mLearn 2012 – 16-18 October 2012, Helsinki, Finland

Workshop Proceedings

Mobile Learning in Security and Defence Organizations

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INTRODUCTION

Peace support operations, crisis and disaster management, law enforcement and civil protection are increasingly of multinational concern. The personnel of international organizations often are confronted with managing complex logistic and cooperation scenarios under the threads of military offense, terrorist attacks, or environmental devastation often outside their own cultural and legal settings. Armed forces, international organizations and NGOs who operate in crisis areas face similar educational challenges although the content of their training might differ. Even for domestic activities of the police or the customs the underlying legal frameworks are complex and subject to change and adjustment. Working under such conditions requires flexibility, frequent relearning, and situational awareness. This leads to a high demand of just-in-time information, higher-order procedural skills and competences, frequent re-learning, and re-contextualization of practices and habits. Mobile technologies do not only hold great potential for learning, training, information access, and knowledge management, but are already part of the practice found in security and defence organizations.

The current development and uptake of mobile technologies in the security sector challenges existing advanced distributed learning (ADL) and knowledge management approaches. Yet, research and practice of mobile learning for supporting security and defence learning is in its infancy, scattered, and weakly connected.

CONTEXT AND MOTIVATION

Many security and defence organizations and affiliated institutions already make good use of web-based ADL technologies for providing trainings for performance support and career development. Over the past years, ADL solutions have become part of the standard procedures for training and development in these organizations.

The majority of web-based ADL systems are optimized for desktop computing systems, reflecting the infrastructure that is available to learners and trainers in these organizations. However, with the current generation of smart phones the "mobile web" gained momentum and become relevant on a large scale. The mobile web refers to a number of technologies that support a wider range of interaction modes beyond the "keyboard-mouse-screen" interaction of desktop computing. This includes support for "responsive" (Marcotte, 2010) arrangement of information for a wide range of screen sizes and touch interaction, but also interactions that go beyond active manipulation of information on a personal screen. These new forms of interaction include location-based and gesture-based interactions that are used for but not limited to information filtering. Like many legacy ICT are ADL systems not designed to support these new forms of interacting with information. Moreover, the related educational resources are often unsuited for the delivery to different platforms or prepared to benefit from these new interaction forms. Yet it is clear that desktop computing systems remain an important part of the ICT infrastructure in security and defence organizations. This raises questions and doubts about the needs and benefits for supporting mobile technologies for education and training in security and defence.

A recent study on the mobile learning readiness of the Swiss Armed Forces (Glahn, 2012 unpublished) analysed the responses of almost 500 learners and trainers regarding the availability of mobile technologies among and the expectations towards using mobile technologies for education and training. The results indicate that more than 90% of the respondents own a recent smartphone, 27% own a tablet computer and 71% own a laptop. This indicates that providing support for mobile devices can increase the outreach of learning. The data also indicated that it is common to have access to several devices that are capable to connect Internet. Furthermore, the study results indicate that the use of mobile devices is ubiquitous without major differences across age groups or organizational ranks and that the majority (70%) of the respondents expect to access all their relevant information also from their mobile devices. The wide availability and adoption of mobile technologies in daily life indicates the exiting demand for mobile alternatives to existing web-based services.

CHALLENGES AND APPROACHES

The Swiss data indicate that there is a demand for implementing mobile learning in security and defence organizations. However, it remains a challenge to satisfy this demand and meet organizational requirements and training objectives at

the same time. The contributions to this workshop analysed four aspects of mobile learning in security and defence organizations.

1. The technological challenge of providing mobile user interfaces to existing infrastructures.
2. The organizational challenge of meeting the legal and regulative constraints under which security and defence organizations operate.
3. The educational challenge of orchestrating novel scenarios of technology enhanced learning.
4. The content challenge of enabling trainers and educators to create educational learning material for the new medium.

The first challenge emphasizes that educational technologies are not new to the security and defence sector and that mobile devices are likely to be used together with traditional web-based systems. The contributions suggested two approaches to this challenge. The first approach is to provide alternative interfaces for mobile devices. Alternate interface enable learners and teachers to access all functions of ADL systems from mobile devices. These interfaces are designed for meeting the specific constraint of the small screen estate of mobile devices. While the screen resolutions of contemporary smart phones would be sufficient to display most types of web-content, it is the constraints of the human body special attention for enabling learners and trainers to interact with this content. The second approach is to provide complementary learning opportunities based on the available learning material through mobile devices. This approach considers mobile devices not as an alternative way for accessing the same functions as with desktop computers. Instead, Glahn considers that mobile devices offer new affordances that can be utilized for alternative learning experiences. For example, it is possible to improve the continuity of learning through casual exercises that are mediated through mobile devices.

