Model Validation Tools Web X.0 in Teaching and Learning

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Abstract — It is important to adapt current teaching methods to the new information society and knowledge dominated by digital technologies. The so-called traditional teaching methods and teachers need to readjust to this new reality. This will necessarily be by the use of the Internet and web tools systematically manipulated by the new digital society students. With this article we intend to create a model based on validation parameters carefully selected by the authors in previous studies, which to judge the degree of functionality in the teaching-learning of the five most used web tools in Portugal. The model will allow in future research to assess the degree of functionality of web tools preferably used either by teachers or by students, enabling the use of these more efficient and profitable in the learning process of students.

Keywords — models; web tools; teaching; learning

INTRODUCTION

In this new digital society, described by many authors as the information society or network society [1], knowledge society [2] or learning society [3], the construction of knowledge is another key device in the learning process, where the teacher must be a proactive participant who links and guid this construction.

The teacher using the correct devices, has more opportunity to understand the mental processes, the concepts and strategies used by the student and, with that knowledge, mediate and contribute more effectively in the knowledge construction process [4].

According to José Lencastre [5], we are in the era where teachers should be placed as teachers and learners, in the hope that through iteration established with students, learning takes place for both.

In this new society, the use of the Internet and web tools contribute to its constantly evolving, improving the quality of life of the individual when using this type of technology [6]. Also according to the International Commission on Education for the twenty-first century, in its report to UNESCO [7], students with difficulties in traditional education are more motivated when they have opportunities to use these technologies and can thus better reveal their talents.

According to Steven Maged Kamel Boulos and Wheeler [8], the appearance of platforms LMS (Learning Management System) provides new and exciting opportunities for teachers to create collaborative and communicative means of education for their students.

The big question around technology and online education for Margaret Honey and Babette Moeller [9] focuses on knowing how far it can facilitate the act of teaching and learning. The same authors reported that the most important thing is knowing when and how teachers will use technology in their classrooms and if their enthusiasm and convincing is real.

In this context, the objective of this research focuses on the construction of a model with which to judge the functionality degree of the most used web tools daily, many of them are essential and take integral part of the student's daily lives.

When evaluating web tools we enable teachers for a particular pedagogical content to know when and how they should use a particular tool as an aid in transmission.

This model will be a tool to accompany the technologies available to the teacher. Moreover it will be a didactic strategy to contribute to better experience the student may have on teaching and learning [10].

RESEARCH METHODOLOGY

Qualitative research is mainly descriptive. The collected data is more in words or figures format than in numbers. This data may include desk research, field notes, statements or other document form. The qualitative researcher tries to analyze the data in all its richness, respecting, as far as possible, the form of record or transcript. In investigative approach to qualitative context nothing is trivial, every manifestation has the potential to provide important clues in the construction and understanding of the phenomenon studied.

According to Augusto Triviños [11] the phenomena descriptions are imbued with meaning that you print environment, product of a subjective view. Thus, the interpretation of results is based on the perception of a phenomenon in context.

Thus, the character of this research will be of qualitative multimethodological second Norman Denzin and Yvonna Lincoln this type of methodology is based not only on the stage of collecting data for the study, but when you analyze them and interpret them, the multitude of theoretical frameworks that can underlies them [12].

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This investigation had two objects as the main sources of important research: the first focuses on the study of Nuno Peixoto and Sonia Sobral [13] on the Validation Parameters Tools Web X.0 in Teaching and Learning, and the second relating to documentary research and bibliographic used for constructing the model, according to Robert Yin [14], which is the technique of collecting more frequent data as a source of information in the case studies. This methodological approach is also referred to as Schmidt Arlinda Godoy [15] as one of three possible offered by the qualitative method.

The first source was focused on the scientific article written by the authors for the 9th Iberian Conference on Information Systems and Technology held in Barcelona. For documentary and bibliographic research, the main instrument used was the internet, tool currently used in the search for theses and scientific articles. This functions as an aid in the development of research and dissemination of knowledge. It is also responsible for retrieving large amounts of information published [16], still used to some concepts related to web tools and LMS type with all organizational aspect that involves teaching and learning.

