Factors affecting to effective eLearning: Learners Perspective

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Abstract- eLearning is a method of delivering education via electronic means. Timely it is online learning as education or learning happens via world wide web. Effectiveness in eLearning with reference to the learner is whether he/she could meet the learning goals while learning online. In this research it has tried to identify the meaning of learning effectiveness with regard to users' perspective and the factors affecting the effectiveness of eLearning. In order to conduct the research 121 active online eLearning participants have been interviewed and observed. Qualitative method of Ground theory and Quantitative analysis methods of Principle Component Analysis were used in order to process data and the results provide 10 factors that affect effectiveness in eLearning. At the same time it highlights and ranks the 10 important dimensions which any eLearning provider should attempt to address in providing a successful eLearning practice. Among all, the top 5 ranks were 1.Interactivity, 2.Collaboration3.Motivation 4.Network of Opportunities 5. Pedagogy. This research uniquely identified a ranking to the dimensions by the users' perspective and also a new dimension, Network of Opportunities which was ranked under top 5 and should be addressed by any eLearning module in the future to provide an effective learning.

Index Terms—eLearning, effectiveness, MOOC

1. INTRODUCTION

The improvement in Information and Communication Technology (ICT) infrastructure has led to an explosion in web usage across the world. Since then eLearning has been taken place for decades around the world and has reinforced the importance of learning and helped to bring convergence between learning, working, communication and entertainment. It widens the access to education through eLearning concept which has redefined the way of dispensing education across the world. But in the context of world, there have been success stories as well as some failures to acquire objectives of eLearning.

The literature states as a meaning for effectiveness in eLearning as meeting the goals of the stakeholders in eLearning [1],[2].The main reasons to fail, unsuccessful or less effective eLearning is because any organization fail to identify and treat the factors affecting effectiveness. There has been tremendous amount of research in identifying methods to improve the ability to meet the goals. In other words researches involved in identifying to improve effectiveness in eLearning.

Recent researches found the theories behind the effective learning and teaching [1]. It is important to identify the affections it brings to the eLearning as well. Hence, purpose of this study is to identify the meaning of effectiveness in eLearning with regard to users' perspective and the factors affecting the effectiveness of eLearning. It is found in many explorative studies that the potentials in MOOCs (Massive Open Online Courses) are increasing due to the facts it addresses the Social and collaborative-ness in an eLearning platform. According to the review of working paper published in Harvard and MIT , Ho et al states it is the beginning of an exciting effort to understand how people learn and how to educate well and effectively at scale [2].

While identifying the importance of effectiveness in eLearning methods and frameworks, most importantly our research gathered the evidence of latest evolution of eLearning in MOOC being effective as it addresses the main issues which the eLearning concepts so far has not covered. Our research is unique as it identified a new dimension, Network of opportunities affect the effectiveness in eLearning and apart from that this research also revealed the ranks for the 10 dimensions found in research.

In the literature review section of the paper will explain the past concepts and frameworks of effectiveness. Methodology section explains the design of the research in finding the

learners' perspective of effectiveness and how the grounded theory allowed discovering a new dimension of Network of Opportunity. As an outcome of this paper, the factors affecting to effectiveness in eLearning will be presented by rank where any interest party could easily identify and apply to address in improving the effectiveness in eLearning to their organization. Especially as a developing nation, "effective" eLearning could bring inclusive development beyond the Millennium Development. In conclusion this study quote the highlights of major factors which impact effectiveness which will influence the policy objectives in education in order to achieve the targets in vision 2020.

2. OBJECTIVE

The main objective of this paper is to explore the dimensions of effectiveness from learners' perspective catering to the current demand. It is mainly because unlike the past eLearning is facing huge transformations in pedagogically and the technology vise where many people experiment the effective methods to succeed in the future. Next objective is to provide a ranking to the dimensions where it is necessary to identify the most important dimensions to address in providing an effective eLearning solution. Findings in this paper will be a major input to the eLearning educators, trainers and designers to focus in the users' expectation to achieve their goals.