The second challenge addresses the legal frameworks and operational regulations of security and defence organizations. For this purpose it is necessary to understand the legal frameworks and the security needs to which mobile learning solutions relate. This is of particular relevance for innovating ADL solutions across organizations. In order to meet the legal and operational requirements of different organizations common denominators for the use of mobile technologies in related organizations. The contribution of Hodges and Stead provided a first analysis of the factors that influence research ethics for testing mobile learning solutions in defence organizations. They indicate a great variation of regulations between organizations and nations that influence how research ethics can and have to be applied for studying mobile learning.

The third challenge refers to the practical implications of applying mobile learning into the educational practice. The affordances of mobile technologies create new ways of supporting learning processes such as more authentic and situated learning. The contributions discussed trainer monitoring and intervention as well as rewarding mechanisms for approaching this challenge. Ternier et al. presented a system in which trainers can monitor the learner activities in a mobile scenario simulation for team training. Depending on the learners' performance the trainer can decide to change parameters of the simulation script in order to escalate or ease the challenge for the learners. Glahn showed a rewarding mechanism for self-assessment and formative evaluation. The mechanism combines performance-based and effort-based metrics in a mobile dashboard for the learners. This enables the learners to monitor their learning progress. Furthermore, these metrics are synchronized with the ADL system so trainers can analyse learner statistics and provide support where needed.

Finally, the fourth challenge addresses the need for mobile learning content. Beligan et al. as well as Glahn highlighted that content authors need empowerment for supporting new delivery modes. The learning material in security and defense organizations is often tailored to the special requirements and training procedures of the organization. The very trainers who use these resources often also create them. Therefore, it is necessary to provide easy to learn and to handle tools for creating appropriate material for mobile learning. The SCORM specification provides a widely accepted and used framework for creating and exchanging learning resources. Both contributions build on SCORM compliant learning material. While Beligan's system seeks to run complete SCORM packages on a mobile device, reuses Glahn's approach parts of SCORM assessment and tracking specification. Both contributions suggest reusing the available authoring environments for the creation of learning material.

KEY RESULTS

From the contributions it appears that the core technological concepts are well understood and are ready for mobile learning applications. The workshop indicated three key challenges for future mobile learning research in security and defence organizations.

- Organizational regulations.
- Mobile Interfaces for existing infrastructures
- Novel instructional designs

The influence of laws and organizational regulations cannot be underestimated in the security and defence sector. For bringing mobile learning solutions from prototypes to practice it is necessary to understand the context in which mobile learning will be applied. Specifically defence organizations have rigid rules for how and where to use mobile devices. These rules go clearly beyond the level of research ethics. Therefore, it is necessary to develop a better knowledge about the influence of organizational, national and even international regulations on implementing mobile learning in this sector.

The workshop participants highlighted that integrating mobile learning with existing infrastructures remains one of the main practical challenges on the way of scaling up the use of mobile devices for education and training. This does not only include the user interfaces of these environments, but also touches the communication between the mobile devices and the main ADL system. Concepts such as extended offline periods or push messages are typically not well considered by the existing infrastructure. Furthermore, it is necessary to revisit the data-traffic footprint of ADL systems for communicating with their mobile clients.

Finally, it became evident that mobile learning also requires revisiting the concepts of instructional designs for ADL. This is not only required for novel concepts such as mobile team simulations, but also for more conventional concepts such as formative tests and content delivery. Although existing learning material remains accessible if appropriate interfaces are available, its attractiveness and usefulness appears to change with the move from desktop computing environments to mobile devices. Therefore, it is necessary to develop a better understanding about the relation between mobile technologies and micro-level instructional design patterns.

ACKNOWLEDGEMENTS

This workshop has been funded by the ADL Co-Lab and awarded by the Office of Naval Research Global (ONRG) under the grant no. N62909-12-1-7022. The views expressed herein are solely those of the author and do not represent or reflect the views of any academic, government or industry organization mentioned herein.

REFERENCES

Glahn, C. (2012). Mobile Learning Readiness in the Swiss Armed Forces. ISN Report. Zurich, Switzerland: ETH Zürich(unpublished).

