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TOJDEL welcomes you. TOJDEL looks for academic articles on the issues of distance education and e-learning and may address assessment, attitudes, beliefs, curriculum, equity, research, translating research into practice, learning theory, alternative conceptions, socio-cultural issues, special populations, and integration of subjects. The articles should discuss the perspectives of students, teachers, school administrators and communities. TOJDEL contributes to the development of both theory and practice in the field of distance education and e-learning. TOJDEL accepts academically robust papers, topical articles and case studies that contribute to the area of research in distance education and e-learning.

The aim of TOJDEL is to help students, teachers, school administrators and communities better understand how to organize distance education for learning and teaching activities. The submitted articles should be original, unpublished, and not in consideration for publication elsewhere at the time of submission to TOJDEL. TOJDEL provides perspectives on topics relevant to the study, implementation and management of learning with technology.

I am always honored to be the editor in chief of TOJDEL. Many persons gave their valuable contributions for this issue.

TOJDEL, Governor State University and Sakarya University will organize the IDEC-2017 International Distance Education Conference (IDEC 2014) (www.id-ec.net) between July 17-19, 2017 in Berlin, Germany.

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TOJDEL invites article contributions. Submitted articles should be about all aspects of distance education and e-learning. and may address assessment, attitudes, beliefs, curriculum, equity, research, translating research into practice, learning theory, alternative conceptions, socio-cultural issues, special populations, and integration of subjects. The articles should also discuss the perspectives of students, teachers, school administrators and communities.

The articles should be original, unpublished, and not in consideration for publication elsewhere at the time of submission to TOJDEL.

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AN EXPLORATION OF ARAB STUDENTS OPINIONS ON HIGHER EDUCATION SYSTEM IN ROMANIA

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Abstract: The article analyzes how the Arab students adapts to the education system and daily life in Romania. First it shows the attraction of Romanian schools for Arab students to attend graduate, masters and PhD studies. Then identified some Romanian cultural particularities and how they consider be. Based on the responses to a questionnaire identifies Arab students opinion about how they are received by the Romanian colleagues, and by society in general. Likewise identified Romanian students opinion about their fellow Arabs. At the end of the paper, shows some changes that have been made in teaching to ensure the performance of all students, including those Arabs.

Keywords: education abroad, technical education, cultural adaptations.

INTRODUCTION

Traditionally, Higher Education in Romania has a world-wide reputation as a centre of excellence in learning, teaching and practice. Romanian Universities and Colleges have been receiving thousands and thousands of students from all over the world, especially from developing countries. Today most all Romanian Universities are partners with thousands of well known Universities in all over the world. And Romania has become one of countries offering state-of-the-art facilities and cutting-edge research opportunities together with the chance to walk in the footsteps of so many of the world's most influential thinkers.

Higher education institutions in Romania began to provide education services based on promoting international cooperation between universities in order to respond to the requests coming from different industries. In these conditions appeared a large number of educational offerings for students from different countries.

The Romanian education was popular among the foreign students, especially after World War II. Before this, between 1850 and 1914 many Romanian students have studied in other European countries and afterwards they have contributed in building up the Romanian education system, Romanian industry and culture. Today, when Romania is part of the European Union, it can be noticed an increased mobility among youngsters that decide to go abroad for studies in European universities or in USA.

The purpose of this article is to identify key aspects that represent an attraction for foreign students to come to study in Romania, especially Arabic students. To identify these attractive factors we have started our analysis beginning with a range of studies met to underline the cultural particularities of the Romanian people.

ROMANIAN EDUCATION ATTRACTION

The Romanian higher education system comprised 48 public universities and 56 private universities. These universities included 536 faculties with a total number of 620,529 students enrolled. Mention should be made that the data available do not allow for the identification of the accurate number of individuals enrolled in the Romanian universities, either public or private.

In 2014, 12.000 foreign students were registered in Romania and in 2015 their number reached 21.000. Most of them are coming from other European countries, especially from France but 6100 foreign students are from non-European countries. The number of foreign students registered for a bachelor degree is around 19.000, for a master degree have registered around 1000 foreign students and for Ph.D around 1000. Foreign students have arrived also from Arabic countries, for example from Tunisia have registered around 1500 and from Maroc around 900.

The application file must be sent to Romania by 15th of September (for undergraduate and graduate studies), but there is no deadline for PhD applicants. International students have to prove good knowledge of the teaching language (English, French or German). For the students who do not meet this criterion there are specialized departments where they can improve their language skills.

It is commonly believed that foreign students decide to attend the Romanian universities due the high quality of the education. There are also opinions that state the fact that Romanian universities represent an attraction due to lower tuition fees in comparison with other European countries and also due to the low cost of living. Researches have demonstrated that foreign students have chosen Romania to complete their education because the living costs in Romania are low even though the trend is heading towards the European Union level, also universities' tuition fees are smaller compared to other European countries (3200 USD or 2300 Euros per year), there is also the possibility of getting hired in a multinational company at a wage similar with the ones in European Union, in addition to this the Romanian Government offers study scholarships to talented. The average annual budget for studying in Romania is: €5500 (€4700 - living expenses, €300 for Books, €500 for Holidays/travel in Romania).

