

E-Learning for Secondary and Higher Education Sectors: A Survey

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Abstract—Electronic learning (e-learning) has gained reasonable acceptance from educational institutions at all levels. There are various studies conducted by researchers considering different aspects of e-learning to investigate how we can benefit in imparting quality education. However, there is a requirement to find out how researchers consider different sectors of secondary and higher education (HE) sectors. In this paper, we carefully select published research article of past six years and study how the research was conducted and which research methods are applied to attain results. We also investigate how case studies are presented for evaluating results. We finally present our findings from conducting this study of e-learning research at secondary and the higher education levels.

Keywords—Distributed learning environments; elementary education; improving classroom teaching; intelligent tutoring systems; interactive learning environments; media in education; post-secondary education; secondary education; simulations

I. INTRODUCTION

E-learning is a learner-centered instructional strategy which provides students with the opportunity for an in-depth investigation of a given topic. With the advent of information technology and its growing use in education sector, a transformation is seen in traditional and conventional teaching methods that are used in schools. There is an increase in the competency requirement within pedagogical professions such that the modern-day teachers require improving their skill level through effective use of e-learning initiatives. The use of e-learning has a two-fold impact on the students' learning, i.e., we are able to provide a uniform system of education and, secondly, the students learning pattern can be recorded. E-learning is successfully used for augmenting students' learning in education sector. It has been noticed that e-learning is more effective in teaching subjects such as Mathematics, Science and English and impact of e-learning is more evident where tools specific to teachers' everyday use were utilized Cox and Britain (2003). In order to conduct an in-depth study of the impact of e-learning initiatives, it is important to classify different studies and published research into intermediate and HE levels. Our interest is in the classification of selected research papers according to different education levels.

The paper is organized as follows. We present our evaluation criteria in Section 1 and our finding from secondary and HE levels in Section 2 and Section 3. Finally, we conclude

our findings in Section 5.

II. OUR EVALUATION CRITERIA

We study related research papers of last six years, i.e., 2007 onwards and classify them according to the education sector forming the research focus. We consider two sectors of education, i.e. secondary and higher education. The secondary sector covers students of Grade-6 to Grade-10 where HE sector consists of college and university levels. We develop a classification so that selected papers may be distinguished on the basis of their main research focus to classify research presented in reviewed papers. We present this classification in Table 1 where each classification is given a tag or name and a short description to explain its meaning.

TABLE I. CLASSIFICATION OF MAIN FOCUS

S/N	Classification	Description
1.	Adaptability	Possible uses of e-learning methods for imparting quality education
2.	Tools	Tools to support e-learning
3.	Challenges	Challenges related to implementation of e-learning
4.	Impact Analysis	Analysis of impact after implementation of e-learning
5.	Environment	Present environment related experience (computer-based learning/Mobile based learning)

We present our findings according to our evaluation criteria based on the paper, main focus and effect of their focus area. Finally, we discuss selected research papers to provide the reader an overview of research in each educational sector. We do not include papers that do not fit in our evaluation criteria. Examples of such papers include research by Journell (2010) which is based on investigating perception of e-learning from students and teachers perspective, research published by Kalinga (2008) who developed an interactive Learning Management System (LMS) to support teachers and students for sharing learning materials across different Tanzanian schools. We also do not consider game based learning e.g., Krunoslav Bedi (2011), Nalin Warnajith et al. (2012) etc.

III. SECONDARY LEVEL

We devote this section to papers related to secondary level of education. We present our findings considering our evaluation scheme as shown in Table 1.

