Low-key m-learning: a realistic introduction of m-learning to developing countries

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Abstract:
In August 2004, the Faculty of Health Sciences (FHS) at the University of Cape Town (UCT), South Africa, recognised a need to communicate with students in ways not accommodated by current online methods. Consequently, it planned a Pilot project, to be implemented in January 2005, to examine an m-learning solution. The solution had to be:

- guided by the current m-learning philosophy, theory, and practice
- contextualised in the current reality, and
- driven by the needs of the courses and the students

After an investigation into these principles, and an examination of the realistic possibilities, it was decided to use early generation cell phones to supplement administrative procedures in the running of two of its face-to-face courses. The courses chosen for the project were the 2nd-year and 3rd –year Medical degree (MBChB) courses. The type of communication chosen would be exclusively the broadcast of administrative messages such as re-scheduling (and cancelling) of classes, network problems, and availability of test results.

At a superficial glance, with its concentration on administrative functions, the project does not seem remarkable, particularly as the developed world moves into sophisticated m-learning.

The importance of the project, however, is that it illustrates a set of principles useful for the introduction of this technology into the third-world environment, or into any institution making first steps into m-learning. Apart from meeting the current need, the project aims at a philosophical and psychological goal of adapting current mind-sets of staff and students to the use of mobile communication in teaching. This will be in preparation for full-blown m-learning possibilities as the technological context develops.

This model can be used in other courses at the institution, and at other third-world institutions, to provide the foundations for transitions into m-learning.

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1. Introduction

Mobile learning (m-learning) is gathering force around the world. That statement is so obvious, one flinches at its blandness. Except, of course, that it is *not* true for millions of people living in developing countries, and might not even be true for many in developed countries.

While we, in developing countries, do not have the infrastructure to supporting m-learning, we do have similar *needs* for m-learning. We also recognise that m-learning is more than merely using a mobile device for e-learning,[1] and that it requires an entirely different mindset in education. We must understand this mindset so that, as the technology becomes more easily available, we can harness it properly. Further, our solutions might allow us to contribute to the body of knowledge and experience, thereby weakening the image of the developing country's begging bowl continually asking for handouts.

The problem is: where and how to start.

2. Our own vision

A starting point is our own vision, experiences and proposed destinations. Like most universities, the University of Cape Town (UCT), South Africa, has seen the potential of communicating with students in scenarios other than traditional face-to-face situations. The Faculty of Health Sciences (FHS) uses WebCT, an online Learning Management System (LMS), extensively in its undergraduate face-to-face courses. The LMS is a solid foundation on which to build flexible learning, including m-learning.

Accessible through computer laboratories or slow and expensive dial-up connections, however, it does not cater for communication with our students who are mobile; either travelling to or from campus, or working in off-campus sites such as clinics and hospitals. It is with these students, that m-learning in Health Sciences will come into its own. Contributing to the picture is the fact that PDAs are already being used by both qualified medical professionals[2] and in medical education.[3]

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[1] As noted by Turuen H. Syvänen, A., Ahonen, M. 2001. "Supporting Observation Tasks in a Primary School with the Help of Mobile Devices." In Nyíri, Kristóf (ed) *Mobile Learning: Essays on Philosophy, Psychology and Education*, pp. 209-221. Vienna: Passagen Verlag.

[2] See Johnson, ED, Pancoast, PE, Mitchell JA, and CR Shyu. 2004. "Design and evaluation of a personal digital assistant- based alerting service for clinicians." *Journal of the Medical Library Association* 92 (4): 438-44. Torre, Dario M. and Scott M Wright. 2003. "Clinical and Educational Uses of Handheld Computers." *Southern Medical Journal*. 96 (10): 996-999. Giammattei, Frank P. 2003. "Implementing a Total Joint Registry Using Personal Digital Assistants." *Orthopaedic Nursing.* 22 (4): 284-289. Fontelo, P, Ackerman, M, Kim, G and C Locatis. 2003. "The PDA as a Portal to Knowledge Sources in a Wireless Setting." *Telemedicine Journal & E-Health*. 9 (2): 141-147.