The majority of the foreign students have enrolled in the medical university but also they have enrolled in other universities as well. For example, the Polytechnic University of Bucharest has around 27.000 students, 800 out of 27.000 are foreign students enrolled for a bachelor, master and Ph.D degree. 700 students out of 800 foreign students that the University has are from Arabic countries and Turkey.

Polytechnic University of Bucharest is the oldest and most prestigious engineering school in Romania, with a tradition accumulated over 190 years of existence through the efforts of some of the greatest teachers of our nation, defines its uniqueness by creating knowledge through research and by technological innovation and its implementation through education and vocational training at European level. University Politehnica boasts many years of academic excellence. A rich academic heritage is based around many landmarks in human knowledge, and today's this higher education institution benefit from this lasting legacy.

The studies in University POLITEHNICA of Bucharest can be done in international languages at the following in different faculties. For bachelor studying electronics and telecommunications engineering (in English, French, Germany), computers and information technology (in English, French), applied electronics (in Germany), mechanical engineering (in English, French, Germany), chemistry and engineering of organic chemicals, petroleum and coal chemistry (in English, French), materials engineering-materials science (in English, French), economical engineering for electrical, electronics and power engineering fields (in Germany), economical engineering for mechanical field (in Germany), air navigation (in English).

For master studying business management in (English), biomedical informatics (in English), automatic translation technology (in French), business administration of industrial systems (in Germany), engineering and management of industrial systems (in French), software engineering (in English), mechatronics and bionics technique and organization (in Germany), management digital enterprise (in English), artificial intelligence (in English), advanced microelectronics (in English).

Another factor of attraction is the certification programs in universities. The qualifications of Higher education must be internationally recognized. Transferable qualifications aid mobility, making it easier for students to further study or to transfer achieved credits to other higher education institution or to move from studying to launching a career elsewhere. In order to facilitate and ensure that the quality and transferability of higher education qualifications mean something and are recognized all over the world, Politehnica University developed and apply a number of instruments, among which: European Credit Transfer and Accumulation System (ECTS), The Diploma Supplement (DS), The European Quality Charter for Mobility, The European Qualifications Framework for Lifelong Learning (EQF), The ENIC Network (European Network of Information Centre on academic recognition and mobility), The NARIC Network (National Academic Recognition Information Centre).

THE CULTURAL PARTICULARITIES

Even though all the aspects mentioned above are true, from different discussions with foreign and Romanian students resulted that the Romanian people demonstrated kindness towards the foreign students that have arrived in Romania for studies.

Now Romanians are adapting to the European culture, but some cultural aspects have been formed over time and can not be ignored. It has been studied in the last 150 years folklore, traditions, customs, mores, popular literature, classical literature, art, film, religion, nature, architecture and through this cultural particularities were identified. The opinions are quite divergent, but in general any Romanian believes that the peasants, which until 50 years ago used to represent the majority in the country, should be welcoming, tolerant, humane.

It is true that different races have contributed to the Romanian people, some in a higher proportion such as Dacians, Romans and Slavs and others in a smaller like Turkish peoples. For example (quote from Stănescu 2006), D. Drăghicescu (1907) in a classic book believes that the Scythians would have transmitted a strong will, a sharp mind, lively, an opening towards relationships, on the other hand they have also transmitted a some kind of guile, hypocrisy, duplicity. From Thracian it has been inherited the sober character and some sort of guile and even the tendency to deceive. The Romans would have transmitted the forbearance, strong-willed character and sometimes choleric temperament. Slavs contributed with a sense of sociability, an exuberant enthusiasm, belief in superstitions. From the Turkish people it is believed to have acquired a certain carelessness, belief in destiny, in faith and luck and the lack of confidence in ourselves. From the experience of being in contact with the great empires that used to be right across the border, Draghicescu also distinguishes the passivity, the resignation, the lack of offensive power and defensive resistance practice. From these key cultural particularities would results the heterogeneity of the Romanian people ethos.

As shown in the literature (Stănescu 2006), great Romanian philosopher, Lucian Blaga believes that the geographical place has influenced the Romanians' body and soul. The great French geographer Em. de Marton noted that Romania's geography is an almost ideal space. Being sedentary and taking care of agriculture to survive, the Romanians knew that time passes after a certain cyclical. Other scholars such as C. Radulescu-Motru said that Romanian history thought them to resist over time and to behave sometimes collectively and sometimes individually to hide their existence. The great historian Vasile Parvan speaks about fatalism, melancholy, levity into action and about a shell where the soul retreats. The philosopher Constantin Noica noticed a serenity and a fear of change, a shepherd cosmic solitude. The writer Mircea Eliade noted that Romanians being surrounded by great empires have adapted, although they are neither pessimistic, nor passive, nor resigned. Mihail Ralea believed that Romanians are essentially good, with no memory of the evil, not infatuation and exhibit passive adaptability resulting from the East passivity. Other scientists have noted a tolerant and open character, no religious wars, maybe some soul atheism although it is not declared and that the Christianity has profoundly influenced their lives. Romanians were too weary to deal too much with spirituality until the Middle Ages and they have witnessed a lot in their long history.

