

# **TOWARDS A SUSTANABILE OPEN EDUCATION RESOURCES MODEL THROUGH GAMIFICATION**

Ahmed Alzaghoul  
LSIIS  
Facultad De Informatica,  
Universidad Politécnica de Madrid.  
Madrid-Spain  
[a.alzaghoul@alumnos.upm.es](mailto:a.alzaghoul@alumnos.upm.es)

Edmundo Tovar  
LSIIS  
Facultad De Informatica,  
Universidad Politécnica de Madrid  
Madrid-Spain  
[etovar@fi.upm.es](mailto:etovar@fi.upm.es)

## **Abstract**

The purpose of the paper is to show a literature review and its current status about developing a generic understanding of how to sustain the process of learning through gamifications in OER repositories. That once instantiated can lead us to the development of Quality Model of OER Sustainability concept. Having a strategy to innovate the eLearning to enhance its process of learning by using gamifications can lead us to a motivating outputs, which its purpose is to engage the students with the best scenarios to learn accomplished with achieving attractive challenges to increase the level of commitment and competitiveness. It appears some requirements to adapt current products and services into a way of working more efficiency and friendly in a social and economic demand that can help to increase the quality of delivering learning. However, some factors in gamifications can affect the requirements of the quality to solve the problem of poor delivering knowledge to the learner to increase his performance. In this purpose, there is being designed OER tasks which should include innovative teaching strategies such as gamifications methodology as an application of learning visual material. Questionnaires, open-ended interviews, and visual learning tasks are prepared to be delivered to participants. After collecting quantitative and qualitative data using some research analysis methods such as interviews and surveys. The proposed results point to differences between those participants who use a visualized gamified courses in OER repositories that use quality attributes to sustain this process of learning and those who do not, in terms of being more efficient and successful. This object of this research is to assess the impact of the term sustainability as a quality factor applied on a gamified course in OER repositories. This is be done with the aim of increasing the quality level of teaching by using Gamifications methodology as a useful application to enrich and enhance the way we deliver the knowledge visually. That leads us of developing a Quality Model of OER Sustainability concept.

## **Keywords**

Gamifications; OER; Sustainability; Quality.

## **1- Motivation and context of this research:**

The motivation to undertake in this study is to develop a quality model based on Open Education Resources (OER) repositories by applying sustainability as a quality factor on gamifications courses. That once instantiated can lead to the development of Quality Model of OER Sustainability Concept. The purpose of this paper is to show a PhD dissertation research plan-and its current status- about using gamifications and sustainability through online teaching (OER). The present research is aiming to increase the quality level of teaching by enhancing the way we deliver the knowledge. Regarding this pedagogical, technological, innovative opportunity, it is appropriate to ask: How by applying Sustainability as a quality factor can affect the process of learning in OER repositories and how gamifications can be useful to enrich the delivery of knowledge? At the moment we are working on the initial specifications of the quality model.

## **2-State-Of-The-Art**

“One of the most important skills that any student can learn is where to go for information and resources,” Sams said [2]. E-learning can be an access of education including some activities such as: direction, teaching, learning and assessment through different electronic media [3]. Thousands of online courses are now being offered to take thought different platforms. Not only can be an available submitted instructional material on the Internet but also an online collaborative learning and discussions can also occur. This online content can be accessed on various devices using different systems and tools [4]. Learning technologies are used at many universities and colleges as an approach of learning that blends face-to-face and online teaching methods such as the MIT’s OpenCourseWare project [5]. Nowadays, it is a fact that the increasing use of

computers in education can often enrich the interacting with some kind of visual formalism [6].

Through gamifications e-learning becomes possible to deliver clearer and more engaging training, which is more likely to be understood and remembered (especially in case of complex topics). Sustaining the e-learning can be developed by sustaining the way we present knowledge visually in creative ways by making the course as gamifications or by enhancing the process of teaching and knowledge delivery [7]. This is how we can eligible to the eye of the learner and catch his behavior. However, we have first to understand the need of each learner and the way they thinks and then find the suitable games techniques to apply on a particular course to present the knowledge visually creative and gain back the interaction of the learner with the course and feedback.