[3] See: Relan, A. and Bailie S. 2001. "Invigorating Clinical Education via Handheld Computing" In Nyíri, Kristóf (ed) Mobile Learning: Essays on Philosophy, Psychology and Education, pp. 223-233. Vienna: Passagen Verlag. Torre, Dario M. and Scott M Wright. 2003. "Clinical and Educational Uses of Handheld Computers." Southern Medical Journal. 96 (10): 996-999.

With this in mind, during August 2004, UCT's FHS planned a Pilot to investigate m-learning technology to support its teaching. There were three principles guiding the planning:

1. A recognition of the current theory, philosophy and experimentation so that we could learn from others. We would also keep in mind their predictions and projections, so that their vision could act as a guide.
2. A need to understand our technological and cultural context. South Africa, although more technology developed than most African countries, is not a developed country. Implementation strategies must note this for long-term sustainability.
3. The driving force behind the project was *not* interesting technological experimentation, but rather the educational needs and requirements of the courses, students and staff.

The goal was the practical implementation of a project using an appropriate device or technology[4] that could

- accommodate these principles,
- serve as a frame-work for other projects (our own and other institutions), and
- contribute to the body of theory and philosophy of m-learning.

3. Theoretical Framework

With the wide range of views on m-learning, we cannot accommodate every aspect and discussion. We can, however, draw on those appearing to be the most prevalent.

3.1 Pedagogy

The driving force behind using the technology is the pedagogy. In particular, m-learning is driven strongly by (or at the very least, thrives within education that is driven by) learner-centred and constructivist principles,[5] is aimed at life-long learning,[6] is collaborative, [7]especially where boundaries between disciplines are

[4] Stone, A., Alsop, G., Briggs, J. Tompsett. C. "M-learning as a means of supporting learners: tomorrow's technologies are already here, how can we most effectively use them in the e-learning age?" Networked Learning 2002, Sheffield.

[5] Milrad, M. 2001. "Mobile Learning: Challenges, Perspectives, and Reality" in Nyíri, Kristóf (ed) Mobile Learning Essays on Philosophy, Psychology and Education. Pp 151-164. Vienna: Passagen Verlag. Sharma, Sushil K., Kitchens, F.L. "Web Services Architecture for M-Learning." Electronic Journal of E-learning. 2 (1): paper 2 [np]. Available: http://www.ejel.org/volume-2/vol2-issue1/issue1-art2.htm

[6] Kárpáti, Andrea. "Digital Didactics for Mobile Learning." in Nyíri, Kristóf (ed) Mobile Learning Essays on Philosophy, Psychology and Education. Pp 175-187. Vienna: Passagen Verlag.

[7] Nyíri, Kristóf. 2001. "Preface" in Nyíri, Kristóf (ed) Mobile Learning Essays on Philosophy, Psychology and Education. pp 13-15. Vienna: Passagen. In the same text, see articles by Milrad, M, Mifsud, L., Kárpáti, A., Stone, *et al*, and several others.

While the idea of taking the computer to the student is good, the actual computer *taken* is not. This solution should be seen as a medium-term solution at best.

3.3 Ubiquity of the technology

Although there is disagreement in the literature about the *translation* of "ubiquity" into practice,[13] there *is* agreement that ubiquity of the technology is a requirement.

By ubiquitous, we mean *already* ubiquitous, not merely ubiquitous for the duration of a Pilot, for this can create a dangerous illusion of continuity. Stone *et al* [14] argue that "Whenever new technologies are being used in a project, it is inevitable that a dependency exists on the hardware suppliers, in terms of their commitment for the duration of the research project." They cite an example of a hardware supplier withdrawing from a project and the resultant implications. This reliance on an outside hardware supplier is a risk not worth taking – not only to the project, but also to the feasibility of a wider application once the project has ended.

In addition, if the technology has been supplied for the Pilot only, then what does one do with it after the Pilot? Withdrawing it from the students is harsh after the undoubted reliance has been created, and expanding the supply to all the students will be an unexpected expense.[15]

There are two more arguments for the technology's being already ubiquitous. One is that it will remove the technological novelty of the Pilot, which might skew survey results.