3. LITERATURE REVIEW

A. Meaning to "Effectiveness"

Most of the literature identifies effectiveness as meeting the goals of the stakeholders in eLearning. At the same time it's supported to claim effectiveness in eLearning can be measured by return on investment [3], analysis of learning outcome [4], content quality, systems quality and service quality [5]

B. eLearning effectiveness

E-Learning effectiveness' is complex and depend on stakeholders view, it has many dimensions. Some argue that the effectiveness of eLearning should be judged by the same criteria and standards as face-to-face education. Others hold that conventional quality concepts are not appropriate because eLearning is structurally different [6], [7]. Yet others argue that while certain general principles of quality should apply to both conventional and eLearning, there are certain features unique to eLearning that should also be addressed, such as synchronous/asynchronous interactions, open access to vast resources and distributed learning [8]. And eLearning typically relies to a greater extent than conventional education on learners' motivation and commitment to interactivity and collaboration, which make it more difficult to scale and assure the quality of eLearning.

The findings of the dimensions in 9 frameworks are summarized in the Table 1.

TABLE 1: DIMENSIONS FOR DESCRIBING QUALITY

Dimensions for effectiveness of eLearning	Dimension Reference
Institutional support, course development, teaching/learning, course structure, student support, faculty support, and evaluation and assessment	[9]
Clear planning; robust and reliable infrastructure; good support systems for staff and students, including training and written information; good channels of communication between staff and students; regular feedback to students on their learning; clear standards for courseware development; ongoing evaluation with a strong student input	[10]
Institutional commitment; technology; student services; instructional design and course development; instruction and instructors; delivery; finances; regulatory and legal compliance; and evaluation	[11]
Structure/ virtual environment; communication, cooperation and interactivity; student assessment; flexibility and adaptability; support (for students and staff); staff qualifications and experience; vision and institutional leadership; resource allocation; and the holistic and process aspect.	[12]
Educational planning (clear mission and its integration in institutional policies); instruction (instructional design, content development, delivery and evaluation); human resources (students, academic faculty and administrative staff); physical resources (facilities, hardware and software/network system); management and administration; and educational results (stakeholder satisfaction and social recognition)	[11]
Collaboration, technology, costs-expectations-benefits in formation transparency of provider and courses, course structure and presence didactics	[13]
Institutional support, course development dimension, course structure, teaching and learning, evaluation and assessment, student support, Faculty support	[14]
Checking a course's relevance to the organization's needs; analyzing content quality and usability; and applying instructional design methodology in course development	[15]
Flexibility, responsive teachers, materials and course design, access to resources, and online assessment and feedback	[16]

Scrutinizing through the dimensions of past literature, it was evident that the criteria was primarily influenced by eLearning institutions and faculty and administrators, which means it has shown fewer interests given to the users of the systems who learn from it in their day to day activities. However, the dimensions found in the literature lacked empirical evidence of learners' perspectives of eLearning quality [13]. However Cashion and Palmieri [16] conducted a study of Australian learners' views of vocational education and training provided online, and found that learners rated the factors illustrated Table 1. For these learners, quality factors cited in earlier sections of this paper were rated as less important; specifically, institutional planning, infrastructure, administration and management, and faculty support.

Another study of online learners was conducted in the European context. After interviewing European learners with extensive experience of eLearning, Ehlers [13] empirically identified seven key factors of eLearning as stated in Table 1. He found that European learners regarded course process-related dimensions such as presence, didactics and collaboration as more important than institutional considerations such as vision, planning and finance in assessing the effectiveness of eLearning. These findings show that there can be important differences between learners and providers regarding the concept of effectiveness and that there is need for further investigation into the learners' views of eLearning effectiveness in various contexts to inform and improve QA frameworks in eLearning in different domains.

Despite all of the above factors recent literature on Massive Open Online Course(MOOC) as emerging technology for eLearning shows that learners perspective drives towards more in harnessing the collective intelligence through collaboration is high among peers and also the time taken for feedback has reduce tremendously [17]. Apart from those individual interactions with interface, content and lecturer has increased rapidly and students' expectations are high within the learning framework [18]. Recent research by Pashler [19], states students expect frequent review and formative feedback at well spaced intervals leads best outcomes of the students and make them highly motivated with any type of learning.

C. Use of Grounded Theory

This research used Grounded theory in order to identify the latest dimensions in students' perspective of eLearning. It is mainly due the fact that this theory investigates the actualities in the real world and analyses the data with no preconceived ideas or hypothesis [20]. In other words, grounded theory suggests that theory emerges inductively from the data [21]. Though it can be used in different types of research, grounded theory is often adopted to formulate hypotheses or theories based on existing phenomena, or to discover the participants' main concern and how they continually try to resolve it [22].