Marcotte, E. (2010) Responsive Web Design. [weblog] A List apart: http://www.alistapart.com/articles/responsive-web-design/

Research Ethics In The Mole M-Learning Program

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ABSTRACT
This discusses the Mobile Learning Environment (MoLE) Project - an ambitious mobile learning project sponsored by the US Department of Defense in partnership with over 20 other nations to explore the usefulness, and effectiveness of mobile learning as a tool to support coalition activity in the medical stability operations. In particular, we aim to showcase the application developed, discuss early feedback from the trialing, and look at some of the challenges of applying consistent research ethics across the different nations, and sectors, all of whom have their own specific requirements

INTRODUCTION
The Mobile Learning Environment (MoLE) Project was based on a requirement by the Commander, U.S. Naval Forces Europe (CNE)/Commander, Naval Forces Africa (CNA)/Commander, SIXTH Fleet (C6F) to effectively operate in the largest maritime area of operations (AOR) where the most difficult challenge is the ability to train and communicate. It was intended to help mitigate the long-standing challenge of delivering low-bandwidth, on-demand and training by using mobile devices where there was a limited internet connectivity and limited infrastructure.

The basic concept was that the MoLE Project would leverage the global cellular network infrastructure, mobile technologies and emerging mobile application/service models to build a mobile learning (m-Learning) capability that integrated into the Deputy Director, Joint Staff (J-7) for Joint and Coalition Warfighting (DD J7 JCW) Joint Knowledge On-Line (JKO) portal to facilitate the sharing of educational content between US and multi-national partners.

It would provide the foundation for conducting a proof of concept for evaluating a mobile learning (m-Learning) and mobile collaboration (m-Collaboration) capability using the Deputy Director, Joint Staff (J-7) for Joint and Coalition Warfighting (DD J7 JCW) Internet Protocol (IP). It would evaluate a solution for meeting emerging requirements that not only exists in the Commander, U.S. Naval Forces Europe (CNE)/Commander, Naval Forces Africa (CNA)/Commander, SIXTH Fleet (C6F) AOR but other Combatant Commanders AOR's, the Defense Medical Readiness Training Institute (DMRTI), Force Health Protection & Readiness (FHP&R), Advanced Distributed Learning (ADL) Co-Lab, and other organizations where there is a need to support NATO, Coalition, Partnership for Peace (PfP), and other International Partners with training requirements in a multilingual environment.

Through the proof of concept it would demonstrate an enhanced interoperability and yielded high benefits, to all Services, Combatant Commanders (COCOM), the International Health Division, Force Health Protection & Readiness organization, and others using the DD J7 JCW Internet Protocol (IP) by providing medical education and training to military and related civilian personnel of foreign countries in need of humanitarian and civil assistance or during joint exercises and force training. This would, in turn, be shared by the International Community to support their education and training in the medical area.

INITIAL RESEARCH
The Project started February 2011, starting with strong background research on the availability of different mobile technologies, and phones worldwide, as well as looking at other initiatives that would be relevant to the MoLE project group. The research uncovered several critical reports and reference sites that proved crucial to the ongoing project. Snapshots of this research, as well as some of the primary sources are available on the MoLE website (see www.mole-project.net/research).

Initially, MoLE focused on currently available mobile devices in order to assess which mobile platforms and solutions 'best' meet the operational needs and requirements since not every participant in this proof of concept has a state-of-the-art mobile device. This approach proved to be a very cost-effective approach since a majority of mobile devices (e.g., GSM, 3G and 4G capabilities) are accessible worldwide. Therefore, the proof of concept, which would involve 22 nations, ensured time and financial resources were focused on identifying and developing an effective operational capability rather than the procurement of specific types of mobile technologies.

In addition to the core research activity, the MoLE Project sponsored several external Science and Technology (S&T) projects in order to develop and deploy a sustained capability – and it is well-known that S&T plays an important part in developing and testing new technologies that will meet defense-related requirements. Through S&T research programs, the defense community is able to develop capabilities that closely link the human and physical worlds in order to meet emerging demands. This linkage can only be achieved through rigorous testing, evaluating, experimenting and conducting trials that will demonstrate if new technology provides an operational capability otherwise not available.

However, although research is critical to bringing forth the benefits that technology can bring to both society and the military environment, the process for providing the positive benefits must first take into consideration the importance of research ethics.

One of the areas that was particularly challenging was agreeing a common frame of reference for research ethics, given the wide range of stakeholders, and the mix of educators and medical practitioners. Medics have their own set of stringent guidelines for any trials. The EU has a secondary set. The US Government has it's own guidelines too. The partners needed to define a subset of these three and seek approval via the appropriate channels, to agree an appropriate protocol.

Appropriate research protocols must be developed and utilized to ensure that each volunteer is aware of the purpose, procedures and processes, testing process, risk and discomforts, potential benefit, voluntary participate and withdrawal and confidentiality. All of these requirements, as demonstrated by the Mobile Learning Environment (MoLE) Project, proved to be quite daunting and challenging when trying to determine if technology can address defense-related priorities.