Ubiquity will arise because the technology exists in our society; we will not accomplish it by having an institution make a large-scale purchase (or even receiving such a donation) of exotic technology in order to meet these needs. This technological island is not sustainable without massive funding. (As it is, the Pilot will no doubt highlight issues of scalability not previously considered –it would be irresponsible to begin a Pilot already knowing that the chief technological component could not be used in a full-scale project).

Of course, ubiquity of this sort relies on the use of students' personal equipment for education. Some research suggests a reluctance of students to have their personal equipment used in this way.[16] Perhaps on blind faith then, we believed that if the

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[13] For example, a range can be found by glancing at Stone, *et al, op cit.,* Milrad, M. *op cit.*, Sharma, *op cit.*, Nyíri, K. "Pictorial Meaning and Mobile Communication" In Nyíri, Kristóf (ed) *Mobile Learning: Essays on Philosophy, Psychology and Education*, pp. 157-184. Vienna: Passagen Verlag. Quinn, C. 2000. "mLearning: Mobile, Wireless, In-Your-Pocket Learning. LineZine." Available: http://www.linezine.com/2.1/features/cqmmwiyp.htm Turuen, H. Syvänen, A., Ahonen, M. 2001. "Supporting Observation Tasks in a Primary School with the Help of Mobile Devices." In Nyíri, Kristóf (ed) *Mobile Learning: Essays on Philosophy, Psychology and Education*, pp. 209-221. Vienna: Passagen Verlag.

[14] Stone, *et al op cit.*

[15] This is probably less of a problem in developed countries, where, by the time the Pilot has ended, the technology has become more widespread. I am indebted to Marcelo Milrad for this point.

[16] Divitini, M, Haugalokken, OK, Norevik, P-A. 2002. "Improving communication through mobile technologies: Which possibilities?" In Proceedings of the IEEE International Workshop on Mobile and Wireless Technologies in Education, Vaxjo, Sweden, August 2002, IEEE Press.

student's need for the communication is great enough, this reluctance might be overcome.

In South Africa, the only mobile device that is currently a contender for ubiquity is the early generation cell phone, recognised as virtually ubiquitous amongst student communities internationally.[17] The International Telecommunication Union (ITU) figures[18] show that South Africa's overall cell-phone density is relatively high (30%) compared to the world (19%) and African average (5%), and is increasing rapidly, as it is elsewhere in Africa.[19]

A 2004 survey showed that more than 95% of our Faculty's students have cell phones. There are no figures in South Africa for PDAs, but as recently as 2002, they were not widespread amongst students in developed countries.[20]

4. The Choice

The above theoretical and philosophical framework outlines the primary concerns to be considered when choosing a device for m-learning, and we used this as a guide for our choice. Ubiquity, especially, led to the choice of the early generation cell phone over other technologies such as 3-G phones and PDAs. These and other tools as described in the literature would probably be an aiming point for the future.

5. The Needs

Before implementing the technology, however, one must establish the particular needs to be met. One must also recognise that, should the chosen technology be unable to meet enough needs, the project might well be postponed until the technological context has improved.[21] These needs will be part of the pedagogy driving the project.

In essence, we try to answer two questions:

- What needs can be met by the chosen technology?
- Will these needs be enough to justify the project?

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[17] Stone, *et al*, *op cit*.

[18] ITU figures have been rounded to the nearest percentage point. These are 2002 figures from International Telecommunication Union (2003) *World Telecommunication Development Report*, Geneva, Switzerland (p A-29-A-31). For 2004, SA's phone density is 36% and Africa is 6% (International Telecommunication Union (2004) *World Telecommunication Development Database*. Available: http://www.itu.int/ITU-D/ict/

[19] Stone, A, Lynch, K. Poole N. 2003. "A case for using mobile Internet and telephony to support community networks and networked learning in Tanzania." ICOOL 2003 - International Conference on Online and Open Learning.

[20] Divitini, M, *et al*, *op cit*. (South Africa's first G3 network came into operation in 2005. This will surely have an impact on the types of devices used by students, so should be monitored.)