RESEARCH FRAMEWORK

To create a template, Allen's Michael [17] [18] [19] and Donald Clark [20] describe five essential steps: Analyze, Draw, Develop, Implement and Evaluate (chart 1) .

A. Analyze

The analysis phase of this model has been performed previously by the authors of this research study on the Validation Parameters of Tools Web X.0 in Teaching and Learning [13].

In this preliminary study were analyzed important features related to the functionality of LMS tools most used in Portugal, which allowed to identify which parameters to be used in building the model validation of web tools.

This phase of model creation is very important, if not the most important. The fact that sometimes the requirements analysis of the model are not well equated, is the reason why many projects have no impact or even never arrive due to be held, being the reason of many deceptions .

For less pleasant situations occur during the other stages of model creation, Donald Clark [20] mentions that in the analysis step we must define a series of tasks: each with a specific goal and a time to be achieved .

By effectively consider this very important phase in addition to the previously mentioned study that allowed the parameters selection before had been drafted by the same researchers, another study that allowed the assessment base of the four pillars of the current trend of teaching and learning environments: the domains of knowledge, the connectivity theory, web tools (specifically the type LMS, learning Management System) directed to the earning management and the Bologna Declaration [21].

The pillars identified above, analyzed separately, their characteristics are different, but together they complement each other. Having been the basis of sustainability of selection parameters that will create the model that will validate web X.0 tools in supporting teaching and learning.

B. Draw

The design phase ensures the development of the experimental model, in which it performs the detailed definition of the global architecture of the model. This process derives from the results of the analysis phase and ending the sketch of the experimental model which will be developed in the future [20], the structured planning model consists of 4 steps:

1) Definition of constraints

It is important to identify the relevant constraints to the planning process of the model. In this case, restrictions are considered in the model relating to the scope and number of web tools to be validated.

Ideally there's no constraints in the model and include all the web tools that are daily used both internationally and nationally. But this would be virtually impossible. According to Rodolphe Ghiglione and Benjamin Matalon, is never possible to know everybody and what is gained in accuracy is minimal compared to a more reasonable sample [22].

Thus and for the first constraint, we chose to confine this study using only the web tools used in Portugal. For future considerations will be the same study, but internationally.

The second constraint and also for the sake of the feasibility study it will be analyzed only the five most used tools daily in Portugal.

2) Selection Criteria

Taking into account the restrictions set out the methods that must be defined to identify.

For the first criterion restrictions are well defined only considered if the web tools used in Portugal. The same can not be said for the second, the method used to identify the five most used tools in Portugal was based on information from Alexa - The Web Information Company [23]. This is an online company that provides data statistical of the hundred most used sites in Portugal, based on the daily average hits the last three months.

3) Specification of requirements

While the above steps let you draw a model successfully in this and the next you specify the criteria for the success of the model, the level of expected requirements expectations, choose the type of assessment that will be conducted.

According to what Roger Pressman [24] the requirements specification is the representation of the behavior of the model and an indication of performance requirements and assessment of this.

In this step the criteria that will be part of the evaluation method of the model will be identified.

4) Revision of specification

According to Shari Pfleeger [25] the specification requirements provides a way to validate the model and revision ensures that this purpose is achieved, and it is vital and necessary.

In this step based on the criteria identified in the previous step will set out the mathematical formula that will allow the model to assess quantitatively the degree of functionality of certain web tool for teaching and learning.

Carol Britton and Jill Doake [26] suggest that the revision/validation should be conducted throughout the lifting process and specification of requirements. Roger Pressman [24] states that the review should be conducted in a thorough manner to ensure that the specification is complete, consistent and accurate.

C. Develop

As regards Carlos Alberto Silva and Vine [27] modeling is the art and science of creating models of a certain reality, are idealized representations to real world situations [28].

At this stage the materialization of the design previously developed which includes all activities of developing and building the model itself is made. It is the transition of the intellectual development of the model for the development and physical development.

