Emerging eLearning and eExamination Trends in the Aviation Maintenance Training Industry

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Atlantic Simulation & Training Technologies (ASTech)

Stefanie Augustin, Iarfhlaith Ó Raghaill and Paul Nolan

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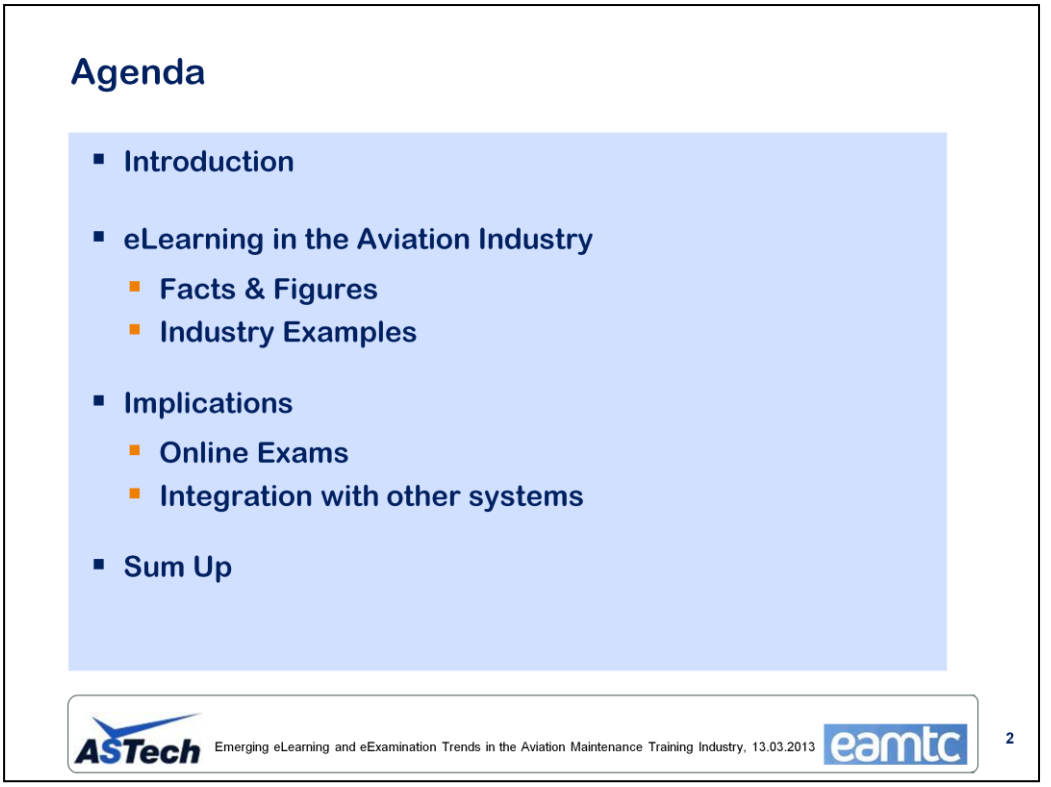


Paul

Thank you Ian Williams and thanks to EAMTC for giving us this opportunity. First I'd like to introduce the team, my name is Paul Nolan and I am the Managing Director of ASTech. My two colleagues, Stefanie Augustin and Iarfhlaith Ó Raghaill will also be presenting.

Here is the agenda for the presentation. It is divided into three main parts. First of all, I will provide a brief introduction and talk a little about our company for those not familiar with us. Next Stefanie will talk about eLearning in the aviation industry and will cite some facts and figures as well as industry examples. Iarfhlaith, the manager of our flagship product 'GEMS' will show how our exam systems have developed in the context of the emerging eLearning trends.

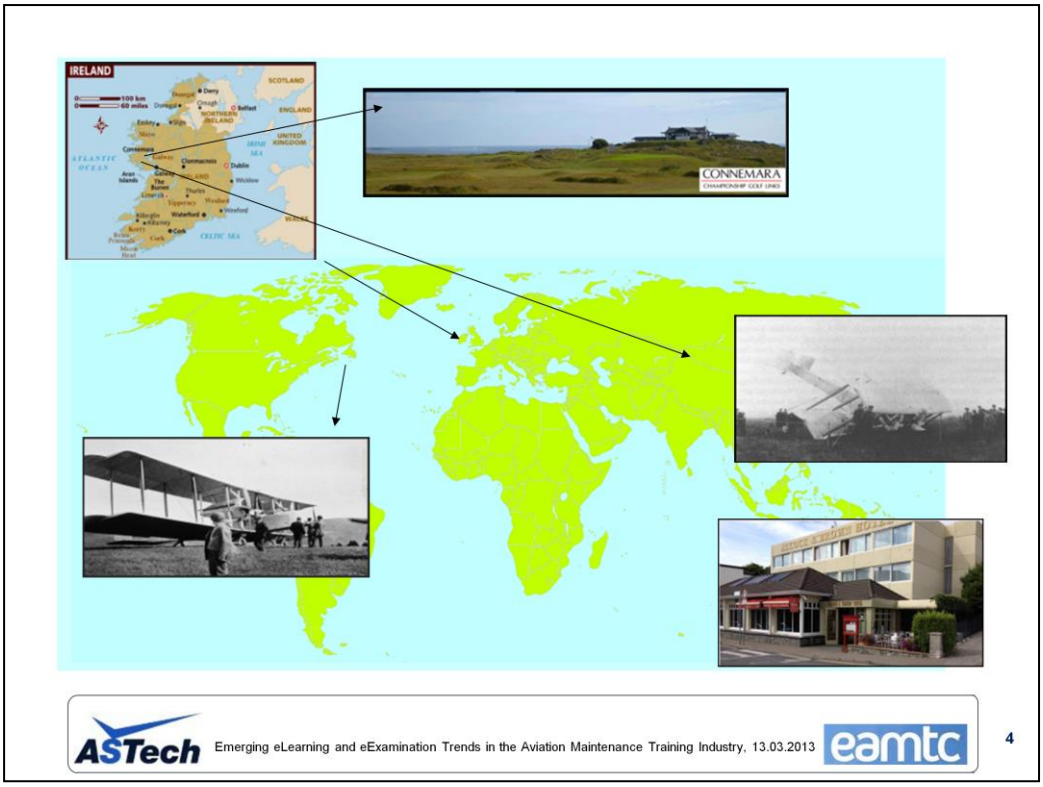
Finally we will talk about the requirements for the integration of examination management with other IT systems.

Who are ASTech?

- Software company based in Galway, Ireland
- Specialise in the development of web-based training and examination systems
- Targeting the aviation training industry

Paul

This slide speaks for itself. The montage of images includes a picture of our office in Galway



Paul

Some of you may not know where Galway is located - this slide provides a little lesson in Geography as well as a note on aviation history.

The picture shows where Ireland is located in the world and where Galway is positioned on the west coast of Ireland. Located near Galway is a very picturesque area called Connemara. Apart from breathtaking scenery, the area has an aviation connection. In 1919 Alcock and Brown set off from Newfoundland, Canada (see map) in a Vickers Vimy twin propeller biplane and headed for Europe. They 'landed' near Clifden in Connemara. The landing was not perfect (see photo) Ian, relax, this was not a maintenance related incident! There is also a beautiful Golf course near the site.

Strategic Focus

Aviation Industry and eLearning

- Pioneer in using educational technologies
- AICC
- Replacement of existing training methods with eLearning Solutions
  - Business drivers:
    - Meet regulatory obligations
    - Improve learning
    - Reduce costs, time

Stefanie

The aviation industry has been a Pioneer in using educational technologies since decades.

The AICC (Aviation Industry Computer Based Training Comitteee) was the first professional organization to declare that training delivered via computers needed to conform to a specific set of guidelines.

So nowadays most airlines and independent training organisations are looking to replace their existing training methods with eLearning solutions.

Business drivers herefore are:

- To meet regulatory obligations such as tracking of learner performance and archiving of results
- To generally improve learning for their trainees in e.g. flight crew, ground staff, engineering or maintenance training
- Reduce costs and time

I would now like to show you a couple of facts and figures on eLearning and training methods

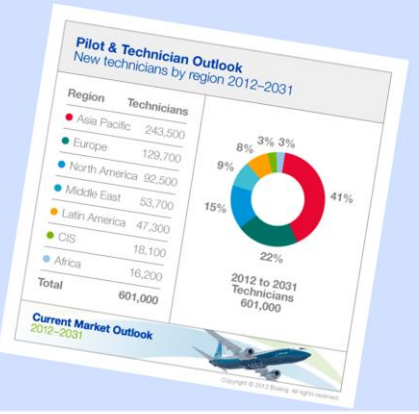
Stefanie

According to LearnDash – a LMS and learning strategy provider- there are over 1 billion people currently in a training course

From 2012-2031 there will be a need for

601,000 Aircraft Maintenance Technicians – who all need to be trained

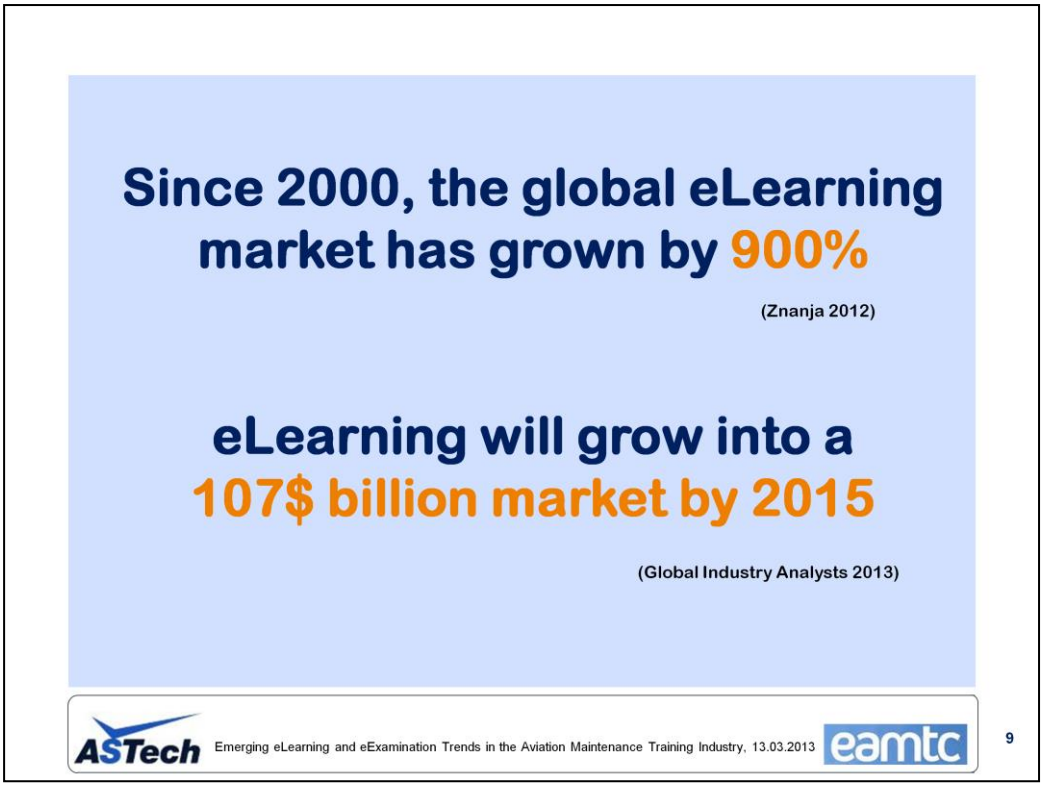
(Boeing 2012)



