UNIQUENESS OF MOBILE LEARNING

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From the desk of Kortny Williamson...
Much like the corporate world is seeing a decrease in cube dwellers, learning organizations are experiencing a decrease in training session attendees. The solution for some companies? Mobile learning, or training via a 5-ounce electronic device. Is this really a step in the right direction or just another distraction until something better comes along?
We've all heard the phrase "if you can't beat them, join them." Well, that's where m-learning seems to be positioning itself. Learning professionals are forced to shed the last vestiges of the idea that learning must take place in a classroom with "real" teachers and "real" materials.

M-learning: the future of e-learning?
A little while ago, I was asked to do some research on mobile learning (m-learning) and was really intrigued by the concept. Not only have some universities experimented with the technique, but some companies have tapped into it as well.
At first, this seemed like the perfect way for companies to train their remote employees. At second glance, however, it began to seem like a distraction from the actual training content. I'll get to that a little later because first, m-learning needs to be defined.
http://www.corpu.com/weekly/article/mobile-learning/

1. DEFINITION OF MOBILE LEARNING

Definition in the context of mLeMan project

The definition of mobile leaning used in the mLeMan project is 'Mobile learning is the provision of mobile learning on mobile devices'.

This definition may be expanded to ''Mobile learning is the provision of mobile learning on mobile devices: Personal Digital Assistants (PDAs), smartphones, mobile phones, handhelds, palmtops, MP3 players and similar devices'.

The definition may be further expanded to include 'learning on devices which a lady can carry in her handbag and a gentleman can carry in his pocket.'

In defining mobile learning one confronts tensions between functionality and mobility. There is a continuum from the point of view of functionality in
the devices used for distance education, e-learning and m-learning. This

continuum goes from desktop computers to laptop computers to PDAs or handhelds or palmtops to smartphones to mobile phones. In the definition of *mobile* learning the focus should be on mobility. Mobile learning should
be restricted to learning on devices which are easily portable.

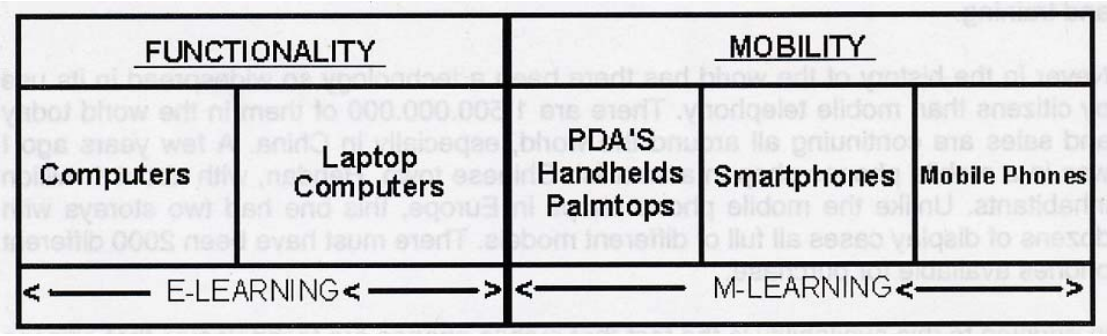

Figure 1. Functionality and mobility in a definition of mobile learning

This definition clearly emphasizes the uniqueness of mobile learning and distinguishes clearly mobile learning from the other sectors of education and training provision today: face-to-face education, distance education and e-learning.

Face-to-face education is traditional, conventional education in school classrooms, university lecture halls, laboratories and training centres. It has existed at least for 2000 years and for 1000 years at university level. It is different from mobile learning because it is based on interpersonal communication between the teacher and the learning group and, if it uses technology, this is used as a supplement to the teacher and not a substitute for the teacher.

Distance education started over a hundred years ago and finally became a recognized sector of educational provision with the foundation in the 1970s of the European Open Universities, notably the Open University of the United Kingdom at Milton Keynes, the FernUniversität in Hagen, Germany and the Universidad Nacional de Educación a Distancia in Madrid, Spain. These universities brought about an immediate change in the quality and quality of distance education provision and the acceptance of university degrees by distance education. Mobile learning differs from distance education because it uses wireless devices instead of the multimedia packages of distance education.