A. Adaptability

Kiilu Redempta (2012) examined Kenyan schools to find out if schools were ready and if they showed a positive attitude towards the adoption of e-learning. He conducted a desktop review supported by Current Situation Analysis (CSA). He concludes that less than 10% of Kenyan schools offer computer science as a subject in the curriculum, The current educational practices neglect e-readiness. Mildred A. Ayere (2010) presented a case study of New Partnership for Africa's Development (NEPAD) schools of Kenya. These schools were developed to integrate ICT and they are compared with the ones that are not implementing NEPAD. We call them Non-NEPAD schools. Twelve schools participated in the research where six NEPAD and remaining Non-NEPAD schools are selected. The researchers select NEPAD schools through saturated sampling whereas they select Non-NEPAD schools through random sampling. The research is a combination of exploratory approach using descriptive survey and ex-post-facto design with questionnaire as the main data collection instrument along with interviews involving students, principals and heads of departments. The authors use descriptive and inferential statistics for data analysis and do a comparison of both types of schools concluding that teachers should be fully facilitated and their roles should be strengthened in schools which offer ICT education. Glushkova (2012) used Sharable Content Object Reference Model (SCORM) standard templates and modified them to create e-lessons. The underlying approach in SCORM is a combination of stereotypical and overlay models which not only benefited students in terms of providing better guidance and distance learning but also helped special students.

Neyland (2011) investigated factors associated with integration of online learning in Sydney high schools. The research is carried out by conducting interviews and questionnaires in New South Wales secondary schools. The authors conclude that school support and the micro factors such as teacher capabilities are important.

B. Tools

Hsien-Sheng Hsiao, Lin, and Lin (2012) proposed a self-regulated web quest learning method for Chinese secondary schools with the aim of examining correlation between students' self-regulated behavior and their achievements. The proposed web quest learning was based on self-regulated learning assisted functions and traditional web quest learning.

The experiment was conducted on sixth grade students and results were analyzed by observing their self-regulated behavior as well as system records collected during in the learning process. The results showed that the presented system assisted students in learning and helped teachers in monitoring students' performance. Wei-wei Feng (2010) targeted Chinese secondary schools in Hong Kong and analyzed benefits of e-learning in teachers' training and emphasized importance of e-portfolio as a learning and assessment tool for teachers training. According to the authors, use of e-learning could make in-service training more easy and learning process could be made more transparent and innovative by applying e-portfolio.

C. Challenges

Micheuz (2007) focused on Austrian secondary academic schools to investigate how far e-learning technologies are established at this educational level. The research was carried out with the help of online questionnaires and the authors evaluated whether e-learning helped in learning and concluded that it is still an unanswerable question since it faces many obstacles like budget, teachers' adoption, etc.

D. Impact Analysis

Huan-Ming Chuang (2008) examined the impact of Knowledge Sharing Blog (KSB) among three groups of secondary students. Authors divided students in groups such that one of the groups used e-learning with KSB, second used e-learning without KSB and the third group comprised of those who studied in the traditional classroom environment. The results concluded that students of the first group showed significant improvement in their learning as compared to the other two groups.

E. Environment

Chiu-Pin Lin et al. (2010) studied learning of social studies and involved 6th-grade students to find out the impact of collaborative concept learning by having a comparative analysis of two different learning environments. In the first environment, each student used a computer system for learning purpose while in the second scenario; multiple students shared a single computer system. Analysis through questionnaires and interviews showed that students belonging to the first scenario demonstrated better performance as compared to the second one. We summarize our findings for e-learning research at secondary education level in Table 2.

TABLE II. E-LEARNING AT SECONDARY EDUCATION LEVEL

Paper	Main Focus	Effect
Kiilu Redempta (2012)	e-learning adoption	Current educational practices often neglect e-readiness
Mildred A. Ayere (2010)	e-learning in schools	e-learning implementation improved teaching and learning
Glushkova (2012)	Use of Sharable Content Object Reference Model and creation of e-lessons	better guidance and distance learning
Neyland (2011)	factors associated with integration of online learning	better educational outcomes achieved through online learning
Hsien-Sheng Hsiao, Lin, and Lin (2012)	self-regulated web quest learning method, correlation between students self-regulated behavior & their achievements	improved students' learning and assisted teachers in monitoring students performance
Weiwei Feng (2010)	benefits of e-learning in teachers' training and e-portfolio as a learning and assessment tool for teachers training	e-portfolio made learning process more transparent and innovative
Micheuz (2007)	establishment of e-learning technologies	availability of subjects' courses hasn't been achieved yet
Huan Ming Chuang (2008)	impact of Knowledge-sharing Blog (KSB)	improvement in students' learning
Chiu-Pin Lin et al. (2010)	impact of collaborative concept learning and comparative analysis of two different learning environments	better performance of students working in collaborative concept learning environment

