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Active Content for E-Learning

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Executive summary

This paper offers a view on a new concept and approaches of making e-learning more efficient by shifting from the (text)book paradigm to a new digital content structure and integrating learning process management elements into the content workflow thus improving the efficiency of the e-learning process. This way the resulting content becomes “active” (simultaneously conveying knowledge and helping the self-directed learners to better manage themselves) compared to the content created by the conventional methods widely used today.

Elements of an innovative methodology for designing such “active” learning content aimed at improving e-learning efficiency are described further in the text. This new methodology is targeted to help instructional designers to apply technological advancements creating more efficient ways of e-learning. It enables instructional designers produce “autonomous” courses integrating knowledge and management of the process into the learning content and thus no “external” learning management system is required. The “active” content helps the learners to follow the shortest pre-designed learning path(s) on the knowledge map acquiring the required knowledge thus enhancing efficiency and quality of the whole e-learning process. The major advantage of the proposed innovative methodology is that the well performed self-guided learners get the exact required outcomes (=knowledge) with no waste of time (=improved efficiency).

Keywords

Innovative, instructional design, e-learning, content

Introduction

The Knowledge Society made the concept of lifelong learning a continuous objective, necessity and challenge driving changes in the way we learn. Today lifelong learning became an essential “way of life” for many individuals permanently engaged in personal self-development by seeking new ways of extending their knowledge and skills thus building a sustainable career. In parallel, lifelong learning helps companies to find or develop human resources needed within the framework of the constant evolution of their activities in the ever changing market.

In itself, lifelong learning sets new requirements to learning – to be faster, cheaper and better. But to be more efficient lifelong learning needs new concepts, approaches, integrated solutions and flexible tools that can be adapted to each specific training request in order to consider all forms of learning when assessing and following-up various training needs.

Technology has always been a leading factor of change and major technological innovations have led to transformations in learning paradigm. Information and Communication Technologies (ICT) have changed the process of acquiring knowledge. This includes the design of and access to learning content, the delivery of learning and training as well as the management of the learning process.

Looking at the history of technology-enhanced learning we will see that although this evolution is far from over, we are today in an important phase named “e-learning”. E-learning applies technological advancements to create new ways of learning and training. ICT can solve “time-space” problems intrinsic to traditional instructor-led learning by extending instruction in space and time. Using technology we can reach more learners in a shorter period of time - and as a bonus they can learn at their own place and pace. This makes the learning process more effective. In summary, ICT eliminates the constraints of time and space and thus enhances the overall effectiveness of learning in the digital age.

Not long ago e-learning seemed to be a magic wand bringing us faster, cheaper and better learning. Many universities and companies have already set up virtual learning environments to deliver e-learning to the distant/home-based learners – students and employees. But although e-learning has been on the horizon for almost 10 years, its overall results and efficiency are still hotly debated among learning professionals. Many share the view that it still hasn't fully developed its potential. What are the reasons for this? The schools, universities and vocational training organizations still follow the 18th-century's learning model when they organized themselves around the printed book. Although many courses are already in electronic form, the old paper book model still widely used in education and training today continues “separate” the content from the learning process management thus reducing advantages of using digital technology. Today there is a critical need of new significantly improved concepts and approaches for building more efficient e-learning practices. It seems that the existing educational and vocational training systems require a serious overhaul - and technology is precisely the needed tool to accomplish this. E-learning will become more efficient when schools, universities and companies change the way they teach and train.

What's wrong with e-learning today?

In 1992, Peter Drucker predicted that in the next 50 years, “schools and universities will change more drastically than they have since they assumed their present form 300 years ago when they organized themselves around the printed book”.

In the beginning of the 21st-century the 18th-century's learning model is still the one we use. This paper-based system is unable to meet the requirements of ICT-based learning and training therefore the educational system should be geared towards innovation. The integration of technology and changes in the existing learning environment can help build a new highly personalized “on demand” self-directed learning model. Consequently, there is a critical need the today's learning model which is still instructor-led and (text)book paradigm-based to be changed. Even though it uses various e-learning tools and despite the fact that many textbooks and courses are already in electronic form they still follow the old paper book-based approach. They merely present the learning content with minor changes - reading on screen instead of on paper (which is not an ergonomic advantage), and provide limited ICT-based functionality (including hypertext and multimedia elements/objects).

