



enTourage eDGe

Technology Scan

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Mini research plan teacher supporting technologies

Introduction

The LICTO research group of Windesheim university of applied sciences (www.licto.nl) regularly executes a technology scan. The purpose of a technology scan is to assess current technologies' capabilities to support education and research. This technology scan is characterized by a low-profile approach and delivers results quickly. The research plan presented here is aimed at investigating the impact of technology on the teacher's activities.

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Problem definition

Education – including higher education - does not have the luxury of having unlimited resources at its disposal. One consequence of this limited nature of resources is the available time assigned to teachers' tasks. In many cases, time available according to standards and procedures is subject for debate.

But is there really a problem with time assignment? Recent research of educational logistic processes¹ reveals a gap between the world of education process planning and the real world of education execution. Or, to put it in other words: *there is not enough time for the teacher in higher education to successfully execute his or her tasks.*

Indeed, solving this problem does call for another organization of education. However, will current technological solutions, when deployed in an intelligent manner, have a positive impact (if any impact at all) on the teacher's efficiency? Will the teacher be supported in managing his precious time, eliminating bottlenecks and creating room to breathe?

When focusing on technology and efficiency, one may quickly forget the quality dimensions of education. An increase in efficiency does not have to result in quality being thrown out of the window. Quality can be expressed in many ways. It can be seen as the percentage of students that finish the study successfully and within a well-defined period. This performance-driven quality dimension may well be important, yet it is not the dimension focused on here. In this research, quality is seen as the effectiveness in which content of education and pedagogical/didactical theories are supported.

In the following paragraphs, this notion of quality is being examined in greater detail.

¹ Peter van't Riet, 2009, *Onderzoeksrapport Knelpunten in de plannings- en roosteringsprocessen van de hogescholen*, as retrieved from www.licto.nl, 10 october 2010

Research context

Figure 1 reveals the cyclic nature of the educational process, as seen from the teacher's perspective.

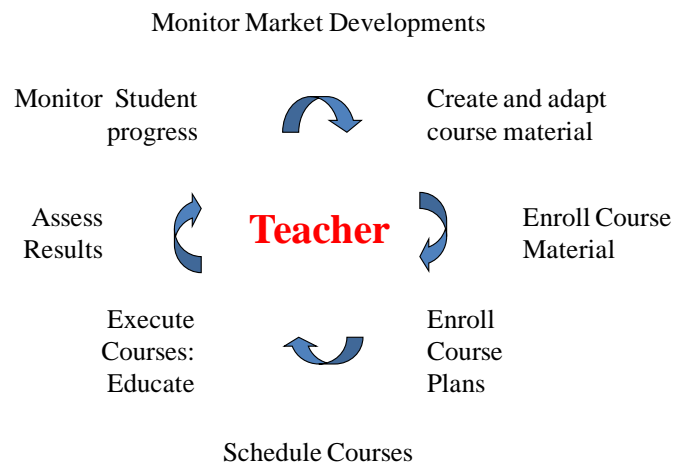


Figure 1: The educational process from a teacher's perspective²

Starting at 'Monitor Market Developments', the process involves:

The teacher stays in touch with market developments. An ever-changing situation creates the need for new or updated education. This change may well be comprehensive (a completely new type of education is required) or, as is the case in many instances, be very limited (a single course is updated).

Once educational material has been created, this is being prepared for distribution. Examples of activities here are storing material in databanks, printing readers, preparing books by closing printing-on-demand agreements with publishers. In the meantime, scheduling is prepared by creating schedule information and discussing this information with schedule specialists. This clears the way for building the final study schedule.

Once scheduled, the education is successively executed and results are assessed. Study progress is discussed between teachers and students. Indeed, the teacher is a coach too, inspiring students and guiding them through the difficult times of making study choices, which are bound to have long lasting implications. Coaching may even be regarded not to be a phase, but a role the teacher has during the complete cycle.