IV. SECONDARY EDUCATION LEVEL

We classified the research papers of HE level on the same criteria used for secondary level of education. Here, we did not consider papers such as Nicole Wagner (2008) since they do not fit our classification and the purpose of this contribution. Nicole Wagner (2008) discussed stakeholder's point of view and discussed their role in successful implementation of e-learning in HE. Other such examples are Nikolaos Tselios and Papadopoulou (2011), Ksenija Klasnic and Seljan (2010), Oystein Sorebo, Gulli, and Kritiansen (2009), etc. The following is a careful selection of papers as per our classification discussed in Section 2.

A. Adaptability

Bradford S.Bell (2013) inspected the use of e-learning at post-secondary education in three different aspects. They investigated e-learning effectiveness in comparison with other traditional teaching methods; listed key features influencing e-learning effectiveness and discussed obstacles in adoption of e-learning. Meta-analysis, study and research review were used as research tools. While resolving first issue, the researchers found that e-learning is as effective as other delivery methods when used in similar instructional conditions.

Fageeh (2011) conducted in-depth-interviews along with literature review to find the attitude of undergraduate students of a Saudi Arabian university towards adoption of e-learning. A similar type of study was conducted by Nikolaos Tselios and Papadopoulou (2011). Shintaro Okazaki (2012) proposed the use of Technology Acceptance Model (TAM) to find out effects of gender on adoption of e-learning in Brazil. The study was carried out with the help of questionnaires from three Brazilian Universities. The results concluded that male students showed more flexibility towards e-learning adoption as compared to the female students. Liaw (2008) examined reasons that despite popularity of e-learning at university level, some students are uncomfortable while accepting it. The author claims that such problems can be handled effectively by individuals since using an e-learning system depends on self-efficiency and flexibility of the learner.

Adnan Riaz (2011) explored factors of successful acceptance of e-learning among university students. Teachers

and e-learning tools were found as the main factors. Ndume, F.N.Tilya, and H.Twaakyondo (2008) designed a tool for helping disabled students of Tanzanian institutions. Documentary review, structured questionnaires and interviews were used as data collection tools. Another feature of this research was analysis of challenges in e-learning acceptance which included management support, methodology, technology, resource accessibility and availability, etc. Toshie Ninomiya et al. (2007) developed a learning management system named WebClass RAPSODY for university students. Its purpose was to support personalized adaptability by improving LMS in lectures at university level. The learning mode of this system was able to monitor and analyze learners learning status and unit for contents to search and analyze contents status. After learning a content, this system indicated next suitable content, with data mining of learners status and contents status by genetic algorithm (GA). This function was able to support learner to sustain e-learning with understanding of contents and highly-motivation to learning. Mubarak M Alkharang (2013) explored challenges and barriers which influenced acceptance of e-learning in Kuwaitian HE institutions. Semi-structured interviews were used to gather data and it was found out that there are obstacles such as technological and language barriers, lack of management awareness and support in implementing e-learning in Kuwait HE system.

B. Tools

Colin Beard (2007) introduced media based material (files on CD-ROM) to provide e-learning support to post graduate students. The students were provided with a model that was a combination of film and text. The feedback about the model was received from the students in the form of questionnaires, interviews and reflective writing. The authors found that this concept was highly appreciated by distant learners and on-campus students which indicated that proposed model could be used as a diagnostic tool for design of learning experiences. Ann Heirdsfield, Tambyah, and Beutel (2011) designed an online survey to get response from faculty, staff and students about use of an online learning environment (Blackboard). The aim of this study was to help teaching staff in getting students perceptions and experience about online learning.

