

PUSH TO LEARN

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If Ichabod Crane, the school master in Washington Irving's story *The Legend of Sleepy Hollow* was to materialize in a 2010 lecture theatre, he would have little difficulty recognizing the room, where he was to stand and what was expected of him. Similarly, if he took a look at the materials students used to learn, he'd be comforted to note that all students got the same material at the same time and were largely assessed by their assimilation and utilization of this information.

Now of course, the medium of much of this material has changed, in much the same way our economy has, through the substitution of bits for atoms. The boards may be smarter, the laptops both lighter and brighter than textbooks and our transition from textual culture to visual culture almost complete but the one size fits all approach remains inviolate.

This is in contrast to almost every other aspect of the lives of both faculty and students. Consumer experiences are highly customizable, from the topping on your burger to the pattern on your car roof. People choose the TV they want to watch, fast forward or skip unwanted content, wear the clothes they want and generally are permitted to live their lives in the manner they wish.

How did we allow our education processes, particularly in higher education to become so far out of synchronization with student's everyday experience? In an increasingly diversified HE intake, why have we not allowed the customization of content, the modalities of delivery and the overall student experience to be tailored to individual need, local context and cultural expression?

The purpose of this article is to look at the role of push technology as a means of stepping out of this increasingly burdensome straightjacket and to deliver educational experiences that more closely chime with the everyday expectations of the 21st century consumers that are our students.

Push Technology

There's nothing new about push. Anytime an advertising leaflet falls through your letterbox, when songs play on your car radio or when the airline meal tray arrives at your seat, content is being pushed at you. In contrast, the client-server models of most contemporary computer systems, the architectural infrastructure of the web with its browser led interface and the broadcast TV model all lead users instinctively to a system where they click on links or channels and (often passively) engage with digital content.

In an educational setting we use electronic materials largely as a new instantiation of traditional content and learning approaches. Examples of this being the transfer of lecture material into PowerPoint's, further readings as links to web resources, quizzes and tests being set up on-line and tutorials via Skype and Wimba. And the same content is delivered to all students irrespective of need, background, perspective or learning style.

This one size fits all approach seems to us neither able to exploit the capabilities of contemporary technology nor meet the specific needs of our increasingly diverse student body. Our students come to learning with different ages, backgrounds, skill level, enthusiasm and learning styles. We wanted to create individualized learning experiences that reflected this and perhaps more importantly, helped them feel empowered as customers of the services, knowledge and skills we have to offer. Out of this came our push to deliver Push.

Push

It's helpful to define at this stage what is meant, in this context, by 'Push'. We define Push as the distribution of content to individuals without their explicit request and that this information is customized for the user on the basis of educational requirement, individual preference, time, location and equipment. It is in contrast to the traditional form of e-learning, where students access the web or e-books and where the content does not vary between cohorts.

So for Push to be realized, individual students need to receive different material and that material should be transferred/made accessible to students without the student having to explicitly seek out that material.

To deliver Push we need the follow capabilities

- A high-performance, low or zero-cost network that student devices are regularly connected to. Without the capacity to regularly update the student's resources the customization of content, especially time and location based content, lags behind user need.
- Support tools and methods to allow faculty to understand individual student need and easily craft and deliver appropriate learning material. This aspect has to be as easy for faculty to use as writing a PowerPoint or drafting an email. Unless the process is simplified and largely flawless, faculty will be reluctant to invest time and effort into customization.
- Professional development for faculty to ensure they understand motivation and capability and that they have the skills to implement new learning outcomes via Push.

Push at the Higher Colleges of Technology

The Higher Colleges of Technology is the largest provider of Higher Education in the United Arab Emirates. A comprehensive university in the Carnegie Classification, it provides Bachelor's, Masters and Professional Doctorates in 17 Campus across the country. Abu Dhabi Men's is one of these constituent

colleges based in the capital of the UAE; it looks after some 8200 students on 5 different sites. Its main focus is on Engineering, IT, Business Media and Health. About 400 of the students are post-graduate. All programs are internationally-accredited and with some 350 staff from 52 countries around the world, it is considered a pace setter in the use of technology for learning.