E-Learning has recently become a promising alternative to the traditional classroom learning, helping society move toward a vision of lifelong and on-demand learning. It has become one of the fastest-moving trends and aims to provide a configurable infrastructure that integrates learning material, tools, and services into a single solution to create and deliver training or educational content quickly, effectively, and economically [8]. Thousands of online courses are now being offered. Not only can instructional material be made available on the Internet but online collaborative learning and discussions can also occur. One of the most significant changes in the field of education in this information age is the paradigm shift from teacher-centered to learner-centered education as the learner choose what and when to learn.

Along with this paradigm shift, here appears the idea of sustain the online learning. The term "Sustainable" is essentially associated with ecology. Sustainability is 'the quality of being sustained' that is capable of being endured and capable of being maintained" [9]. As Coral Calero et al said, "If sustainability a way to achieve the quality, this means, can we have a sustainable quality and a non-sustainable". First option is to consider the sustainability from all perspective of quality such as: performance, efficiency, time, delivery etc... Second, Sustainability could be mentioned as a new character in this model of quality. Third, it could already include as a performance requirement. Finally, Sustainability can't be a part of quality but an influence factor over the quality. However, choosing one perspective of

sustainability as a quality factor can affect our perspective on how we look at the system [10].

What we mean by quality here is the quality of performance of the learning process in capturing the behavior or the learner during taking a visual course (Video learning). Gamification is now becoming a trend in online learning environments [11-12-13] and its usefulness and efficiency has been recognized in different areas of education. Several authors [14-15] have pointed out likely that the games as valuable learning tools. Coordination of disparate systems and paths, and modification of processes will serve the satisfaction of learners wants and needs [16]. However, some factors in gamifications can affect the quality of requirements such as the Availability as when this game is operational and accessible when required for use or Reusability which this game can be used in more than one system, or in building other assets [17]. Here we can say that those factor can help in somehow to sustain the E-learning, furthermore Sustainable development has been defined in many ways, but the most frequently quoted definition is from *Our Common Future*, also known as the Brundtland Report:

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts:

- the concept of needs, in particular the essential needs of the world's poor, to which overriding priority should be given; and
- the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs." [18].

"Sustain - to cause to continue (as in existence or a certain state, or in force or intensity); to keep up, especially without interruption diminution, flagging, etc.; to prolong." [20]. On the other hand, "Develop - v.t. - to bring out the capabilities or possibilities of, to bring to a more advanced or effective state" [19]. This is how, we can say that sustainability is meeting the needs of all learner, while ensuring some degree of openness and flexibility to adapt to changing circumstances to any course [20].

In order to various concepts competing for the "Sustainable Software" name. We can say that it's about how well a piece of software will be fixable and able to cope with changes. In other words, the goal is to build "long lasting" software. Moreover, it relates to qualities such as reliability, (self-) adaptability, maintainability or context-awareness of software, as well as to development paradigms such as Agile.

A second one we could call it "lean" software. It is about the software and the environmental impacts, such as energy loss and e-waste from computers due to software upgrades. In this sense a sustainable software is one that requires few hardware capacity and reduces its own power consumption.

A third one is about indirect effects of software on the environment. In this sense a sustainable software is one that encourages to sustain human behaviours in daily life. An examples as we use software almost in all our activities, in personal use or business use, and most of them effect our behavior. We may cite google maps' ability to show you public transportation routes towards your destination [21]. Such a classification allows us to move from the focus from thinking about how we sustain existing software, to understanding how we can develop sustainable software in the future. This is how we can say that a real sustainable software is one that combines all of them together. The following drawing below figure (2) can be a starting point to a model for sustainability.