Schiaffino, Garcia, and Amandi (2008) designed a tool (e-Teacher) to assist e-learners. This tool created students' profiles by observing their behavior during the course. Student's profiles were reflection of their performance which showed learning style. Bayesian networks were used to automatically detect the students actions. Student was able to improve his performance by getting a continuous feedback on his learning behavior. Chin-Yeh Wang et al. (2010) built a humorous learning system to develop the interest of students in learning. This system provided an interactive learning environment so that students may not feel bored during lectures. After testing this software on different college students, it was concluded that students learning process could be made interesting by interacting with them through empathic activities. Regueras et al. (2009) presented a case study of the effects of competitive learning on the satisfaction and academic achievements of telecommunication students and a tool, QUEST, for active and competitive learning was used in an undergraduate course named Communication Networks. The data was collected through survey and tool was analyzed by using T-Test for students outcomes and results showed that overall students were satisfied with QUEST tool.

Ivana Simonova (2013) found out if better results of increased knowledge could be achieved by tailoring the ICT supported process of instruction to students individual learning style. The query was resolved by designing an e-application (plug-in) and considering a case study of the University of Hradec Kralove, Czech Republic. Assessment questionnaire was filled by 105 students of the university which clearly showed that 93% of them were fully satisfied with provided application. K. Koistinen (2009) studied various social media using concepts of virtual and mirror worlds. He evaluated them based on different parameters such as usefulness of media in teaching photogrammetry, pedagogical aspects etc. The author presented a case study of how Helsinki University of Technology (TKK) utilized various e-learning methods in eTKK project including administrative course information system, study and teaching portal, learning management system (LMS), etc. He proposed how to use new e-learning tools like Google Earth, Geocarching, innovation exercise, etc. The purpose of this research is to encourage innovative trials with new e-learning tools.

C. Challenges

Milan Puvaca (2010) studied Croatian institutions to investigate possible challenges faced in the adoption of e-learning. Suggestions are made to implement e-learning in different universities at common ground. Obstacles in implementing e-learning are identified such as resistance provided by faculty or students depending on their abilities and perception and the conservative nature of the organization to avoid change are discussed. Ndume, F.N. Tilya, and H. Twaakyondo (2008) designed a tool for helping physically challenged students of Tanzanian institutions. The researchers used documentary review, structured questionnaires and interviews as data collection tools. Analysis of challenges in e-learning acceptance was a feature of this research.

A. S. Sife and Sanga (2007) presented examples from Tanzanian institutions to discuss challenges faced by developing countries in HE while implementing new teaching

and learning technologies. Some of important issues found included lack of administrative and technical support, inadequate funds, staff development, etc. Mubarak M Alkharang (2013) explored those challenges and barriers which influenced acceptance of e-learning in Kuwaitian higher educational institutions. Semi-structured interviews were used to gather data and it was found out that there are obstacles such as technological and language barriers, lack of management awareness and support in implementing e-learning in Kuwait HE system. Paredes J. et al. (2008) covered 11 Spanish universities to analyze the problems, uses and effects of using platforms in European Space for Higher Education (ESHE). Data gathering was done through questionnaires and the findings revealed that there was a lack of institutional culture. It was also suggested that uses of distance learning platforms can be improved with student participation, mentoring, assessments, etc.

D. Impact Analysis

Olojo Oludare Jethro (2012) examined effects and benefits of e-learning in HE and discussed use of technology more efficiently. The research gathered data by performing empirical study from 1996 to 2008. He concluded that the National Assessment of Educational Progress in mathematics students who were using computers at home more frequently was more useful in at higher level in mathematics. The authors concluded that e-learning tools are more effective when computers and fast internet connection, improved software and reliable electricity is available.