E-learning means electronic learning, that is the provision of education and training on wired desktop and laptop computers via the Internet and the World Wide Web. E-learning began about 1995, when the World Wide Web first became available to educators and quickly became a recognized sector of education and training provision, with its degrees and qualifications quickly accepted and recognized. Mobile learning differs from it because it uses only wireless devices and because of the mobility of the learner while learning.

It should be noted that although mobile learning shares many of the separation of the teacher and the taught and the separation of the learner from the learning group of distance education and e-learning, it can also be used in face-to-face education. In fact, some of the earliest examples of mobile learning are the use of PDAs by Professor

Sharples with groups of primary school children in Birmingham, United Kingdom in the 1990s.

One of the characteristics of mobile learning is that it uses devices which citizens are used to carrying everywhere with them, which they regard as friendly and personal devices, which are cheap and easy to use, which they use constantly in all walks of life and in a variety of different settings.

Another distinguishing characteristic of mobile learning is that for the first time in the history of the use of technology in education there is a technology (mobile telephony) which will be owned by nearly every one in the world and can be used for education and training by everyone in the world.

The justification for this comes from an address to the United Nations on 25 September 2008, by the CEO of Ericsson, Carl-Henric Svanberg, in which he stated 'Today there are more than 3.7 billion mobile subscriptions around the world. In a few years we will pass 5 billion. Ninety percent of new growth will come from emerging economies'.

One has to respect the research of Svanberg's researchers but to achieve his statistics of 5 billion mobile devices for a world population of 6.5 billion, nearly every person in Africa and Asia would need to possess one.

Never in the history of the use of technology in education has there been a technology as available to citizens as mobile telephony. One can safely conclude that every student in every course in every higher and further education institution in every country in the European Union possesses one. For the first time in history the European Ministries of Education will not have to pay for the use of technology in education because the students own the technology to be used.

The fields of distance education, e-learning and mobile learning have many aspects in common, especially the separation of the teacher and the learner and the replacement of the teacher in the classroom or lecture theatre by a form of communication based on technology.

The wonderful developments of technology in the Industrial Revolution of the 19th century, especially in the fields of transport and communication, led to the beginnings of distance education and the beginnings of teaching at a distance.

The wondrous developments of technology in what we may call an Electronics Revolution of the 1970s led to the development of e-learning.

In the last years of the 20th century there was what we may call a Wireless Revolution. Suddenly wireless connections began to replace wired ones all over the world. Wired telephone boxes in cities all over the world stood empty as citizens stood outside them talking on their mobile phones. It was from this 'revolution' that the field of mobile learning was born.

Definition of leading authorities

Three of the leading authorities in Europe on the field of mobile learning are all from the United Kingdom.

They are:

- Professor Mike Sharples of Nottingham University, often referred to as the 'father of mobile learning'
- Professor Agnes Kukulska-Hulme of the Open University of the United Kingdom, joint editor with Traxler of the first book on mobile learning *Mobile learning: a handbook for educators and trainers*
- Professor John Traxler of Wolverhampton University, joint editor with Kukulska-Hulme of the first book on mobile learning *Mobile learning: a handbook for educators and trainers* and an administrator of the €15.000.000 UK government fund for the development of mobile education in Further Education institutions.

Sharples

Sharples gives us two definitions of mobile learning:

1. Any sort of learning that happens when the learner is not at a fixed, predetermined location, or learning that happens when the learner takes advantage of the learning opportunities offered by mobile technologies.

This is the Wikipedia definition developed by Sharples when working on the MOBILearn project, led by Giunti Labs (now Exact Learning) in the early 2000s. In this definition Sharples insists on two characteristics of mobile learning: the mobility of the learner '*when the learner is not at a fixed, predetermined location'* and the use of wireless devices '*the learning opportunities offered by mobile technologies'.*

2. The processes of coming to know through conversations and explorations across multiple contexts amongst people and personal interactive technologies.

This is a more recent (2009) definition in which Sharples insists on the context of the learner and prefers the terminology '*personal interactive technologies'* for wireless devices.