The most recent transformation of eLearning is the MOOC, which provided eLearning to many participants unlike earlier the participants were selective. As a consequence of mass access to the education via online, their perspective of effective eLearning may have affected. The traditional research designs which usually rely on a literature review leading to the formation of a hypothesizes where the

actual finding may subject to statistics. Then test the hypothesis through experimentation in the real world. However in order to identify the phenomenal changes and how the user depend on the changes in MOOC learning in web 2.0 new era, it is appropriate to use the research method Grounded theory which is a powerful research method for collecting and analyzing data and to formulate a theory inductively from the analysis.

4. METHODOLOGY

As the first step, this research conducted a qualitative data gathering and analysis of data collected from participants of eLearning over 2 years of time. It is important to understand the depth of social reality, contextual importance in the new web.2.0 era. In qualitative method, researcher is involved in every step listening to human needs, responsive and adaptive to explore what actually the users in eLearning finds as effective for them [23]. A qualitative study designs in understanding the eLearning culture which focus on individuals live experience of events and also going beyond adding to existing body of knowledge in forming theories grounded on data as Grounded theory being used. Fig.1 explains the steps taken in the Grounded theory.
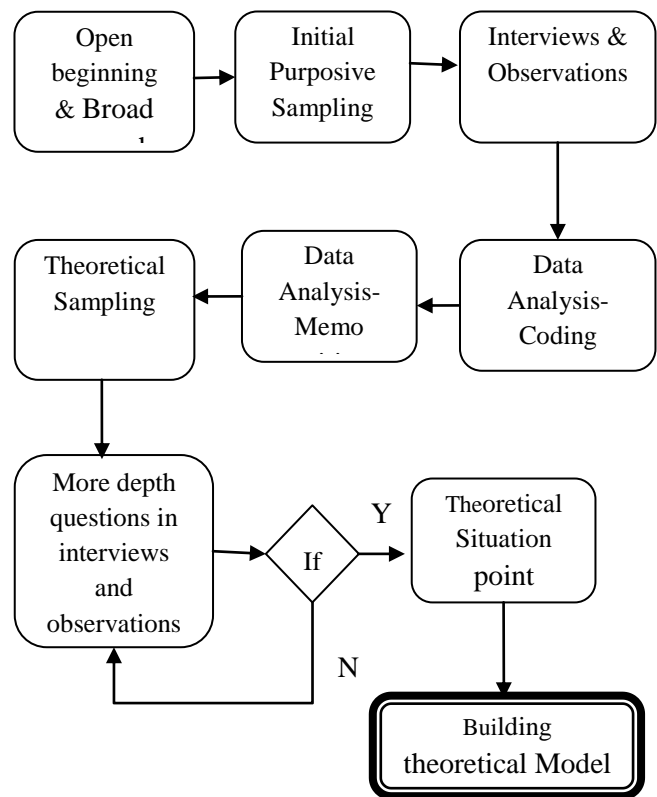

Fig.1. Steps taken in the Grounded theory

In step two, an instrument was created using the analysis of data in the step 1. In order to develop the study's instruments, relevant existing instruments and literature were reviewed. Validity of the instruments was determined by Content-Related Validity. In general, the content-related evidence demonstrates the degree to which the items on an instrument are representative of a domain or universe of content. To

establish content validity for this study's instruments a panel of experts from the online educational practices reviewed each item to ensure constructing an instrument that reflected the domains of interest. Suggestions for modifications on some of the items and scaling were provided by the panel. This included rephrasing items and deleting others that seemed repetitive. After carrying out the necessary modifications, the panel reported that the instruments were appropriate for the study and that the language was clear.

Step three was a questionnaire conducted using instrument rubric created in step 2. The analysis of the results will provide the factors which will affect the effectiveness of eLearning as per the participants' perspective.

A. Sampling

As for sampling technique, our study used judgmental sampling. Therefore we selected very active users of eLearning where they have carried the practices at least 6 months of time. It was important to focus on highly productive answers from participants in a short period of time [24].

B. Data Collection

Data collected from 121 students from round the world. Mix of methods as Focus groups from the eLearning platforms in MOOCs, observations and interviews, and a rubric questionnaire with 5 point likert scale was conducted from highly active users in eLearning platforms in local and global students.