Rodgers (2008) explained the role of e-learning in improving students' grades. The author used a fusion of e-learning methods and lectures. The research showed that students could excel in HE with the help of e-learning methods. Islam (2013) proposed a model to examine usefulness and role played by e-learning in improving students academic performance. Data collection was done by testing the model on university students and was analyzed with the help of Partial Least Squares (PLS). The results revealed that proper utilization of e-learning could be predicted by students' perceived academic performance. Ahmad Al-Adwan (2012) discovered factors having the effect on the implementation of e-learning in Jordanian HE. The researchers conducted study in two universities of Jordan involving staff and students. The researcher used Questionnaires and focus groups for data collection. Results suggested that e-learning facilities improve technological skills of faculty and students.

Shopova (2011) explained the role of e-learning in European HE. The author presented a case study of Bulgarian university and concluded that successful learning process and high quality results could only be achieved with the proper utilization of e-learning at HE. Michael Zastrocky (2008) conducted a survey considering timescale of ten years (1999 - 2008) to find maturity level of e-learning at HE. Fan Liu et al. (2010) presented a hypothesis to show whether an extension of TAM could be helpful in predicting that users will adopt online learning. The extension comprised of different variables like online course design, user-interface design, perceived interaction, etc. Questionnaires were used as a data collection tool and Structural Equation Modeling (SEM) was applied for

data analysis. This research has added new variables to the already existing TAM.

Gurmeet Singh (2009) chose the University of South Pacific as a case study to find out how far e-learning has been successful in improving the quality of learning at HE. The authors concluded that e-learning approaches are capable of improving learning process quality however the developing countries are unable to recognize key areas of e-learning due to which these are suffering in terms of development. Haverila (2011) carried out a study on a Finnish university to investigate the impact of e-learning experience on students perceived learning outcomes. Results recommended that some prior knowledge of e-learning experience such as collaborative and situated learning experience, construction of knowledge experience, etc. can help students in improving their learning ability. Lai (2011) explained how digital technologies can support teaching and learning practices. He surveyed literature to find the changing needs and expectations of today's students. The author also emphasized that students must be aware of their learning characteristics and they should be prepared for future as innovative knowledge creators by using formal and informal strategies.

Jamal F. Kakbra (2013) focused on Kurdistan (Iraq) to determine the effect e-learning and analyzed if it should be redesigned and implemented through MOODLE which is an LMS. There was lack of LMS due to which students and teachers were facing difficulties in the university under consideration. Sorebo and Sorebo (2009) conducted a study to investigate level of satisfaction experienced by Norwegian university teachers in using e-learning methodologies on the basis of their expectations, perceived usefulness and perceived competence. It was concluded that teachers' perceived usefulness seemed to be the best indicator of their satisfaction. Paul Lam (2011) research was based on analysis of issues related to perception of undergraduate students towards e-learning usage in teaching and learning and the affect of their previous e-learning knowledge on their perception of the value of e-learning. Cradduck (2012) discussed future of e-learning and interdependency between internet and e-learning in Australian institutions. It was concluded that e-learning cannot be utilized effectively without having required skills and proper internet access. Laura Asandului (2008) used mixed mode research methods to examine level of distribution of e-learning in Romanian HE. It was concluded that male students spent more time on computer as compared to the females. While comparing e-learning with traditional methods, students appreciated e-learning methods in terms of updating content, efficiency, and amount of knowledge while intelligibility was rated low.

Ainhoa Alvarez et al (2009) proved that inclusion of a recommendation system based on courses to study and contents of each course, the students can be provided

assistance in strengthening their own study process. The recommendation system allowed flow of information between online and off-line environments. Regueras et al. (2009) presented a case study analyzing effects of competitive learning on satisfaction and academic achievements of telecommunication students and a tool, QUEST, for active and competitive learning was used in an undergraduate course named Communication Networks. The data was collected through survey and tool was analyzed by using T-Test for students' outcomes and results showed that overall students were satisfied with QUEST tool. Xiaofei Chen (2010) presented characteristics, functions and investment benefits of e-Learning were found to be improving teaching and learning model, and the quality of teaching, enhancing college teaching efficiency, etc. Ivana Simonova (2013) designed an e-application (plug-in) and considering a case study of the University of Hradec Kralove, Czech Republic. Assessment questionnaire was filled by 105 students of the university which clearly showed that 93% of them were fully satisfied with provided application.