[21] One would obviously prefer that the technology were designed entirely in order to meet the needs, as noted by Milrad, but, failing that, we identify the needs that can be met by the technology at hand. Milrad, M. *op cit*.

5.1 What needs can be met by the chosen technology?

5.1.1. Broad education needs

It is clear that m-learning needs served by only sophisticated functionality,[22] cannot be considered in the current South African environment. In fact, even static images, which would add great value to our communication,[23] are not currently feasible. The environment, especially ubiquity, however, should be monitored and evaluated over time so that we can respond to opportunities. In the mean time, sophisticated communication will be restricted to WebCT, the LMS.

Other needs can be met by the cell phones, particularly by the Short Message Service (SMSs). From the literature, one sees that students need assistance with basic time management,[24] (a problem exacerbated by mobility), especially in the form of "timely, relevant information provision ('where and when'…)", information regarding changes and updates in the LMS, exams, marks, seminars, date changes, and collection of marked coursework.[25]

In essence, then, the need that can be met by the cell phone is communicating information required too urgently to be accommodated by the LMS.

To determine the particular needs, we would survey the staff and students, using the needs identified as a basis from which to work. The survey would have to take into account the number of students expressing an interest and registering for the project. The literature[26] indicates that initial interest amongst the students is high, but uptake is slow. This implies that a low initial registration is expected, but should be monitored during the program.

Finally, the underlying need to be met would be the changing of the mindset of the staff: moving from a view of the cell phone as an irritation, to a communication device useful for education.

5.1.2. Costing Needs

The costs of the Pilot must be met. The Pilot must also take into account the costs to be met if wide-scale m-learning is implemented.

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[22] Such as such as wearable computers, videos, web pages, PowerPoint presentations, spreadsheets, and word-processed documents as described in various works. See: De Freitas, S. et al, *op cit*. Quinn, C. 2000. "mLearning: Mobile, Wireless, In-Your-Pocket Learning. LineZine." Available: http://www.linezine.com/2.1/features/cqmmwiyp.htm

[23] Nyíri, K. "Pictorial Meaning and Mobile Communication" In Nyíri, Kristóf (ed) Mobile Learning: Essays on Philosophy, Psychology and Education, pp. 157-184. Vienna: Passagen Verlag.

[24] Stone, A., Alsop, G., Briggs, J. Tompsett. C. *op cit*. Divitini, et al, *op cit*.

[25] Stone, A., Alsop, G., Briggs, J. Tompsett. C. *op cit*., Stone, A. 2004. "Blended Learning, Mobility, and Retention: Supporting First Year University Students with Appropriate Technology." MLEARN 2004, Bracciano, Italy. Divitini, *et al, op cit*.

[26] Stone, A. 2004. "Blended Learning, Mobility, and Retention: Supporting First Year University Students with Appropriate Technology."

Previous experiments[27] had shown that students would not be in favour of paying for such a service, so it should be as low-cost as possible. We have already referred to the risk associated with the reliance on outside assistance with equipment; large cash donations will leave one similarly exposed.

Ubiquity of the technology will already exclude a major cost – the cost of the device. One should investigate and negotiate for special rates for any external services. Further cost reductions can be achieved by ensuring that surveys and evaluations are performed using procedures and systems already in place.

In our case, the cell phone did not require purchase; we obtained a reasonable rate for the Pilot, and our LMS would be used for the registration, surveys and evaluation.

5.1.3. Reliability Needs

For a working service, one must ensure that one is not hampered by the unreliability and differences of providers; in our case, the different cell phone service providers. Given that the messages would assist time management, we would need to conduct tests across the networks to ensure that there was consistency and reliability in the message delivery.

5.2 Will these needs be enough to justify the project?

When all the needs to be met have been identified, one must still take a management decision on whether or not these are enough to justify the project. Only then can one decide whether to cancel, postpone or proceed with the project.

6. Managing Expectations

Expectations and attitudes amongst staff and students will vary, and the needs to be met, and the project's scope, must be advertised before the Pilot is run. Students will want all needs met, irrespective of costs, and knowledge of the technological sophistication amongst a few will place an unrealistic pressure on the Pilot. Contrastingly, all staff will not share this enthusiasm. The literature indicates that most teaching staff members see mobile devices as problematic,[28] and often, they are.