A clear theme is:

In the early research, the concept of mobile learning was strongly linked to the device (Sharples et al., 2002) and the potential for enabling lifelong learning (Sharples, 2000). However, it soon became clear that rather than the device, the focus should be on the mobility of the learner.

The conclusion is:

Current work is exploring the notion of learning in the mobile age, to develop a theory of mobile learning that builds on Activity Theory and the Conversational Framework. The focus of this work is on mobile learning as communication in context.

Sharples also gives us four criteria for guidance on developing a definition of mobile learning:

- Distinguish what is special about mobile learning compared to other types of learning activity
- The concept of mobile learning must embrace the considerable learning that occurs outside offices, classrooms and lecture halls
- To be of value it must be based on contemporary accounts of practices that enable successful learning
- It must take account of the ubiquitous use of personal and shared technology. Just as learning is being re-conceived as a personalized and learner-centered activity so mobile networked technology can enable people to gain and share information wherever they have a need, rather than in a fixed location such as a classroom.

Kukulska-Hulme

Kukulska-Hulme provides a recent (2010) definition of mobile learning in work done for UNESCO:

Mobile learning is part of a new learning landscape created by the availability of online and personal technologies supporting flexible, accessible, learner-focused education. Mobile, wireless devices can be used on their own, or in learning activities that combine various technologies and media according to what is readily available and what learners need, wherever they are. Mobile learning emphasizes the centrality of learners and close integration of learning with other aspects of their lives and work, so that education is no longer seen as a separate activity that has to take place in a school, college, university or other establishment.

This is a detailed definition in which Kukulska-Hulme identifies:

- The educational context '*a new learning landscape supporting flexible, accessible, learner-focused education*'
- The use of mobile learning either on its own or in a blended learning situation where it is used with other technologies
- The central position of the learner and
- A unique focus of integration of learning with other aspects of life '*integration of learning with other aspects of their lives and work, so that education is no longer seen as a separate activity that has to take place in a school, college, university or other establishment.*

Traxler

Traxler writes:

After lots of discussion about the definition, involving inter alia 'context' and 'mobility', I thought it's probably just 'learning with mobile devices'. Why all the discussion in journal papers? Perhaps 'learning with mobile devices' is just deemed too simple. There were I think however other factors too. I think in the early days it quickly became apparent that mobile learning represented something much more significant than just the chance to access old-style e-learning, tethered e-learning as it became known in some circles, whilst on the move, or to open up old style e-learning to new communities and new countries. Hence all the stuff about 'context'.

However we also have the phrases 'technology enhanced learning' in the UK and these days I'd argue that the phrases create a meaningless distinction between the learning and the technology. These days there isn't (in the 'developed' world) learning that is not 'enhanced' by technology and if there were, that learning, the learning not enhanced by technology, would be irrelevant to our societies, societies that are transformed by pervasive, ubiquitous, personal, connected technologies, technologies that change everything.

So because I'm arguing that phrases like 'with mobile devices' go without saying, are taken-for-granted and redundant in our societies, my definition of mobile learning becomes 'learning'.

Important aspects are:

- Mobile learning is defined as ‘learning with mobile devices’
- Emphasis on the concepts of ‘context’ and ‘mobility’
- Clear distinction from e-learning: not ‘*the chance to access old-style e-learning, tethered e-learning as it became known in some circles, whilst on the move, or to open up old style e-learning to new communities*
- Rejection of *'technology enhanced learning'* in contemporary society
- Mobile learning is ‘learning’.

Types of definitions of mobile learning

Winters (2006) of the Institute of Education at the University of London groups definitions of mobile learning into four groups:

1. Technocentric. This perspective dominates the literature. Here mobile learning is viewed as learning using a mobile device, such as a PDA, mobile phone, iPod, PlayStation Portable etc.

The mLeMan definition, cited above, and the work of Traxler fall into this category.

2. Relationship to technology based training. This perspective characterises mobile learning as an extension of technology based training. These definitions often are all-inclusive and do not help in characterising the unique nature of mobile learning.