We believe that these divergent characteristics belong to people of every nation and not to an entire people. The historian Lucian Boia (1997) noted that one can say anything about he Romanians and about others as well as the ethnic psychology is inconsistent as it has no scientific grounds. However there is an eastern component in the Romanian culture. In conducted research, we've tried mostly to identify how foreign students are being accepted among the Romanian students.

Taking as a reference the G. Hofstede's theory (Hofstede 1995), in Romania studies have been conducted to determine the cultural particularities. Culture is the "structures of thought and action mentality widespread in the environment " (Kelly 2004). These aspects have been formed over time depending on various factors: economic, political, social, geographical, demographic. The business culture lead to a collective mentality, whereby a group of people is different from another group of people. Different business cultures differ (Hofstede 1995) based on five criteria:

Distance towards power: shows the existing inequality. When the distance is small, the subordinate dependence towards the leader is small. Having a big distance requires obedience, if the distance is small people consider themselves equal and organizations are becoming decentralized.

The degree of individualism: individualism allows for personal freedom, personal achievements. Collectivism emphasizes group that protects the person in exchange for loyalty. In collectivist societies man lives through collective society, in the individualistic organizations human involvement is small, more important is to satisfy their needs

The degree of masculinity: masculine societies seek performance, feminine societies seek prosperity. Masculinity is characterized by earnings, recognition, advancement, promotion; feminism by means of cooperation and security. In masculine societies enterprises, managers are aggressive, disagreements are high. In the feminine societies the predominant style is the democratic one where the role of managers is moderate.

The uncertainty level: the need expressed by predetermined rules. Without them we encounter stress, anxiety, irritation. In tolerant societies towards uncertainty the plans are developed on short term, in intolerant societies every action is carefully planned.

Time management: businesses could be targeted in the long term, when promotes perseverance, thrift, savings, or short-term when it is encouraging the initiative.

The Trampenaars model (1997) identifies the following characteristics of culture: universality / particularity (the emphasis is on rules or relationships), individualism / collectivism; emotionality / neutral (show or no show feelings); specific / diffuse (make a difference or not between private and professional life); social status is acquired / purchased (obtained by achievement or by age, education); sequential / synchronous (simultaneous or successive events); internal control / external (it is believed that people can control their destiny or not) .

Gallup Romania has conducted in 2005 a survey on business culture in Romania and found a large distance from the management, collectivism, femininity, high uncertainty avoidance and a short-term orientation.

A recent research (Musat 2013) shows the following indicators for cultural characteristics: the distance towards power - 80, the degree of individualism - 30, the degree of masculinity - 42, tolerance to uncertainty - 90, long-term orientation - 52. The study also investigated the degree of indulgence that has value 20.

THE RESEARCH METHODOLOGY

The research sought to determine how foreign students adapt in Romania, was conducted at the Engineering Faculty of Polytechnic University of Bucharest. In this faculty classes are held in foreign languages like German, English and French. The Engineering Faculty has 500 students enrolled for a bachelor degree and 150 students enrolled for a master degree. Out of the total number of students enrolled in the Engineering Faculty, 300 are foreign students.

In order to identify more accurately the relations between Romanian and foreign students, a research has been conducted over an entire year of study, the last one so the students knew each other for 4 years. Two questionnaires were developed with similar questions addressed to Romanian students and foreign students. All students have answered: 30 Romanians, 16 Arabs and 4 French.

The questions referred to the following:

1. The impact of the existence of mixed groups in preparation;
 2. The existence of rivalries among students by forming mixed groups;
 3. Relations between students;
 4. Participation in joint activities outside teaching hours;
 5. Consultation between students preparing lessons;
 6. Group unity;
 7. Ease of adaptation to Romanian cultural environment;
 8. Interest in knowing the culture of the country to foreign students;
 9. Awareness of the language in which courses are taught;
 10. Awareness of the technical language;
 11. Adapting to Romanian standards of behavior;
 12. Romanians disturbing behaviors towards foreign students;
 13. Interest for knowing the Romanian culture;
 14. The level of knowledge of the Romanian language.
- Foreign students have also responded to two questions:
15. If Romanians are talking about their country;
 16. If teachers give responses to requests to clarify some issues being taught.