² Inspired by *Digital Me*, 2006, Windesheim Digididact

Research Questions

In the context of this research plan, the technology scan is aimed on increasing teacher efficiency, while safeguarding effectiveness at the same time. This leads to the main question:

1. *What is the effect of incorporating the technologies examined on teacher efficiency in the educational process?*

Please note that there is a relation between content, pedagogy (didactic), and technology³. In this research the technology element is observed more closely, including its role of supporting content and pedagogy/didactics.

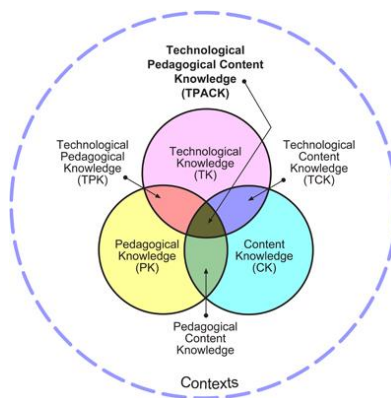


Figure 2: Technology, Pedagogy/didactics and Content (www.tpack.org)

Content Knowledge may be seen as a constant – it is hard to imagine what influence technology will have on content knowledge, unless the content encompass technology itself. Pedagogical Knowledge deals with knowing how students are educated, i.e. how content is transferred from lecturer to student. For this technology scan, one may include didactical knowledge in this quadrant.

This means that for each phase in the educational process (figure 1), the following sub questions may be asked:

- 1a *For each phase in the educational process, what is the impact of the technology observed on the dominant pedagogical knowledge / didactical knowledge and technological knowledge?*

In order to be able to discuss an improvement, or even a decline perhaps, a benchmark is required. This benchmark will be the current practice, in which the teacher is equipped with a standard laptop:

- 1b *For each phase, what is the difference in efficiency in process support using a standard PC and the examined new technologies?*

³ P., Koehler, M. J. & Kereluik, K. (2009). The Song Remains the Same: Looking Back to the Future of Educational Technology. *TechTrends* 53 (5). See also: www.tpack.org

Research Execution: Impact of technology on efficiency in TK and PK

Subject

Subject of this research is the dual-book enTourage eDGe, a device which combines an e-ink Unix based e-reader and an Android tablet. The enTourage eDGe is specifically aimed at students, offering e-reading & annotating functions on the e-reader, and web access & text processing capabilities on the tablet. The e-reader supports taking hand-written notes, which can be saved in Adobe's portable document format. An integrated web-cam and MP3 support is included as well.



Figure 3: enTourage eDGe

Could this unique combination of Android and Unix also be helpful to the lecturer? In this technology scan, the Dutch representative of the eDGe kindly offered one dual-book for testing. Using this dual-book, a test-cycle of the educational process was started, all activities normally executed, this time using the enTourage eDGe as much as possible. During these activities, the performance of the eDGe was compared to the benchmark: a current (2GB\160GB\1,6MHz\Quad Core) MS Windows based laptop.

Technological Knowledge (TK)

The use of the eDGe does require some getting used to. As a tablet operating system, Android has entered the arena very recently, and its approach to human-machine interaction differs from what is currently considered (to be) standard. It has no mouse pointer, for starters, for it does not utilize a pointing device other than one's own fingers. During this technology scan, it was not always clear where a document was stored. In some cases, this led to a document getting (almost) lost. That is, until the basic map structure of Android, and with it the location of stored documents became clearer. Also,

being primarily a Smartphone OS, Android makes use of specialized buttons for menu- and home operations. Once this was recognized, operating the eDGe became quite straightforward.

Therefore, in all phases of the educational process, a learning curve should be expected before being able to fully utilize the eDGe's capabilities.

Pedagogical knowledge / didactical knowledge

Even in the brief period that Google's Android platform has been made available, a plethora of applications has already been developed for it. The open nature of Android may encourage the development of new lightweight and low-cost applications, enabling new didactical approaches. Therefore, compared to the Windows platform, Android- based devices may support current and future insights in pedagogical and didactical processes in equal terms, perhaps even better. For now, this element is regarded to be neutral.