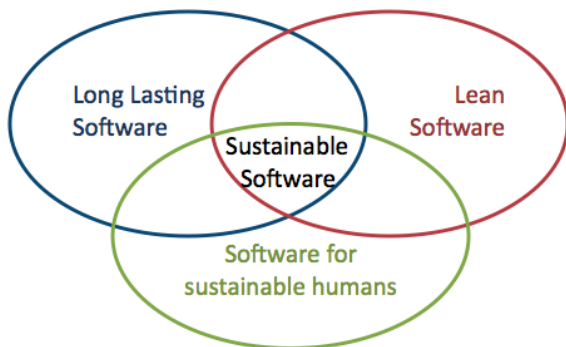


Figure 1: Toward a software sustainably development

From a software perspective, this definition refers to time or longevity and maintenance of a software product. E-learning holds the promise of educational opportunities for massive audiences of learners across the globe. New technologies and pedagogies will continue to increase the effectiveness of e-learning but the vision of truly global education can only be delivered by education providers that plan and invest to sustain E-Learning systems. It is needed to find ways to tap the internet 's potential as a medium of

exchange and collaboration between knowledge centers in a way that enriches the learner.

It appears some requirements to adapt current products and services into a way of working environmentally friendly is already a social and economic demand that can help to increase the quality of delivering learning [17]. New innovation occurs at the intersections of the E-learning of the following three forces: OER, Sustainability and Gamification as shown in figure (2):

- Education investigates the possibility of new products or services;
- Sustainability explores the capability of being endured and capability of being maintained;
- Gamification test the usefulness and efficiency of delivering the knowledge.

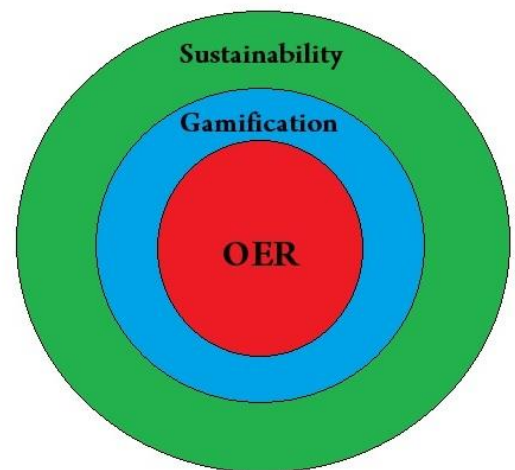


Figure 2: Sustainability, gamification, and OER as intersections in the E-learning.

### 3-Hypotheses and Research Question

This research is proposing the following hypotheses of study:

Null hypotheses: applying sustainability as a quality factor on Open Educational Resources repositories does not sustain the process of learning through gamifications to solve the problem of delivering knowledge to the learner to increase his performance.

Alternative hypotheses: applying sustainability as a quality factor on Open Educational Resources repositories sustain the process of learning through gamifications to solve the problem of delivering knowledge to the learner to increase his performance. This work is informed by the following research questions:

- 1- How Sustainability as a quality factor can affect the process of learning in OER repositories?
- 2- How gamifications can be useful to enrich the delivery of knowledge?
- 3- What are the requirements of OER repositories to develop a quality model of OER sustainability concept?

#### **4- Research Objective/Goals**

This object of this research is to assess the impact of the term sustainability as a quality factor applied on a gamified course in OER repositories. This is done with the aim of increasing the quality level of teaching by using Gamifications methodology as a useful application to enrich and enhance the way we deliver the knowledge visually. That leads us of developing a Quality Model of OER Sustainability concept. Some of the goals to be achieved during this work are as the following:

- 1- Study different OER Quality models to understand the effect of its quality attribute on the performance of the learner in OER repositories.
- 2- Gamification model (game technique) to capturing the learner behavior while taking an online course to identify the quality requirements and attributes in OER repositories.
- 3- Applying Sustainability as a quality factor to sustain the process of learning.
- 4- Design a Quality Model of OER Sustainability concept.