RELATIONSHIPS BETWEEN STUDENTS

From the answers given by foreign students unanimously believes that know well the language of teaching and technical language, are interested to know Romanian culture, teachers respond to their wishes to clarify issues raised in courses, Romanian students do not have behaviors that disturb them.

Also 90% of them believe they have friendly relations with their Romanian colleagues, but they form a distinct entity, they have learned from Romanian culture. Withal 70% consider that the existence of mixed groups has a positive impact in their training. They also consult Romanian students in clarifying certain aspects of the course, it is not difficult to adapt to the environment in Romania, that were easily adapted to living conditions in Romania, they have learned Romanian well, that Romanian colleagues speak about Romania. Also 50% of them consider that there is a emulation between Romanian and foreigners to education. The same percentage believes that participating in the joint action.

From the answers given by Romanian students we can conclude that that students unanimously considers that the foreign students adapt well in Romania, that cultural information is being changed and that Arab students quickly learn Romanian.

It is noted that 2/3 of the Romanian students consider that the existence of mixed groups has a positive impact in training, that students consult each other while preparing their homework, that there is unity in the group, that foreign students are interested in knowing the Romanian culture. Also 2/3 of Romanian students consider that there is no special emulation to learn whether foreign students are part of the group or not, that they do not participate in common activities in their free time, and that Romanian students' behaviors is not to disturbing for foreign students.

Also 85% of the Romanian students consider they have established friendly relationships with foreign students and that they have learned some aspects of the culture of the countries the foreign students come from, they know to an acceptable level technical language and that their behavior is compliant in our country

So Romanian students consider that foreign students adapt well to the conditions in Romania, both in terms of behavior and the Romanian language, that friendly relationships are established between them and that they exchange cultural information. Regarding the educational process there is a collaboration between them and they are not considered as separate entities, all being students, it is estimated that they know very well the French language in which the education process is conducted .

It seems that the friendships do not extend far and extra teaching activities. Although some Romanian students have replied to the questionnaire that they went together to different conferences, they have made visits to potential employers, they went to clubs, to theaters and concerts, doing sports and excursions together.

It is interesting to **compare students' opinions** about their relations. The same proportion (66-70%) think that it is good teaches the same group. Romanians feel emulation for teaching in 33% of the cases and foreigners in 50% of the cases. The same percentage (80-90%) believe that relations between them are friendly, it helps to lessons (66-70%). Romanians feel that foreigners adapt easy to the environment (90%) but only 70% of foreigners feel the same.

Differences do occur. Of Romanian 33% believe that certain behaviors of their disturbs, but no stranger said this. 66% of Romanian feel that they are two distinct entities in the group, while foreigners think this of 50%. It means that each group has however identity.

In order to create a friendly social and learning environment to foreign students, Polytechnic University of Bucharest provides the following supports: printed books and practice handbooks written in foreign languages, with specific indications for foreign students; E-Books and and practice handbooks written in foreign languages posted on the website of the Faculty (Moodle Platform); specialist advice for foreign students; attracting and motivating foreign students to participate in Annual Student Scientific Sessions; tutorial for carrying out practical activities within multinational companies operating in Romania; facilitating participation in scientific conferences and congresses having technical profile; providing accommodation and participating in social activities on campus.

In order to revitalize the relations between Romania and the Arab World, by launching cultural projects with national, European, Arabian, and international support, four years ago was founded The European Romanian-Pan-Arabian Cultural Center (CCERPA). This Center aim is to promote and support the Arab culture in our country, and the Romanian culture throughout the Arab world, by initiating informational and educational programs to raise the awareness of our people and communities, about the history, culture of each nation, emphasizing on the common ground, and also on a good knowledge of the moral, social, scientific, sightseeing, economic and political values specific of each country.

CONCLUSIONS

The study shows that Arab students are welcome in the Faculty of Engineering. Romanian students are friendly with their fellow Arabs. Do not feel differences between Romanian and foreign students, all is considered to be peers with the same interest, training in engineering. This behavior is a consequence of the fact that Romania was at a crossroads of civilizations.

At the same time Arab students retains its cultural identity, as well as Romanian students or students from other European countries.

Foreign students get advantage of wonderful blend of tradition and modernity, vitality and performance, along with traditional and new campuses at low cost.

Also, studying in Politehnica University offers a unique cultural experience in a dynamic and multinational environment. Besides earning a world-class qualification, international students have the chance to learn new languages, get international intercultural skills that are of great value to future employers and an essential advantage in a dynamic world, build a friend and professional network lasting forever, to travel and make practice or exchange studies in other countries, etc.

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AUTOMATED ASSESSMENT OF KNOWLEDGE AND SKILL ACQUIRED BY E-LEARNERS THROUGH ADAPTIVE TESTING

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Abstract: Automated assessment of very large numbers of e-learners registered for popular online courses is a critical issue in the process of e-learning. Due to the flexibility offered to e-learning through online courses, the tests taken by learners at their own chosen time schedules with varying levels of preparedness need to be designed to provide reliable and fairly accurate measurement of the learners' proficiency, the latter found to vary over a wide range. The experience with the adaptation strategy employed in the test scheme adopted in a particular course, the question bank creation and validation issues and the test score calculation options are all discussed with their relative merits clearly brought out.

