Concepts of e-Learning Accessibility Improvement – Codes of New Media Art and User Behavior Study

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Abstract: This article examines our proposed innovative strategies to further improve e-learning and new eBig3 learning approaches using an e-Ecosystem that is based on a multi-screen concept to support e-learning. Here we present the data comparison of user behavior in well-known Moodle and EdX learning environments. We propose the New Media art code analysis as an experimental method for eContent evaluation, and present the design science research method as a tool for application of e-learning research results. This paper is a part of a cross-cutting research in the fields of digital / new media art and ICT product innovation. The research is aimed at finding a path to open up the cache of knowledge situated in the theory of modern art, and to incorporate the codes of modern art into the field of ICT. The goal of the research is to transfer knowledge of modern art into areas traditionally not related to contemporary art and its specific academic trends, as well as to encourage the intersection of these disciplines. Consequently, this research aims to create a new profile of products that would exemplify modern interdisciplinary and analytic thought.

1 INTRODUCTION

This article reports on our innovations to further improve the new eBig3 – learning approaches using an eEcosystem that is based on a multi-screen concept to support e-learning. Here we present our concepts for eBig3 virtual learning environment extension to increase accessibility, usability, and decrease drop-out rate (Kapenieks, et al., 2012).

Our new concepts incorporate codes of the New Media art and design science research methods.

This paper is a part of a cross-cutting research in the fields of digital / New Media art and ICT product innovation. It examines the codes of modern art that were formed during the period of modernism and still constitute the basic trends of intellectual culture today. The research is aimed at finding a path to open up the cache of knowledge situated in the theory of modern art, and to incorporate the codes of modern art into the field of ICT. The focus of this research lies in experimental products such as eLearning, gaming and the digital advertisement industry (the last ones are not represented in this paper, but are a significant part of this research in general). The goal of the

research is to transfer knowledge of modern art into areas traditionally not related to contemporary art and its specific academic trends (although there are artistic tendencies in gaming and advertising for sure), as well as to encourage the intersection of these disciplines. Consequently, this research aims to create a new profile of products that would exemplify modern interdisciplinary and analytic thought.

2 DISCUSSION

E-learning opportunities have been significantly expanded beyond the single (PC) platform, creating the preconditions for an integrated approach to technology-enhanced learning. This potential has also created challenges for e-learning designers due to the variation of technology requirements across platforms and the necessity to find solutions for an integrated technology for e-learning delivery (Kapenieks, et al., 2014).

Moreover, insufficient in-depth research of learners' behavior in a multi-screen environment and

limited understanding of how the behavior changes due to new technology developments, adds complications to designing an appropriate multi-screen learning solution (Kapenieks, et al., 2015).

Our position paper intention was to integrate modern art with e-learning. In this paper, we are presenting our strategy of integrating the codes of modern art into e-learning, and eBig3 learning approach. We examine how integration of the codes of the New Media art context to enhance e-learning and eBig3-learning – through the context of Intertextuality, Random Access and Hacking.

The low-level of participation of people in life-long-learning activities is a critical concern and one of challenges for the e-learning development community. The recent years have seen a number of attempts to make e-learning more acceptable, and more efficient. The proliferation and availability of connected computing devices have extended e-learning delivery opportunities.

The eBig3 approach has the capacity to respond to the skills and preferences of a large target group of users that encompasses all age groups of the life-long learning context. The approach is flexible and easy to use. It can reach, deliver content, and learning support to a diverse group of users and does not require continuous upgrading of technology and special skills. It matched the requirements of the target group of eBig3 courses that, of course, was general public.

Our approach seeks to meet the challenge of applying e-learning, m-learning and t-learning at the same time and adjusting them to the habits of users. To achieve this goal, we use an eEcosystem approach that is calibrated to user preferences.

The approach efficiently integrates the popular technologies of television, Internet, and mobile phones. It is a new way of using technology to support and encourage engagement in the lifelong learning process. We compared the user behavior data from the various presented courses with the number of learning objects to the number of users. We found that the multiscreen e-learning approach with eBig3 boosted eContent accessibility and in the selected courses user motivation in optional courses tend to reach the motivation level of mandatory courses (Kapenieks, et al., 2015).