5. DATA ANALYSIS

A. Organized and Categories data

The interviews and the observations were analyzed after organizing the data by indentifying patterns and key words of commonality. Table 2 illustrates the key dimensions identified as affect to effectiveness by the participants using the Grounded theory.

TABLE 2: DIMENSIONS IDENTIFIED BY QUALITATIVE ANALYSIS

Key factors	Description
1.Technology	How was the introducing new technology changed the eLearning perception
2.Pedagogy	Manner that course was designed to support the needs of the user
3. Motivation	How motivated the student to take courses online
4.Usability	Is it user-friendly to access the platforms and media
5.Content/ Material	Are the materials up to date and meet the goals of learner
6.Support for Learners	Do the system or the platform accommodate users needs and support
7.Assesment	How the evaluation of courses carried out
8.Future Directions	Recognition to the course and how the industry will look at what course did

9.Collaboration	Does it allow to collaborate with peers and also the other interest networks
10.Interactivity	Does it allows enough interactions to keep the student engage with the course

B. Building Instrument Validity and Reliability

Based on the dimensions found in the initial step, the next step was to build and discover whether the instrument support accurately to find the information of user perceptions of effectiveness in eLearning.

Two statistical methods were used to determine reliability via SPSS (version 10.0 for Windows): first, was an internal consistency approach by calculating the value of alpha reliability co-efficient. As it is clear in Table 3, all measuring criteria have desirable reliability coefficient (Cronbach's alpha). Likewise factor analysis results show the validity of the questionnaire.

TABLE 3: RELIABILITY AND FACTOR ANALYSIS

Dimension	Reliability Analysis		Factor Analysis	
	No of Questions	Cronbach's Alpha	Extraction	Eigen Value
1.Technology	3	0.783	0.634	2.896
2.Pedagogy	3	0.842	0.641	2.845
3.Motivation	4	0.789	0.579	2.226
4.Usability	4	0.724	0.781	2.563
5.Content	3	0.834	0.513	1.332
6.Support for Learner	3	0.765	0.645	1.613
7.Future Directions	3	0.893	0.588	1.314
8.Assesment	6	0.722	0.536	2.548
9.Interactive	4	0.874	0.673	1.270
10.Collaborate	3	0.872	0.567	2.673

Table 4 describes the dimensions and the factors which used describe the concept. The Questions in the questionnaire was based on the framework provided in the Table 4 and added with 5 point likert scale.

TABLE 4: FRAMEWORK OF THE INSTRUMENT

Key Dimensions	Factors supports to dimension
1.Technology	HW support SW support Media & Mode of delivery
2.Pedagogy	Student interaction with faculty/ tutors/ students Learning pace Methodology followed by lecturers desi

3. Motivation	Attention Relevance Confidence Satisfaction
4.Usability	interface design learning environment navigation feedback
5.Content/ Material	Relevancy Updated Rich collaborative information
6.Support for Learners	Psychological and social support for students Administrative support Student complaints procedure
7.Assesment	Martial assessment Collaboration assessment Periodic course/program evaluation by various means Periodic review of faculty/staff performances Evaluation of student satisfaction levels Regular review of student achievements
8.Future Directions	Recognize by the industry Direct to opportunities Expose to other Networks
9.Collaboration	With learners With instructor's With Faculty
10..Interactivity	With peers, Material/Content, Instructor

Next was to analyze the output of data in finding relationships to the users' perceptions using the framework of questions using the Table 4. For determining the importance degree of all research's indicators, weight of each criterion was calculated regarding to respondents' answers analyzed by SPSS software and Principal Component Analysis (PCA) statistical method. Weights of these criteria are exhibited in Table 5.

TABLE 5: PRINCIPLE COMPONENT ANALYSIS

Key factors by rank	PCA effects
1.Interactivity	0.873
2.Collaboration	0.845
3. Motivation	0.831
4. Network of Opportunities /direction for future	0.822
5. Pedagogy	0.793
6.Content/Material	0.773
7. Assessment	0.759
8. Usability	0-750
9.Technolgy	0.732
10.Support for Learners	0.698

6. DISCUSSION

Many researches attempts to identify factors affecting to a effective eLearning paradigm. Some try to relate eLearning quality is the main factor for the effectiveness and therefore address the quality dimensions. [25] Among them there are researches to find the user perception of satisfaction on eLearning [26], [27].