Keywords: Adaptive Testing, E-Assessment, Test Strategy

INTRODUCTION

Universities aiming to choose meritorious students for admission into their elite programs or employers attempting selection of right candidates from a vast pool of applicants often resort to automated tests on basic knowledge and skill in specified essential subject areas. Objective type questions (often through selection from multiple choice answers), randomly picked from a large question bank on the specified subject have been used for this purpose for a long time. The increasingly popular e-learning or flexible learning in educational institutions also demand a shift from the conventional fixed timetable examinations with single question paper for a whole class or for a whole university. The new learners are more comfortable with flexible examinations to assess the knowledge and skills of the learners in their own convenient time schedules. Automated testing with focused efforts to generate sufficiently large question banks for diverse subjects is found essential to enable such learner assessment. A survey conducted among a student community about online assessment focusing on affective factors, validity, practical issues, reliability, security and teaching & learning shows positive expectations from e-assessment (John Dermo, 2009). Experience with E-assessments used across the world establishes the advantages of this approach over traditional assessments/examinations. (SIR, U. S. A. OSUJI, 2012)

Often candidates with widely varying levels of proficiency in a given subject area need to be tested within a finite time duration by a single test, still obtaining a realistic quantification of their attainments. This has been found feasible, if the candidates with high initial success rates are posed with questions of gradually increasing conceptual complexity. Such adaptive testing can utilize the test duration with maximum proportion of time spent in challenging the candidates at their own right level of proficiency. If a candidate answers correctly for a set of questions, then the next question will be of higher difficulty level. (Elena Papanastasiou, 2015). The experience gained in such testing of undergraduate engineering students' proficiency in computer program implementation in 'C' language is described here with multiple strategies for classification of learners. Rough Set Theory has been used earlier to model the students' performance in the E-Assessment data and to generate classification rules (Nandakumar G.S. et.al 2014).

QUESTION BANK CREATION

The success of any adaptive test is largely dependent on the quality and quantity of the question bank from which the administered items are drawn. The total number of questions in the bank must be sufficient to probe depth of knowledge on each of the topics in the subject area chosen. A good question bank should have enough

questions to attain high measurement precision while assessing candidates with a wide range of variation in knowledge levels. This criterion essentially means that there should be sufficient number of questions at all levels of complexity. Calibrating the question bank to know the measurement characteristics of individual question is a necessary part of large E-Assessment. It is useful to assign a difficulty level to each question in the bank depending on the fraction of a large population of candidates correctly answering the question. A high-quality question bank will contain sufficient numbers of questions at each difficulty level, to evaluate students at varying levels of proficiency. If the bank is large enough, the chances of each student receiving a distinct subset of questions are enhanced. Students' motivation towards learning, subject areas, programs, characteristics of the online delivery format and other imposed constraints are the factors usually considered in the design of questions for the online tests.(Shijuan Liu, Retrieved March 12, 2016)

CALIBRATION AND VALIDATION OF QUESTION BANK

Every item in the question bank has to be calibrated before being used in the tests. The accuracy of calibration will have a direct impact on the reliability of the test as reflected in the scores of the candidates. A question bank consisting of several hundred multiple choice questions on C-Programming language features was created by collecting questions from multiple course experts. A conventional test was initially conducted where each of the questions in the question bank has to be answered by a large population of students. Calibration of questions was done with the proportion of the examinees who answered each question correctly to the total population, based on which the questions were initially classified into five levels of Degree of Toughness (DT) (Nandakumar G.S. et.al 2014). (1 – very simple and 5 – very tricky) as shown in Table-1.

DT	Classification
1	Very simple
2	Below average
3	Average
4	Tricky
5	Very tricky

Table 1. DT (Degree of Toughness) level and classification

DT	% Answered Correctly	No. of Questions
5	0 – 10	72
4	11 – 29	120
3	30 – 49	146
2	50 – 69	118
1	70 – 100	117

Table 2. Initial classification of questions into DT levels

The initial classification of each question into right DT levels is based on the proportion of correct answers from a large body of learners attempting the entire question bank. The outcome is shown in Table 2. The DT of an individual question has to be updated periodically, after a broad spectrum of students undergoes the tests and the question has been asked sufficiently large number of times.

ADAPTATION STRATEGY

The interesting aspect of this model is that it allows a student to choose initial DT level of the questions soon after logging into the system of examination. If he opts for the k^{th} DT ($k=1, 2, 3, 4, 5$) the system will start displaying the questions randomly from the chosen DT, for which the candidate selects answers from the given multiple choices.