3. Augmenting formal education. In the mobile learning literature, formal education is often characterised as face-to-face teaching, or more specifically, as a stereotypical lecture. However, it is not at all clear that this perspective is wholly correct. Forms of distance education have existed for over 100 years leading to questions regarding the place of mobile learning in relation to all forms of "traditional" learning, not only the classroom.

4. Learner-centred. In the early research, the concept of mobile learning was strongly linked to the device. However, it soon became clear that rather than the device, the focus should be on the mobility of the learner. This led to considering mobile learning from the learner's perspective, and to the definition that: "Any sort of learning that happens when the learner is not at a fixed, predetermined location, or learning that happens when the learner takes advantage of learning opportunities offered by mobile technologies". Current work is exploring the notion of learning in the mobile age and on mobile learning as communication in context.

The work of Sharples falls clearly into this category.

2. Why m-learning??

There never was a technology as widely available to citizens as mobile telephony. This technology connects people working at different places and different education and learning paths with opportunities for expert and peer feedback and co-learning. Mobile technology offers unprecedented possibilities for combining the strengths of formal and non-formal education and professional internship. For the first time in the history of the use of technology in education and training, is a technology that will cost the learners nothing, because they own the technology to be used.

The m-learning is emerging as a new sector in education and training provision, side by side with face-to-face education, distance education and e-learning. Just as distance education was recognized and accepted as a field in the 1970s when the great European Open Universities were founded and e-learning was accepted as a field in 1995 when the World Wide Web first became available to educators. We can say that we have been in the process of acceptance of m-learning from the beginning of the 21st century, along with 3G/UMTS and Smartphone.

3. m-learning in areas with no e-learning

There is much activity, much discussion and much interest in the capacity of mobile devices to deliver, support and enhance learning for the disenfranchised, the disadvantaged and the developing communities and regions of the world.

Many areas of Asia and Africa are isolated from the rest of the world owing to poor geographical and physical infrastructure; and the cost of connecting these areas via the Internet is prohibitive. Dholakia (Dholakia and Dholakia , 2004) wrote that "in regions

with difficult geography or poor economic conditions, mobile networks can be designed and implemented in far quicker and cost-efficient ways than fixed networks".

Wireless and mobile technologies make it possible to provide learning opportunities to learners that are without or unreliable infrastructure for access (e.g. rural or remote learners) or where, also in presence of the infrastructure, there is an erratic and inadequate power supply. This is the typical scenario of several African developing countries where, despite inefficient wired telephone lines, the adoption rate of mobile technologies is among the highest rates globally.

Visser and West (Visser and West , 2005) wrote that in South Africa less than 11 per cent of the population owns a landline telephone whereas 90 per cent of the country's population has access to telephones due to the widespread use of cellular telephones.
By 2009, about one third of the African population had a mobile phone subscription (South African mobile phone use reached 90.16 mobile phone subscriptions per 100 people in 2008 (ITU, 2009)) – as opposed to only 8.7% using the Internet through desktop computers (Internet World Stats). With approximately 360 million cell phone subscribers, Africa has surpassed the USA (270 million subscribers), according to the UN Information Economy Report 2009 (Uni, 2009).

Brown (Brown, 2003) studied the use of mobile phone support at the University of Pretoria in South Africa, and reported that mobile learning "has already started to play a very important role in e-learning in Africa," and that the growth of m-learning "has brought e-learning to the rural communities of Africa to learners that we never imagined as e-learning learners just a few years ago". Brown observed that responses to information provided via SMS messages were "in mass and almost immediate", and that, without the use of SMS, "posted information would have taken between 3 and 18 days . . . to reach all the students". A particular benefit reported by Brown's study was the value of bulk SMS messaging, which resulted in a saving 20 times greater than when the postal service was used to distribute information to learners. The use of mobile phones for bulk SMS mailing has also been employed in Kenya, for in-service teacher training (Traxler & Dearden, 2005).

As a distance education delivery mode, SMS has already proved to be cost-effective and efficient. However in 2005 the mobile phones have started to include full Internet access and introduced the 'always on' cellular technology which enables the cellular telephone user to access the Internet directly. This capability combined with increased power and screen size of the mobile device is fostering the replacement of the m-learning based on the simple SMS with the most complete and interactive mobile learning objects which include media objects, tests, social tools and data synchronization.
In summary, mobile phone technology is widespread, more affordable, easy-to-use, and is familiar to both learners and instructors of developing countries; with proper instructional design it promises educational opportunities with an increased flexibility for learners, satisfying the 'anytime/ anywhere' component of distance educations for those millions of learners where "traditional" e-learning does not or cannot work. And at a fraction of the cost of other methods.