The purpose of this phase is the construction of the model to be implemented and evaluated. All features have been developed and tested according to the requirements and architectural constraints defined in the previous phases.

There are three main objectives in the development phase of the model:

1) Develop the solution: iteratively develop the model specified in the previous phases and leave it ready to implement and evaluated;

2) Minimize costs: resource optimization, avoiding rework and unnecessary activities.

3) Achieving adequate quality, speed and efficiency: adding value added at the end of implementation and evaluation.

D. Implement and Evaluate

These two final stages of creating the model are not within the scope of this study, but future investigations by the same authors. Evaluate the model will be made only at the end of development for web tools that make it up. The assessment itself with the tools most used by teachers and students will be held at a later study.

It should be emphasized that the implementation phase of the model is very important, being a culmination of the entire project. However evaluate it is too. You can never optimize a model if there are no well-defined what criteria it should produce. One can never have a good model if there are different criteria [29] [30].

According to Donald Clark [20], evaluation is an ongoing and adaptive process cannot be expected only through this phase to validate the model, otherwise the probability of error occurs is large (Chart 1).

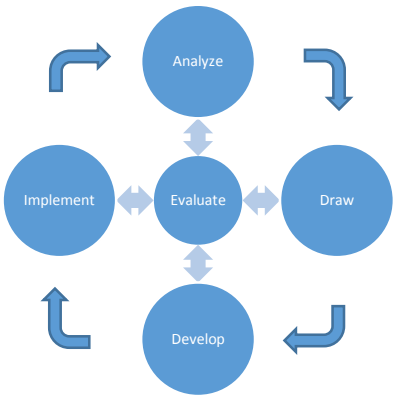

Chart 1 – Process of constructing a model, adapted from Donald Clark [20]

Indeed, the results obtained at a given point hardly will remain unchanged until the end of building the model. Exists in various occasions the need to amend or supplement aspects previously discussed, because of the importance of evaluation to be present at every stage of model building.

MODEL'S CONSTRUCTION

As mentioned, the scope of this research fits only in the design and development phases of Allen's Michael [17] and Donald Clark [20] (Chart 2) model, thus building the model will be to focus on these 2 phases

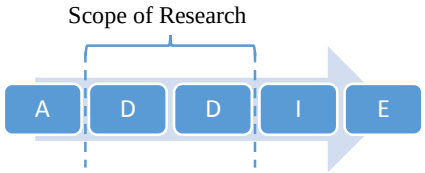

Chart 2 – Scope of Research, adapted from Allen´s Michael [17] and Donald Clark [20]

A. Drawing

The development of the model results of the structured planning conducted at this stage, the elements that will appear on your architecture are:

1) Validation parameters

From the analysis of Parameter Validation Web X.0 Tools in Teaching and Learning [13], 13 features were identified:

Forum - Activity that allows asynchronous dialogue on a topic.

Work - Allows the teacher to assign online or offline tasks.

Chat - Chance of synchronous communication via short messages between teachers and students.

Referendum - Activity where the teacher can create an issue of options for collecting students' opinions.

Dialogue - Allows a private asynchronous communication between the teacher and a student or between students.

Glossary - Possibility of the course participants create dictionaries of commonly used terms.

Lesson - Activity that lets you create and manage a set of

linked pages.

Test - The teacher can build a questions database with different answers formats.

Questionnaire - Allow building surveys to participants.

Wiki - The possibility of building a text for many participants, each of which provides support and / or revise the text.

Resources - Allow for the possibility of including content from various formats.

Workshop - Activity that allows the coordination of group work.

SCORM (Sharable Content Object Reference Model) - Allow to export and import content from other LMS platforms.

2) Restrictions

The five most used web tools in Portugal were the restrictions considered for the architecture model.

In research performed by Alexa - The Web Information Company [23], it was possible to measure the ten most used web tools in the last month in Portugal (Table 1). We chose to measure more than the necessary tools for building the model because some of them are the same type, and it is necessary to make some adjustments to achieve a more diverse list.