APPLICATION DEVELOPMENT

The project was split into three working groups: Content, Platform & Evaluation.

The content team worked with a wide range of medical, and training stakeholders to design, convert, import and create mobile content to support the needs of the target users

The platform team developed a cross-platform toolset that enabled mobile learning content to be deployed to apps on both Android and iOS (apple) platforms, and worked with JKO (the US DoD e-learning platform) to integrate the mobile platform with their back end infrastructure

The evaluation team developed an evaluation process, and script that was embedded into the app, so that users in multiple nations would be able to send feedback on their app usage

PROOF OF CONCEPT TRIALLING

250 users across the partner nations downloaded the apps onto their personal devices, and spent between 1 and 10 hours working through the mobile courses and content. Most were using the app in English, though Spanish, Georgian, French and German versions were available too.

All filled in detailed evaluations, which at this moment are still being processed and reviewed

WHAT NEXT

The primary purpose of this project was to explore the viability of m-learning, and create a transition plan to move it into the mainstream of defense training. This has already been achieved, since several of the partners are already adopting some of the system and processes, and all content created by the project is being transitioned into an ongoing mobile deployment.

In addition, results of the research are still in the process of being reviewed. Completion is expected a few weeks prior to mLearn 2012 which will allow this workshop to be the first place that the results are disseminated

CONCLUSIONS

Mobile learning certainly has a viable contribution to play in Defense training and performance support, if users are allowed to use their own smartphones. There are many technical challenges in ensuring the mobile content can be deployed over multiple channels, as well as practical issues to consider around the areas of research ethics, and personal privacy, but with careful management these can be dealt with clearly and effectively

ACKNOWLEDGMENTS

The authors would like to acknowledge all of the other project partners who have been a part of and contributed to this work.

This research was made possible by research grants awarded by the Office of Naval Research Global (ONRG) and funded by the Telemedicine and Technology Research Centre (TATRC) at the U.S. Army Medical Research & Materiel Command (USAMRMC), Fort Detrick as a contribution to the Coalition Warfare program (CWP)

Supporting Crisis Simulations With The Arlearn Toolkit For Mobile Serious Games

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INTRODUCTION

Although the transfer of factual knowledge plays an important role when training personnel that operate in potentially dangerous conditions, mobile learning techniques to support security trainings are often underused. There is a great value in simulating dangerous situations. In contrast to learning from a textbook, a simulation leaves room customization and surprise, as players do not know what will happen in advance. By experiencing a series of events that occur in a simulation, participants learn in authentic context and are trained to respond to events as they occur. This is different from studying factual knowledge. Organising these simulations in the real world can often become very expensive and resource intensive. For instance, a real-life military simulation can require the use of weapons and explosives to engage the participants in simulation. Many dangerous situations require personnel with different roles (e.g. team leader, communication expert) to cooperate. Managing these different roles during a simulation puts extra work on the simulation facilitator.

Mobiles can play an important role here. Although they won't match the immersive feeling a participant gets when entering a real-world simulation (e.g. flying a full-scale flight simulator), mobile devices are very suited to orchestrate a flow of events. Furthermore they offer many advantages when dealing with a crisis requires different participants to act together. ARLearn is a toolkit that supports the creation of such mobile serious games. In this article, we discuss how ARLearn's features can support a mobile simulation. We proceed with an explanation of how this toolset has been used to simulate hostage-taking simulation with employees of UNHCR. At the end we conclude with an outlook of new features that we are about to integrate to support more diverse simulations.

ARLEARN TOOLKIT

ARLearn, originally a tool for audio augmented reality, has grown over the past few years from a standalone smartphone app to a fully-fledged mixed reality application platform taking into account field-trips, serious gaming, augmented virtuality and a notification system (Ternier, 2012). In order to support the creation of simulations, ARLearn builds on two important concepts:

- A game is a blueprint for a simulation and defines the game artefacts, user roles and the logic that combines these artefacts.
- A run defines users grouped in teams. With a run, the actions of these users, their responses and progress are tracked. For a game, an arbitrary amount of runs can be created.

ARLearn implements a simple data model that enables the definition of several kinds of messages including multiple choice messages, video messages, audio messages, etc. Messages can be bound to a location and/or a timestamp in the game. Furthermore a flexible dependency mechanism enables the author to define the game logic. An author can for instance define through this framework that 60 seconds after all players have read the introduction message, a video message will become available.