4. m-learning is not e-learning on Mobile devices (by John Feser on http://floatlearning.com/2010/04/m-learning-is-not-e-learning-on-a-mobile-device/)

Clearly we don't use our cell phones in the same way we use our desktop or laptop computers. So it follows that the type of learning that is appropriate on a mobile device is very different than what we do at our desk. In fact, the differences between m-learning and e-learning are at least as great as those between e-learning and instructor-led training. The differences between those two deployment paths are so significant that it requires a completely different approach to instructional design, graphic and user experience design and information presentation. So, what makes m-learning so different from e-learning and why is m-learning such an important development?

The primary differences between m-learning and e-learning fall into four main categories: timing, information access, context and assessment.

Timing

The first major difference between e-learning and m-learning is the time when learning is expected to take place and the anticipated duration of the learning session. Most e-learning is designed for the learner to sit at a computer and progress through a specified amount of material for a period of time. The length of time required to complete a particular e-learning module varies, but generally the duration ranges anywhere from twenty minutes to two hours. Because the instruction is designed to run on a desktop or laptop computer, a specific time is usually chosen to complete the module.

But m-learning, by its very nature, is unmetered and can be done anytime and anywhere. In addition, the small screen sizes of today's mobile devices means individual interaction sessions, and by extension, learning sessions are much shorter in duration. Individuals don't want to spend an hour staring at their phone just to complete one learning objective. Instead, mobile learning is ideal for conveying smaller chunks of information that can be absorbed while waiting for the bus, standing in line at the grocery store or located on or around a job site.

An example of this type of training is a quick reference guide. Imagine a new salesperson who has just completed her company's online sales training course. The course was comprehensive, covering a lot of material, including the company's custom sales process. Now she is on her first sales call. Arriving fifteen minutes early, she pulls out her smartphone and reviews a checklist of the 5 key elements of a successful sales call. Seeing that the number one element is to know the name and title of the person she is calling on, she quickly checks her notes and reviews the information about her sales contact. This sort of just-in-time experience exhibits the value in making your learning content mobile.

Information Access

When taking an e-learning course on a topic, such as a sales training or a new product introduction, two key learning objectives are comprehension and retention. Because the information being learned will be applied at a later time, it is critical that the material be understood and remembered until it is needed. m-learning, on the other hand, is more about accessing information at the moment it is needed. This implies that successful m-learning is more about easy and convenient access to information and less about committing information to memory.

Take healthy eating as an example. A lesson on the benefits of healthy eating would make for an excellent e-learning topic due to the amount of information and the level of compression necessary to convey the key points. This type of learning would most likely

not be appropriate for a mobile device. On the other hand, learning whether the Caesar salad or a bowl of black bean soup has more calories at a local fast food restaurant via a simplified interface tailored for the device is an ideal application for mobile learning.

Context

There is no doubt that mobile devices are being used for tasks that extend far beyond talking on the phone and sending text messages. The capabilities of these devices extend across a wide spectrum from geolocation to photography to internet access. As a result, our context drives how we use our mobile devices. If it is lunchtime and we are in an unfamiliar city, we may use a mobile application or the internet to find a suitable place to eat or relax at a park.

Context is one of the key areas where m-learning is distinguished from e-learning. With e-learning, as with instructor-led sessions, it is critically important to establish the context so that the learner understands the importance of the subject matter. For instance, take an e-learning module about the importance of performing a safety check before using a piece of equipment. You would most likely start the instruction with a discussion of why safety checks are important and specifically how they relate to the particular piece of equipment being discussed. Once the context has been established, information on the actual safety check process can be presented.