Therefore, the difference is made by the efficiency by which the educational process is supported. In the next paragraphs, each phase is observed more closely.

The Educational Process

Monitor Market Developments.

During this phase, the lecturer browses the web, reads news and research reports and attends meetings and (master)classes. In this phase, the eDGe is in a class of its own. Its format and flexibility (literally! The two sides of the tablet can be folded away resulting in the tablet screen being available at the front and the e-ink reader at the back) are two of its assets. During congress or class, the reader supports taking notes, and storing those notes as PDF files, whilst the tablet enables the user to stay in contact with the world - provided WIFI is available. Which is a downside of this device: it does not include 3G connectivity. Nevertheless, the eDGe proves to be a convenient package, exactly the right size and packed with functionality. It does help that the battery, be it small, seems to go on forever. It WILL last a working day, and when in e-reading mode only, even longer than that!

Create and Adapt Course Material

In this phase, the creation of new courses and material, or updates on current courses and material is planned, communicated, executed and reviewed. Now it shows that the current windows (Microsoft) oriented infrastructure favors the use of a Microsoft client - the standard laptop. During meetings, the eDGe is ideal for taking notes, while the standard Windows environment is more geared towards translating these notes into more definitive products. The eDGe's word- processing capabilities for instance,- are very limited. The on-screen keyboard is useless for anything other than entering an URL, and even with an external key-board attached, the included DataViz's Documents To Go- application suite offers the very basics of text- editing functions only. For a large part, this document has been written on the eDGe, yet it seems that, at least for now, Android has not been built with massive production capabilities in mind, currently causing it to let the enTourage eDGe down. It must be noted

that attaching an external keyboard proved to be a breeze: once the USB connector was inserted, the keyboard was recognized and operational instantly. Quite refreshing....



Figure 4: Text processing with the enTourage eDGe

There is one element the eDGe offers that is quite unique: its capability to organize documents. Using the reader, partitions of text in a document can be highlighted, annotated or connected to other documents or notes. These links can be conveniently shown on the tablet screen and navigating to a link requires the mere touch of a finger.

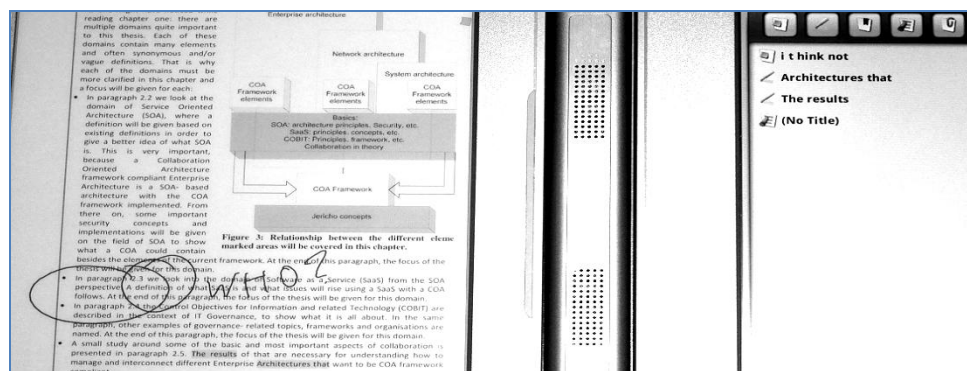


Figure 5: Annotations, links and highlighted text as shown by the eDGe's two panes

Enroll Course Material.

During this phase, course material developed in the previous stage is released in e-learning environments and saved in electronic dictionaries. During this test, the eDGe was connected to the international Eduroam WIFI network and interacted with Blackboard academic suite version 7, Microsoft Exchange and Microsoft Sharepoint, exchanging mail and documents. Again, a MS Windows- based client showed closer integration, resulting in more efficient process support. However, the eDGe dual book was surprisingly adequate in handling those environments.

Schedule courses.

This phase has not been tested using the enTourage eDGe.