UNHCR HOSTAGE TAKING PILOT

The Office of the United Nations High Commissioner for Refugees (UNHCR) leads and co-ordinates international action to protect refugees and resolve refugee problems worldwide. As this organisation is sometimes confronted with kidnappings of their co-workers, employees are trained on how to deal with such situations. An ARLearn "decision making" game was designed that presents the participants a real-time simulation of a hostage-taking situation. The game script was created taking into account several roles (Head of Office, Security Official and Staff Welfare). Depending on the role, participants receive different tasks and information. For instance, the head of office receives calls from journalists, while staff welfare receives a call from a distressed hostage's family member. Therefore different educational scenarios and collaborative scripts have been implemented in ARLearn to simulate complex hostage taking scenarios and their management with different roles.

UNHCR aimed at giving their trainees an authentic learning experience. An incoming video message with a plea for help from the hostage created a sense of immersion. Through overloading the participants with many messages and tasks, the game designers wanted to create a level of stress. For this purpose the possibility to trigger notifications automatically,

was extended with the possibility for a game operator to trigger them manually. This way, the operator can better estimate when a message (with additional work) should be dispatched.

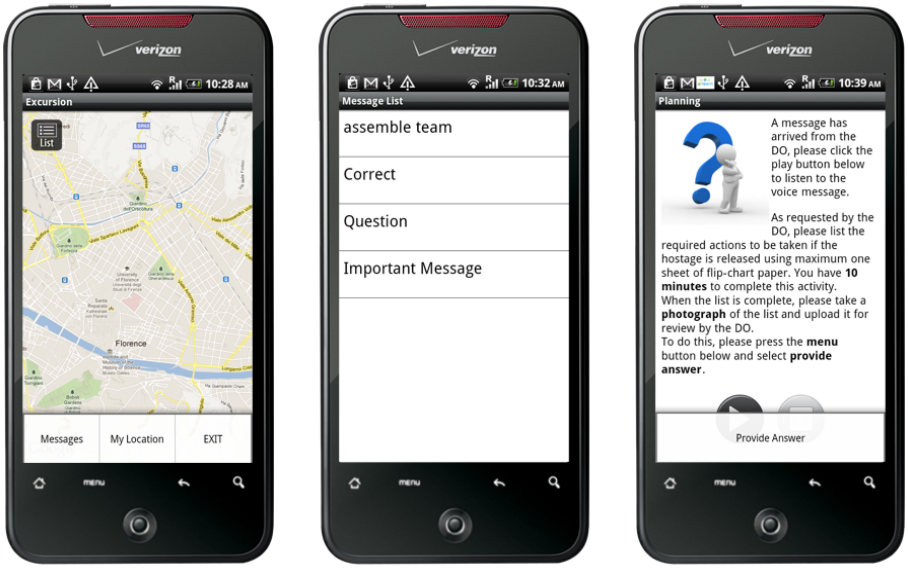

Figure 1. UNHCR screenshots: map view (a), message view (b), example assignment (c)

This game script was implemented in two phases. In November 2011, a dry run was organised in Budapest with staff members of the organisations. In December 2011, the actual pilot was organised in Entebbe, Uganda. Here, 3 game runs were ran at the same time featuring 3 roles per run.

Although no summative and quantitative evaluation was organised for this pilot, the game organiser provided the following formative feedback.

- Being able to run the game on Android devices has many advantages. Although this was not the case for the UNHCR pilot, ARLearn games can be ran on personal devices, implementing a "bring your own device" (BYOD) strategy. Leverage a widespread operating system, makes the solution much cheaper compared to AR solutions that need special hardware. In this particular case however, learners had to become familiar with the device (touchscreen, Android OS, etc.). Therefore it was suggested to create a demo run to enable participants to get accustomed to the device.
- The script was implemented with both manual and automatic triggers for items to appear. Although manual triggers offer some degree of flexibility, future pilots should have more automatic triggers and fewer dependencies on a network connection. The unreliable network results sometimes in manual triggers not arriving at a device. Automatic triggers have the advantage that they are cached on the mobile device and they lower the workload for the operator.
- Lowering the dependency on Internet connection will make the game easier to port to other countries, not having to acquire many SIM cards or deal with wireless settings.

FUTURE WORK

ARLearn is and will probably always be under development. However at regular times we schedule releases of new functionality. By implementing real pilots we learn a lot, and new ideas take shope on making simulations better. The runs we organized so far suggest the following extensions.

Near field communication/tag scanning

Quite often in a simulation, players need to gather on a location. When all players are present the game continues. Currently a game facilitator tracks the players and manually triggers the next message to be broadcasted to all players. This puts some some burden on the game facilitator and prevents multiple simulations to take place on the same time.