E. Environment

Graham Attwell (2007) research was based on Personal Learning Environments (PLEs) to investigate why PLEs are helpful in learning and how these can be developed with different services such as ubiquitous computing and development of social software. It was concluded that PLEs are a new approach which not only support learners to develop and share their ideas but this approach also bridges the gap between educational institutions and the outside worlds. YUE Jun, Yanqing, and Zetian (2009) offered a semantic retrieval approach that was based on semantic layer, semantic similarity and semantic mapping. The keywords could be analyzed by using semantic layer, semantic similarity is calculated to catch the users retrieval intention and proper semantic mapping from keywords to concepts in knowledge base was realized. Rafaela Lunardi Comarella, Silveira, and Catapan (2012) designed educational Linux for Brazilian high schools students. The benefit of using educational Linux was to provide Virtual Learning Environment (VLE) platform and availability of online practical activities on a virtual lab. The author presented findings on the basis of usage experiences of students. Donghuai Gao, Ning, and Zhang (2011) identified the issues of current e-learning environments [ELE] which were found in non-excellent environment structure, fragile support service and improper promotion policies. The authors discussed a four-layered ELE comprising of information infrastructure, application platform, information resource and support service to overcome these issues. In order to conduct the experiment, a system was designed for providing comprehensive information service to the teachers as well as the students in Fourth Military Medical University.

TABLE III. E-LEARNING AT HIGHER EDUCATION LEVEL-ADAPTABILITY

Paper	Main Focus	Effect
Bradford S. Bell (2013)	Comparison of e-learning effectiveness and features influencing e-learning	obstacles in the adoption of e-learning
Fageeh (2011)	Attitude of under graduate students in a university and adoption of e-learning	students' acceptance for e-learning initiatives
Shintaro Okazaki (2012)	Use of TAM and effects of gender on adoption of e-learning in Brazil	male students showed more flexibility towards e-learning
Liaw (2008)	students' (dis)comfort for e-learning acceptance	learners' behavior positively affected by perceived satisfaction / usefulness
Adnan Riaz (2011)	factors of successful acceptance of e-learning	students' commitment towards e-learning and characteristics as well as use of technology and resources
Ndume, F.N.Tilya, and H.Twaakyondo (2008)	tool for helping disabled students of Tanzanian institutions	challenges in e-learning acceptance
Toshio Ninomiya et al. (2007)	development of a LMS WebClass RHAPSODY and support personalized adaptability	well-understanding of contents, highly-motivation to learning
Mubarak M Alkharang (2013)	challenges and barriers which influenced acceptance of e-learning	Kuwaitian higher educational Institutions

TABLE IV. E-LEARNING AT HIGHER EDUCATION LEVEL-TOOLS

Paper	Main Focus	Effect
Colin Beard (2007)	media based material (files on CDROM) to support e-learning	Model used as diagnostic tool for the design of learning experiences
Ann Heirdsfield, Tambyah, and Beutel (2011)	use of an online learning environment (Blackboard)	help in teaching staff in getting students perceptions and experience about online learning
Schiaffino, Garcia, and Amandi (2008)	designing of tool (eTeacher)	improve students' performance
Chin-Yeh Wang et al. (2010)	Develop interest of students in learning	learning process made interesting by interaction through empathic activities
Regueras et al. (2009)	effects of competitive learning on satisfaction and academic achievements	overall students were satisfied with QUEST tool
Ivana Simonova (2013)	Tailoring ICT supported process of instruction to students individual learning style	93% students fully satisfied with provided application
K.Koistinen (2009)	Usefulness of media in teaching photo-grammetry, pedagogical aspects	Encourage innovative trials with new e-learning tools