The following is the algorithmic strategy followed for transitioning into adjacent DT levels during the test progress:

Case 1: If the candidate answers the first three questions of the k^{th} DT level correctly, the system will shift to $k+1^{\text{st}}$ DT level provided $k \neq 5$. When $k = 5$, the system continues to ask questions from the same level.

Case 2: In case the candidate answers all the three questions of the k^{th} DT incorrectly, the system will shift to $k-1^{\text{st}}$ DT provided $k \neq 1$. For $k=1$, the system continues to display from the 1^{st} DT level irrespective of the number of wrong answers provided.

Case 3: If the examinee correctly answers only one or two out of the first three questions from the k^{th} DT level, the system provides one more question from the same DT.

Three correct answers out of a total of four questions leads to a shift to $k+1^{\text{st}}$ DT level, provided $k \neq 5$.

Three wrong answers out of four questions leads to a shift to $k-1^{\text{st}}$ DT level, provided $k \neq 1$.

In case examinee answers two out of these four questions correctly from the k^{th} DT level, one more question from the same DT level is given. A total of three correct answers out of five given questions, shifts to $k+1^{\text{st}}$ DT; otherwise shift is made to $k-1^{\text{st}}$ DT. However such shifting to next higher or lower DT does not take place when $k=5$ or $k=1$ respectively.

SCORE EVALUATION PROCEDURE

The final score is calculated using the relation

$$Score = \sum_{i=1}^5 w_i n_i$$

Where

n_i – is the number of i^{th} DT level questions correctly answered
 w_i - is the weightage associated with i^{th} DT level.

The weightage currently used for questions from each of the DT levels are given in Table 3. It is to be noted from the table that weightage in score calculation increases linearly with the DT level.

DT	1	2	3	4	5
Weighting Element w_i	0.2	0.4	0.6	0.8	1.0

Table 3. Weightage associated with each DT level

The above weightage parameters and the duration of the examination can be set according to the needs of the subject. The test will get terminated either on the expiry of the time frame or the examinee attempting questions for the prescribed maximum score whichever occurs first. The test score, the number of DT level-wise questions asked and correctly answered gets displayed at the end of the test.

SCORE CALCULATION OPTIONS

The above conventional method of score calculation assigns an incremental score for every correct answer, the increment size depending on the degree of toughness (DT) of the question answered. The final scores obtained by a sample of students is given as Total Marks (TM) in Table 4. To penalize answering questions without clear knowledge of the problem (i.e. through mere guess work), negative markings were assigned to wrongly answered questions with 25% and 50% negative marking of the incremental score for each DT level. The revised scores (TMs) with negative markings are also provided in Table 4. When the candidates are sorted in terms of descending TMs, we find multiple candidates sharing the same discrete values.

Stud-id	Total Marks (TM)	TM with 25% -ve	TM with 50% -ve	Success Rate Score
47	8.8	7.3	5.7	222.0
101	8.8	7.3	5.7	119.3
102	8.8	7.3	5.7	58.7
26	8.2	6.5	4.8	120.5
79	8.2	6.5	4.8	116.1
135	8.2	6.5	4.8	106.4
17	8.0	6.3	4.5	144.4
14	8.0	6.3	4.5	122.9
119	8.0	6.3	4.5	95.5
59	8.0	6.3	4.5	93.7
84	8.0	6.3	4.5	63.8
4	8.0	6.3	4.5	60.8
97	8.0	6.3	4.5	60.8
60	7.8	6	4.2	97.7
7	7.8	6	4.2	73.7
130	7.8	6	4.2	62.4

Table 4. Sample list of candidates with marks sorted in the descending order of ‘Total marks’

The final scores could be alternatively calculated by following a strategy similar to the one adopted in all conventional (non-adaptive) tests, i.e. based on the proportion of right answers among the total questions posed. Such a score termed as success rate score is defined as

$$\text{Success Rate Score} = \frac{100}{3} \sum_{i=1}^5 w_i n_{c_i} / n_i$$

Where

- n_i – is the total number of questions faced by the candidate in i^{th} DT level
- n_{c_i} is the number of correct answers in the i^{th} DT level and
- w_i - is the weight associated with i^{th} DT level.

Since the maximum value of the summation is 3 for the assumed w_i values, to normalize the score in the range of (0-100), it is multiplied by 100/3.

The success rate scores included in the above table is found to provide superior discrimination over the entire range of scorers. It is particularly useful for finer discrimination among top scorers. The scatter diagram given in Figure 1 providing the correlation between conventional scores and the success rate scores throws further light on the relative merits of the different score calculation options.