Through tag scanning (e.g. QR codes, NFC tags), players can indicate their presence to the system. When they arrive on a location they check-in by holding their phone next to an NFC tag, or by scanning a barcode. By doing so, the system can automatically take action and proceed with the next phase of the game.

Dependencies between teams, roles and players.

In the current version of the framework, the game logic runs both on the server and on the mobile device. This insures that a simulation can go on even when a player's device is temporarily not connected to the Internet. Because of this, inter-device communication has been postponed. The ARLearn framework is currently being extended so that actions

taken on one device can implicate other players. Depending on the actions that the team leader role takes, the other roles will experience a different game play and could for instance suffer from ill taken decisions.

Authoring environment

ARLearn currently comes with an authoring environment that covers only part of the features that are offered. Features that are not supported by the authoring tool are hand coded and require programming capabilities. By including the creation of dependencies and other features, we expect the authoring environment to become more suitable to create complex security simulations.

ACKNOWLEDGMENTS

With special thanks to Atish Gonsalves and his team at UNHCR, for giving valuable input to this work.

REFERENCES

ARLearn project page. (2011) See also website: http://code.google.com/p/arlearn

Ternier, S. Klemke, R., Kalz, M., van Ulzen, P., Specht, M. (2012, in press). ARLearn: augmented reality meets augmented virtuality. Accepted for Journal of Universal Computer Science, Special Issue on Technology for learning across physical and virtual spaces.

Using Mobile Technology To Enhance Elearning In CAROL I National Defence University

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M-learning has represented a huge field of interest in the last 10 years. The research and development efforts are especially oriented towards M-learning applicability in formal education as a complementary solution of the methods and forms of organizing learning and developing communication capabilities in groups. Mobile devices allow people to be less dependent on a certain place in order to be involved in economic or social activities.

Currently, there is a wide variety of smart phones that can access and surf on the Web through installed browsers. This variety can be seen from both perspective, also as a good thing but sometimes as something that causes problems for adapting software for users. Therefore, it is necessary to use standards, but in this domain of mobile technology standards are still in developing phase.

One of the main problems of compatibility between the content of education in classical and electronic platforms for mobile devices, is characteristic of display and multimedia. Content for desktop computers is not automatically compatible with mobile devices and their display screens. Creating different content for mobile and for desktop on the same subject is quite expensive, that why most eLearning solutions on the market are only aimed at the desktop. Contrary to this aspect, the eLearning systems users are most out of time and usually in motion. Providing access to educational content, not just in a fixed location is a key objective for developers of eLearning solutions. The technology is evolving very rapidly and there is a very close competition between developers to create apps and to offer many features and applications to end-users. Mobile devices involve unique requirements and challenges. They are usually limited in terms of processing power, battery life and user interface estate.

The educational content that is dedicated specifically to mobile devices can have many forms, depending on the capabilities of the targeted mobile device. For modern mobile devices containing an advanced Web browser with support for multiple media formats and Macromedia Flash or JavaScript programmability, the educational content could have the same complexity and form like in the standard educational content. For mobile devices that do not support a modern browser, the content must be created using specialized standards for structuring and delivering content.

Research regarding the development of such applications for mobile terminals is still confronting with essential questions such as: is it preferable to have a web-based application to a standalone one?

To cover the widest possible range of mobile devices and provide a consistent experience with mobile device capabilities, educational content packages must include two forms of educational content, in terms of quality and functionality: one with a low quality and functionality and an interactive format, and one with high quality and interactive functionality. Both formats should be wrapped and stored in the repository of educational content. Formats will be delivered according to the capabilities of the device either by selection or by automatic detection capabilities.

All these aspects were considered in 2008 when "CAROL I" National Defence University started the development of a scientific research project to identify opportunities for expansion of educational and training system for lifelong learning segment using high technology components for computer and mobile communications.

The proposed model, named "Mobile learning – net centric based on knowledge access" – „Access to knowledge and learning database using mobile technologies" aimed to integrate the cutting edge technologies in the field of computers, wireless communication, educational and knowledge management advanced software. The most important aspect of this enterprise is to find the solution to access knowledge databases on different types of wireless terminals (PDA, SmartPhone, iPOD, UltraMobile PC, handheld military radio stations etc.) that connect through different communication networks using different specifications and communication protocols.

The final product of the project is an experimental model for an integrated mobile learning system that allows access for different users, from formal educational systems or from professional system, to knowledge bases and real time learning, according with "anywhere and anytime" principle. The mLearning integrated project aims to cover two major directions of interest: access to education (mobile Learning Management System- mLMS) and access to knowledge resources (mobile Knowledge Management System - mKMS) together with a study conducted about the role of these new technologies in a knowledge society in relation with market opportunities to adopt such solutions.