Students will need to learn etiquette – to be aware of when and where the use of these devices is acceptable. Staff will need convincing that any inconvenience will be off-set by the convenience offered when they wish to communicate with students. Once they have experienced this, we anticipate a mindset change that will eventually lead to the next stage of m-learning: using the technology in their teaching, and by students in their small group exercises. This is naturally far in the future, and is a long series of small steps away, but is a journey worth taking.

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[27] Stone, *op cit*. Divitini, *et al*, *op cit*.

[28] Stone, A., Alsop, G., Briggs, J. Tompsett. C. *op cit*., Milrad, M. *op cit*., Sharma *et al op cit*., Trotter, A. 2001. Handheld Computing: New Best Tech Tool Or Just a Fad?" Education Week, 26 Sept. 2001 Available: http://www.edweek.org/ew/articles/2001/09/26/04palm.h21.html (Understandably, 200 cell phones unexpectedly bleeping in a lecture fills most teaching staff with dread.)

Finally, it helps tremendously if these devices are already being used in the profession. From the references cited earlier[29] it is clear that the Medical profession uses these devices extensively – if one can regress this line of professional development to undergraduate education, then the value will be more obvious.

7. Evaluation

The project's evaluation is crucial to widespread implementation. Stone[30] received a low response (less than 7%) in surveys attempting to gain feedback from students, and his result serves as warning to us.

In our registration process, students would be made aware that participation in surveys is part of the Pilot project. While we reasonably would not expect a 100% response rate, we hope to have one higher than the 7% experienced by Stone. Further, we would set aside a discussion area in the LMS for discussion outside the formal evaluation structures.

8. The Model

The sections above describe the theory and our implementation.

While the first three elements (Pedagogy, Mobility and Ubiquity) have been dealt with in a linear fashion, that is a function of language's linearity rather than a chronological flow, for all three elements are inter-related to form the environment in which the Pilot is to be run. These first elements then form a single unit, and the stages and decisions that follow are then more easily represented in a flow diagram. The diagram is shown in Figure 1.

Some might criticise the model because it is apparently strongly driven by the technology rather than the educational needs. Surely one should start with the educational needs and then investigate a technology to meet those needs? The problem is that the educational needs are so vast, and this model is aimed at relatively immature technological environments; one risks "feature scope creep", or scoping needs that would be met only much further into the future.[31]