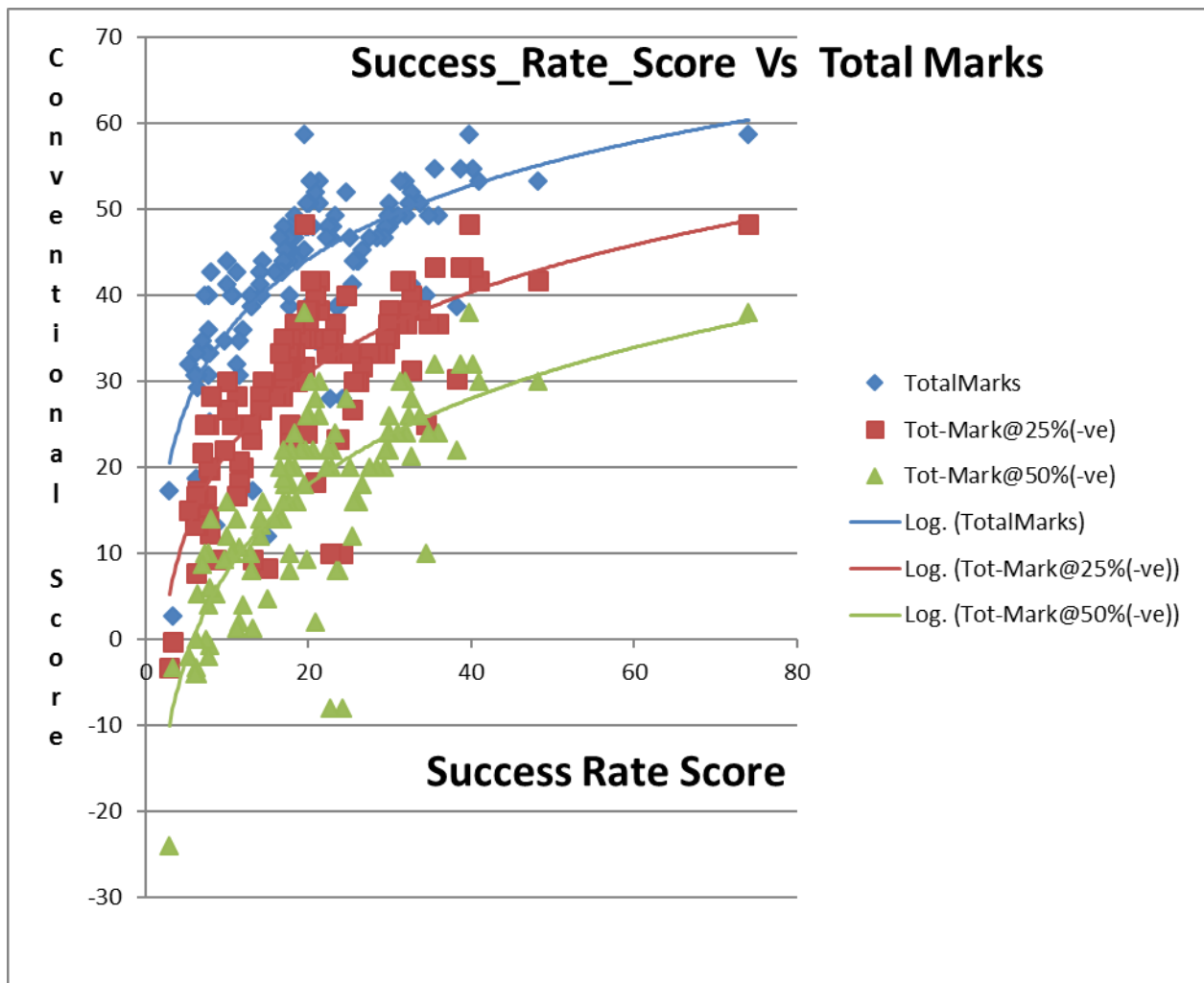


Figure 1: Scatter diagram showing the correlation between conventional scores and Success rate scores

The correlation between success rate score(X) and the total marks(Y) calculated as

$$\text{Correlation} = \text{covariance}(X, Y) / (\sigma_X * \sigma_Y)$$

is only around 0.62. This correlation with X was found to improve marginally with negative marking, 0.68 with 25% negative marking and 0.69 with 50% negative marking.

Since success rate score is similar to conventional proportion of correct answers at each difficulty level, they are to be preferred in most circumstances. However, to get a deeper insight into the profile of a particular candidate, the entire sequence of questions faced at different DT levels along with the consistency with which the candidate scores at different levels can be viewed graphically as shown in Figures 2, 3, 4 and 5. Student no.47 is found to fast climb to higher levels of DT, though he achieves right answers for only about 50% of the questions at DT levels of 3 and above. Student No.101 climbs to a higher level slowly and also makes as many mistakes as the correct answers. Student No. 102 starting at DT 2 is spending all the time in levels 2 and 3. He is able to attempt more number of questions at lower DT levels compared to the earlier two, all three getting the same total marks. But the success rate score for these three students found in the top 3 rows of Table 4 provides very good discrimination that is in conformity with the intuitive assessments of merit from Figures 2 to 5.