The purpose of this paper is to share information about the main results of the project: mLMS and mKMS.

The mLMS product runs digital content in various formats, including SCORM, which was really something new in domain.

The mLMS eLearning application is a N-tier web application (presentation, application and data tiers) built mostly on top of open source technologies. It is truly database independent; it works on PostgreSQL open source database server as well as on commercial database servers like Microsoft SQL Server 2005/2008 or Oracle 11g. The application tier is divided in two different tiers: the content repository server and the learning management system server. The content repository is a lightweight content management system customized for the eLearning activities. It stores lessons, tests, and documents, and offers different features which exist in a document management system like storing information in a files and folders structure, versioning operations, clipboard like features (copy, cut, and paste) and archiving. The learning management system offers features that make easy the interaction between a trainer and a trainee in a remote environment, like: authoring tools (HTML editor, editors for standard compliant SCORM lessons and IMS QTI tests), managing learning activities in both synchronous (virtual classroom module) and asynchronous modes, assignment of work to other users, system notifications and personal messages between users and also a reporting area.

The second product of the project, mKMS is designed for business which by nature has employees who are in constant motion, but they need a permanent connection to a portal of knowledge to solve certain tasks.

The general conception of the second product is not new, being used by other systems of this kind. The novelty factor of it is given by access to 3G networks and the possibility of adding events and new procedures in real time. Thus, the knowledge base is accessed as if it is a living organism and grows with each step made by any of the users.

Both products have been tested with several types of mobile devices, from simple phones with Internet access, smart phones and tablets. Depending on the operating system of each device, the responses were from excellent to satisfactory. Studies on the impact on knowledge-based society and the market research on mobile devices and services revealed that in the coming years these specialized software offers becomes much larger and increasingly more individuals users or organizations will adopt such solutions.

The mobile Learning Management System and mobile Knowledge Management System solutions open up new opportunities for learning environment corresponding to the skills of the future generations and the requirements of a dynamic economic environment.

Supporting Learner Mobility In SCORM Compliant Learning Environments With ISN Mobler Cards

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INTRODUCTION

Over the last decade mobile information technologies have become a ubiquitous part of daily life. Mobile learning research dates back not even 10 years further (Oppermann & Specht, 1998, Soloway & Norris, 1998). As such it is among the latest research areas for educational technologies. Given the overwhelming success of smart mobile devices on a global scale this technology appears to be suited to extending the reach and continuity of educational programs. For many security and defence organizations these new opportunities are problematic because much of their content and infrastructure has been optimized for web-based desktop computing environments. Much has been invested into the training of instructors and authors to make good use of the available ADL solutions many organizations have a rich pool of educational resources available in the SCORM format (ADL Initiative, 2009). However, some criticism of SCORM highlighted that it is not sufficiently supporting mobile learning. This raises the question for security and defence organizations, whether they have to create new educational resources and programs if they want to introduce mobile learning on a large scale.

THE MOBLER CARDS APP

This contribution introduces the Mobler Cards app for learning management systems (LMS). Mobler Cards is basically a variation of a flash card learning app that uses test questions for repetitive practicing on smart phones. The unique feature of Mobler Cards is that it synchronizes itself with a LMS while offering all functions even while the learners are offline. After learners installed the app on their smart phone, they connect to the LMS. After the authentication Mobler Cards identifies appropriate learning resources for the courses into which a learner is enrolled. For each of the learners' courses the app has two modes: a practicing mode and a statistics mode.

The practicing mode offers the typical flash card learning experience of a question and an answer. In order to monitor the learners' progress they have show that they are able to answer the question correctly. In addition to this question-response activity, the learners receive immediate feedback on their answer and can evaluate their answer in comparison with the correct answer. Each answer can have three levels of achievement: "excellent" if the correct answer has been provided, "partially correct" if the parts of the answer were correct, and "wrong" if the provided response were not matching the correct answer at all.

The statistics mode allows the learners to analyse their performances for the course. Four analytical measures are available for the learners: The number of questions handled during a period of 24h, the average score that has been achieved during the same period, the progress to answer all questions correctly, and the average speed for answering each questions. The difference between the average score and the progress is that the average score includes partially correct answers as well as fully correct answers, while the progress includes only fully correct responses. In addition to these performance-based learning analytics, the app offers two learning badges that are based on the effort learners using the app. The first learning badge indicates that the learner handled all available questions for a course. The second badge is awarded after the learner answered a large number of questions in one sitting. For both learning badges, the performance is irrelevant.