All students are issued with a tablet PC. We use tablet PC's as one of our goals is to assist students in writing in Latin orthography as well as Arabic. The main campus has a ubiquitous and high-capacity wireless network, linked to a server farm that allows us to stream high-quality video to all our fixed and mobile digital assets.

As such it represents a reasonable start-of-the-art IT infrastructure and a well-equipped student and faculty body. The challenge we set ourselves was to go beyond 'look how fast our systems are' and 'look at all the laptops and displays' and use this infrastructure to pioneer new forms of learning.

The fact that almost all our students are learning in a second language, requires us to teach in relatively small groups. Rarely at the undergraduate level does a class exceed 25 people. This relatively small size means it is perfectly feasible, indeed we encourage, faculty to get to know their students as individuals and understand their particular background and needs. Out of this came the idea of customizing the learning content we provide for our students. A faculty member is able to access our complete range of digital resources and create for a student a unique set of material that reflect the students needs, background, strengths, shortcomings and learning styles. This material is then seamlessly pushed to our students laptops anytime they come in range of our network. We do this rather than just leave it on a customized section of our server, to permit off-line access and perhaps, more intriguingly, to help our students see the material as theirs. The concept of ownership of digital resources in an educational setting is worthy of further analysis.

When new material becomes available or where students within the class uncover extra material, the faculty member can push that directly to individual students or to the complete class if desired. We call this faculty-generated content.

While in principle each student can have a unique set of content, in practice there is overlap in the material. All students will have the material that corresponds to the learning outcomes associated with that module. Some students will need extra material to compensate for gaps in their earlier studies. Others will need extra material to revise things they should already have covered. Math is the most frequent example of this. Others still, wish to be challenged by studying advanced material or linking the topic to others they have studied. Our Push policies all support this.

Mobile

The educational world is PC-centric. However, Push is not just limited to PC's. There are many other routes by which learning can be pushed.

One of the most noticeable aspects of the generation we educate is their use of mobile devices as the primary route to accessing digital information. We already know well students do not use email. Our network usage statistics indicate a strong and steady decline in PC access relative to mobile.

Our first efforts at mobile Push were simple SMS messages. Every day, every student who signed up received learning advice on their handset. We monitored the uptake and usage over a 20 week period. Later we did some focus group work on the student's assessment of the messages. We found that students read at least 90% of the messages on average. In contrast for some courses email reading would be below 30%. The extent to which novelty accounts for these figures is harder to discern but certainly we did not receive any feedback to suggest habituation occurred in the later weeks. What we did find out was that specific advice was much better received than generic advice (e.g. study skills). There was a strong preference from our students for module-related information in the SMS. Overall the results were encouraging in terms of the uptake. This reinforces the notion that customization of content is a key aspect of effective e-learning.

SMS's cheap and useful though they are, are limited by the textual basis and the shortness of the message. Fortunately, it is perfectly possible to embed a URL in an SMS message. Most URL's are less than 168 characters and even the larger, parameterized ones are readily compacted into 'bit.ly' formats. Almost all our students have a smart phone. Indeed the majority own more than 1 mobile device. Consequently most of them can readily access media rich content via the built in web-browser. Our second development was therefore to transmit URL's in the SMS. If they clicked on the URL, then a web page opened up on their screen. To be effective these pages had to be customized to reflect the small form factor of the device. Rather surprisingly this was not greatly appreciated. There seemed to be some antipathy to treating mobile web pages as learning object. Often we heard remarks, like 'too small to read' or 'unclear material'. We looked at transmitting media rich content via MMS or picture messaging. While technically this is supported on most networks, in practice we found constraints as to MMS size varied significantly across networks and across handsets. Also formatting was greatly altered in the transcoding processes. After some struggle we concluded the design tools and interoperability issues made the construction of high-quality content difficult to deliver by MMS.