Stefanie

According to Boeing, from 2012 till 2031, there will be a need for 601,000 Aircraft Maintenance Technicians- who all need to be trained

(Meeting this demand will require airplane manufacturers and the commercial aviation industry to rely more heavily on new digital technology, including online and mobile learning, to meet the learning requirements of a new generation)



Stefanie

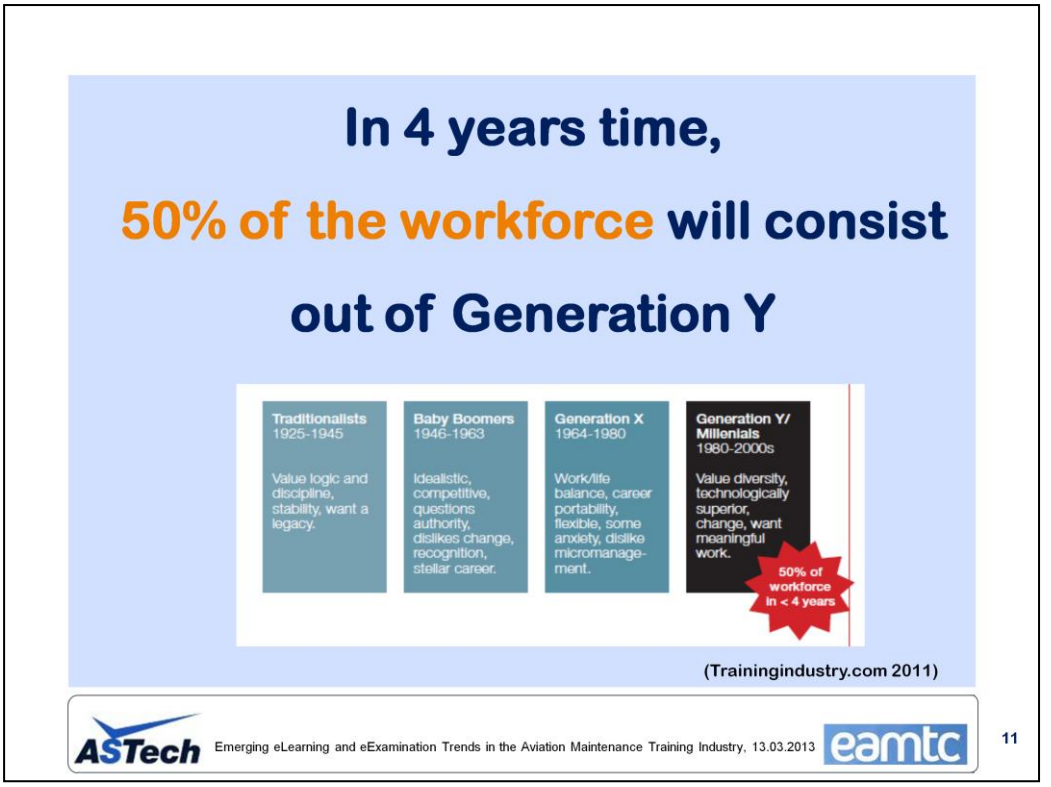
Since 2000, the global eLearning market has grown by 900 % and will continue to grow into a 107$ billion market by 2015

Stefanie

How dependent we all are on online technology shows this image:

In 60 seconds….

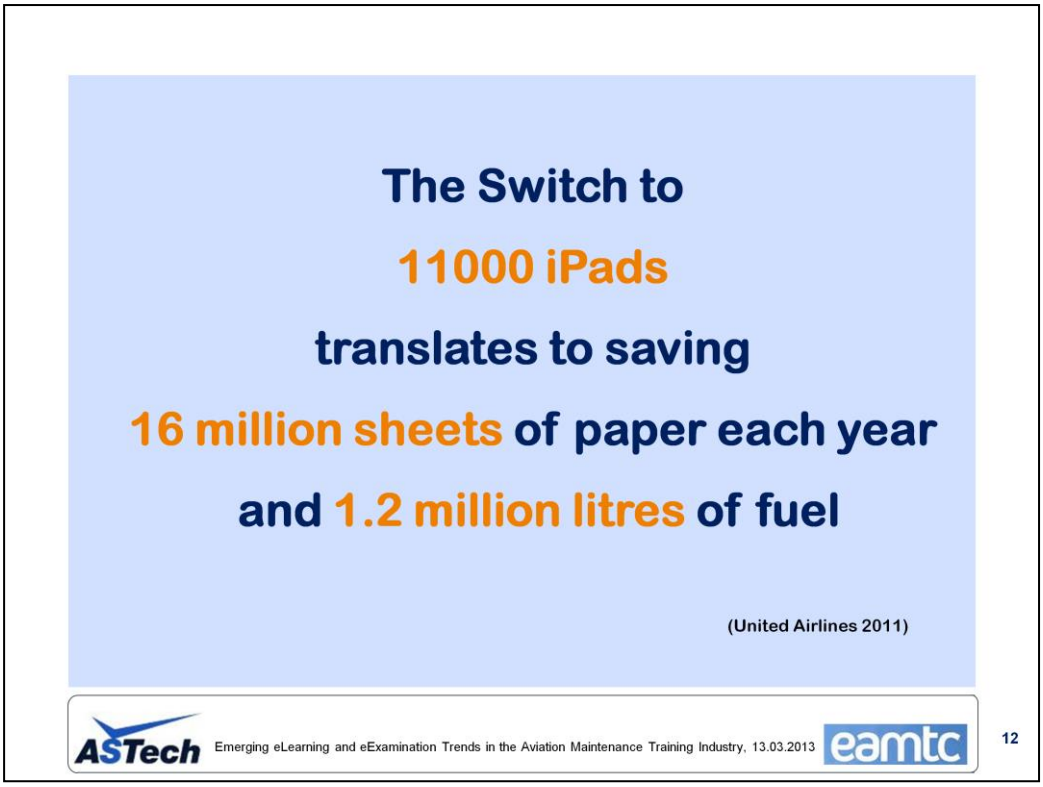
- 168 million emails are sent
- 600 new videos are uploaded onto YouTube
- 60 new blogs are created and 1500 blog post are posted
- 13000 iphone apps are downloaded
- And almost 700 000 facebook status updates are posted in 60 seconds so this means while I explained that image to you all the above happend



Stefanie

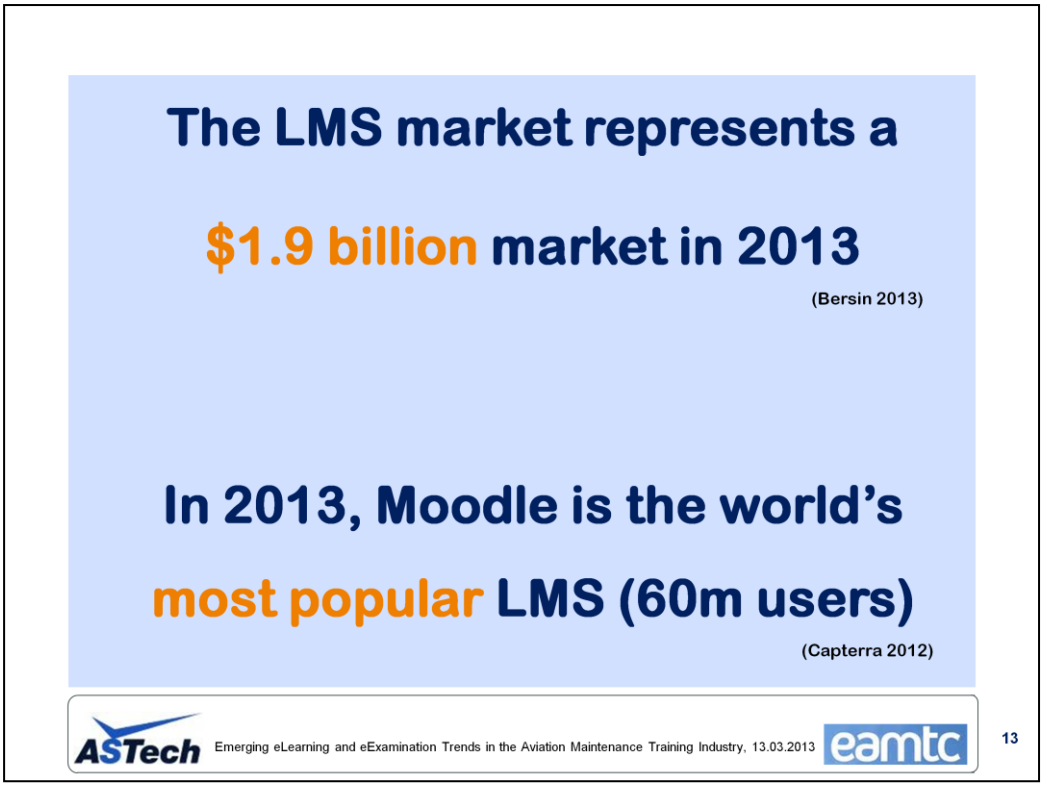
The numbers of the previous slide are heavily influenced by this next fact - which is that in less than four years time, nearly half of the workforce will consist out of Generation Y or also called Millenials. Millenials are those born between 1980 and 2000 such as me or my colleague Iarfhlaith.

So being a pure Millenial, I am highly technology literate: I have a smartphone, have a profile on Facebook, twitter and LinkedIn, wrote my own blog and accessed a LMS system from my laptop on a daily basis during my studies.



