



A conceptual model for the educational deployment of QR codes

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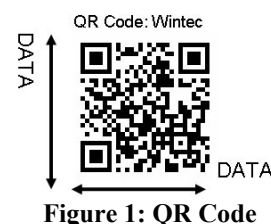
As mobile internet adoption increases, mobile engagement with information and access to services becomes increasingly routine. However, m-learning implementations are currently input dependent. The protracted methods of accessing stored information and services through phone-pad input functionalities is time-consuming, frustrating and serves to limit the uptake of m-initiatives. To increase the impact of m-deployments, to enhance flexibility of provision and also to advance the personalisation of learning, a number of institutions are using Quick Response (QR) Codes and Mobile Tags (MT) which allow users with embedded camera phones ready access to information and services. However, the increasing use of QR/MT creates challenges for the institution, for example, managing changes in approaches to learning, secondly, making informed investment decisions, and finally, evaluating impact. This paper describes a conceptual framework used by the Waikato Institute of Technology to integrate QR/MT within their current policies, procedures and institutional ICT infrastructure.

Keywords: flexible learning, m-learning, QR Codes, mobile tags

Background

It is increasingly recognised mobile learning (m-learning), in its variety of forms, is shaping, and being shaped by, the way we live, work and learn. Recent research indicates a growing acceptance of the use of mobile technologies in tertiary teaching and learning (Wexler, Brown, Metcalf, Rogers, & Wagner, 2008). However, m-learning implementations are often heavily “keypad” dependent. The protracted and often clumsy method of accessing stored information and services through the limited input functionalities of mobile phones is time-consuming, frustrating and affects uptake of these m-technologies. To increase the impact of m-deployments a number of institutions are using Quick Response (QR) Codes and Mobile Tags (MT) to provide learners with speedy and ready access to information and services (Ramsden, 2009) and formative assessments (Susono, & Shimomura, 2006) that are location sensitive.

The advantage of the QR code over a normal bar code, where information is presented solely in a horizontal direction, is the ability of the QR code to present contained information in both vertical and horizontal directions. This means substantially greater amounts of information (such as website addresses, text and numerical information, and contact details) can be stored within the code. The information contained in the QR code is decoded by a “smart-phone” with an embedded camera and code reading software installed. An example (Wintec Research Archive) is shown in Figure 1 on the right



Embedding QR codes into test environments, both physical and electronic, will enable learners to move from one place to the next, and to be able to use readily-available, handheld computing devices and

communication technology to access information and learning materials from anywhere and at anytime. In recent years, research has indicated that learners are increasingly emphasising the importance of communication and collaboration in teaching and learning along with convenience and flexibility, to accommodate the needs of their active lifestyles. In other words, learners are looking to educational providers to deliver in a relevant manner that is technology-enhanced rather than technology-driven (Traxler, 2007).

The creation of location-based access to communication channels broadcasting information and providing services does not, in itself, provide the learner-centred environment tertiary institutions are striving to create. Traffic generated through the channels needs to be monitored, usability assessed, student learning requirements have to be identified, mobile-appropriate content provided, and tutors need to engage with students in a consistent and meaningful manner. In essence, m-technologies should be integrated with institutional e-learning services such as learning management systems (Muevo, 2009), with professional development support structures and with accepted pedagogical models.

QR/MT project overview

Across the education environment a shift of focus is occurring which places the learner within context, whose needs define technical specifications, content management, a rich set of capabilities and services, accessibility and authorisation protocols. The new model offered is – ‘learner demands, the technology supplies seamlessly’ – differing from the traditional ‘technology defines and pushes, learner accepts as mobile device permits’. The increasing diversity of mobile education and the increasing power, sophistication, and complexity of mobile technologies call into question the adequacy of the conventional approaches around formal, sedentary, and traditional learning (Alexander, 2004).