In Figure 1 we present a set of e-learning approaches (e-learning, eBig3 learning) and a set of new approaches virtual learning environments (Moodle, EdX). This article presents a set of new our approach to extend the accessibility of technologically enhanced learning.
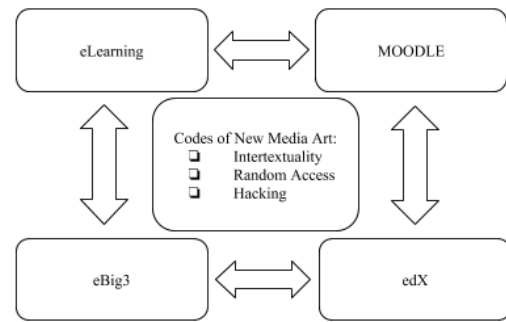

Figure 1: Set of e-learning technologies evaluated in relation to the New Media art.

2.1 Design Science Research Method

The design science research method used in this paper helps boost the efficiency and interest towards e-learning. Design science research tends to integrate seemingly distant disciplines and seeks parallels in different areas in order to gain new knowledge and adapt fresh concepts. By finding common aspects in different areas, design science research fuses areas and invites new trends into a research field. It creates new visions of handling problems in research (Pohl, Hadorn, 2007: 59).

A different perspective such as innovations in art language with its intuition-based and creatively irrational approach can open new horizons in traditionally logical and organized fields such as formal education. E-learning and modern art theory can be linked as related areas consequently moving the contemporary art codes closer to life-world and making e-learning more efficient in the meantime. Contemporary art, rooted in the modernist tradition and the Enlightenment paradigm, functions today as a closed area. It contains brilliant ideas that are worth importing to life-world. Modern art codes lie in a field of pure art that has usually no utilitarian function.

This research follows the German Bauhaus tradition in the sense of integrating modern art and aspects of a life-world. The modern art theory comprises a huge intellectual cache that can be used as modes for activating other fields such as e-learning. As the design science research is a method of promotion of common good (Pohl, Hadorn, 2007: 21), it can make the modern art codes function on a socially important level. By using the art codes as a tool of supporting e-learning, we translate the codes situated in area of pure art to a socially relevant territory. Besides, we gain a new approach to e-learning that embraces aspects of hacking and random access, and significantly encourages interest of the e-learners.

Contemporary art practice that incorporates digital technologies is called New Media art today. Historically, it lies in a framework of art theory of Modernism starting with Cubism, Dadaism and other avant-garde movements and continuing in a post-modern scope. The theoretical basis of New Media art is much like its antecedent Modernism. It is often coded by its nature as it is conceptually non-transparent (Eco, 1988: 28). The new artwork is usually intellectually overloaded. It requires the spectator to be immersed in its historical and conceptual context. It is most likely not understandable at the first glance. It only reveals itself to its audience when a sufficient information has been gathered and the audience learns to read it as a semiotic phenomenon, in other words, the artwork is coded (Gintere, 2017: 435).

The modern art codes involved in this research of e-learning strategies are identified as intertextuality, random access and hacking.

2.2 Intertextuality and Random Access

The eBig3 system embodies the idea of intertextuality that emerged in the theory of literature and art (Kristeva, 1980) and that is used to describe the modern cache of knowledge as a net of many texts. The structure of Internet is also created like an intertextual space that links many areas of information and leaves the individual to wander in this multi-level area according to one's own needs. This principle of free choice is typical to the contemporary understanding of learning. Our feeling of how we enter the knowledge cache is non-linear and rather improvisatory. In other words, we enter the space of knowledge in different ways, using each one's own door because entrances are innumerable and all of them are equal.

In theory, intertextuality appeared as an art code described by Julia Kristeva in her book *Desire in Language*. It comprises ten essays first published in her book *Séméiotiké* (1969). Kristeva refers to the psychoanalytic and poststructuralist approaches as well as to authors such as Jacques Lacan, Roman Jakobson and others. Her original idea was to characterize the act of writing and reading the modern literature. Since Kristeva's first attempt to define the concept, it has been widely developed and gained many meta-meanings resulting in a net-like understanding of the contemporary environment (Derrida, 1967, and elsewhere).