Stefanie

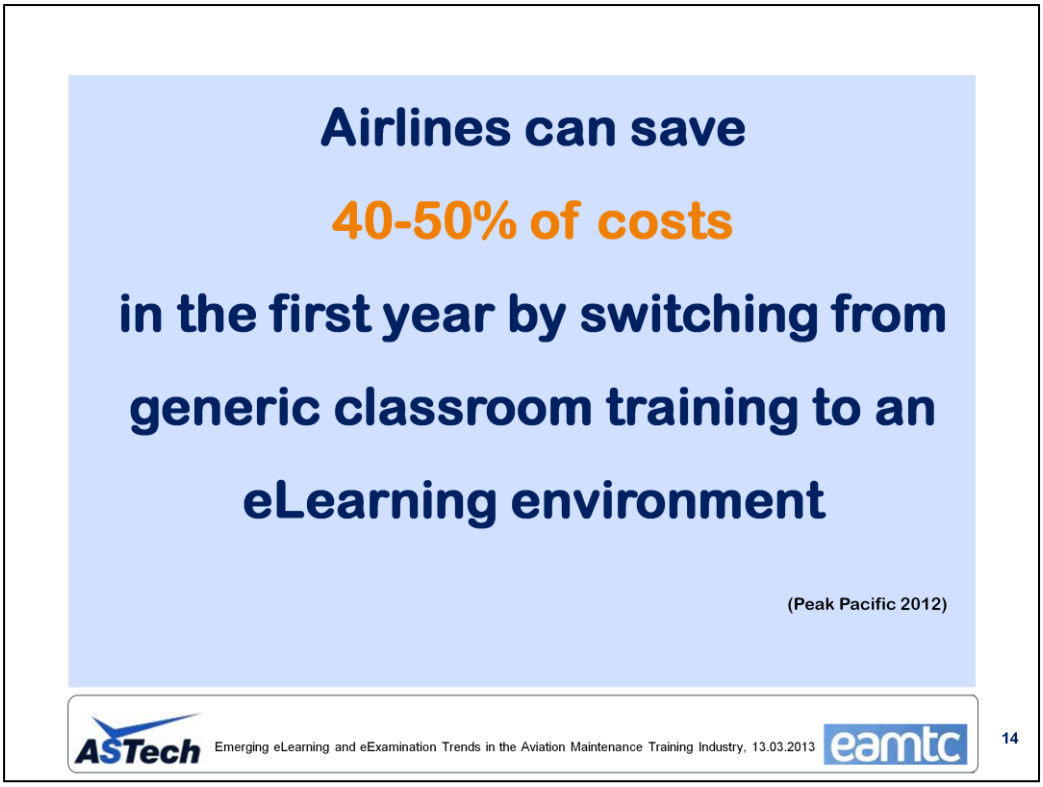
United Airlines stated that the switch from using paper based manuals to 11000 ipads for their pilots translates to saving 16 million sheets of paper each year and 1.2 million litres of fuel as the weight of flight bags is reduced according to not using heavy paper based flight manuals anymore.



Stefanie

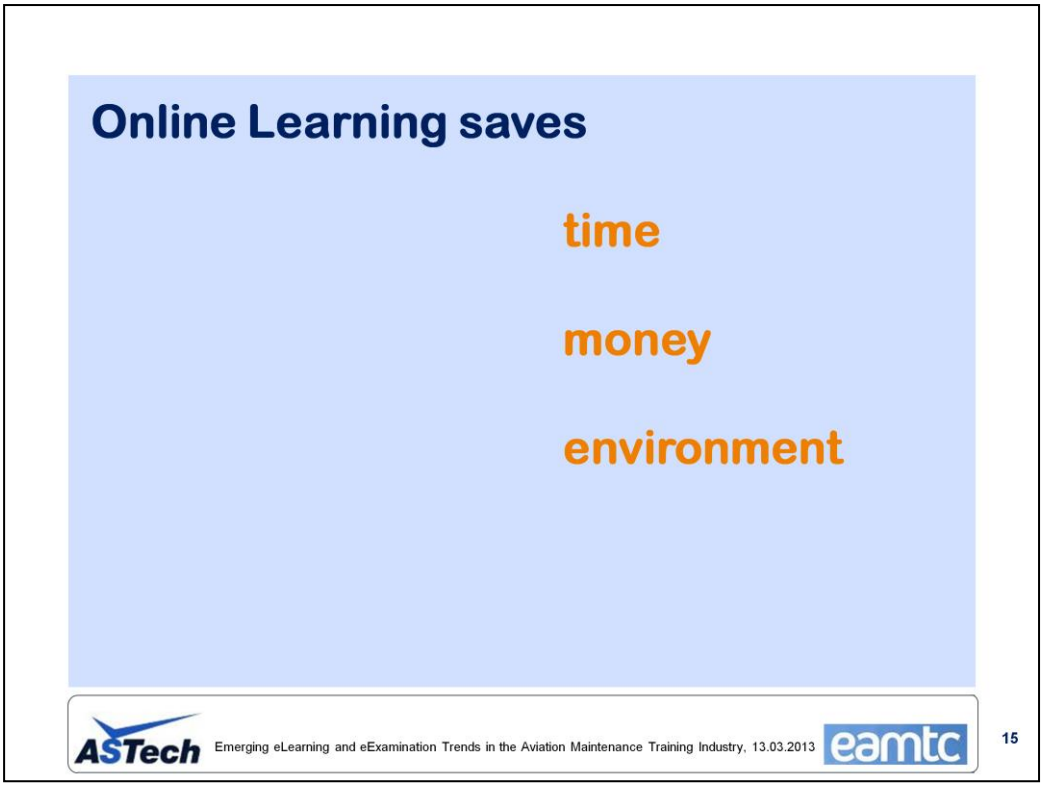
The lms market represents a 1.9 billion $ market in 2013.

According to Capterra, moodle is the world‘s most popular LMS in 2013 with 60 million users worldwide



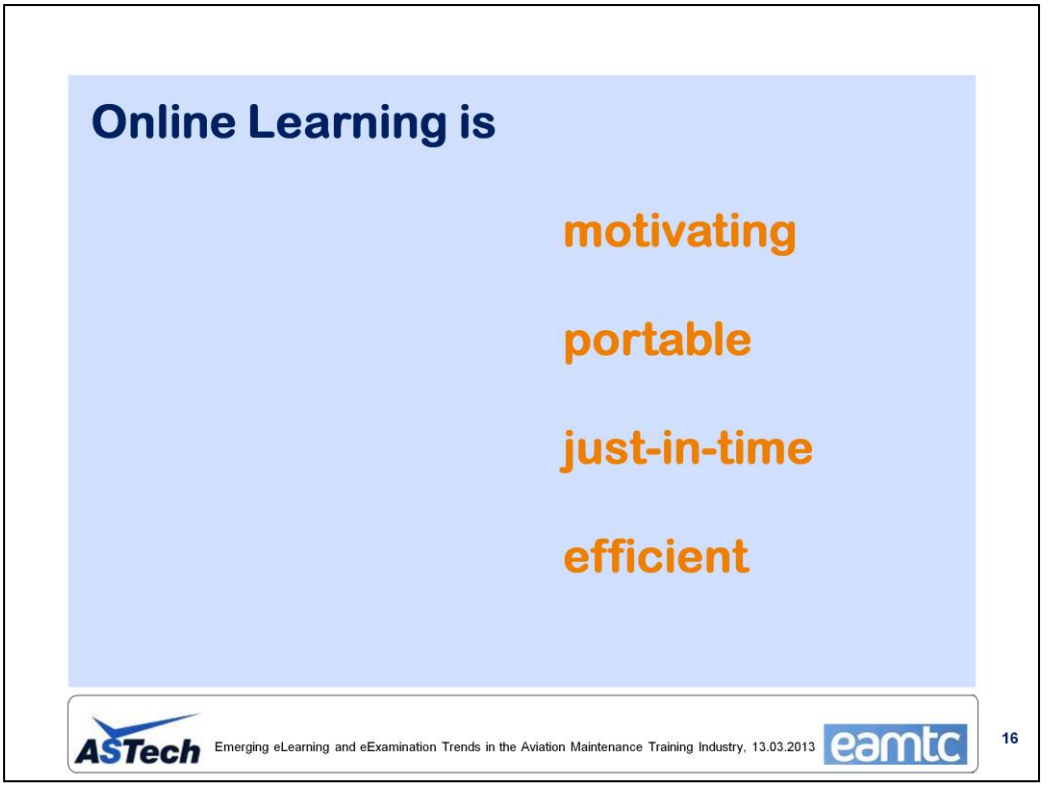
Stefanie

Peak Pacific states that airlines can save up to 40-50% of costs in the first year by switching from generic classroom training to an elearning environment. Costs can especially be saved due to a decrease in travel costs and eliminated costs for classroom bookings/ provision.



Stefanie

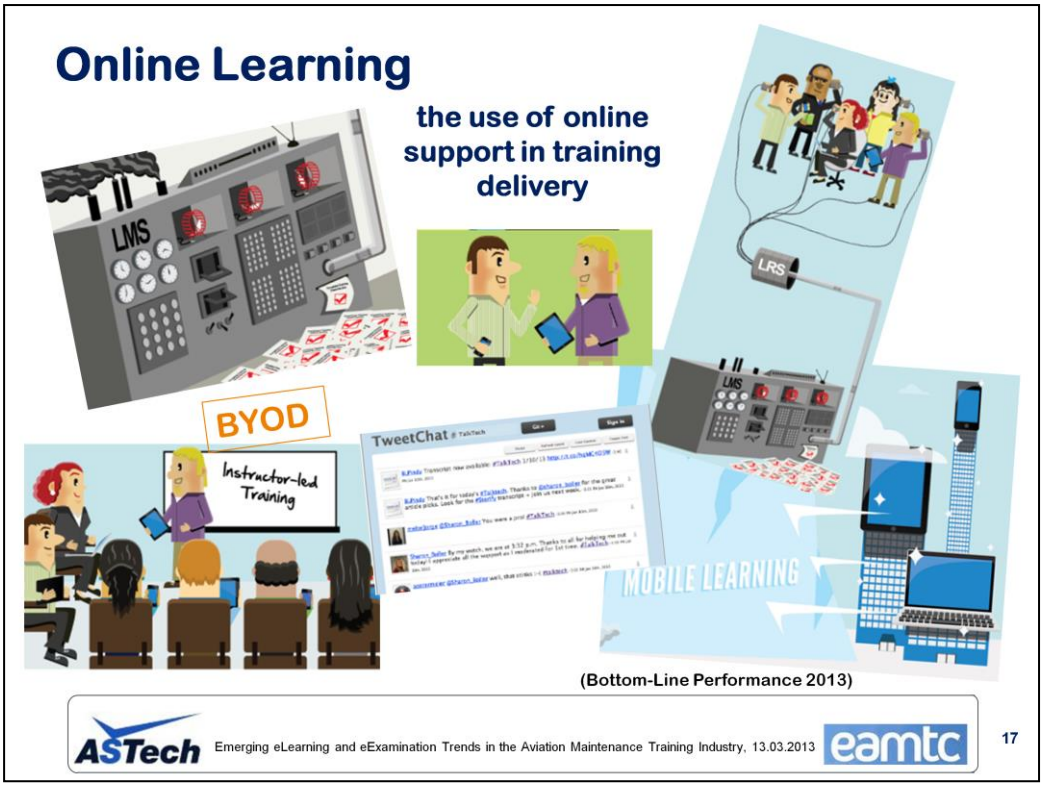
So Online Learning saves time, money and the environment



