Engineering Intelligent Content for Mobile Learning (Mar 11)

By Rick Wilson and Gary Woodill
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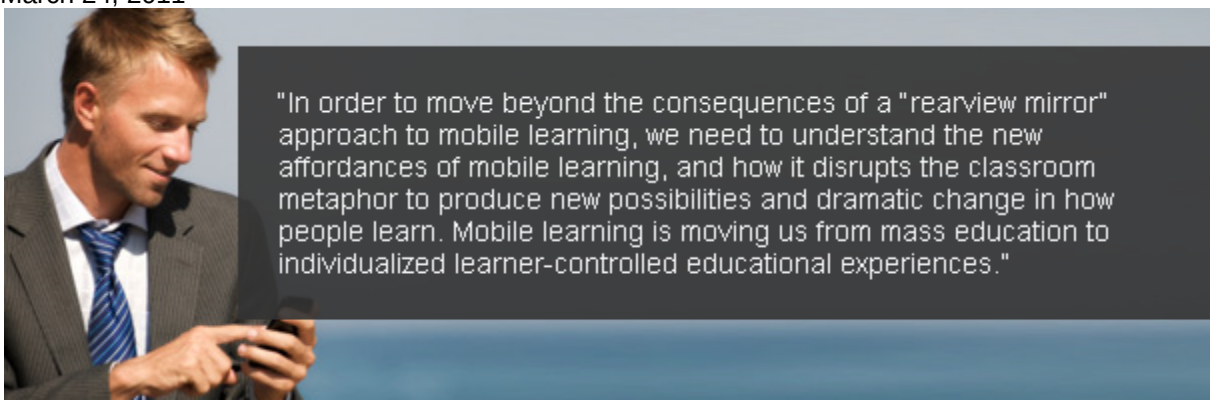

For the past 250 years the idea of "learning content" has been almost synonymous with having a standardized curriculum presented by an authoritative instructor. In fact, the major innovation of the modern classroom, developed in Prussia the 1770s, was that everyone at the same grade level learned the same thing from a single teacher. The modern classroom literally *immobilized* learners, sitting them in rows all facing the same way, receiving instruction from the reputed expert at the front of the room (Woodill, 2010). As French philosopher Michel Foucault (1979) has pointed out, it is also a *disciplinary* regime, tying learners' bodies down to a single place and making sure that they are under strict control.

Making learning mobile changes everything

Given that "frontal instruction" was the dominant model of education and has persisted to the present time in spite of the development of alternatives in the 1960s by the "new school" movement (such as active learning, experiential learning, and "open" classrooms), it is not surprising that early attempts at both e-Learning and mobile learning have been based upon the classroom metaphor. However, using a computer is *not* the same experience as classroom instruction. It immediately fragments the group experience into individuals learning at their own pace, and in many cases, interacting with different sets of materials. Once we add the ability to move around and to contextualize learning based on the learner's location, the classroom metaphor barely works at all. Learning content moves from neatly packaged standardized curriculum units, to a complex ecosystem of many different potential experiences and sources of information for the learner, and numerous ways for educators to facilitate learning other than presentations.

With e-Learning, and now mLearning, we produce learning content fashioned to particular rules and processes to make sure it's used appropriately, which increases the complexity of an already difficult software engineering problem. But, in our world of knowledge intensity and velocity of acquisition, where the consumers now want to use their own creativity, innovation, initiative, and "self-fashioning" based on their needs and interests, the static standardized curriculum materials just don't cut it anymore. Instead, we need *intelligent* learning content, content that possesses extra information built into it that allows it to be made available to learners as appropriate to their self-defined needs and desires (Gollner, 2011).

Learning content becomes intelligent

In our article we present some issues and considerations about engineering intelligent learning content, especially in the context of the latest wave of online innovation – mobile learning. To date, creating mobile learning content and experiences is not an easy task. Learning content can be anything that a learner finds useful at a particular time. The environments, in which we need to create mobile learning content,

are complex mixes of different forms of mobility and different technologies used by different types of learners who learn in different ways and contexts, and then various training professionals with many different approaches to online or mobile instructional design.