Martin Heidegger in 1942 pointed out that we are transiting from being a literary culture to a visual one. By 2010 in the UAE, this transition is largely complete. Our students respond much more positively to video than still images or text. Given this our next approach was to see how we could create videos suitable for mobile phones that conveyed meaningful and lasting learning.

Initially, we looked at taking existing video and providing links to the source. It quickly became clear that the way video was shot for a large screen did not make it a satisfactory small screen viewing process. Often much of the material was too indistinct to make an impact. We then looked at recording learning material for mobile devices that suited the form function of the device. The idea was to develop a series of learning videos. We took into account the fact that student preference was clearly for course specific material and that literature studies indicated that attention spans for TV on mobile was much shorter than for PC viewing. We proceeded to seek out companies that produced video-based learning to assist us. Surprisingly this was one of the hardest of elements of the work. Many companies could produce a

30-minute video. Hardly any understood the need or techniques to shoot for a small screen and only 1 company understood the need to produce short videos. Eventually we found a UK company icanplayit.com who previously had been developing an internet proposition to teach music and we commissioned them.

After much experimentation we came up with the concept of a 'nugget'. Each nugget was short, typically 3-5 minutes, was shot very tightly on the material and was rendered to fit the format and resolution of handheld devices (no more than QVGA). We developed around 50 of these nuggets, all of which are available at Youtube.edu under the channel ADMCvideos (iTunesU is not operational in the UAE).

We made these materials available to students in 3 ways. Firstly, students received an SMS with the URL linking it to an MP4 of the nugget. Streaming media had to be deployed as storage capacity was always at a premium and usually unknown. Secondly students who moved into areas where we had Bluetooth capability (typically cafes or exhibition areas around the institute) would receive notification that our video service was trying to send a file. If accepted the video was uploaded onto the mobile device. Thirdly for iPhone users (a minority among our students, BlackBerries are the preferred device) all these nuggets could be stored in their iTunes library.

The streaming media was the most frequently used option (some 70% of accesses). Most phones could play a video and the process of access was straightforward. The Bluetooth option was less frequently used. Bluetooth push was a novelty to many students who often did not know how to accept a file, some phones were configured to refuse such requests and in some cases there was not enough storage on the device to support it. Also the relatively slow rate of Bluetooth transmission and absence of roaming meant students had to stay in the Bluetooth zone for many minutes. The iPhone option was well received by the relatively small number of users who participated. Finally it is also possible, since there videos were shot in full-HD to push them onto student laptops. Although we observed little take-up of this, partially because we did not promote it widely.

We learned a number of things.

- Firstly video on mobile was a format our students were entirely comfortable with.
- Secondly, repeat viewing of videos were frequent, some of our English language exam preparation ones would be watched a dozen times or so by the same mobiles (and hence, we assume the same students).
- Thirdly, 3 minutes seemed the optimum time for viewing. In focus groups we got students to assess the length of a video and whether it was too short, just right or too long. 3 minutes was the preferred length. After 5 minutes, attention span dropped sharply. Partially this was because of distractors, and partially there seems something intrinsic in the screen size that requires higher levels of concentration.
- Fourthly, as with other push techniques the more specific the material the better received it was.
- Finally, there were 3 distinct roles that these nuggets handled well.

- Introductory material to set the context and rationale for a module
- Repetition of conceptually complex elements of the program (e.g. Laplace transforms or Kolmogorov complexity models)
- Linking the material studied to other topics student either have or will study.

Push wide-screen

Any contemporary educational institute will have large numbers of wide-screen displays across the campus. Ours is no exception. Since students learn as much out of the classroom as they do inside it, it is important to use these digital assets to deliver learning. In corridors, meeting places and cafes, we linked all our display assets under the control of a single channel manager. The role of the channel manager is threefold

- To identify, source or create digital content that stimulates and provokes interest in our students.
- To be responsible for the distribution of this material across all our digital screens and the Bluetooth servers taking into account, time, location, activities in the college and the desire to set a 'mood' for the institution to reflect themes, events, visitors or celebrations. Typically we would set one mood per week.
- To assess the user impact and to modify and develop the processed accordingly.