To address the issues created by this changing landscape, in mid-2009 the Waikato Institute of Technology (Wintec) created a project team to review the use, effectiveness and impact of QR codes and Mobile Tags across a range of tertiary teaching scenarios and learning support services. The project was structured around three key themes listed below:

- *Creation*: To examine what software applications are currently available to create, store and manage QR Codes and Mobile Tags, their level of reliability and their “intuitiveness” in use by tutors and students.
- *Deployment*: To determine in what ways QR Codes and Mobile Tags can be used to generate location-based content and provide services, what institutional policies, learner support and tutor professional development are required to encourage and support stakeholders in the use of these technologies, how these technologies are distributed, and how tutors and learners can be informed of their impact on teaching and learning.
- *Impact*: To assess how QR Codes and Mobile Tags usage can be monitored, what modifications to existing ICT infrastructure are required to integrate these technologies into existing learning environments, how usable the content and design of the information is, and how the impact on student learning and tutor teaching can be evaluated and reported on.

It is anticipated that the project will determine efficient and effective ways of creating, storing and managing QR Codes and Mobile Tags. It will investigate how these technologies are integrated within the current institutional ICT infrastructure and it will examine the impact their use will have on students’ learning. The project outcomes will enable the institution to:

- Create a small demonstrator site that demonstrates the functionality of QR codes and Mobile Tags in the localisation of content and services and contextualisation of the learner, placing the learner at the centre of the learning experience.
- Develop the competence, confidence and capability of tutors and learners in using QR codes and Mobile Tags to a level sufficient for them to be able to continue using these technologies to enhance or influence their learning environments.
- Allow a body of experience on the impact on learning of QR codes and Mobile Tags to be built as processes are developed and QR Codes and Mobile Tags are built, deployed and evaluated.
- Provide standardised and readily-available m-environment “help”, both to assist student learning and for technical assistance.
- Enable tertiary organisations, and their learners, to be better equipped to track their m-learning activities, automate m-learning processes, and leverage m-technologies to actively engage with on-demand content and the provision of learning support.

Conceptual development framework

The concept of benchmarking as a tool for establishing the capability of an organisation to be effective in a particular area of undertaking is well-established (Marshall, 2006). Throughout the QR/MT project it is anticipated “benchmarking” will be a critical feature of sustainable commitment to quality delivery of m-learning experiences. The project team believe when benchmarking is used appropriately, the findings of the benchmarking process will help the institution:

- Reflect on their strengths and weaknesses in the integration of m-learning opportunities within their structures and processes,
- Identify action(s) that will facilitate increased learner competence, confidence and understanding of m-learning applications
- Measure and report on the impact m-learning events on strategic alignment and business operations.

In essence, the project team are aware the drive to use QR/MT, while creating opportunities for the transformation of the learner’s educational experience, increasing flexibility of provision and advancing the personalisation of learning, will also create many challenges for the institution. For example, how will the change in approaches to learning be managed, how will informed ICT investment decisions be made, and how will progress be measured. Since 2008 Wintec has been systematically reviewing its open, flexible and networked learning capability using results obtained from an external review using the e-Learning Maturity Model (Left, Neal, & Marshall, 2008). During this review a conceptual framework, the A.C.E conceptual framework, was developed by the project team for evaluating the effectiveness of open, flexible and networked learning activities undertaken (Clayton, Elliott & Twohey, 2009).