Stefanie

And online learning is

- motivating - as the needs of Generation Y are met
- Portable - as trainees can use their smartphones or tablet devices and access learning material wherever they are
- Just-in-time as trainees can access learning metrial anytime and anywhere
- And it is very efficient as costs and time can be saved



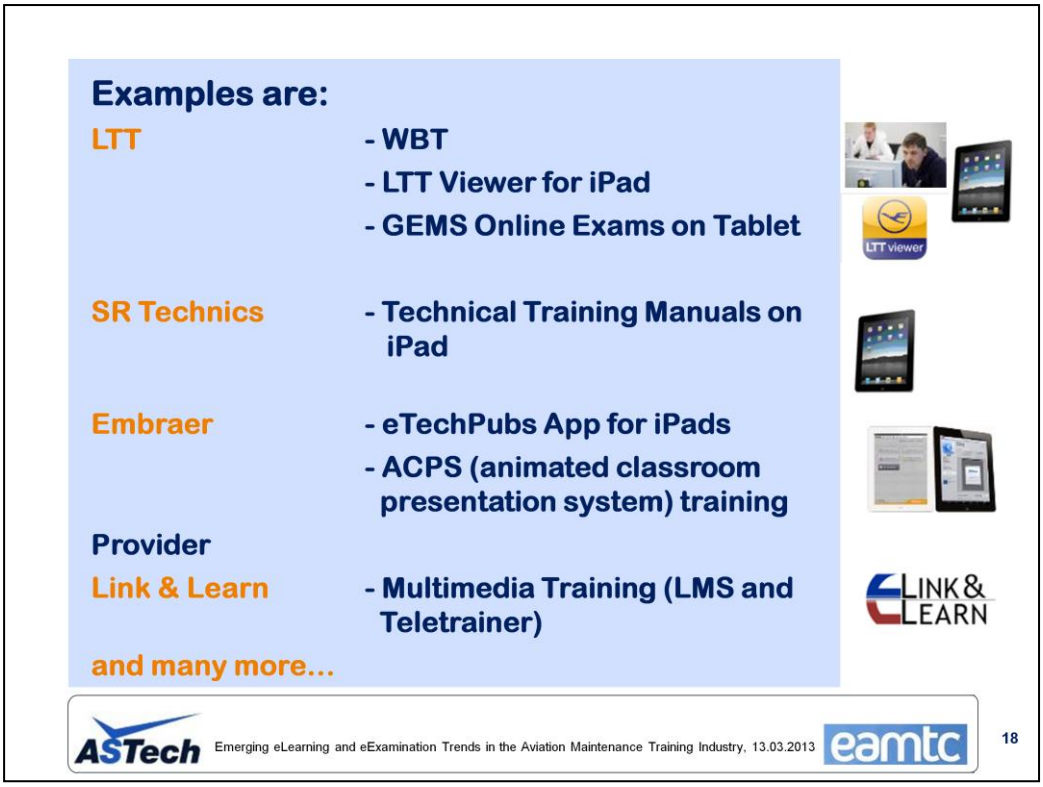
Stefanie

So what is online learning and what are the current trends?

Online Learning simply is the use of electronic support in training delivery so that could be the use of a Learning management system to manage traning and store results

Some trends in online learning are the following:

- In the next years, Online Learning means less desktop and more mobile so that means more usage of tablets and smartphones during training
- Online learning doesnt mean that instructor led training is dead but it means that instructor led training is more modern. So BYOD will be the motto for trainees in the next years
- Training will also be less formal and more social. So that means that learning will be happening in twitter chats, while watching YouTube videos and while writing or reading blogs
- A new trend also is going away from normal LMS systems towards TIN Can API. TIN Can API is a system that tracks experiences learners have rather than course completion. An experience might be the completion of a course, but it could also be playing a game, participating in a twitter chat, reading a blog or watching a video



Stefanie

So what is happening in the aviation industry?

One example of a training organisation using online learning technologies is LTT.

LTT is offering web based training using a Learning Management Systems, which supports the maintenance training for students. LTT also developed an app called LLT viewer. This app offers in-depth information on aircrafts, helps to prepare for EASA Part-66 CAT A or B Full Basic Examination and offers abbreviation directories and it is optimized for the iPad. Since January 2013, LTT is also running exams online using tablet devices and ASTech's GEMS Online Exams software solution, about which Iarfhlaith will talk to you about in a couple of minutes.

Another example to mention is SR Technics. SR Technics is offering technical training manuals on iPads to eliminate the need for carrying heavy manuals, enhance the learning experience, and to keep everything conveniently stored and instantly accessible on one portable, easy-to-use device.

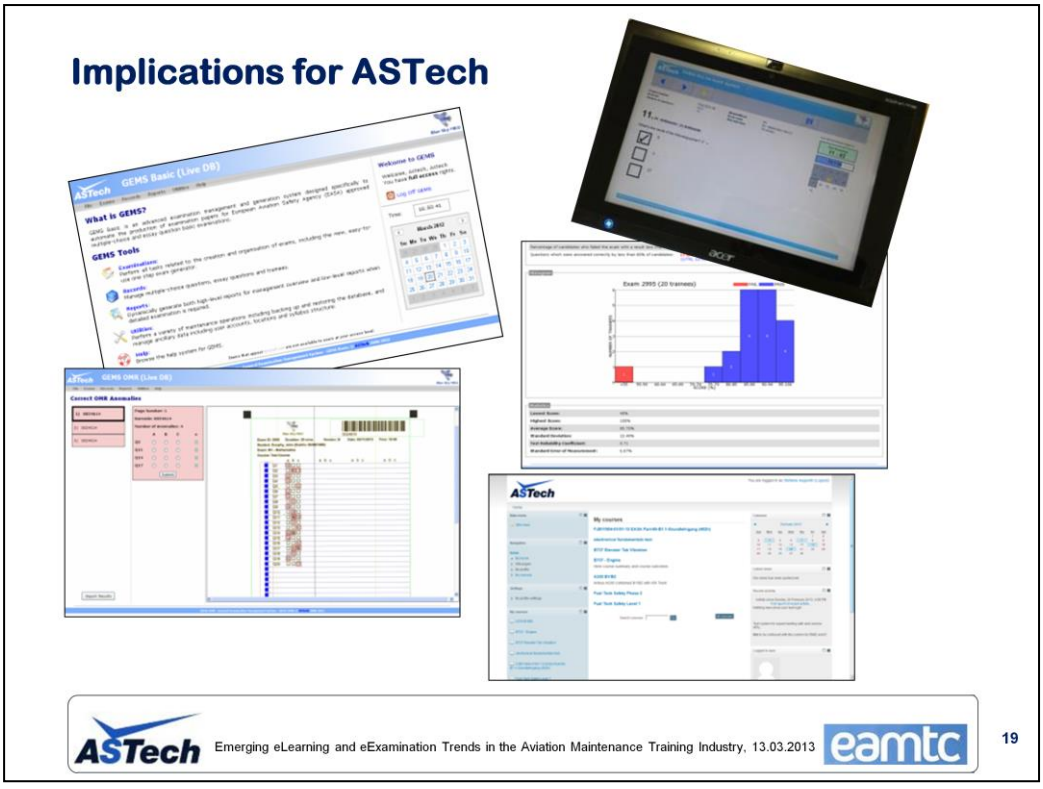
Like SR Technics, Embraer has created a new iPad app called eTechPubs. With the app, trainees and technicians can access the manuals with only a fingertip at all times. Further, Embraer is doing ACPS training. ACPS stands

for Animated Classroom Presentation System (ACPS) which employs a modern, new approach to classroom training, incorporating instructor-led Animated Systems and Walkaround training (Computer based virtual aircraft).

An example of a provider of online technologies for the aviation industry is Link & Learn. Link & Learn (Austrian Airlines, Fairchild/Dornier and infoWerk) provide a Part 66 Web Based Training Program using a learning management system and offering the possibility for trainees to communicate with a teletrainer. This system offers state-of-the-art training as per the latest industry standards.

That is just to mention a few, there are many more examples….

…I would like to hand over to my colleague now who will explain the implications elearning trends had and still have on ASTech and our training technologies.



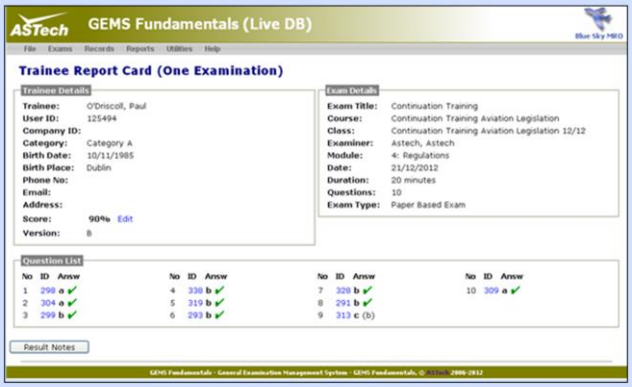
Iarfhlaith

I'll be elaborating on what Stefanie has just talked about by explaining the implications of Online Learning for ASTech.

You can see in this slide, a collection of screenshots from the learning and exam management systems that we supply to our clients. You can see here a tablet device for online examinations, a learning management system developed using Moodle, and images from GEMS Basic, and GEMS Type which are now established in the market and many of you are already very familiar with. GEMS Basic and Type are required to facilitate online exams.