Moreover, content and experiences are somewhat restricted by the requirements of different mobile carriers and regulated by several levels of government. Add to that the huge number of possibilities for what can constitute valid learning content or activities involving mobile devices, and you have a situation that is daunting to say the least. The “mobile learning ecosystem” consists of over five billion mobile phone subscriptions, using over 5,000 distinct mobile devices, with more than 30 different browsers, a multitude of input and output choices, a network infrastructure controlled by large carriers for mobile phones, and a changing Internet, with new concepts such as mashups and cloud computing.

The challenge of producing mLearning content

Producing learning content for mobile devices means that a designer needs to take all the variables of the system into account. The mobile environment is *not* the Internet, where standards were developed to allow you to build and render text and media-based Web pages, and send messages and media files around the world. Unlike the World Wide Web, at the moment there are limits on making changes to the system and little in the way of “best practices” and examples for guidance from those who have gone before.

Marshall McLuhan wrote, “We look at the present through a rear view mirror. We march backwards into the future” (McLuhan and Fiore, 1967). We see this in the fact that a decade ago the first versions of mobile learning were either talking heads giving a lecture, or lots of pages of text and graphics, delivered on a very small screen. The classroom metaphor persists in such conventional applications for mobile learning as course delivery, e-books, grade books, learning management systems, and multiple-choice testing. These conventions and techniques will continue to have a role to play in the choices for mobile learning in the future, but they only scrape the surface of “possibility” for this new technology.

The fact is that mLearning is not just learning as we know it. In order to move beyond the consequences of a "rearview mirror" approach to mobile learning, we need to understand the new affordances of mobile learning, and how it disrupts the classroom metaphor to produce new possibilities and dramatic change in how people learn. Mobile learning is moving us from mass education to individualized learner-controlled educational experiences. It is changing the classroom from one-directional transmission of information from the expert instructor to the passive student, to bidirectional and multidirectional possibilities. The individual is an active agent using mobile devices to interact with others or send back information gathered and aggregated in a collaborative learning project. Learning has moved from "just in case” to “just-in-time.”

New possibilities: beyond classrooms

Here are some of the new educational possibilities of mobile learning that are *not* based on the classroom metaphor:

- Peer-to-peer text messaging
- Social networking and mobile communities
- Using mobile devices as a research tool for collecting data
- Trend tracking and analysis
- Information retrieval from both structured and unstructured data
- Augmented reality based on the learner's location and orientation
- Personalized instruction based on the learner's context and previous performance
- Mobile learning games and virtual worlds
- Personal and collaborative media production
- Performance support and live coaching

- Controlling the environment through mobile devices
- Documentation of the world around the learner for personal recall and sharing with others
- Use of gestures and haptic feedback devices as new human/computer interfaces
- Self-organization of collectivists who want to take action together

Engineering intelligent learning content

How do we engineer a system that allows for both the more conventional uses of mobile devices for learning, but allows for the new possibilities listed above and others that are emerging as valid ways of adult learning? There is a formidable task of understanding what's needed and how to get what's needed where it needs to be. Learning organizations face a variety of content challenges: types of content, types of delivery, types of channels, and types of consumers – all based on the types of organizational and user requirements and consumer demands. There is a high correlation between successful personal performance and the relevance and reach of the content to support and encourage performance. At a minimum, we need to respond to the following in order to produce content that is relevant and valued by a mobile learner: Content needs to …

1. Be effectively usable on various devices using various operating systems,
2. Work within the constraints of the virtual computing and mobile world,
3. Be designed for the personal characteristics and context of specific users, and
4. Take into account the many ways learning takes place.

In addition, content may have to move to and across many digital environments (often at the same time), and it may be structured or unstructured.

The first versions of e-Learning in the 1960s and mobile learning in the 1990s functioned within the computing infrastructure available as they were developed. The dominant approach in computing until the end of the 1990s was "client-server" architecture. This tracks nicely with the classroom metaphor in that the learners are seen as "clients" and the server was configured as a "virtual classroom." Online courses are produced, individual learner histories are tracked, and the developing Internet provides a territory for virtual field trips (also known as "Webquests"). Instead of standardized textbooks, an analogy with "object oriented programming" led to something called learning objects, standardized "chunks of learning" that could be repurposed over and over again.