Educate

While delivering classes, IT is mainly used for displaying slides, using a beamer or smart board. The enTourage eDGe does have capabilities to connect to beamers - sadly not the standard ones used in current education – i.e. at Windesheim. For this, the standard Windows laptop wins hands down. But when it comes to preparing for class, or taking notes during students' presentations, the eDGe proves to be more favorable. In these situations, the combination of an e-ink based reader and a tablet in one device enables the lecturer to display an examination form or class schedule in one screen and simultaneously take notes in another. What hampers fluent in-class process support is the lack of responsiveness of the eDGe. When processing large files (i.e. more than a hundred pages or so), response times reach minutes, which is highly undesirable in real-life processes. One simply cannot ask students to halt their presentations for a while, simply because the lecturer's tablet cannot cope....

Assess Results

This is really where the eDGe could shine. Already, it has proved surprisingly adequate in handling the educational environment, integrating with Blackboard, Sharepoint and Exchange, albeit not at the same level of ease as a standard MS Windows client. In some cases, a workaround was required. Initially, downloading documents from Blackboard's gradebook for instance, did not work, until the option of opening a link ' in a new window' was chosen, which resulted in a successful download.

Once a file has been downloaded, the eDGe's file organization capabilities do outclass any Windows based PC or laptop. Labels can be defined and assigned to documents, enabling the lecturer to view multiple subsets of documents, again with one touch of a finger. When a file is opened in the reader, it can be annotated, linked to other documents or notes. The index, annotations and links of documents can be made visible for quick navigation in the tablet screen. While assessing students' documents, the EnTourage eDGe totally eliminates the need to print and assess those reports on paper, as well as keeping track of an ever growing physical archive. It may come as no surprise that many (all except annotations) of the eDGe's superb file management functions are lost when files are transferred from the eDGe. To preserve annotations, the document has to be saved under a new name, which by then is ready to be sent back to the student, including any annotations added.

Again, there is a downside. Currently, the eDGE's e-reader only supports Adobe's portable document format (PDF) and the standard ePub electronic book format, while most students use the Microsoft suite to create documents. Of course, students could be asked to save and submit their documents in PDF format, or the lecturer could migrate Office documents to PDF files - which reduces efficiency quite a bit. But during this transformation process, no index is created in the PDF document, unless Adobe's (quite expensive) own suite of software is used for the job. It would be more useful if the eDGE's e-reader at least supported DOC documents.

Secondly, again the lack of responsiveness while dealing with large files is quite disturbing. Minutes of waiting for things as basic as highlighting text have been observed - which does not help efficiency.

Also, in one case a PDF file turned out to be illegible in the e-reader. While all documents resulted in a crisp and easily readable experience, this font type seemed to cause too light a font in the e-reader. The figures show a normal representation of an e-reader page and the illegible version.

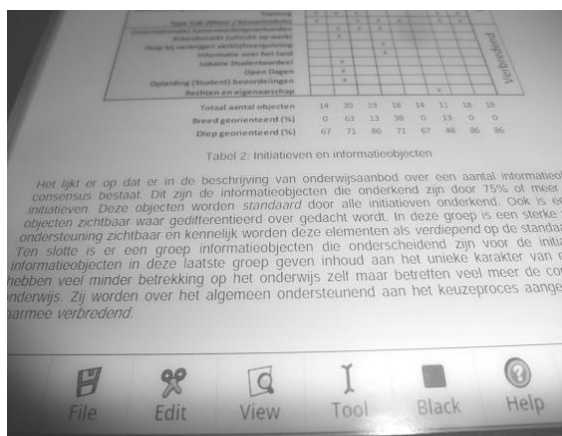


Figure 6: Normal, crisp e-reader screen.