TABLE V. E-LEARNING AT HIGHER EDUCATION LEVEL-CHALLENGES

Paper	Main Focus	Effect
Bradford S. Bell (2013)	comparison of e-learning effectiveness with other traditional teaching methods	key features which influence the e-learning effectiveness and the obstacles in the adoption of e-learning
Milan Puvaca (2010)	possible challenges faced in adoption of e-learning and suggestions to implement e-learning in different universities at common ground	Facilitation to teachers in achieving easier communication with students
Ndume, F. N. Tilya, and H. Twaakyondo (2008)	tool for helping disabled students of Tanzanian institutions	helped in developing trust
A. S. Sife and Sanga (2007)	Challenges faced by developing countries in HE while implementing new teaching and learning technologies	ICT adoption in teaching and learning can be effected by pedagogical, technical and cost issues
Mubarak M Alkharang (2013)	barriers which influenced acceptance of e-learning in Kuwaitian higher educational institutions	different hardware and software used by various departments result in e-learning adoption & implementation difficulties
Paredes J. et al. (2008)	problems, uses and effects of using platforms in European Space for Higher Education (ESHE)	uses of distance learning platforms show improvements

TABLE VI. HIGHER EDUCATION LEVEL-IMPACT ANALYSIS

Paper	Main Focus	Effect
Olojo Oludare Jethro (2012)	effects and benefits of e-learning in HE and efficient use of technology	students using computers at home performed better in mathematics
Rodgers (2008)	role of e-learning in improving students' grades	students could excel in HE with e-learning methods
Islam (2013)	Usefulness of e-learning in improving students academic performance	students academic performance predicted through e-learning tools
Ahmad Al-Adwan (2012)	Factors having effect on implementation of e-learning in Jordanian HE	students' lack of interest in e-learning and showing resistance in adoption
Shopova (2011)	role of e-learning in European HE successful learning process	Quality and proper utilization of e-learning at HE
Michael Zastrocky (2008)	Maturity level of e-learning at HE in ten years (1999 - 2008)	drastic increase in implementation rate of e-learning
Fan Liu et al. (2010)	How TAM helpful in predicting users' adaptation of online learning	added new variables to the already existing TAM
Gurmeet Singh (2009)	Use e-learning in improving the quality of learning at HE	e-learning approaches capable of improving learning process quality
Haverila (2011)	Impact of e-learning students perceived learning outcomes	Prior knowledge of e-learning experience helpful in learning
Lai (2011)	How digital technologies can support teaching and learning practices	help students in being prepared for future as innovative knowledge creators
Jamal F. Kakbra (2013)	Effect of ICT and e-learning through MOODLE	Positive response of teachers and students towards ICT and e-learning methodologies
Sorebo and Sorebo (2009)	Norwegian university teachers satisfaction in using e-learning methodologies	achieved teachers perceived usefulness as the best indicator of satisfaction
Paul Lam (2011)	Undergraduate students perception towards e-learning	students with previous experience of e-learning were more adamant in adoption
Dr. Laura Asandului (2008)	E-learning in Romanian HE and comparison of e-learning with traditional methods	students appreciation for e-learning methods
Ainhoa Alvarez et al. (2009)	recommendation system based on courses to study and contents of each course	allowed the flow of information between online and off-line environments
Regueras et al. (2009)	Satisfaction and academic achievements of telecom students and QUEST tool	overall students were satisfied with QUEST tool
Xiaofei Chen (2010)	Characteristic and functions of e-Learning technology	improving teaching and learning model and quality of teaching
Ivana Simonova (2013)	Increased knowledge by tailoring process of instruction to students individual learning	93% students fully satisfied with provided application