The other disappointing thing concerning e-learning today's is that the recent learning management systems (LMS) and virtual learning environments (VLE) continue to “separate” the digital content from the process management and thus reduce the advantages of using digital technology. Even transferred online the learning process management continues to follow the old classroom-based learning/teaching model. Almost all LMS on the market today try to simulate the traditional instructor-led learning process, but a skilful integration of both content and management elements into the same digital information workflow may vastly increase the overall process efficiency and the quality of the final results (knowledge acquired by the learners).

Each learning process (whether instructor-led or technology-based) cannot start without a major component – learning content. Without e-content, no e-learning is possible, the process just cannot

start. And no knowledge transfer is possible – the main goal of every learning process. But almost all today's digital libraries and learning content repositories are built around the book/textbook-like form in different digital formats. The stored content continues to be in an unstructured form that vastly reduces the reusability of the huge knowledgebase created by humankind so far. In this book-oriented environment the instructional designers are unable to find ready highly granulated knowledge building elements (objects) and use them as LEGO© bricks constructing new learning content. There is an obvious need of significantly improved instructional design methodologies and tools that can meet the ever-rising training needs of the Knowledge society.

New concepts, approaches and principles in e-learning and content design

The new concept described further in this paper are based on some innovative approaches in today's learning/teaching practices combined with some basic principles of Cybernetics, the Systems theory and the latest developments in the modern Management practice.

In order to be able to make the e-learning process more efficient, instructional designers and system developers have to "unite" and:

- shift from the old (text)book paradigm to a new information structure and content workflow conveying the required knowledge
 - integrate process management elements into the digital content workflow
- thus improving the outcomes and efficiency of the learning process.

There are already many examples of such integration in company management based on **lean principles** (or Toyota Production System) aiming at improving production workflow in industry. The term "**lean**" was coined to describe Toyota's business during the late 1980s by a research team headed by James P. Womack at MIT's International Motor Vehicle Program. The core idea of lean is to maximize customer value while minimizing waste. Simply, lean means creating more value for customers with lesser resources.

In "Lean Thinking" book (1996) James P. Womack and Daniel T. Jones defined a set of five basic principles that characterize a lean enterprise as follows in short:

1. Identify value
2. Map the value stream
3. Create flow
4. Establish pull
5. Seek perfection.

These five basic principles enable managers and teams to **pursue perfection** through continuous improvement eliminating further waste of resources.

Nowadays the leaders in a wide range of industries, non-profit organizations, government agencies, healthcare, and other areas are finding ways to apply the principles of lean as a means of producing goods and delivering services that provide value for the customer with the minimum amount of waste and the maximum degree of quality. They use lean principles, practices, and tools to create precise customer value - goods and services with higher quality and fewer defects - with less human effort, less space, less capital, and less time than the traditional system of mass production.

Obviously **the lean principles can be applied successfully to e-learning** improving its quality and efficiency. Elements of those are in the core of the innovative concept and methodology described further below.

Making a transition from traditional "passive" to "active" e-learning content

Applying the approaches described above the instructional design teams will be able to develop “active” e-learning content going beyond the old “passive” book-based paradigm.

The proposed instructional design methodology is based on the following innovative approaches:

- design of the learning content by small chunks/bricks - knowledge objects that convey the required knowledge
- integration of quality control elements (“check points”) into the knowledge objects and in this way building “active” learning objects for managing the learning process
- development of an improved metadata system for both knowledge and learning objects
- mapping the knowledge objects (creating knowledge maps and space) and pre-defining shortest learning paths on the knowledge map(s)
- linking all learning objects into units and modules thus designing “active” e-learning content
- tracking the learners’ behaviour, performance, progress and results based on an extended learning measurement system
- presenting each learner’s progress and results in visual form helping the self-guided learners and online tutors to easily get and analyse the “whole” picture of the learner’s performance including the current progress, achieved results, process history and statistics.