GEMS - General Examination Management System

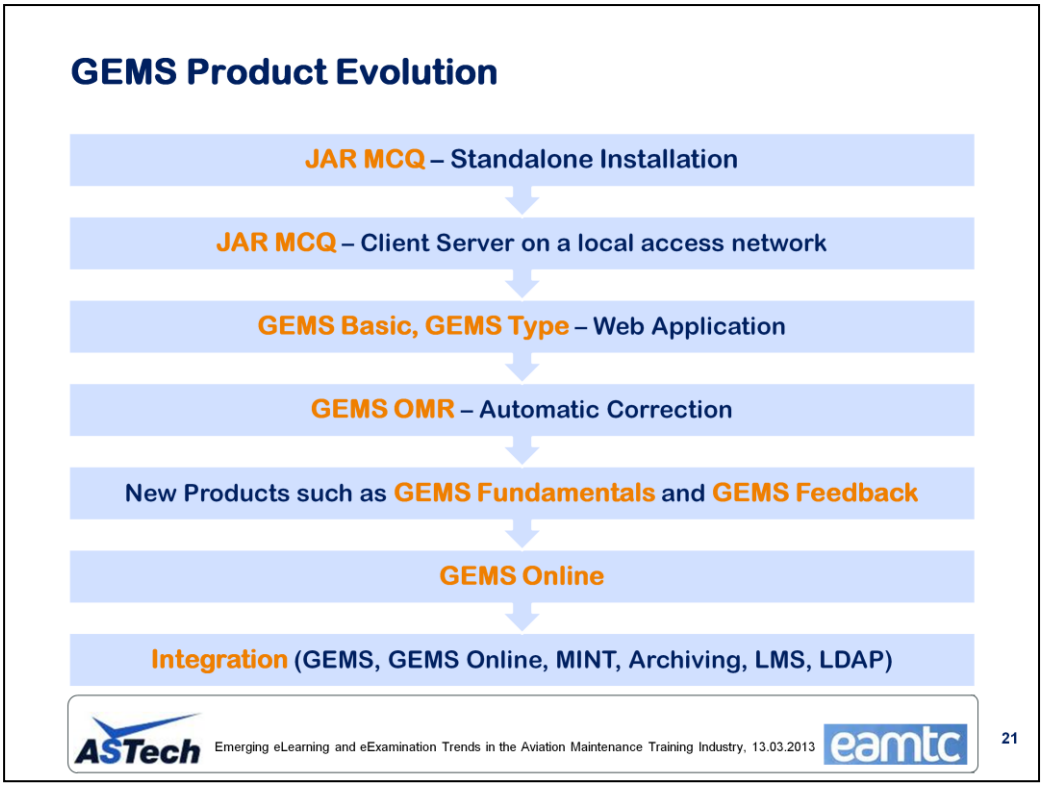
GEMS is an advanced exam management system that automates the generation and correction of multiple choice and essay question exams. Exams can be delivered paper based and online.



Iarfhlaith

Before I talk about the Online Exam, I will just explain briefly what GEMS is to those of you who haven't seen it before. GEMS is an advanced exam management system that automates the generation and correction of multiple choice and essay question exams. Exams can be delivered paper based and online.

Therefore GEMS allows you to manage your questions, exams, courses, trainees, and results and it can be integrated with other solutions so that relevant data can be imported and exported easily to and from GEMS.



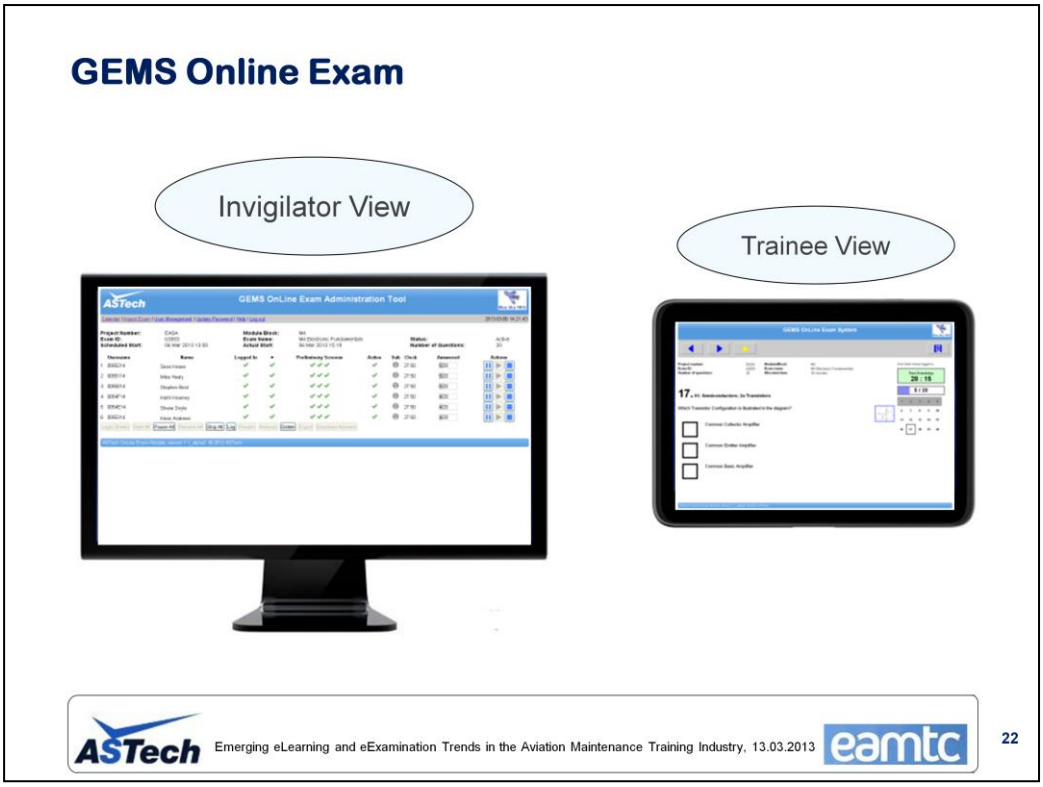
Iarfhlaith

This slide gives an indication of how we have consistently adapted to the changing trends in e-learning.

We initially started off with a standalone installation followed by a client server on a local access network.

Over time it became clear that a web application would be more suitable. GEMS Basic and GEMS Type were created. This was followed by GEMS OMR which could be used to automatically correct paper based exams. With co-operation with our existing clients these products evolved into what we have today with much more advanced features (such as better reporting features). Based on client requirements we developed new products such as GEMS Fundamentals (non EASA certified exams such as Fuel Tank Safety, Human Factors, and EWIS), GEMS Pilot Type (pilot training), and GEMS Feedback (to give course feedback to instructors).

However, the current trend is moving towards Online Exams and this is what I will be discussing over the next few slides. Paul will the discuss integration and how everything can now work together (for example GEMS and MINT integration)



Iarfhlaith

GEMS Online is an exam delivery system that makes it possible to hold multiple choice online exams. Examination candidates may take an online exam using either a conventional computer interface, as found on a laptop or desktop computer, or using a touchscreen interface, as found on an iPad, Android, or Windows tablet device. An examination administrator can monitor the progress of each candidate through an examination console, and may start, pause, and stop the exam as appropriate.

You can see an example of this layout in this slide. The invigilator is monitoring the exam using a computer, while at the same time the trainee is answering questions using a tablet device.

GEMS Online Invigilator View

Iarfhlaith

I'll now show you a few slides demonstrating the functionality of GEMS Online. There are 2 modes in the Online Exam -> these are the Admin Mode and the Trainee Mode. This slide shows the Admin Mode. This screenshot is taken after the exam is started. You can see a list of all trainees currently sitting the exam, as well some other details relevant to the exam.

The data on this page is updated every second and it shows whether the trainee remains logged in, whether their connection to the server is working correctly, whether they have agreed to all the terms and conditions in the preliminary screens, whether they are actively answering questions, if they have submitted the exam, the time they have remaining, and the number of questions which they have answered.

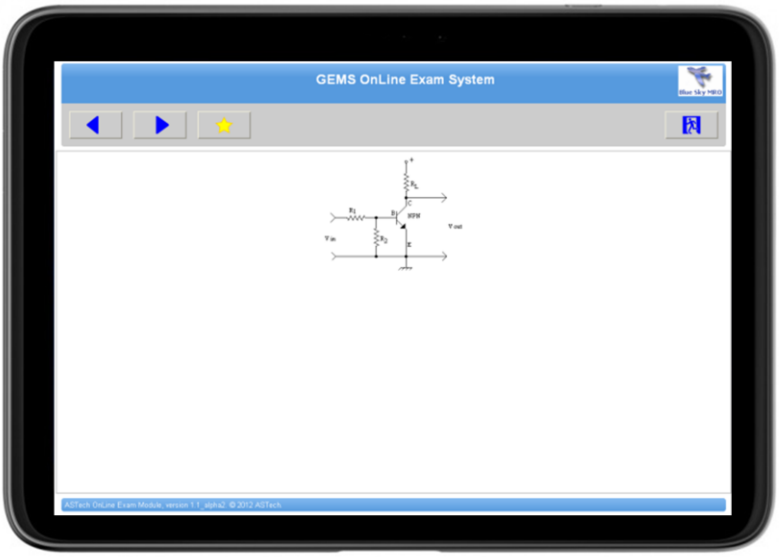
This gives the invigilator all the information they need relating to the exam that is in progress.

GEMS Online Trainee View

Iarfhlaith

This screenshot shows an image of what the trainee sees. This trainee mode has been tailored for use with a tablet device and so all buttons are large enough to be easily used with a touchscreen device. An important feature of the trainee mode is it's simplicity. The user selects one of the check boxes to indicate the correct answer and can easily navigate through the questions using the arrows at the top of the page or by using the matrix at the right hand side. Questions can also include images as can be seen in this screenshot. The image is shown as a thumbnail with a border on it. By clicking on the image it can be increased to it's normal size.

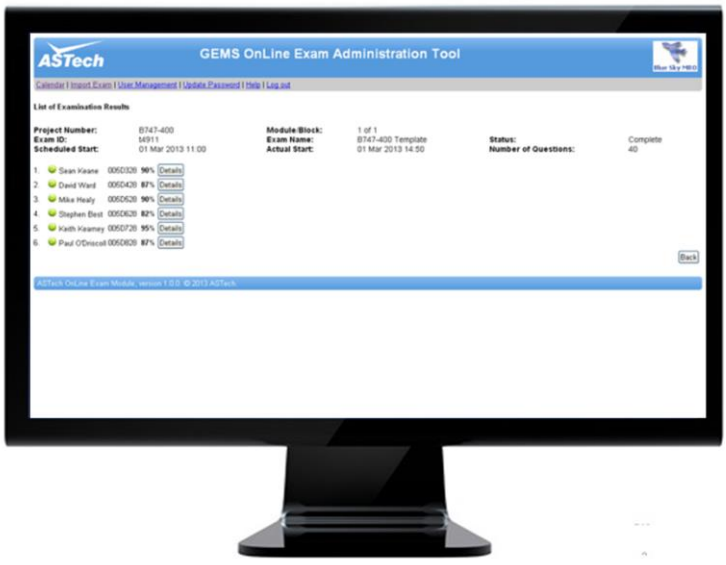
GEMS Online Trainee View - Images



Iarfhlaith

This screenshot shows the images after it has been selected. It can be seen in much better detail here. GEMS Online facilitates the use of good quality photographs and schematics which might not be suitable for a paper based examination.

GEMS Online Result View



Iarfhlaith

GEMS Online also comes with some basic reporting features. Trainees can be shown their result immediately upon exam completion, and the administrator will also be shown the results for each trainee.