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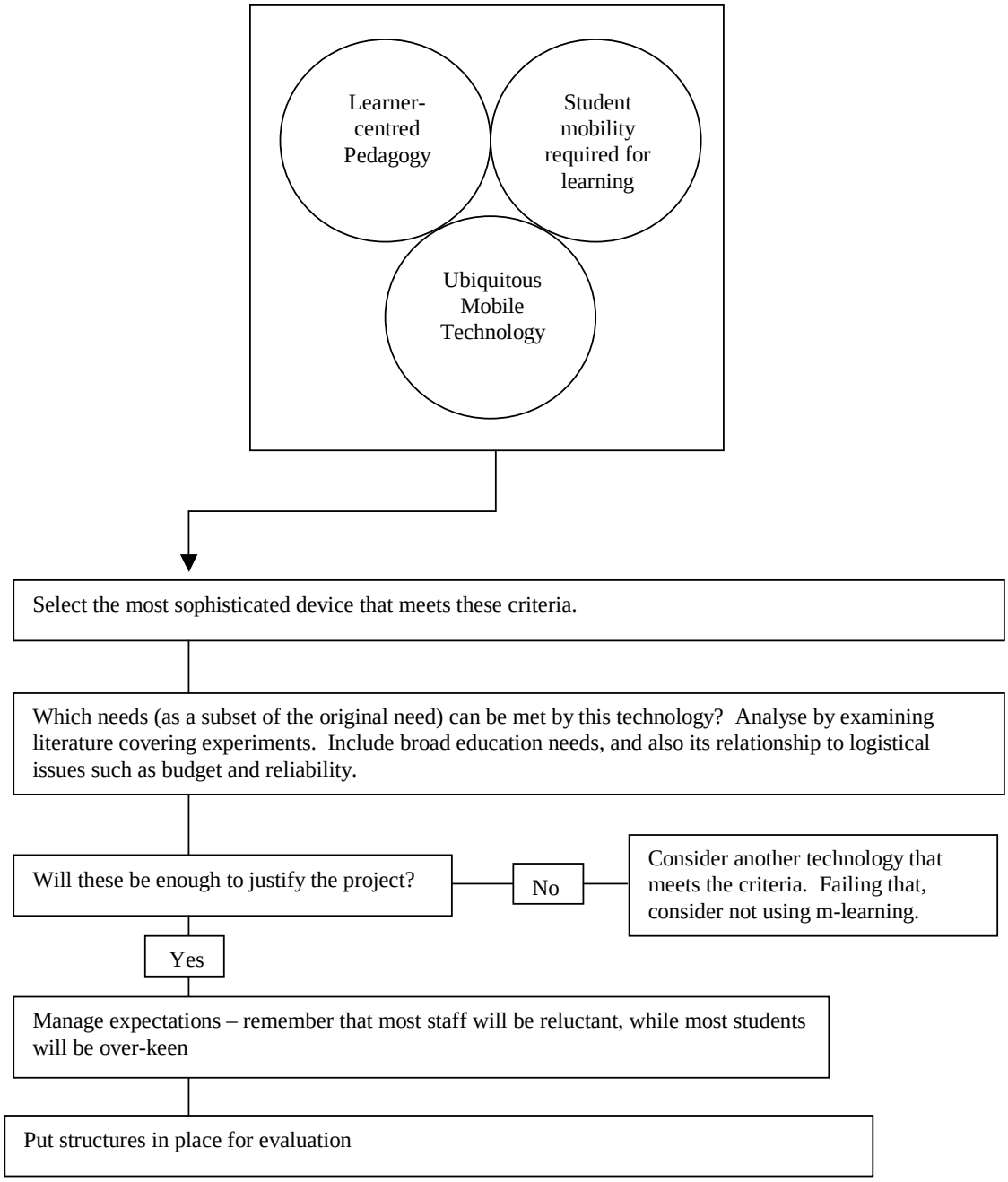
[29] Johnson, ED, Pancoast, PE, Mitchell JA, and CR Shyu. 2004. "Design and evaluation of a personal digital assistant- based alerting service for clinicians." Journal of the Medical Library Association. 92 (4): 438-44. Torre, Dario M. and Scott M Wright. 2003. "Clinical and Educational Uses of Handheld Computers." Southern Medical Journal. 96 (10): 996-999. Giammattei, Frank P. 2003. "Implementing a Total Joint Registry Using Personal Digital Assistants." Orthopaedic Nursing. 22 (4): 284-289.

[30] Stone, A, *op cit*.

[31] For example, a current need is to have mobile reporting of cases by students in hospitals and clinics. One obvious solution is the use of PDAs as described by Relan and Balie *op cit*. Because PDAs are so scarce amongst our students, however, ubiquity is not addressed, and so this solution cannot be considered. In time, as the South African technological environment changes, so too will the viability of this solution.

This model proposes that, after recognising a broad need for m-learning, we begin by examining our available resources, then investigate the needs that could be met by these resources, and then use these resources to meet the needs.

Figure 1: Model for transitions into m-learning



9. Conclusion

Internationally, many have recognised m-learning's value. Many more, however, especially in the developing world, are far from implementing m-learning. For these countries, the developed world's emphasis on highly sophisticated devices is a futuristic dream. That, however, is no reason for developing countries to delay implementing m-learning; it is imperative that, if the need exists, the institutions should begin the journey as soon as possible. The problem is, where and how to start.

This paper has proposed a simple model that is embedded in understanding m-learning theory (in particular, the principles of pedagogy, ubiquity and mobility) but which also takes into account the specific technological environment, and the needs, choices and expectation of both students and staff. While this paper's focus has been on developing countries, the model is applicable to all institutions that wish to embark on the road to m-learning.

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