Answering to the bigger problem "What the learner wants from eLearning?" our research uniquely identified that the most important dimension they require is to be interactive. The research discovered that student value more towards the interactions between other students and the lecturer or the instructor kept them leading towards their goals of learning. As the below quotes from the interview, it is well elaborated the need of it.

"The interactions from the lecturers made me very connected to the program. For example, when I post a comment on any concern, I got a feedback from my instructor of how to solve that"

" my involvement with the peers in the subject matter is important in eLearning, I always want to see what other students have done to solve the given problem, and is that method efficient than mine..that way I can learn more.."

It is the collaborativeness that the students identified as mostly equal as the interactivity. Collaborativeness is an evidence base best practice in teaching and learning which recently integrated to the web 2.0. Students identified the success and the motivation from the collaborated environment provided in learning. For example the team work, group work facilitated in eLearning environments attracts the users as the many active learning practiced in such environments [28] [29] .

This study also proved the fact of importance of keeping to student motivated toward the learning process even with electronically. They confirmed the factors provided in Kellers ARC model to sustain the users motivation will be an important fact [30].

One of the important discoveries of this research is the fact that students identified the Network of opportunities and the recognition was an important factor for a better eLearning. It was not found in many studies relevant to the effective eLearning as when the new era of eLearning emerges students value the consequence of their learning.

7. LIMITATIONS

One of the major limitation is that this research accompanied some traditional statistical methods (PCA in SPSS) to evaluate our data. In the future, other statistical methods such as big data analysis, neural network may be employed to explore cause/effect relationship among variables.

Next limitation is the fact that this research framed the 10 effectiveness dimensions where as education by electronic means transform the next generation learning in to new

behaviors. It could lead to new dimensions which user may change the perspectives of existing dimensions.

8. CONCULTION

This research attempted to identify the factors affecting to the eLearning as per the view of the participants or the students. Initially it has gathered data based on Grounded theory and generated a framework which will be aid to provide a questionnaire among online participants. Framework itself had a new dimension "Network of Opportunities", unlike in the previous first generation eLearning researches it has shown the students expect the online courses to provide adequate opportunities to meet new jobs, an equal recognition or more toward the online learning. This includes the students expectation of the course to provide additional links and networks of people where they could practice the learning and collaborate with industry. The PCA analysis uniquely weighted the dimensions ranking 1to 10. The Interactions, Collaborative aspects, Motivation were at first three priorities and next with the unique dimension, Network of opportunities leads the participants into a new dynamic way of learning online.

Dimensions and the factors in the framework provided in the Table 4 will be a benchmark for solution providers in eLearning field. It is vital to address students' needs in online environment as they will be the primary customers in the next generation education.

REFERENCE

[1] Felder Andrew and B Soloman, "Next Generation Learning:Pathway to possibilities," EDUCAUSE, 2013.

[2] A. D Ho et al.,". (2014). HarvardX and MITx: The first year of open online courses ," *HarvardX and MITx Working Paper* , no. 1, 2014.

[3] O Martin C Gráinne, *Contemporary perspectives in E-learning Research: themes, methods and impact on practice*. Oxon, UK: Routledge, 2007.

[4] Alfredo Soeiro Rita Falcão, "Measuring impact of e-Learning on Quality and learning outcomes," Universidade do Porto, Portugal, PhD Thesis 2010.

[5] Samantha Samarasinghe and Alexei Tretiakov, "A multi-dimensional measure of e-learning systems success," in *ascilite* , Auckland , 2009, pp. 908-910.

[6] E-Learning Advisory Group, *Highways and pathways: Exploring New Zealand's e-learning oppotunities*. New Zealand: E-Learning Advisory Group, 2002.

[7] A Stella and A Gnanam, "Quality assurance in distance education: The challenges to be addressed," *Journal of Higher Education*, vol. 47, no. 2, pp. 143–160, 2004.

[8] I S Jung, "Quality assurance survey of mega universities," in *Perspectives on distance education: Lifelong learning and distance higher education*.

Vancouver, Paris: Commonwealth of Learning and UNESCO, 2005, pp. 79–98.

[9] R A Phipps and J P Merisotis, *Quality on the line: Benchmarks for success in internet-based education*. Washington DC, USA: National Education Assosiation, 2000.