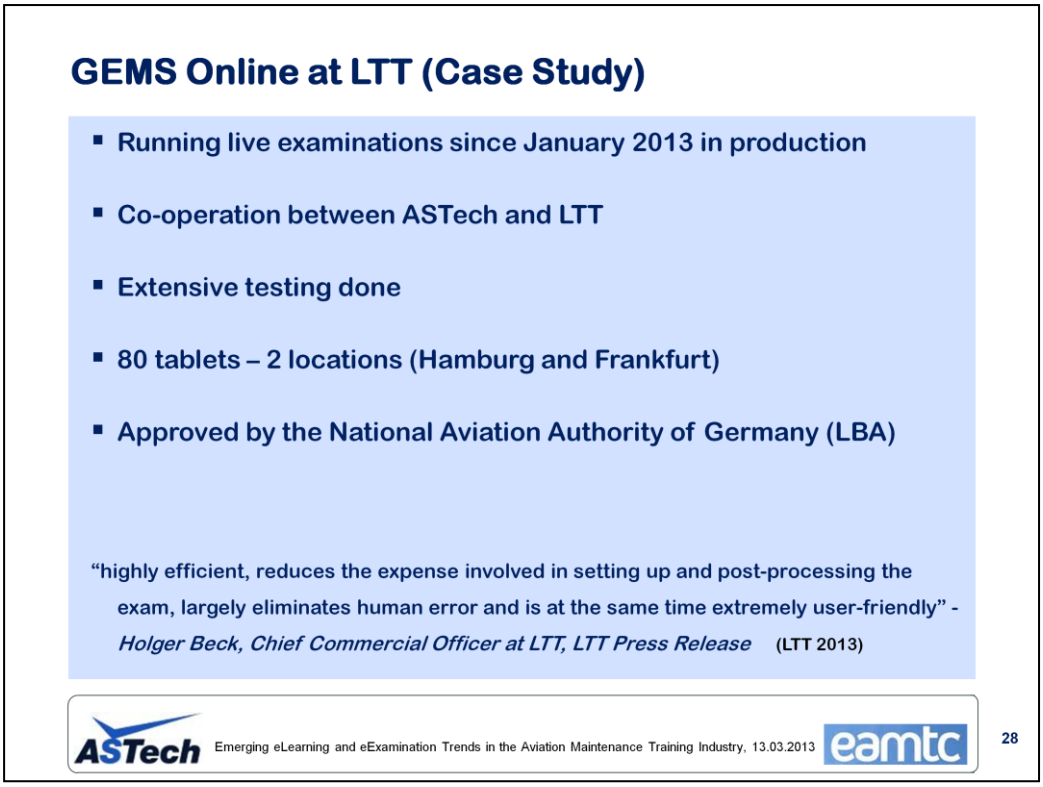
Questions that were answered incorrectly by numerous students are highlighted and the invigilator can look through these questions with the trainees and discuss the problems at the end of the exam if they wish.

GEMS Basic and Type have much more advanced reporting features. Once the exam has been completed results are automatically exported back into GEMS Basic and Type, and these reports can be used.

GEMS Online at LTT

Iarfhlaith

I will now do a short case study of GEMS Online Exam at LTT. The image above shows a classroom at LTT with tablet devices used to run exams online using our GEMS Online Exam system.



Iarfhlaith

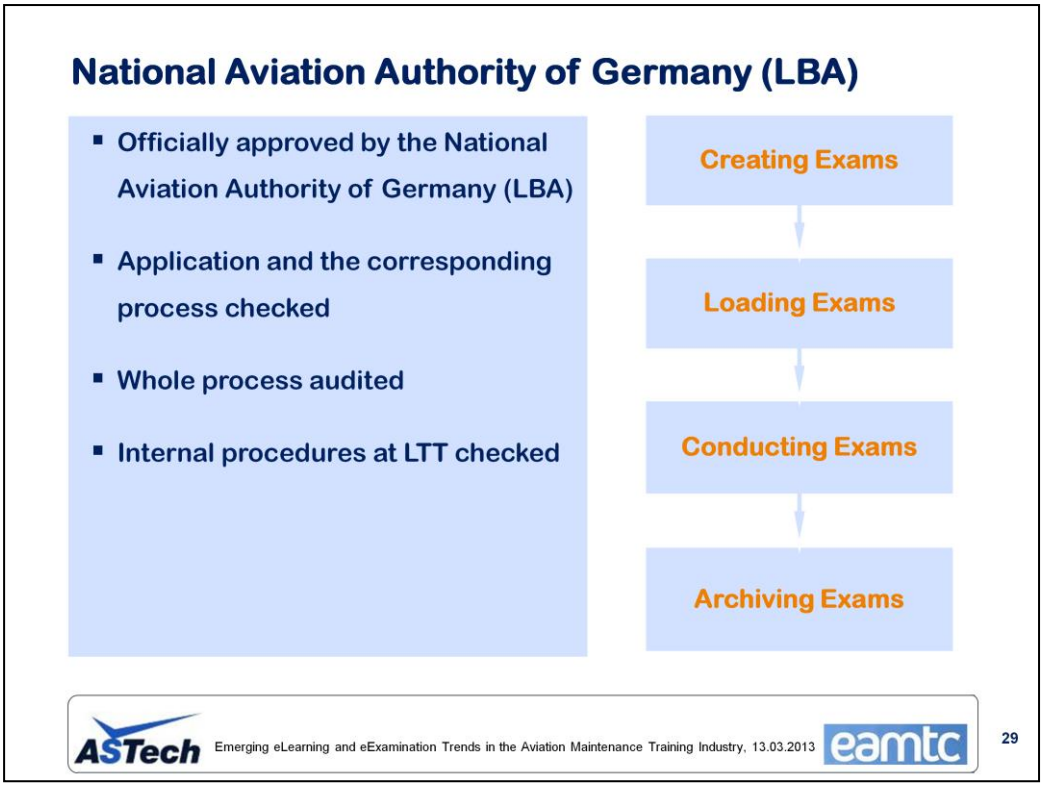
LTT have now been running live examinations using GEMS Online since the start of the year and so far feedback has been very positive.

ASTech and LTT have worked together on this project for a long time. The project was very complex and extensive testing has been done on both sides to ensure that all scenario's have been covered. Some of the challenges we faced included; making the system as easy as possible to use for trainees, covering the possibilities of server failure or device failure while running an exam, logs in case of a trainee dispute, and integration with GEMS, MINT, and the archiving server.

LTT have installed GEMS Online Exam at 2 locations (one in Hamburg and one in Frankfurt). In total they have 80 tablets split over 4 classrooms with 20 tablets each. Examiners at these locations have been trained in theory and in practise on usage of GEMS Online Exam. Participants are also trained before using the system. This is done by means of a presentation, information letter, and preliminary screens within the system itself. There is also the facility to sit a dummy exam to practice using the system.

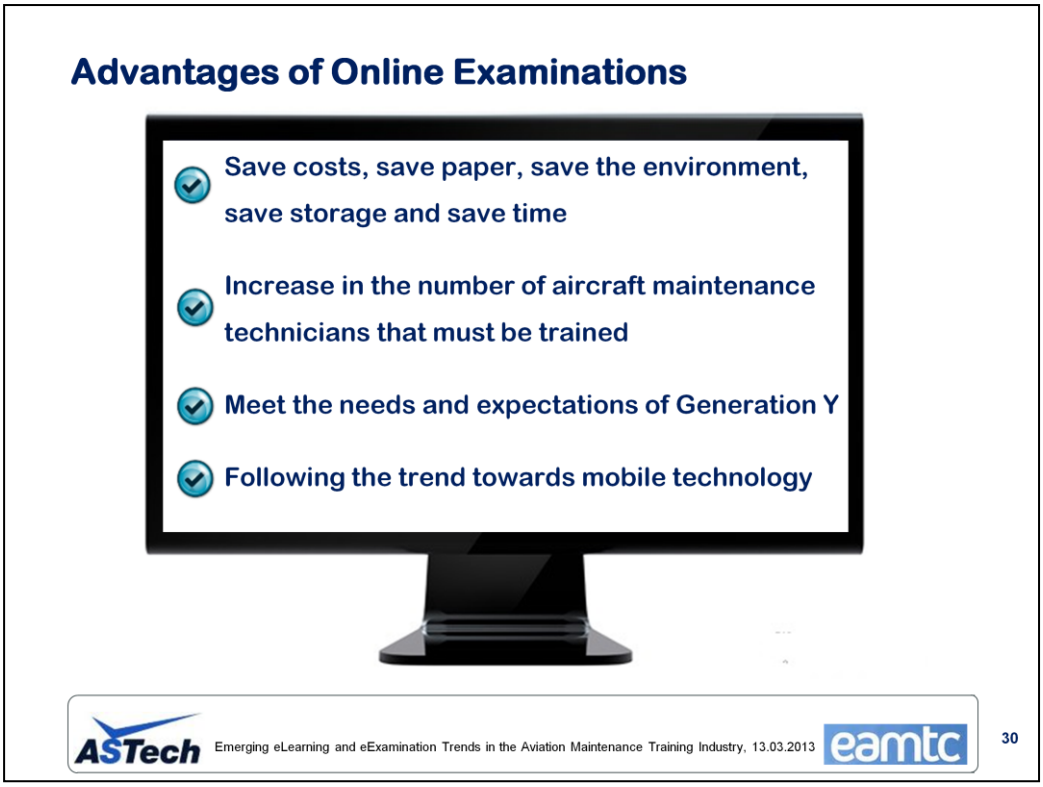
Holger Beck (the chief commercial officer at LTT) described the system as "highly efficient, reduces the expense involved in setting up and post-processing the exam, largely eliminates human error and is at the same time extremely user-friendly"

GEMS Online Exam has also been approved by the National Aviation Authority of Germany.



Iarfhlaith

Before running any exams, the Online exam had to be approved by the National Aviation Authority of Germany. It has now been officially approved and the LBA have granted LTT clearance to conduct this form of exam. To do this LTT had to provide the LBA with details on the application and the corresponding process. GEMS Online was audited by the LBA following the whole process -> creation exams, loading exams to the online exam server, conducting exams, and archiving exams. Internal procedures at LTT regarding online exams were also checked by the LBA.



Iarfhlaith

There are a number of advantages to Online Examinations (and e-learning in general) and this slide re-emphasizes some of the items that Stefanie discussed earlier in this presentation.

Online Exams save costs, protects the environment by saving paper, save of storage, and most importantly it saves time. With new regulations training, examination, and assessment records have to be kept for an unlimited period. It's not feasible to keep holding paper records forever. It's much more efficient if all of this information is stored and backed up electronically.