RESEARCH CHALLENGES AND SOLUTIONS

The key challenge that has been addressed by the research related to this app is how to make use of SCROM compliant learning material for supporting learning and extending the continuity of learning. The objective was to identify whether the reuse of existing learning material for new learning experiences can get achieved with existing SCORM compliant resources.

Mobler Cards is designed to complement existing web-based ADL courses with exercises for repetitive practicing. Three core requirements were considered for the app. These requirements are key for scaling up mobile learning in security and defence organizations.

Firstly, the app is integrated with the underlying LMS system. Besides avoiding the hosting and maintenance of additional systems and infrastructure, this also integrates mobile learning into existing education and training programs. Furthermore, the reuse of existing infrastructure allows utilizing existing SCORM compliant learning material whenever possible without additional overhead.

Mobler Cards provides an alternative interface for accessing and using the question pools that are stored in the LMS. By doing so, the app complements web-based training but it does not build on existing interfaces of the LMS. The app reuses

the LMS' components for user management and preferences, for course management, and for test objects. In order to minimize the network traffic for the mobile app, the app contains all parts of the user experience and exchanges only the relevant data with the LMS through a set of REST services.

Secondly, the app minimizes the overhead for content authors. This lowers a significant barrier for scaling mobile learning in security and defence organizations by enabling content authors to use their knowledge about web-based courses and web-based assessment. This has been achieved reusing the authoring capabilities of the LMS for content creation. As Mobler Cards reuses the available question pool function provided by the LMS it allows the immediate use of existing course resources for learning. As a side effect this allows to repurpose components of existing SCORM packages for mobile learning.

Being able to use existing learning material for initial courses can significantly reduce the barrier for providing mobile learning offerings on a broad scale. Instead of the necessity for creating entirely new educational resources this approach relies on adapting existing educational material.

Finally, the app provides full flexibility for mobile learners in order to support the continuity of learning. For the learners' perspective the objective of Mobler Cards is to enable learning in suitable moments as they occur. These "learning opportunities" can vary in their duration and in their contexts. Such as waiting for a bus or commuting in the train. Also it was presumed that the Internet connectivity is not a reliable factor of the learning experience. Furthermore, it should be possible that learners still have access to the learning material during extensive offline phases. Yet, the learning activities must not be disconnected from the LMS with it features for learning support.

Mobler Cards optimizes the time frame that is available for learning by hiding most of administrative tasks from the learners. This includes authentication, data synchronization, and course navigation. Furthermore, Mobler Cards allows the learners accessing supportive features such as learning statistics at any time. This feature requires that all functions have to be implemented in the app instead on being provided by the LMS.

PROOF OF CONCEPT AND DEMONSTRATORS

In order to prove the concept of Mobler Cards it has been tested for delivering course material for two courses. The first course "Introduction to NATO" had no question pool available so an entirely new question pool has been created that was specifically tailored for mobile delivery. The second course "Building Defense Organizations" is an existing SCROM compliant course that has been implemented in 2008. This course included a question pool for assessing the achievement of the learning objectives. Both courses were successfully delivered on a range of test devices.

FUTURE WORK

Further research includes the proof of effectiveness for learning. This will include a field test using the "Introduction to NATO" course. Additional work is required for providing more flexible ways for providing course specific learning analytics and learning badges. This is closely related to integrating support for the Tin-Can API (ADL, 2012) into Mobler Cards.

ACKNOWLEDGEMENTS

The research related to this contribution has been funded by the ADL Co-Lab and awarded by the Office of Naval Research Global (ONRG) under the grant no. N62909-12-1-7022. The views expressed herein are solely those of the author and do not represent or reflect the views of any academic, government or industry organization mentioned herein.

REFERENCES

Advanced Distributed Learning (ADL)(2009). Sharable Content Object Reference Model (SCORM) 2004 4th Edition Run-Time Environment (RTE) Version 1.1. Alexandria, VA: ADL Initiative.

Advanced Distributed Learning (ADL) Co-Laboratories (2012). Experience API. Draft Specification (10 Oct. 2012). http://cdn3.tincanapi.com/wp-content/assets /spec/Tin-Can-API-Releasev095.pdf

Oppermann, R., & Specht, M. (1998). Adaptive Support for a Mobile Museum Guide. Proceedings of the Conference on Interactive Applications of Mobile Computing (IMC'98). Rostock, Germany. http://www.egd.igd.fhg.de/~imc98/proceedings.html

Soloway, E. & Norris, C. (1998). Using technology to address old problems in new ways. Communications of the ACM (CACM), 41(8), 11-18.