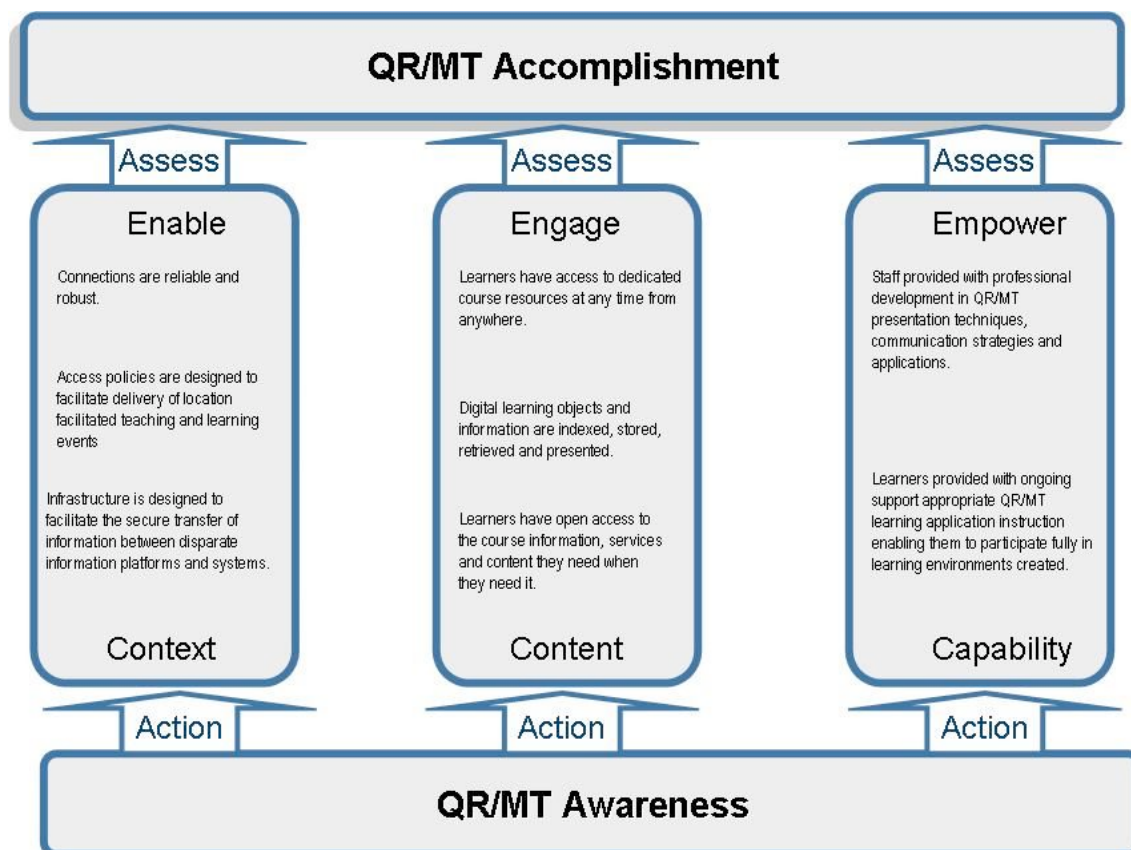


Figure 2: QR/MT A.C.E. conceptual model

The A.C.E. conceptual framework is based on the three As, Cs, and Es (A.C.E.), the constituent parts of which are:

- *The 3As*: Awareness (participants reflect upon the existing educational capacity and capability), Action (activities are generated providing guidance for m-learning implementations) and Accomplishment (the impact of implementations are measured).

- *The 3Cs*: Context (factors shaping and influencing perceptions), Content (factors influencing direction and focus) and Capability (factors shaping participant confidence and understanding).
- *The 3Es*: Enabled (initiatives can be measured by how they have enabled users to participate), Engaged (initiatives can be measured by how they have initiated and maintained engagement) and Empowered (initiatives can be measured by how they have ensured capability of participation).

The QR/MT A.C.E. conceptual model created is illustrated in Figure 2.

Summary

The project team is aware the intention to allow a variety of non-stationary environments - incorporating ease of access to media-rich information and services without requiring bulky hardware, computer labs or specially-equipped spaces - will enhance the context or authenticity of learning taking into consideration how, where, or when it is likely to be best accessed by a learner. However, this initiative cannot be completed in isolation. An understanding of quality and the impact of effectiveness cannot be divorced from the existing environment. Any model intended to be used as a tool for moving an organisation through the processes of developing confident and competent staff and implementing improvements to planning and delivery needs to allow for progression from a current state, which may not necessarily contain awareness of present capabilities, through to a desired state that includes commitment, evaluation, leadership and sustainability. It was anticipated that the applicability of the framework will allow benchmarking of the mobile learning environment in a manner similar to that for e-learning assessment.

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