Top Ten	Web Tool			
	Name	URL	Linked Sites	Type
1	google.pt	www.google.pt/	9.843	Search
2	facebook.com	www.facebook.com/	6.912.060	Social
3	google.com	www.google.com/	3.566.557	Search
4	youtube.com	www.youtube.com/	3.580.860	Videos
5	sapo.pt	www.sapo.pt/	30.758	Search
6	neobux.com	www.neobux.com/	66.572	Business
7	wikipedia.org	www.wikipedia.org/	1.933.807	Encyclopedia
8	live.com	login.live.com/	88.778	E-mail
9	abola.pt	abola.pt/	2.862	Sports
10	xl.pt	www.xl.pt/	4.133	News

Table 1 – The 10 most used web tools in the last month in Portugal, adapted from Alexa [23]

In Table 1, Facebook excels not to be the tool of choice for the number of daily visits but because unquestionably binds with the highest number of sites. The perspective of the George Siemens theory about Connectivism [31], this web tool used appropriately in educational environments can make a difference in teaching and learning.

Based on Table 1, the web tools that will be part of the model are:

google.pt - Allows you to perform searches for information in the entire world of web type, pictures and video pages. It offers unique features in the search technology;

facebook.com - social network Tool that connects people and friends, allows sharing of photos, links and videos;

youtube.com - way of obtaining and sharing videos for all the internet users;

neobux.com - Provides a new business solution in which the internet user is paid for each mouse click; you can multiply the earnings just by viewing advertisements;

wikipedia.org - free encyclopedia built collaboratively by all internet users.

Were excluded from the initial list google.com and sapo.pt for being both the same type of tool google.pt. Thus the assessment will be achieved if the model having a set of more diverse and close to reality tools.

3) Requirements

To Celina Oliveira, Eliane Menezes Mercia and Moreira [32], evaluate is a process of specific situations of pre-established criteria.

To identify the criteria that will allow state the formula that will evaluate the tools, we met the validation parameters into three groups: Communication, Teaching and Learning Management and Review.

Communication - contain parameters which enable synchronous and asynchronous transmission of knowledge and learning between teacher and student or student and student. This group parameters: Forums, Chat and Dialogue.

Teaching and Learning Management - contain parameters that allow to monitor and assist the transmission of knowledge of the teaching-learning in students. This group parameters: Labor, Glossary, Quiz, Wiki, Resources and SCORM.

Review - gathers all parameters that enable the teacher to make a continuous evaluation of the student in the process of acquiring knowledge in teaching and learning. This group parameters: Referendum Lesson, Test and Workshop.

Each of these groups will have a different weight relative to the total percentage of assessing the degree of functionality of the web tool. This criterion is related to the fact that the group of parameters to be related or not to the teaching-learning process, the greater this percentage will be higher affinity which will contribute to the final result.

It was considered that the communication would be the group that provided less able the teacher to participate in the whole process of student learning. This group presents a contribution of 6% in the final evaluation of the web tool and each of its parameters 2%.

In Management learning group their parameters have strong features in the field of teaching and learning, therefore every parameter is assigned 7%, leaving the group with a total of 42%.

Consider the review group as a major contributor in the student learning process, not only by the evaluation component itself but also consider that the parameters are those that enable the teacher to better transmit and address the educational content. The group represents 52% of the total assessment of the functionality of web tools and their parameters 13% each.

The mathematical formulation for the evaluation of the degree of functionality of the web tools will be based on the criteria identified, we also consider how the groups have terminology, the group communication is attributed to the following nomenclature (1):

$$\mathrm{X} = \{\chi_1, \chi_2, \dots, \chi_n\}\ with\ \chi_i \subset \mathrm{X}\ \text{and}\ i \in \mathbb{Z}_0^+ \quad (1)$$

Where are χ_i parameters were present to review the web tool.