This is a difficult post to fill, educational experience, content creation, good technical skills and an eye for design are all needed in this role. When it works right it can be profoundly impactful as we have witnessed students focusing intently on a screen or writing something down they have just observed.

It is also hard to get it right all the time, freshness of content matters. Also since we generally do not broadcast sound or keep it very quiet, the material itself needs to attract via visuals. This means that the material we have used for mobile is not often ideal.

Most set-ups have developed ad-hoc and a significant amount of walking around resetting monitors and inserting new DVD's is involved. But when it works, it gives a very powerful sense of an entire community immersed in learning.

Push Books

In a high-technology environment like the HCT, it is important to remember the role books have in learning. They are tangible, malleable, editable and shareable in ways that much digital content is not. As part of our efforts in promoting a culture of Push, we looked at how we could create customizable text books for our students. Recent service offerings such as [Blurb](#), allow one to design a high-quality text book and print a single copy of it for a relatively reasonable price. Other offerings such as Flatworldknowledge.com also provide access to content that can be selected edited or added to at will.

Given this, it was an exciting idea to see if we could customize textbooks for our students in the same way as we do for electronic material and then 'push' them into the hands of our students.

After 3 months effort in this, we have come to some interim conclusions

- Firstly, significant effort is needed to create customized textbook even using existing materials. We estimate twice as much effort is required as for an on-line version.
- The toolsets to create such books are not particularly sophisticated. Blurb's toolset struggles with anything more than pictures with small amounts of text. They will accept PDF, which helps but then this requires a high level of design and experience with complex layout tools.
- People's expectations of the layout quality of books are significantly higher than their expectations of on-line material.
- The availability of content of this quality is quite limited Flatworldknowledge focuses mainly on business texts but did not support the science, math and engineering that dominate our provision.

Because of the above we have limited ourselves to producing 3 versions of a text book.

- An introductory one which typically adds context and math necessary to study a subject.
- A standard one for students who form the bulk of an intake
- An advanced one which challenges the more able members of the cohort.

Initial studies indicate the idea of a customized textbook is well-received. Adding the student's name, ID and photograph is highly popular. The standard of production must be similar to a regular textbook, any diminution impacts the acceptability of the book and indeed it creates a response whereby often, the book is rejected as 'not a real book'.

There's a lot more to do in customized textbooks. It clearly is significantly more expensive to produce acceptable ones, when compared to digital assets. Moreover the paucity of good quality, relevant and appropriately formatted material inhibits the widespread deployment. However, there is genuine interest among our students and indeed, pride, in having customized text books. Right now our feeling is this is an important idea but one whose time is not yet right.

Concluding Remarks

This article has tried to give a sense of the broad developments underway at the Higher Colleges of Technology in enhancing the learning experience we offer. Core to this has been 2 elements. Firstly the capacity to customize content on a per student basis and secondly the pushing of that material directly to the digital devices a student has access to. Customization and ownership are 2 sides of the same coin.

These things will only succeed if the content is in the form students respond to well and reflect the technological capability of the system, the students expectation and the quality of the available content. Failure to align all three will result in rejection of what is offered.

Cost should not be neglected. In our analysis of the costs, it became clear that Push offers better learning but not cheaper learning. Around 20% of the total additional costs are in the form of network hardware and distribution platforms. A further 65% of the costs are in the tools, methods and support to make the usage of Push as simple and as reliable as composing and sending an email. The remaining 15% needs to be invested in professional development for faculty to ensure widespread understanding, a cohesive debate about the approach and facility with toolsets and best practice.

Push is clearly a journey not a destination but our experiences in the last 2 years suggest it is a direction well worth pursuing.

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This article represents the authors' personal views and opinion. All errors, mistakes and misrepresentations are his and his alone.

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