It facilitates the management and training required for the increase in the number of aircraft maintenance technicians that must be trained. There's an increase in the number of people that need to be trained, while budgets (especially in Europe - us in Ireland in particular) are getting smaller. A change towards improved technology can help to facilitate this.

It meets the needs of my generation. I expect to be able to do everything online.

People are now used to doing everything on smartphone, tablet devices, and laptop computers. People work while on bus, trains, and aeroplanes. We're at a stage where people are very comfortable doing exams online and are generally very trusting of the software they use.

Trainee Feedback

- Very positive feedback from candidates
- Questionnaire by LTT
- Modern, Professional
- Improved presentation and legibility of exam questions and images and equations associated with questions.
- Technically very easy to use

Iarfhlaith

Finally to mention some of the feedback so far from trainees

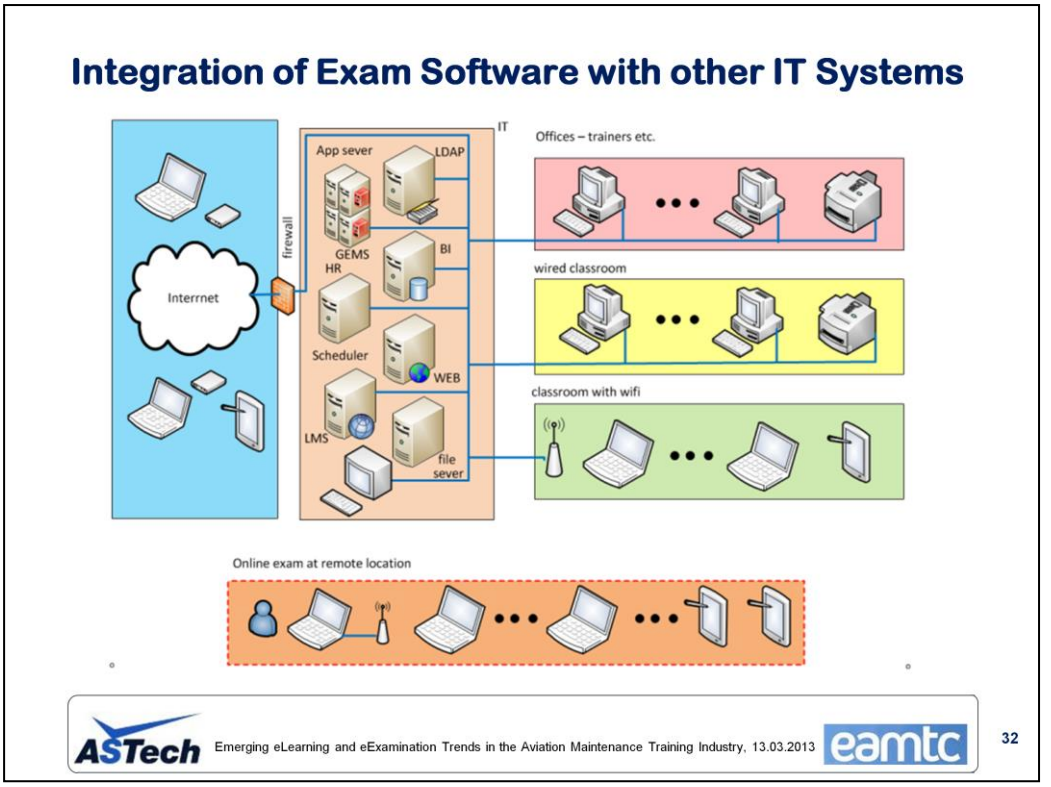
Candidates have been so far very happy with the online exams

LTT are asking trainees who use the system 14 questions. These cover electronic exams, the tablet computers, the information given, and the exam process.

It has been noted that the system is very modern and professional.

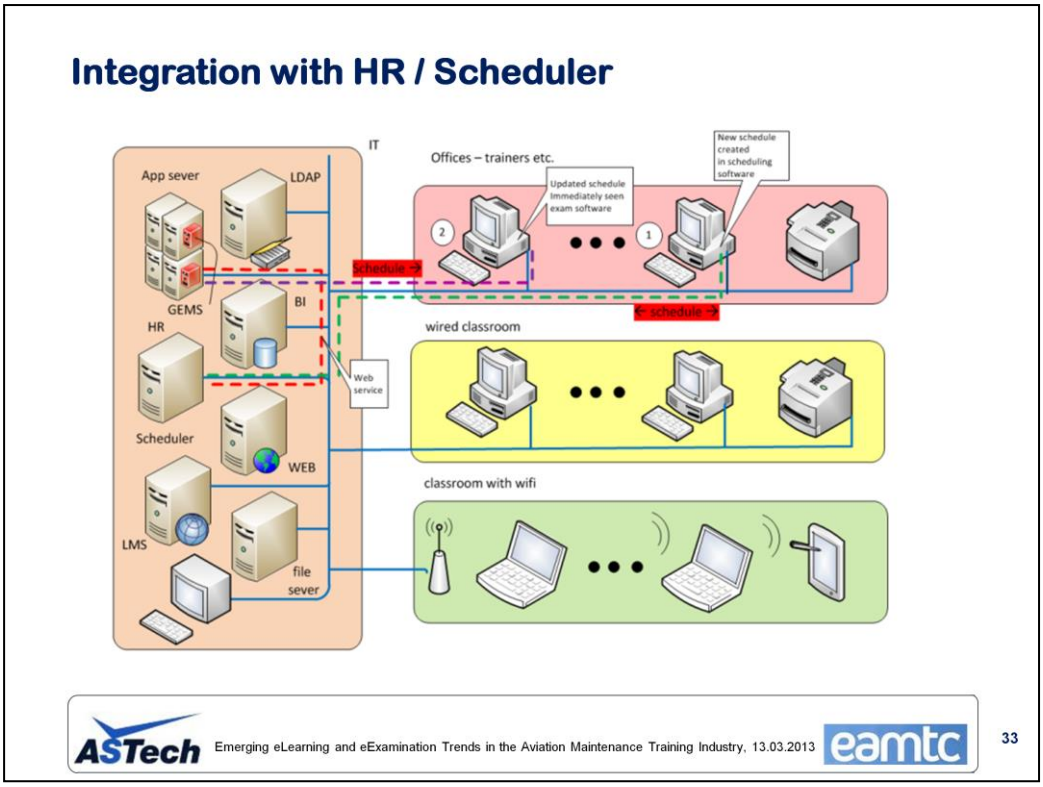
Importantly, it has improved the quality of the exam questions. Images and equations are very clear and it allows for much better quality images such as photographs and schematics to be used.

It's also very easy to use. Little or no training is required for trainees to use this system.



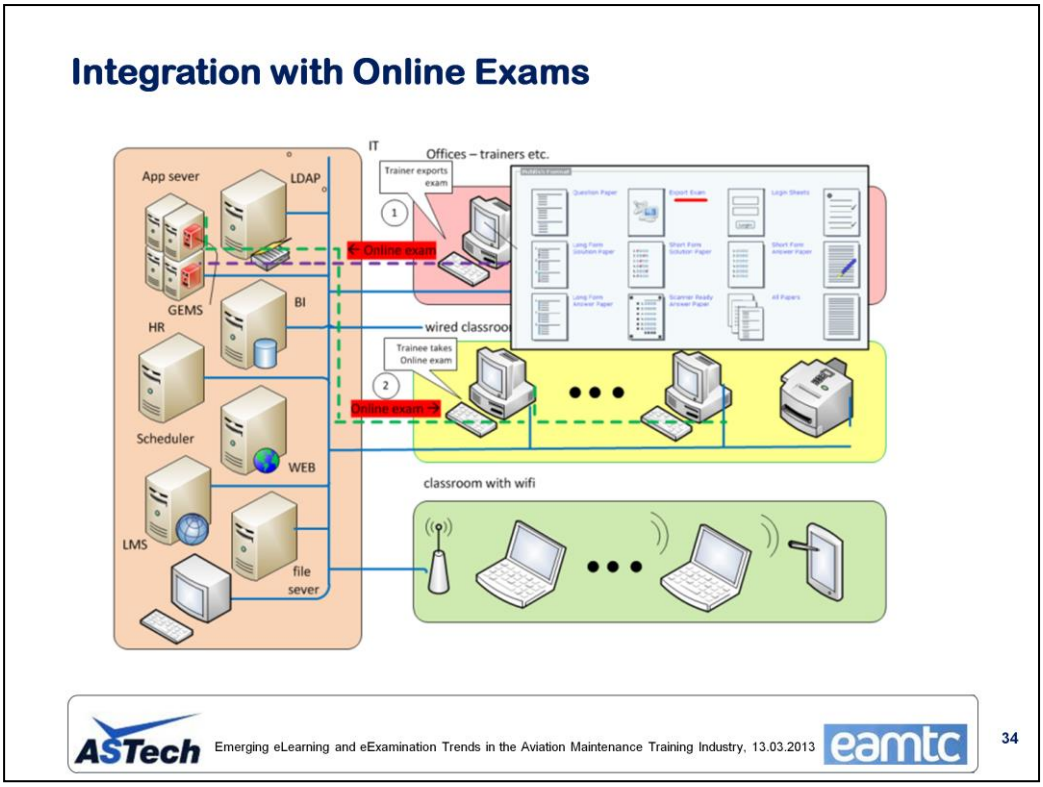
Paul

What I am hoping to explain in the next few slides is the requirements for the online exam system to share data with other IT systems. This picture shows a typical setup. Trainer and admin offices (top right hand side) are all on the organisations' network which connect to the organisations IT systems. We also show a wired classroom. There may be a number of these and, in the spirit of blended learning, they may be used for regular instructor led classes, simulation exercises, online learning, online examinations and so on. A 'breakout' area with wireless networking is also shown. In the centre of the picture we show typical IT infrastructure comprising LDAP server, DB server, web servers, file servers, and hosts for HR and other applications. At the bottom of the picture we show a typical setup for online exams – all that is needed is a netbook with the exam system VM (virtual machine).