In the contemporary New Media art world, intertextuality holds a dominant role. Many digital artworks carry the idea of a knowledge space with paths of individual choice. This territory has no center, and one can choose the entrance of the knowledge cache. Intertextuality is a concept used mainly to describe the textual world, nevertheless its abstract shape is similar to the eBig3 project structure. The eBig3 uses the principle of a space that has different entrances and can be accessed by users not only via computers, but via SMSs and television (see Table 1). The response shows a significant boost of registration for eBig3 courses compared to traditional registration for online courses. It helped decrease the drop-out rate and guaranteed that users felt encouraged to stay for the whole duration of the course (Kapenieks et al, 2014: 325).

The idea of entering the public area by using three different technologies was possible because the social knowledge was treated as an intertextual space that can be potentially opened in several ways. eBig3 used this structural feature to show that the social potential of learning can be better activated by integrating different media. It was possible by understanding the structure of social mind as a net that does not have a single entrance but is better suited for a multi-media approach.

The eBig3 concept implies also the possibility of random access that is a dominant feature of New Media art. Its abstract shape recalls the already classical New Media art principles. *Random Access* (1963) by Nam June Paik (1932-2006) is a work made of an audiotape cut in strips and collated on the wall. It has an audio system with an extended playback head. One can play the pieces of tape using the playback head by creating an original shape of the given material (Paul, 2003: 15). The example shows that a piece can be played from any point and one can gain new insights by using an unconventional entrance. The authors of eBig3 used this idea to show how the public space of knowledge can be activated or "played" (see Table 1). It could be resounded at home by television or at work by a computer, and it could also be activated in other public spaces simply by using an SMS. This approach creates random access to public knowledge.

2.3 Hacking

The so-called hacking feature is one the New Media art codes used by eBig3. In the field of New Media art hacking has been used very actively. There are many examples such as *[domestic]* (2003) by Mary Flanagan, *The Third Ear* (2015) by Stelarc, *The Intruder* (1998-1999) by Natalie Bookchin and *Super Mario Brothers* (2002) by Cory Arcangel (Tribe, 2009: 28-29). In a sense, it is an anarchic

trend with a tendency of crossing the red lines of accepted behavior: entering a space of another artwork or game, breaking its original identity, inventing new accents. The aims of hacking are nevertheless ethical: its goal is the liberation of the art world from conventions, a constructive criticism of values and lifestyle, searching for new horizons in the existing entourage of art.

The history of hacking goes back to Marcel Duchamp's and Robert Rauschenberg's classical works where they dare to intrude into pieces of other artists in order to create new ones. Duchamp used a post card with Leonardo's Mona Lisa painting and added a moustache and a beard to it (*L.H.O.O.Q*, 1919). Rauschenberg in his turn used the drawing by his colleague Willem de Kooning, erased it and treated the traces of the drawing media as his own artwork (*Erased de Kooning Drawing*, 1953). Those examples illustrate the tendency of the contemporary art to rebel against conventional practices in culture and a wish to assign equal rights to every creative process (Tribe, 2009: 76).

We have transferred the trend of hacking to the field of e-learning to show that in the context of eBig3 new practices, or new horizons emerge when technologies as an ensemble come into our life-world. The triple-screen approach combining computer / internet, television and SMS meet the needs of learners better than a single screen based e-learning (Kapenieks et al., 2014: 328). It would be too harsh to say that eBig3 is a breaking-in activity, although it works as an ethical hacktivism. It intrudes in a positive way into the traditional entourage of knowledge and brings high standard values such as improvement of studies and intellectual development (see Table 1). Using hacktivism, eBig3 has shared a new practice in the knowledge space creating a social common good. Moreover, it opens the knowledge space in order to modify it, to activate and move the intellectual and practically oriented social potential. With this demarche, eBig3 demonstrates freedom to edit the knowledge gaining area and simplify the entrance to education. It reviews the existing educational values and uses the three media in a fruitful cross-cutting perspective.

2.4 User Behavior in EdX and Moodle

The problem of detecting measurable learner outcomes is receiving considerable attention with the development of new online learning management systems (LMS). Ease of use, concise video-based contents, and simple access from any device are critical factors from an end user's perspective. Some LMS are very popular in use, although, they lack some features stated as standard nowadays. As a result, most of the learners complain about inefficiency and unreliability, as it was evident from a learners' study we conducted in two content equal Basic Business courses at Riga Technical University in Latvia. The only difference in both experiments was the kind of LMS. We compared two LMS – MOODLE and Open EdX.