TABLE VII. E-LEARNING AT HIGHER EDUCATION LEVEL-ENVIRONMENT

Paper	Main Focus	Effect
Toshie Ninomiya et al. (2007)	Development of learning management system named for university students and support of a personalized adaptability by improving LMS in lectures at university level	learners get support to sustain e-learning with well understanding of contents and highly-motivation to learning
Graham Attwell (2007)	investigation of reasons why PLEs are helpful in learning and how PLEs can be developed with different services	learners develop and share their ideas and bridge gaps between educational institutions and the outside worlds
YUE Jun, Yanqing, and Zetian (2009)	semantic retrieval approach that was based on semantic layer, semantic similarity and semantic mapping	helped in analyzing retrieving intention
Rafaela Lunardi Comarella et al (2012)	Educational Linux for Brazilian high schools students and usage experiences of students	students' progress can be monitored
Donghuai Gao et al (2011)	issues of current ELE and design of four layers model	Benefits to students and teachers using comprehensive information system

V. ANALYSIS AND DISCUSSION

Our research assisted in getting a real picture of what has been done so far in the educational sectors with respect to e-learning. This paper clearly shows that a lot more work has been done in higher education as compared to the secondary education. While particularly discussing the secondary section, more attention has been paid to the adoption of e-learning.

Some researchers focused on the development of e-learning tools, few have emphasized on its impact and challenges faced in its adoption, and a small number of researchers have worked on the designing of suitable environment in support of e-learning. Following graphs, shown in Figure 1 provide statistical picture of research performed on e-learning in various fields of secondary and higher level during the course of this study.

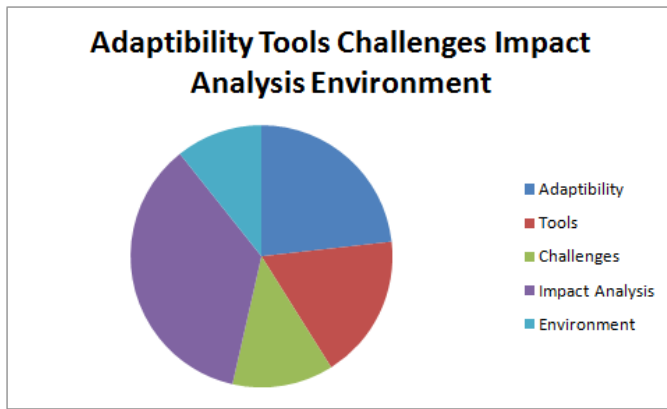


Fig. 1. Comparative analysis

On the other side, we find e-learning at higher education to be of great importance from the researchers' point of view and much work has been done at this level. In contrast to secondary education, we found most of the research on impact analysis of e-learning at the higher level. Other areas of interest are its adoption and designing of various e-learning tools; some researchers examined the challenges in its adoption, and few have paid attention to the development of e-learning supporting environment.

At the higher level, we conclude that use of various e-learning tools and methodologies plays a significant role to make the learning process more effective. However, it is important to dig out all the related aspects in order to get the maximum benefits of e-learning. We also conclude that most of the emphasis is on the learning process from students' perspective. It is pertinent to mention here that teachers' role is of pivotal importance as students and teachers share equal role in the successful learning process.

VI. CONCLUSION

Concluding our findings at the secondary and the higher levels of education, we found a mixed kind of research where most of the work has been performed on the adoption of e-learning. Different tools are developed and some of the authors have focused the challenges faced in implementing e-learning. Being the highest education level, this field has almost covered all e-learning aspects in terms of research with the main contribution in the development of tools and the impact of e-learning on the higher institutions and the stake holders. Not only this, the researchers have also explored the challenges and investigated the rate of adoption of e-learning and its related experience. The researchers have also discussed risks and shared proposals related to designing e-schools, e-colleges and e-universities. According to our study, important part of the theories and proposal of models related research was found generic in nature like e-learning usage, its role in effective learning, maturity level of e-learning in HE system, etc. Novel and innovative learning environments and systems have also been developed either for the HE level or secondary level.

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