With m-learning, however, the context has already been established. For example, the defense company, Lockheed Martin has recently developed an iPhone app that includes a full pre-flight checklist for the C-130 Hercules Transport plane. The app contains a rotatable, zoomable image of the plane as well as a visual step-by-step guide to each task required prior to flight. The idea is that a visual checklist is easier to use and interpret than a written document. When you add in the ability to clearly see close-ups or levels of detail that simply wouldn't be possible in a traditional checklist, the value in leveraging the context of being next to the item you are inspecting or using becomes obvious.

Assessment

With e-learning the gap between when learning occurs and when it is applied in practice can be significant, especially when compared to mobile learning. As a result, the methods of assessment are very different for the two learning styles. While Donald Kirkpatrick's four levels of learning evaluation are applicable to both e-learning and m-learning, the approach to evaluation is different.

When assessing an e-learning module, it is relatively easy, through a series of questions to determine the success of Level 1 – Learner Reaction (what the learner felt about the training) and Level 2 – Learning (the resulting increase in knowledge or capacity). However, with Level 3 – Behavior and Level 4 – Results, it becomes much harder to assess the impact of the e-learning. This is not to say that Behavior and Results are hard in and of themselves to measure. But so many other factors can influence a person's behavior or an organization's results, that it is difficult to tie these changes specifically to e-learning.

The time span between when mobile learning actually occurs and the application of that learning is usually very short, often it is immediate. As a result, it is much easier to assess m-learning's impact on both an individual's behavior and the ensuing business results. In addition, because m-learning is less about comprehension and retention and more about easy access to the right information, Level 1 and Level 2 assessments are less important if the behaviors and results are appropriately changing.

5. Difference in tables (http://www.youtube.com/watch?v=QI4UzwE1ols)

Differences in Technology

e-learning	m-learning
Computer	Mobile device
Bandwith	GPRS, G3, G4, Bluetooth
Multimedia	Objects
Interactive	Spontaneous
Hyperlinked	Connected
Collaborative	Networked
Media-rich	Lightweight
Distance learning	Situated learning
More formal	Informal
Simulated situation	Realistic situation
Hyperlearning	Constructivism, Situationism, Collaborative

Pedagogical differences

e-learning	m-learning
More text- and graphics based instructions	More voice, graphics and animation based instructions
Lecture in classroom or in Internet labs	Learning occurring in the field or until mobile

Differences with respect to methods of evaluation

e-learning	m-learning
Asynchronous and at times delayed	Both asynchronous and synchronous
Mass/standardized instructions	Customized instructions
Benchmark-based grading	Performance & improvement-based grading
Simulations & labs-based experiment	Real-life cases and on the side experiments
Paper-based	Less paper, less printing, lower cost

6. Conclusions from our needs analysis and literature study presented above

The new mobile learning arena imposes significant new design requirements of training programs - the ways they are structured and maintained.
The effective m-learning imposes specific usability requirement. The assessment of the mobile learning in terms of learning outcomes is similar in all VET systems but techniques in m-learning are specific.

The validation of the assessed formal and non-formal m-learning should be done in accordance with the common European principles. The quality assurance should be an integral part of the management of m-learning providing institutions.

Our study shows that managerial level in the field will acts as premise and stimulus to development of job-roles in the design and development levels. m-learning Manager is a manager but should know about the specific of m-learning pedagogy, m-learning technology and m-learning application development. He or she is not a developer, or teacher – he or she has to organize and manage m-learning design, development, evaluation and implementation into his, or her, organization. In this light he or she needs to get a picture of development and teaching processes of m-learning. m-learning Manager should be aware of the benefits and potential of m-learning, staff needed for m-learning development, resources and organization.

Mobile learning differs from electronic learning (usually referred to as e-learning) because it uses smartphones, mobile phones, PDAs (Personal Digital Assistants), palmtops and similar devices instead of the desk top and lap top computers of e-learning. This means that mobile learning, unlike e-learning, uses devices which citizens are used to carrying everywhere with them, devices which a man can carry in a pocket or a woman can carry in a handbag and uses devices which citizens regard as personal, friendly, cheap and easy to use.

A further difference is the mobility of the learner in mobile learning. The mobility of the learner is seen with commuters on buses, trains and metros, with learners on the job for instance on a crane or at a base station and with learners at art galleries, museums or tourism locations.