We obtained log files with the learners' click records available for analysis. We applied the method to reveal learning session length using some assumptions. The characteristic formulation of Maximum Session Length (MSL) was implemented to obtain an algorithm capable of evolving Cumulative Student Activity (CSA) in learning course. We further used the Learners Rendered Activity (LRA) formulation to characterize learner activity including the number of clicks and activity time. Data collected from two LMS deployments gave us new insights into learners' behavior.

Our first e-learning version is a Moodle site, linear in its spatial structure. All the materials can be found by scrolling down the page: the course design is a list of resources. The content of the site is transparent, the structure is clear, however it is all based in a computer environment. EdX in its turn transgresses this well-arranged homogeneous space and presents a matrix-like structure.

Study results (Figure 2) demonstrate higher user activity in EdX virtual learning environment. It confirms our assumption that codes of New Media art are motivating learners for activity.
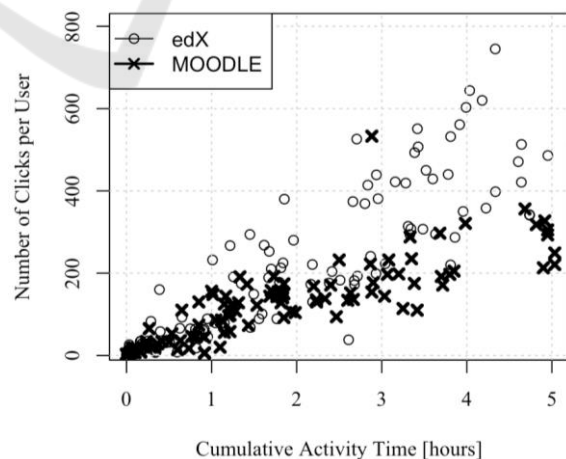

Figure 2: Cumulative number of mouse clicks VS student time spent in virtual learning environment EdX (o) and Moodle (x) for Basic Business Course. Each point (o) or (x) represents the activity data for one student.

Table 1: Modern art codes enhancing e-learning into eBig3-learning.

Modern art codes	
Intertextuality and Random Access	Hacking
↓	↓
The social space of knowledge: a net with several entrances	Intervention in and transformation of the knowledge space
Significant boost of registration	Ethical hacktivism: intrudes in a positive way in the traditional entourage of knowledge
Entered by different "doors" Three-pronged approach (computer / internet, TV, SMS)	Technologies as an ensemble entering into the life-world, simplifies the entrance to education
Improvement of accessibility of eCourses	Reviews the existing educational values and uses the three media in a fruitful cross-cutting perspective
New approach to knowledge gaining: the knowledge cache activated by extra possibilities (TV, SMS)	Triple-screen approach better meets the needs of learners
Users feel encouraged to stay the duration of the course	Social common good
Drop-out rate decreased	Opens the knowledge space in order to activate and move the intellectual and practically oriented social potential

3 CONCLUSIONS

To boost the efficiency of eBig3 eContent, we suggest the New Media art codes as an experimental method of cross-cutting the intellectual fields such as education and art. Analysis and integration of the New Media art codes is an original method for the development of e-learning process and other ICT products. The codes such as Intertextuality, Random Access and Hacking bring a fresh look to the field of e-learning and introduce a creative approach to knowledge acquisition. The art codes turn e-learning activities into contemporary trends of art of the recent decades. Namely, e-learning becomes a platform of common good that is activated by the three-media ensemble.

With the meta-structure of the New Media art eBig3 suggests a new e-learning model based on values of contemporary art. Consequently, eBig3 can be a way to cross-cut the traditional learning methods with modern art where intervening is welcome since it brings new insights and practices. Entering the social reality and modifying it in a reasonable way contributes to new creative ideas and fresh aspects of knowledge.

By comparing the Moodle and EdX e-learning environments, we conclude that the content in a matrix-like format is an efficient way to enhance learning and contribute to more efficient user behavior. The traditional Moodle version was created for computer / internet only and it did not succeed as well as the multi-screen approach. Moreover, by transferring the elements of modern art theory to the structure of e-learning we propose to conceptually unify the contemporary tendencies in the field of ICT. This theoretical framework is unique as e-learning and theory of modern art have never been viewed before as related fields.

ACKNOWLEDGEMENTS

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