#### **5- Research Approaches and Methods**

The motivation to undertake in this study is to develop a quality model based on Open Education Resources (OER) repositories by applying sustainability as a quality factor on gamifications courses. Due to collected data and its translation to the information for the support of learner's decisions. There is a designed eLearning task which should include innovative teaching strategies such as gamifications methodology as an application of learning visual material. During this process of learning we can capture some quality attributes that are the overall factors that affect run-time behavior and user experience [19]. Capturing those factor can be derived from the learner behavior while taking this task. After this process, different instruments and techniques are to be applied as the following:

Instruments and techniques:

- 1) Survey: OER participants will take a survey. This way, we will know sociodemographic indicators, such as gender, educational level and either or not the participant will change or not (open innovation levels).
- 2) Questionnaire: OER participants will take a pre and a post test, in order to compare sample participants, results against the performance of this learning activity.
- 3) Participant dashboard (progress log in the system): the participants' level of achievement will be analyzed using the database in order to measure their commitment (engagement) in the gamified activities.
- 4) Exams: participants will test their knowledge in contextualized situations during the examinations. They will take partial exams when finishing each topic and a final exam when finishing the course.
- 5) Interviews: About 5% of the participants that conclude OER will be interviewed to know their beliefs about this model.

Data analysis:

The mixed methodology allows us to jointly analyze the results from the quantitative and the qualitative methodologies. Data collection will be doing jointly as well as the result analysis afterward. For this study, it will be of great value to apply the mixed methodology as it will deepen our understanding of the phenomenon of study through methodological triangulation of information gathered from the survey, the questionnaire, the challenge based gamification activities and panel participants. These results to be compared with the results of qualitative instruments, such as the interview and productions of the participants. Regarding the ethical aspects, the necessary arrangements between the participants will be done to observe and obtain information from the OER. Their identity is protected.

Means and Resources:

- 1) Typeform /Google Analytics: software for developing the statistical analysis.
- 2) OER: means through which OER repository courses are delivered, and in which the challenge based gamification will be applied.
- 3) Google Forms: application software for designing and delivering questionnaires.
- 4) Academic programs: these will permit us to see the contents and with this in mind, the visual gamification course will be designed.
- 5) Google Docs: these will allow the communication between professors concerning new ideas and improvements of gamified activities.

## 6- Results to Date and Their Validity

At the meantime, many of the higher education institutes are successfully adapting OER to their courses around the world. It appears some requirements to adapt current products and services into a way of working more efficiency and friendly in a social and economic demand that can help to increase the quality of delivering learning [17]. New innovation occurs at the intersections of the E-learning of the following three forces: OER as it investigates the possibility of new products or services, Sustainability as it explores the capability of being endured and capability of being maintained,

and Gamification as it test the usefulness and efficiency of delivering the knowledge.

The output is leading us to developing a generic understanding of how to sustain the process of learning and applying sustainability as a quality factor on gamified courses, that once instantiated can lead to the development of Quality Model of OER Sustainability Concept.

## 7- Current and Expected Contributions

In this research we expect to capture a set of factors where sustainability is an influence factor over the quality. What we mean by quality here is the quality of performance of the learning process in capturing the behavior or the learner during taking an online gamified visual course (Video learning) that is enriching the way we educate the learner. Education investigates the possibility of new products or services such as OER repositories; Sustainability explores the capability of being endured and capability of being maintained; Gamification tests the usefulness and efficiency of delivering the knowledge. During this research work we expect to come up with a quality model based on Open Education Resources (OER) repositories by applying sustainability as a quality factor on gamifications courses.

## 8- References:

- [1] Chapter 16: Quality Attributes.  
<https://msdn.microsoft.com/en-gb/library/ee658094.aspx>
- [2]<http://ww2.kqed.org/mindshift/2013/05/21/flippe-d-classroom-2-0-mastery-levelcomptenecy-learning-with-videos/>
- [3] Alex Koohang, Liz Riiey, and Terry Smith (2009), E-Learning and Constructivism: From Theory to Application, Interdisciplinary Journal of E-Learning and Learning Objects, Vol. 5, pp 91-109.
- [4] Richard Caladine University of Wollongong, Australia (2008), Enhancing E-Learning with Media-Rich Content and Interactions pp 101, 138.
- [5] Kozinska, K.; Kursun, E.; Wilson, T.; McAndrew, P.; Scanlon, E. and Jones, A. (2010). Are open ed ucational resources the future of e-learning? In: 3rd International Future-Learning Conference: Innovations in Learning for the Future, 10-14 May 2010, Istanbul, Turkey.
- [6] Perspectives and challenges in e-learning: towards natural interaction paradigms Virginio Cantoni, , Massimo Cellario, Marco Porta,