A major difference is in the type of technology used which means that there are types of learning that mobile learning can do that the other sectors of education and training (face-to-face, distance education and e-learning|) cannot do or cannot do as well as mobile learning: context sensitive and location sensitive learning materials and augmented reality.

A development which has the potential to transform the way we use mobile devices to interact with the world is Augmented Reality or AR. This specifically generates composite views using the real scene viewed by the user and a virtual scene generated by the device. The key aspect of AR is that the virtual elements enhance the person's performance and perception of the world by supplying relevant information that is not contained in the real world. MAR (Mobile Augmented Reality) systems are intelligence amplifying systems to enhance human cognitive activities, such as attention, planning, and decision making. AR (Augmented Reality) crucially provides both the direct primary experience (the real world scene) and the mediated representation (the digital augmentation). As a result AR provides significant support and opportunity for real time situated learning.

7. Comparison between e-learning Manager skills card and m-learning Manager skills card

REFERENCES

Brown, T. (2003). *The role of m-Learning in the Future of e-Learning in Africa?* http://www.tml.tkk.fi/Opinnot/T-110.556/2004/Materiaali/brown03.pdf

Dholakia, R., & Dholakia, N. (2004). Mobility and Markets: Emerging outlines of m-commerce. *Journal of Business Research, 57*(12), 1391-1396.

Gadd, R. (2010) Top myths and misconceptions of mobile learning. *Learning Solutions Magazine* (9 June 2010)

Feser, J. (2010) Who owns mobile learning in your organization? *Learning Solutions Magazine* (29 October2010)

ITU. (2009). Online statistics, ICTeye. http://www.itu.int/ITUD/icteye/Indicators/Indicators.aspx

Kukulska-Hulme, A. and Traxler, J. (eds) (2005) *Mobile learning: a handbook for educators and trainers.* London: Routledge

Laouris, Y. and Eteokleous, N. (2005) 'We need an educationally relevant definition of mobile learning. *Proceedings of 4th World Conference on Mobile Learning.*

O'Malley, C., Vavoula, G., Glew, J., Taylor, J., Sharples, M. and Lefrere, P. *Guidelines for Learning/Teaching/Tutoring in a Mobile Environment.* Retrieved from http://www.mobilearn.org/download/results/guidelines.pdf

Sharples, M. (2006)(ed) *Big Issues in Mobile Learning: Report of a workshop by the Kaleidoscope Network of Excellence Mobile Learning Initiative.* Nottingham: University of Nottingham

Sharples, M., Taylor, J. and Vavoula, G. (2007) A theory of learning for the mobile age. In Andrews, R. and Haythornthwaite, C. (eds) *The Sage handbook of e-learning research.* London: Sage, 221-247.

Traxler, J., & Dearden, P. (2005). *The Potential for Using SMS to Support Learning and Organization in sub-Saharan Africa*. http://www.wlv.ac.uk/PDF/cidt-article20.pdf

Traxler, J. (2005) Defining mobile learnng. *Proceedings of IADIS International Conference on Mobile Learning.*

Traxler, J. (2007) Defining, discussing and evaluating mobile learning: the moving finger writes and having writ…*International Review of Research in Open and Distance Learning.*Vol 8. No 2.
Uni (2009), http://www.unctad.org/Templates/Download.asp?docid=11915&lang=1&intItemID=5133

Vavoula, G. & Sharples, M. (2009) Meeting the Challenges in Evaluating Mobile Learning: a 3-level Evaluation Framework. *International Journal of Mobile and Blended Learning*, 1,2, 54-75.

Visser, L., & West, P. (2005). The Promise of m-learning for Distance Education in South Africa and Other Developing Nations. In Y. Visser, L. Visser, M. Simonson, & R. Amirault (Eds.) *Trends and Issues in Distance Education: International perspectives* (pp. 117-129). Greenwich, CT.: Information Age Publishing.

Winters, N. (2006), 'What is mobile learning?',In M. Sharples (Ed.) *Big Issues in Mobile Learning: Report of a workshop by the Kaleidoscope Network of Excellence Mobile Learning Initiative.* Nottingham: University of Nottingham