The content innovative characteristics are as follows:

- The “row” knowledge content resides in a knowledge digital repository in highly granulated form of knowledge objects (KOs) making them highly reusable and easily retrieved from the digital repository
- A new metadata system is used for describing and hyper linking all knowledge objects semantically (by meaning) and taxonomically (by subject matter area)
- The learning content is created by learning objects (LOs) which are built by integrating KOs, the corresponding learning metrics, tracking elements and process management parameters
- Learning metrics, process management and tracking elements (time, learner’s results and behavior) are integrated into all LOs by linking them using a specially designed metadata system
- The required learning content is easily created by linking selected LOs thus forming the learning content flow based on learning elements and modules just following the well-known Lego® building principle. This approach makes also the learning content very easily personalized and graded by complexity level, e.g. for beginners, mid-level, advanced users and experts
- The learning content is web-based deliverable online on-demand
- The learning content designed using this innovative approach combining knowledge with integrated measurement, control and management functions can be defined as “active” in contrast to the traditional “passive” content that just present the knowledge.

The constant feedback data generated and collected at each step and phase of the process is used by the system, delivering the content online, to increase the efficiency of the whole process and the quality of the final outcomes.

The proposed methodology gives the possibility to be effectively designed an “active” learning content by means of knowledge objects that carry the required knowledge planned to be acquired step-by-step during the learning process. Learning objects are formed by integrating control and navigation elements (check points, knowledge metrics, tracking, hyper links, timing and descriptive metadata). The learning units, modules and completed learning courses can be built by linking the designed learning objects and applying appropriate pedagogy models. These specially designed “autonomous” courses combine learning content and control/management functions and can be defined as “active” in contrast to the traditional “passive” courses that merely present the learning content. The active courses integrate knowledge and management of the process into the learning

content and render the “external” learning management systems unnecessary. The learner only needs authorized access to the course and then the active content guides him through the shortest learning path and helps him acquire the maximum of the demanded knowledge. This way the efficiency and quality of the e-learning process are greatly enhanced.

Advanced instructional design approaches and techniques (“The quality of the final product should be integrated into it still on the design phase” – a designers’ saying)

On the Instructional Design phase two major tasks should be completed:

- integration of quality into the final product
and
- design of an efficient learning process.

To complete those tasks successfully some advanced instructional design approaches and techniques should be applied:

- Knowledge design and presentation in form of knowledge maps
- Shortest learning paths (on the knowledge maps) pre-determination
- Digital storytelling/storyboarding
- Minimalist writing
- Visual language
- Multimedia-rich content
- Frame based presentation (no scrolling)
- Two-tier (in-frame and between frames) easy frame navigation
- In web browser presentation
- Three-tier/layer (by complexity) content design and navigation.

The learning content can be designed using any common authoring tool for editing and integrating the course text, images and multimedia objects. The instructional design team just needs any e-learning authoring tool that enables creating e-learning courses from the text and multimedia elements stored and tagged in a digital repository (serving as a file database), using pre-defined templates. The output format should be in standard HTML code (no sophisticated authoring system is needed)

New “active” content role

The “active” content based on predefined knowledge maps and constantly generated complete feedback data helps self-guided (aka do-it-yourself) learners follow the shortest learning path(s) thus there is no need of an “external” LMS to manage the content and the process. A simple communication system can be used when/if the learner needs help from an online tutor/coach.

Learning courses/materials built by using “active” content will give self-guided learners the following important advantages:

- The learners will be able to get the exact required knowledge (**= quality**) at the end of the course, besides spending less time achieving the best results (**= efficiency**)
- A self-guided learner just needs an online access to the course content and does not invest time to learn initially how-to use a LMS where that content resides. This approach vastly reduces the time of the whole learning process and makes the learners’ task much easier and better focused.

Integrated learning metrics (“If you can measure it, you can control it” – another designers’ saying)

Learning metrics elements are created and integrated into all learning objects in form of questions and answers, tests, quizzes, etc. They form a separate “Learning metrics” database complimentary to the knowledge conveyed by the learning content. The created learning metrics database may be

used by instructional designers also for generating assessments, tests, quizzes, etc. at the end of any selected learning module or at the end of the completed course (as a final exam).

The integrated learning measurement generates constant feedback data at each completed step and phase of the learning process. This data is stored into a separate “Results” database. The “Results” data is used by the system to control the process and for further results analysis. The self-guided learner also uses this data as self-check points following the pre-designed learning path(s).

The whole “history” of the learning process stored into the “Results” database can be accessed online by the learner and the authorized tutors and supervisors. The stored data are presented in easy-to-use visual format (as knowledge maps, dashboards and graphic charts) making the process of result analysis fast, easy and accurate.