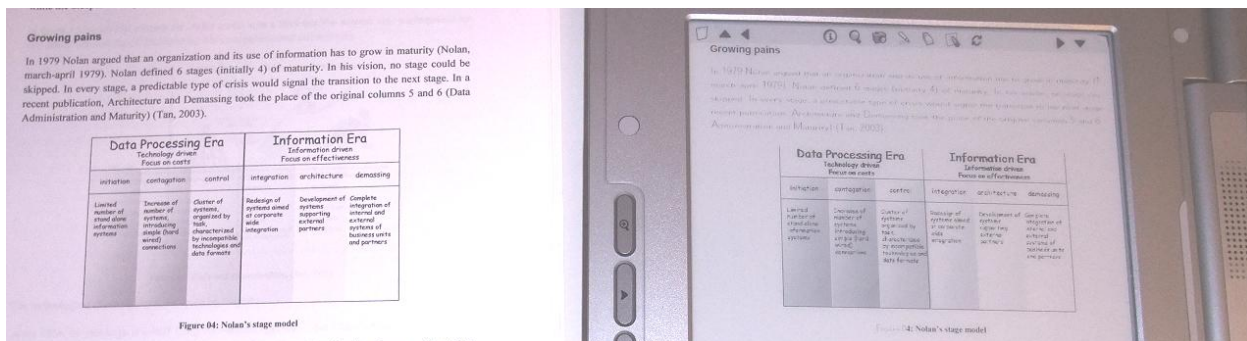


Figure 7: Illegible e-reader screen. On the left, the original paper document. On the right, the e-ink version

Monitoring Student Progress

When monitoring student progress, and discussing this progress and future plans with the students, the enTourage eDGe offers a non-intrusive means of taking notes and viewing progress. Normally, during interviews with students the lecturer takes notes on paper and has to either transfer these notes to an electronic environment or (to) manage an growing physical archive. Using the eDGe, notes can be saved as PDF documents, managed by the eDGe and placed on a file server, in order to be secured in standard back-up procedures. Of course, interview results can be typed into a report using a laptop or PC, yet when asked, students replied that they felt uncomfortable with this means of taking notes. Writing instead of typing notes seems to be less distracting. Again, the eDGe's document management capabilities enables to organize multiple documents more student-centered, helping in monitoring a student's progress. However, it should be noted that these capabilities are not available outside the eDGe's environment.

Conclusion

Sub Questions:

- 1a For each phase in the educational process, what is the impact of the technology observed at the dominant pedagogical knowledge / didactical knowledge and technological knowledge?*

It may be argued that, in order to utilize the eDGe to the fullest, the lecturer will have to update his/her technological knowledge, sometimes overcoming difficulties associated with new technologies using workarounds. Therefore, using the eDGe may induce a learning curve. On the other hand, the open nature of the used platform, Android, may well support new pedagogical / didactical knowledge fast with low cost and lightweight applications.

- 1b For each phase, what is the difference in efficiency in process support using a standard PC and the examined new technologies?*

Table 1 summarizes the impact of the enTourage eDGe on efficiency in each phase:

	Efficiency
1 Monitor Market Developments	
1a Read news	+
1b Attend to meetings	+
1c Attend to (Master)classes	+
2 Create and Adapt Course material	
2a Plan activities	0
2b Take notes	+
2c Write documents	-
2d Manage dictionaries	+
2e Communicate	0
2f Manage progress	0
3 Enroll Course Material	
3a Connect to and interact with e-learning environments	-
3b Transfer documents	-
3c Finalize schedule information	0
4 Schedule Courses	
4a Acquire shedule information	0
4b Create schedule	0
4c Communicate schedule	0
4d Adjust schedule	0
5 Execute Courses: Educate	
5a Prepare class	+
5c Present information	-
5d Observe student presentations	+
5e Comunicate / collect classroom response	+
5f Present prototype / simulation	-
5g Monitor progress	+
6 Assess Results	
6a Acquire document	0
6b Manage document collection	+
6c Assess, annotate and assign results	+
6d Return documents	-
6e Store assignment result	0
7 Monitor Student Progress	
7a Observe progress	+
7b Plan student interviews	+
7c Execute student progress interviews	+
7d Process results, store notes	+
7e Monitor execution of follow up actions	-

Table 1: Impact on efficiency

Let It be noted however, that current positive impact on efficiency is *seriously* hampered by lack of responsiveness and native e-reader support from the Microsoft office .DOC document format.

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