The learning management group attributed to the following nomenclature (2):

$$\mathrm{B} = \{\beta_1, \beta_2, \dots, \beta_n\}\ with\ \beta_i \subset \mathrm{B}\ \text{and}\ i \in \mathbb{Z}_0^+ \quad (2)$$

Where are β_i parameters were present to review the web tool.

The learning management group attributed to the following nomenclature (3):

$$\Upsilon = \{\upsilon_1, \upsilon_2, \dots, \upsilon_n\}\ with\ \upsilon_i \subset \Upsilon\ \text{and}\ i \in \mathbb{Z}_0^+ \quad (3)$$

Where are υ_i parameters were present to review the web tool.

Therefore, heuristic mathematical model that will allow the measure quantitatively the degree of functionality of certain web tool for teaching and learning is represented by the function $f(\mathrm{X};\mathrm{B};\Upsilon)$ (4):

$$f(\mathrm{X};\mathrm{B};\Upsilon) = 2\% * \sum \mathrm{X} + 7\% * \sum \mathrm{B} + 13\% * \sum \Upsilon \quad (4)$$

B. Development Model

Having defined the validation parameters, restrictions and requirements deemed necessary for the validation of web tools, the model proposed in this study is reproduced in Table 2.

The actual evaluation of the model will be made in the post-implementation phase. There will be analyzed not only the most used web tools in Portugal, but also those who teachers prefer to use in teaching-learning.

The assessment will be made in this investigation, and that is shown in Table 2, are intended to test the proposed formula. It will appeal to web tools which last month were the most used in Portugal.

		google.pt	**facebook.com**	**youtube.com**	**neobux.com**	**wikipedia.org**
Communication (6%)						
	Forums		✓	✓	✓	✓
	Chat		✓	✓		
	Dialogue		✓	✓		
			6%	6%	2%	2%
Management Learning (42%)						
	Labor	✓	✓	✓		✓
	Glossary					✓
	Quiz					
	Wiki					
	Resources		✓	✓		✓
	SCORM		✓	✓		
		7%	21%	21%		21%
Review (52%)						
	Referendum					
	Lesson					
	Test					
	Workshop					
Degree of functionality $f(\mathrm{X};\mathrm{B};\Upsilon)$		7%	27%	27%	2%	23%

Table 2– Model Validation Web X.0 Tools in Teaching and Learning

By the standards of LMS review and the parameters selected and included in the model, the degree of functionality of the web most used tools in the last month in Portugal is low. The three largest percentages are between 23 % and 27 %, with Learning Management Group which most contributes to the final result, 21 %.

The google.pt due to its characteristics of research, can be an important tool to aid in learning. However, as evidenced only in conducting this type of work that this search engine can be useful, and its degree of functionality of only 7 %.

Communication Group is the feature that most evidence and the only rating that is not present in any of the analyzed tools.

With the future implementation of the model will be possible to assess the degree of functionality of web tools most used by teachers and students in teaching and learning, probably with different end result.

CONCLUSIONS

To Pierre Lévy [33], the prevalence of certain technologies developed to ensure the man overcoming natural obstacles and survival with better quality of life, in every place and at every time, necessarily refer clients to new learning.

The time when the company is currently living man transiting culturally mediated by technologies that are contemporary to him. They change their ways of thinking, feeling and acting. Also change their ways to share and acquire knowledge [34].

Technological advancement are a reality, not only outside but inside schools. Increasingly the student is inserted in the universe of information easy, where the teacher needs to update itself to keep up to speed by which information is actually transmitted.

The new possibilities of access to information, communication and iteration, provided by computers, internet and web tools, give rise to new forms of learning.

With this research and the construction of the model, we sought to provide a new tool within the teachers reach, that assist in the process of imparting knowledge to students.

We measured the degree of functionality of the five most used web tools currently in Portugal, concluding that have a low vocation for teaching and learning, while the percentage of the three best classified tools are between 23 % and 27 %.

The construction of this model will be larger in future research, will be done their implementation that will allow us to know the functionality degree of the web tools more used by students or teachers, or any other web tool that a teacher find a suitable auxiliary to transmitting their educational content.

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