The final outcome is an increase of process efficiency (= shortest learning paths/time spent) and better learning results (= more knowledge acquired).

Content authoring (*Knowledge from the bests of the bests*)

Each organization/company usually has a team of experts who can author the required specific knowledge objects corresponding to the company activities by using any suitable authoring system(s) and following the steps briefly described above.

The knowledge objects created by experts may be stored into the organization’s digital repository (or hosted outside the organization) thus object-by-object extending the organizational knowledge base. An expert team of instructional designers can use that knowledge base creating required e-training materials when a learning need is detected.

If the content authoring system allows a “collaborative” authoring work mode, the learners/employees can also co-author or, if needed, amend the final content based on their work experience. The final content may be revised and approved by a panel of authorized subject matter experts after a discussion with the fellow co-author(s). This way a two-way collaborative learning and knowledge and competences sharing will really materialize in the organization.

Content delivery (*One-stop online learning service approach*)

As the training courses developed by using “active” content are “autonomous”, there is no need of any “external” learning management system.

All created knowledge and learning objects, learning modules and completed courses in form of files may be stored in a digital knowledge and learning content repository.

A simple website-like system delivering the created learning content to the final user can be easily developed. By log in and selecting any of the listed courses a user gets access to **knowledge on demand**.

The learning management function of the system is “invisible”/“transparent” to the learner due to the “active” content used. It tracks the user behavior and results along the whole learning process timeline and collects all feedback data needed for a complete result analysis. The system keeps the whole learning process under control, so there will be no unpredictable learning results and/or undefined learning time.

As many of the functions are “transparent” to the final users/learners, there is no need any complex learning management system to be preliminary studied by the learner. A learner just needs to log in to the system, select a course and start studying it directly. This approach reduces vastly the learning time and makes the learner’s task better focused and much easier. The self-guided learner will be able to get the exactly required knowledge (= **quality**) and will spend less time to achieve the best results (= **efficiency**).

Advantages

The described methodology is “neutral” to:

- the content type – learning content for any subject area can be developed
- the pedagogy model – any pedagogy model can be applied/integrated into the developed course
- the program code - any program language/code can be used for programming the course
- the business model used for delivering the course/content – any access model can be applied, e.g. free access for general educational applications, restricted access for corporate training applications, on-demand delivery, subscription-based, etc.

The major advantage of the described innovative methodology is that the learners get the exact required results without waste of time. The learning time is carefully planned by the instructional design team during the design phase and is closely monitored throughout the whole learning process.

Application areas

Although the described methodology is well suited for all learning areas (school and university education and corporate training) it has clear advantages in learning applications with precisely predefined learning goals (the exact knowledge and skills to be acquired at the end of the course). It can vastly improve efficiency in corporate training especially in corporate training areas where the learning goals can be very precisely specified before a new production task arrives such as production and assembly lines, technical services, sales teams, etc. The methodology can also be applied successfully in other areas such as healthcare, defence and security, bank services, etc.

The presented innovative instructional design methodology provides the organizations with immediate “multilayer” benefits:

- the learners/employees get the exact personal knowledge they need, when they need it and in less possible time (by self-guided learning)
- the company departments “extend” their organizational knowledge “just-in-time”. Based on the learning history data of each employee retrieved from the system, the department managers will know exactly “who knows what” and can plan precisely the allocation of the new tasks choosing the “right person for the job”
- applying this innovative approach the companies will change the business culture and day-by-day start building themselves as real “learning organizations” thus improving their adaptability and competitiveness in the market.

Conclusions

E-learning can become truly efficient in terms of time, quality and invested resources by applying such innovative instructional design methodologies. Instructors can use this kind of especially designed “active” learning content to benefit from all the advantages of the ICT-enhanced learning. This way not only the potential of digital technology is better utilised but also a next step in learning is made – personal knowledge management capabilities are integrated into the content flow delivering new knowledge thus improving learning process outcomes.

The methodology presented in this paper helps to be developed and implemented “**active**” **e-learning content** integrating knowledge, learning metrics and process management elements. The aim of this innovative content design is improvement of e-learning efficiency.

Bearing in mind all weaknesses of today’s corporate learning and performance management, the author has developed an innovative concept and integrated system architecture linking and advancing the process of personal and organizational knowledge and performance management. The first “member” of this “united family” is the presented methodology of “active” content design.

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