But the online classroom metaphor cracks with the development of "mashups," a term borrowed from hip-hop. Mashups use "Web services" to gather distributed content from multiple servers to construct richer Web experiences and to give the content consumer control over the construction and representation of the content (Woodill and Oliveira, 2006). The new cloud metaphor has taken this even further. All content previously offered and much more is available from anywhere at any time from any device. Ideally, a cloud based "learning system" will seamlessly track and respond to each user as he or she moves from one location to another, and/or changes from one computing device to the next.

Now what?

The next step in this "content mobilization" journey is to add a level of intelligence to both the mobile cloud-based environment, and to all content assets themselves, so that they can be understood by software that pulls it all together and delivers the right content to the right user at the right time (Gibson, 2009). The content has greater relevance, because it will work for the consumer where he or she is and how he or she needs it – locational and situational contextual sensitivity.

The content development environment today requires a labor-intensive production process of iterative cycles of design, development, publishing, and delivery. And for all the work to produce learning content there is the ongoing requirement to maintain it – versions by business unit, versions by life cycle, versions by audience types (job roles, cultures, language). And, this accounts for the "formal" and "structured"

content for learning (knowledge acquisition and information exchange). Plus, it represents the content that you deal with. What about all the other content in the organization that is available to internal and external content consumers?

Intelligent content engineering is relatively easy when the data are structured. We can know the file type, a description of each piece of content, and its location in a content repository. Because we know this, we can reconstruct it in variety of different ways using presentation or publishing templates designed for a wide variety of devices. The problem arises when the data is unstructured (Inmon and Nesavish, 2008).

As human beings, we handle unstructured data all the time. We have an ability to ingest unstructured content assets. We move them through a process that allows us to tag and index the assets and move them into repositories – videos to a media server, documents to a document structure (possibly managed by some database structure like SharePoint). We create a catalog and now we have these assets, which may be available for use in the structured model and also exposed for use elsewhere. We can search and discover the content, and we can retrieve and display it because the system controls, as with the structured model, how it is transmitted and how it is presented – device and platform sensitive.

Intelligent content engineering attempts to do the same thing that we can do with unstructured data. The infrastructure for engineering intelligent content has particular characteristics, some of which are available through certain LCMS products. However, because the challenge is about absorbing "unstructured" content in a form that makes it equally storable, reusable, searchable, and discoverable; it really requires content management functionality not characteristic of LCMSs. And, critical to having really smart content, it needs to be semantically describable. That only happens when it resides with meta-tagging in an XML schema. If that's not enough, you also need the plumbing in the architecture to have an inherent "ontology" – the information now has categorization and it has a hierarchy (Gollner, 2011).

The emerging vision

Simply put, it means there is an indexing in which content assets possess "meanings" and "contexts." In the mobile world, one example of using a device is locational reference. Using the GPS we can know not only where we are, but we can know about where we are. If we are at 40°44′54.36″N, 73°59′08.36″W? we have a geocentric location, but we are also at a location that is describable and unique – the Empire State Building in New York City. Based on the knowledge of my location, the system can also give me information on the architecture, history, lighting schedule, public records, comparisons to other building, and even the available rental space as a start.

Intelligent mobile content engineering can:

- Provide effective content management automation and processing sophistication
- Increase content value rapidly, as it improves throughput efficiency
- Create a product far easier to use, support, and maintain
- Incorporate meta-tagging for search and discovery
- Optimize content structuring for multi-modality use, reuse, and repurposing
- Permit single-source publishing for multi-channel distribution
- Create content with device sensitivity
- Produce content with contextual awareness

Engineering intelligent content is the next stage in the evolution of learning technologies (Bailey, 2010). It is driven by the relentless innovations in mobile devices and computer networks. Success in this field is crucial to the emerging vision of the future of mobile computing – a world where you can learn from any location, exactly what you need to learn, when you want it.

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