Paul

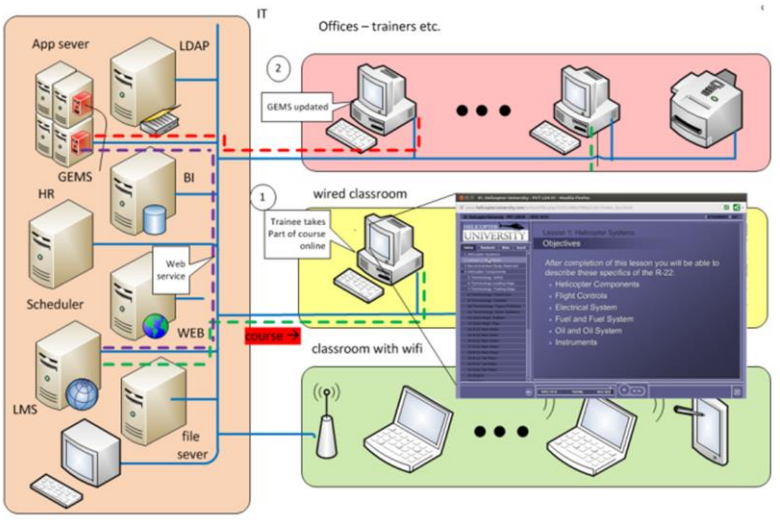
A big concern in Part-147 organisations with all the diverse applications for management is the duplication of data in the different systems. For example, a HR system or training management system will have listing of courses and classes (referred to as products and projects in some organisations), trainees, exam dates etc. etc.. An exam system will need the same information. Obviously, it is very inefficient, as well as error prone to have to enter this data again. A web services interface allows for a sharing of this data - it is entered ONLY once. As soon as data is updated in one system it is immediately available in the other system.



Paul

GEMS Basic, GEMS Type and GEMS Fundamentals (for Part-66 Basic, Type Rating and Non-certifying exams e.g. EWIS, Fuel Safety) can produce paper-based exams (with option for OMR automatic correction) and online exams. For security and other reasons, the online exams is normally hosted separately. This image shows the main exam system exporting the online exam. When the exam is completed, the results and analysis is available locally and the results are also imported directly into the main exam system.

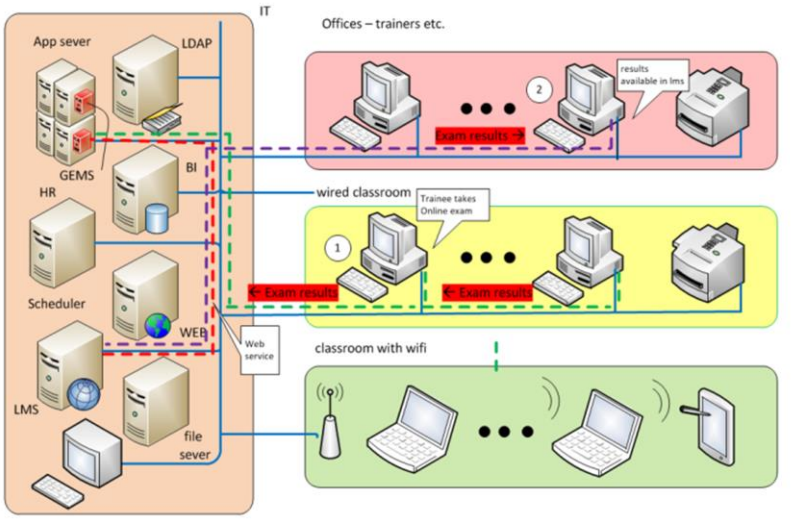
Integration with LMS



Paul

An LMS or LCMS may be part of the scene. Depending on an organisitation's policy, coordination may be required between the LMS or LCMS and exam system. A variety of LMS system are available and different organisations have their own preferences. Exam system must be able to exchange data with LMS. The image shows data exchange between the exam system and the open source Moodle LMS.

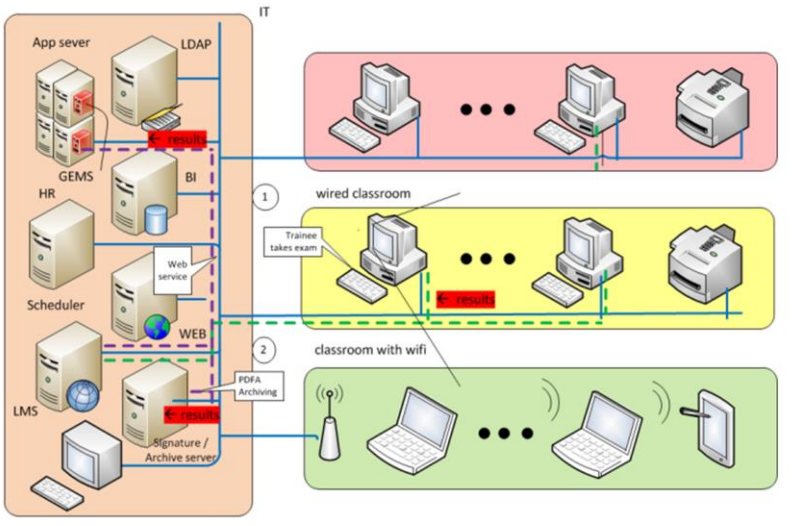
Integration with LMS (2)



Paul

This slide shows the results of an online exam being automatically recorded in an LMS system. Again, this is achieved using a web service interface.

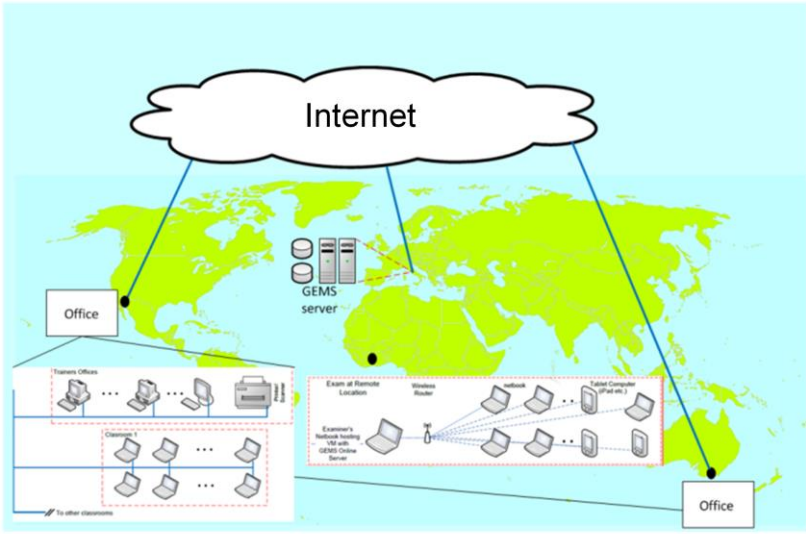
Integration with Archive Server



Paul

Large Part 147 organisations are increasingly digitally archiving all their exam records. A modern exam system should automate the process of providing a digital signature and archiving exam results. This slide shows complete details of an online exam (exam questions, images, shuffling data, student details, answers submitted and a complete log of all exam activity (including changes of mind), being converted to PDFA on a separate server and being archived.

Integration / Different Locations



Paul

Some Part 147 organisations have multiple sites. This slide shows that the exam system can be located at one location and used at other sides. Issues of security, bandwidth, latency and database replication need to be addressed - this would be a topic for a presentation in its own right but available technologies exist to provide cost effective solutions.

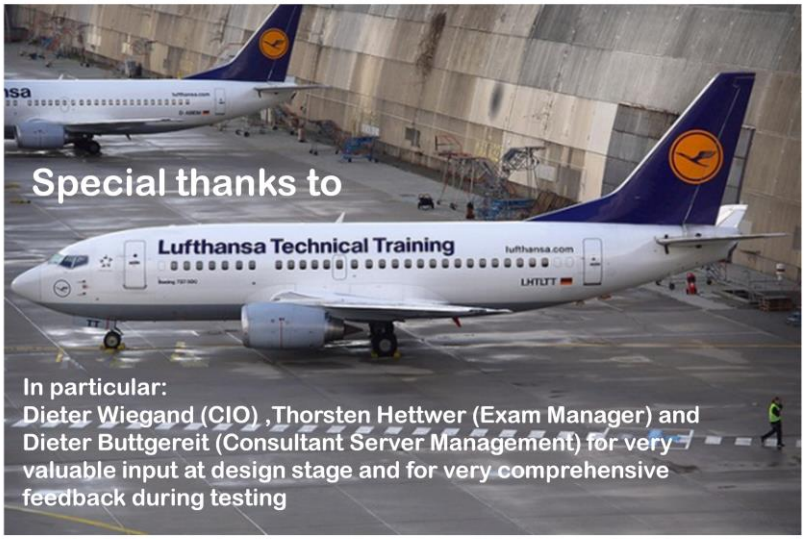
We have covered

- Emerging trends in eLearning and huge implications for the industry
- How organisations are reacting (and hopefully 'leading')
- Emergence of online exams – e.g. GEMS Online
- Requirements for integrating various IT systems to support online training and examinations

Paul

This slide speaks for itself. Hopefully, you have found the overview on eLearning interesting and can see how modern online exam systems fit in, I earn of the positive results from LTT and also see how they can integrate with other IT system to provide a reliable, secure and cost-effective solution.

Acknowledgement



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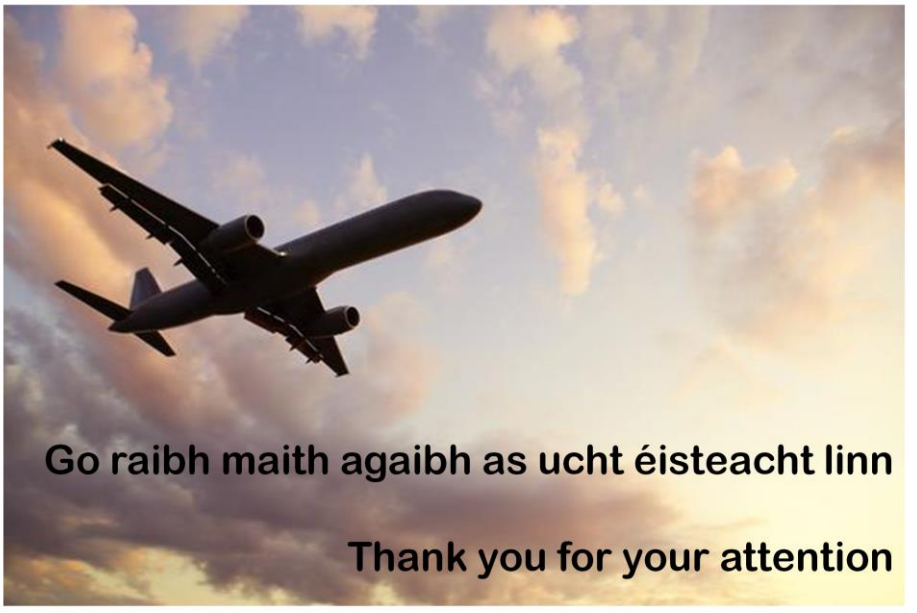
Paul

Very special thanks to LTT.


Go raibh maith agaibh as ucht éisteacht linn
Thank you for your attention

QUESTIONS

Contact Us

Address:	Sybernet Building Galway Business Park Dangan Galway, Ireland
Phone:	+353-91-522-316
Fax:	+353-91-680-023
E-Mail:	paul.nolan@astech.ie
www:	http://www.astech.ie

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