Dipartimento di Informatica e Sistemistica,  
Università di Pavia, Via A. Ferrata, 1, 27100, Pavia,  
Italy, Received 16 March 2003, Revised 16  
September 2003, Accepted 16 October 2003,  
Available, online 7 June 2004

[7] Masson, Á. MacNeill, C. Murphy and V. Ross  
(2008) The Hybrid Learning Model – A Framework  
for Teaching and Learning Practice. TENCompetence  
Open Workshop in Madrid.

[8] D. Zhang, J.L. Zhao, L. Zhou, J. Nunamaker, “  
Can e-learning replace traditional classroom  
learning—evidence and implication of the evolving  
e-learning technology Communications of the ACM,  
47 (5) (2004), pp. 75–79.

[9] Oxford English Dictionary. 2012. Oxford  
Dictionaries.

[10] Coral Calero, M<sup>a</sup> Ángeles Moraga, Manuel F.  
Bertoa. Sustainability and Quality: icing on the  
cake- 2013.

[11] De-Marcos, L., Saenz-De-Navarrete,  
Domínguez, A., J. and De-Marcos, Pagés, C. 2014.  
An empirical study comparing gamification and  
social networking on e-learning. Computers &  
Education, 75, 82–91.

[12] Getchell, K., Miller, A., Nicoll, J. R., Sweetman,  
R. J., and Allison, C. 2010. Games Methodologies  
and Immersive Environments for Virtual  
Fieldwork. IEEE Transactions on Learning  
Technologies, 3(4), 281–293.  
doi:10.1109/TLT.2010.25.

[13] Domínguez, A., Saenz-De-Navarrete, J., De-  
Marcos, L., Fernández-Sanz, L., Pagés, C., and  
Martínez-Herráiz, J. J. 2013. Gamifying learning  
experiences: practical implications and outcomes.  
Computers & Education, 63, 380–392.

[14] De Freitas, S., and Oliver, M. 2006. How can  
exploratory learning with games and simulations  
within the curriculum be most effectively  
evaluated? Computers & Education, 46(3), 249–  
264.

[15] Filsecker, M., and Thomas Hickey, D. 2014. A  
Multilevel Analysis of the Effects of External  
Rewards on elementary Students' Motivation,  
Engagement and Learning in an Educational  
Game. Computers & Education 75: 136–148.

[16] Cohen, R. (2014) Design Thinking: A Unified  
Framework For Innovation. Available at:  
[http://www.forbes.com/sites/reuvencohen/2014/03/31/  
/design-thinking-a-unified-framework-for-  
innovation/](http://www.forbes.com/sites/reuvencohen/2014/03/31/design-thinking-a-unified-framework-for-innovation/).

[17] Coral Calero, M<sup>a</sup> Ángeles Moraga, Manuel F.  
Bertoa. Working towards Sustainable Software for  
Science: Practice and Experiences, (WSSSPE 2013)  
<http://arxiv.org/abs/1309.1640>

[18] Page 8, World Commission on Environment  
and Development. Our Common Future. (Oxford,  
Great Britain: Oxford University Press, 1987).  
(Frequently referred to as the Brundtland report  
after Gro Harlem Brundtland, Chairman of the  
Commission).

[19] Random House Dictionary of the English  
Language. (New York, NY: Random House: 1987).

[20] Jerry Sturmer-Santa Barbara South Coast  
Community [Indicators-JSturmer@aol.com](mailto:Indicators-JSturmer@aol.com)

[21] Interfaith Center on Corporate Responsibility,  
475 Riverside Drive, New York, NY 10115, 212-  
870-2295