[10] C McNaught, "Quality assurance for online courses: From policy to process to improvement? ," in *Meeting at the crossroads. Proceedings of the 18th annual Australian society for computers in learning in tertiary education 2001 conference*. Melbourne: University of Melbourne, 2001, pp. 435-442.

[11] J Frydenberg, "Quality standards in e-learning: A matrix of analysis," *The International Review of Research in Open and Distance Learning*, vol. 3, no. 2, 2002.

[12] Swedish National Agency for Higher Education, *E-learning quality aspects and criteria for evaluation of e-learning in higher education. of e-learning in higher education*. Stockholm, Sweden: Ho¨gskoleverkets rapportserie, 2008.

[13] U Ehlers, "Quality in e-learning from a learner's perspective," *European Journal of Open and Distance Learning*, vol. 3, no. 1, pp. 43-50, 2004.

[14] I Jung, "The dimensions of e-learning quality: from the learner's perspective," *Education Tech Research Dev*, vol. 4, no. 3, pp. 56-70, 2010.

[15] L Gillis, *Quality standards for evaluating multimedia and online training*. New York: McGraw Hill, 2000.

[16] J Cashion and P Palmieri, *The secret is the teacher: The learners' view of online learning*. Leabrook: Australia: National Center for Vocational Education Research, 2002.

[17] C McLoughlin and Elizabeth Catherine, "The pedagogy of personalised learning: exemplars, MOOCS and related learning theories," *World Conference on Educational Multimedia Hypermedia and Telecommunications*, vol. 2013, no. 1, 2013.

[18] Y Wang, "Exploring Possible Reasons behind Low Student Retention Rates of Massive Online Open Courses: A Comparative Case Study from a Social Cognitive Perspective," *AIED 2013 Workshops Proceedings Volume*, p. 58, June 2013.

[19] H Pashler, "Human Memory and Learning," in *Science of Learning Symphosium*, Baltimore,MD, USA, 2014.

[20] B.G. Glaser and A.L. Strauss, *The Discovery of Grounded Theory. Strategies for Qualitative Research*.: Aldine Transaction, Inc, 1967.

[21] J W Chesebro and D J Borisoff, "What makes qualitative research qualitative? ," *Qualitative Research Reports in Communication*, vol. 8, no. 1, pp. 3-14, 2007.

[22] B Glaser, *Basics of grounded theory analysis*. Mill Valley, CA: Sociology Press. , 1992.

[23] M. N Marshall, "Sampling for qualitative research ," *Family practice,* vol. 13, no. VI, pp. 522-526., 1996.

[24] Michael Quinn Patton, *Qualitative research*, 4th ed.: John Wiley & Sons, Ltd, 2005.

[25] S White, "Critical success factors for e- learning and institutional change—some organisational perspectives on campus- wide e- learning," *British Journal of Educational Technology*, vol. 38, no. 5, pp. 840-850, 2007.

[26] Pei-Chen Sun, J. Tsai, Glenn Finger Ray, and Chen, Dowming ,Yeh Yueh-Yang, "What drives a successful e-Learning? An empirical investigation of the critical factors influencing learner satisfaction," *Computers & Education* , vol. 50, no. 4, pp. 1183-1202., 2008.

[27] Ulf-D Ehlers, "Quality in e-learning from a learner's perspective," *European Journal for Distance and Open Learning* , 2004.

[28] Jere E Brophy, *Motivating students to learn*.: Routledge, 2013.

[29] E Stacey, "Collaborative Learning in an Online Environment," *Journal of Distance Education*, vol. 14, no. 2, 1999.

[30] C Pintz and L Posey, "Preparing students for graduate study: An eLearning approach," *Nurse education today*, vol. 33 , no. 7, pp. 734-738., 2013.

[31] MEST, *A report on comprehensive evaluation of cyber universities in 2008*. Seoul, Korea: Korean Ministry of Education Science and Technology, 2008.

[32] J B Strother, "An assessment of the effectiveness of e-learning in corporate training programs," *The International Review of Research in Open and Distance Learning*, vol. 3, no. 1, pp. 65-78, 2002.

[33] J M Pawlowski, "Adopting quality standards for education and e-learning," in *Handbook on quality and standardization in e-learning*. Berlin Heidelberg and New York: Springer, 2006, pp. 65–77.