shorter task-based functional roles.

## **The use of location aware technology:**

Although the course had to be downloaded outdoors due to the constraints imposed by GPS, people seemed to appreciate the advantages of the location aware aspect of the course. Unfortunately location determination via IMS was not yet available and as expected people foresaw limitations with using GPS. The ability to move between different equipment within a building and accessing the relevant course material would not be possible.

## **Conclusions**

Location based, context sensitive training material was successfully developed for tasks related to the Ericsson RNC 3810 node and tested at the global Services Delivery Centre in Dublin. The location based aspect was obvious to the learner and all those that participated saw how location based was addressed.

The survey dealt with a mix of genders and age groups which would have been ideally suited to trial this course. In addition, the skill and knowledge of the group dealing with handsets was very high. This meant that training was not required and the course developed was intuitive to the needs of the learner.

The previous RBS course developed for Work Package 4 was developed for Field Engineers who do not require the same amount of knowledge and understanding as an RNC Engineer. Also the RBS Engineers carry out the same tasks on a day-to-day basis so the previous course was developed with task-based procedures for common activities in the operation and maintenance of the network. Due to the complexity of the RNC role, this course needed to be process-based rather than task-based as it deals with how an engineer should troubleshoot common problem types, outlining the steps that should be taken for each problem type, but not any one specific problem itself. This means that participant would be required to use critical thinking on a much greater level than participants on the previous course. Also, participants from the previous RBS course raised some questions about the usefulness of such mobile learning courses for areas such as RNC troubleshooting. With this in mind, the course developed for Work Package 5 was longer in duration and covers all areas of troubleshooting an RNC. The course itself is much more technical than its predecessor and was developed with more generic troubleshooting steps required for fault resolution on the node rather than specific tasks. By its nature the RNC Engineers role is more theory-based and this is reflected in the course content which is based on standard documented troubleshooting techniques recommended by Ericsson.

The learner's reaction to the courses in general was positive with the majority of participants responding that the concept, look and feel, and usefulness of such learning technologies was positive. As in WP4, issues such as course design and technical aspects of the mobile device were highlighted and can be addressed in future course development. As before, these issues relate to areas such as screen size and phone

functionality. However, it is noticeable that the feedback in general is not as positive as Work Package 4 with a reduction in the number of 'Strongly Agree' responses in comparison to the previous courses. The main reason for this lies in the fact that the course is more advanced at a technical level and may show a limitation of such courses and their application to certain functional roles. Context sensitive courses are very useful for simple task-based roles where engineers follow a set list of instructions to carry out their daily tasks. When the role becomes more advanced the use of such technologies may not be as applicable due to the length of course and content required; the longer course duration potentially being a negative on the participants perception of the value of the course.

In general, the context and location sensitive course was well received by all participants and the vast majority can see the benefits that such technologies will have for end users. The main negative aspects were largely related to limitations with the mobile device but in general these did not detract from the learning experience and the overall satisfaction of those who participated.

# Appendix 1: The Questionnaire

## CONTSENS Mobile Learning Evaluation Questionnaire

Please complete this questionnaire. Your views are very important to us, so please do give your honest opinion. All your answers are confidential, and you will not be identified in any resulting work.

Name:  Male:  Female:

Course or module:

Age: 18-20  21-25  26-30  31-35  36-45  Over 40

1. Which mobile phone do you own?

2. Does your mobile have GPS (Global Positioning System)? Yes  No  Don't know

3. How would you rate your experience in using mobile phones?

Very experienced  Experienced  Not experienced

4. What did you think of the mobile learning course you have just experienced?

5. How would you rate its usefulness in learning the subject?

Extremely useful  Useful  Uncertain  Not useful  Extremely un-useful

6. It was easy to use the equipment.

Strongly agree  Agree  Uncertain  Disagree  Strongly disagree

7. It was easy to navigate through the content.

Strongly agree  Agree  Uncertain  Disagree  Strongly disagree

8. The mobile learning experience was fun.

Strongly agree  Agree  Uncertain  Disagree  Strongly disagree

9. I would take another mobile learning course if it was relevant to my learning needs.

Strongly agree  Agree  Uncertain  Disagree  Strongly disagree

10. I would recommend mobile learning as a method of study to others.

Strongly agree

Agree

Uncertain

Disagree

Strongly disagree

11. Using the mobile device enhanced the learning experience.

Strongly agree

Agree

Uncertain

Disagree

Strongly disagree

12. In what ways did it (or did not) enhance the learning experience?

13. Which functions of the device did you use most?

14. What did you think about the look and visual design of the course?

15. The course used location-based technologies to provide relevant learning material to your phone. How did you find this (e.g. was the course material always relevant, did this work well, etc.)?

16. Did you encounter any technical problems, e.g. in using the device and/or location-based technologies? If so, what problems did you have?

17. What did you like most about the mobile learning course?

18. What did you like least about the mobile learning course?

19. Do you have any suggestions for how we could improve the mobile learning course?

If you would be interested in being involved in further research with us into using mobile phones for learning, please give your details below:

Name:

Email address:

Thank you for your help