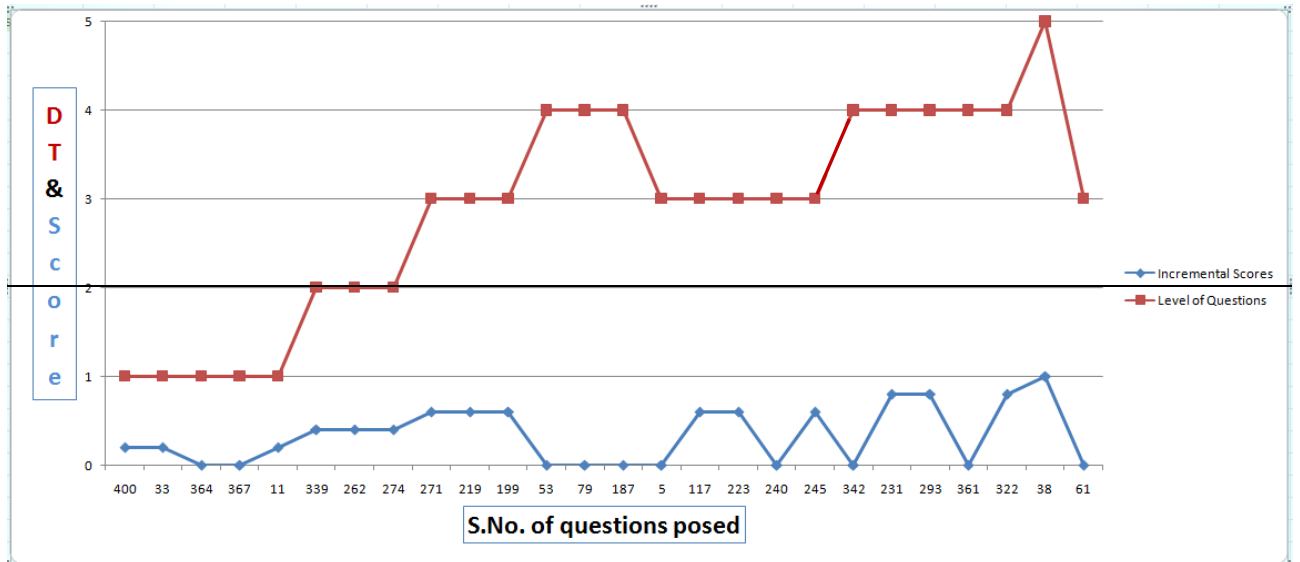


Figure 2: Sequence of questions posed and scores obtained by the candidate No.47

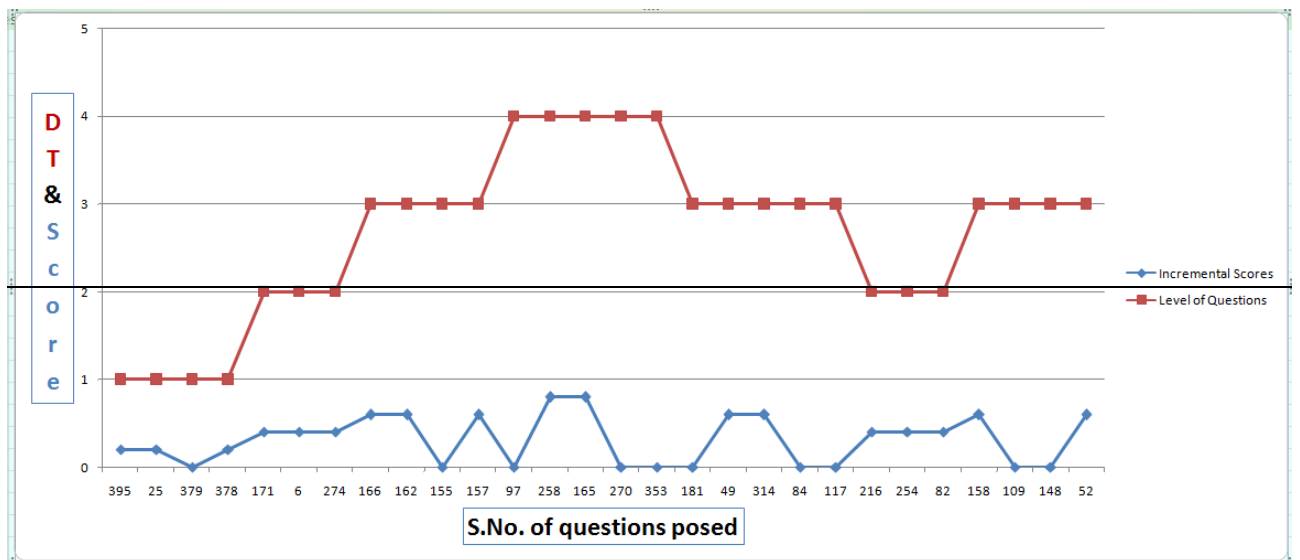


Figure 3: Sequence of questions posed and scores obtained by the candidate No.101

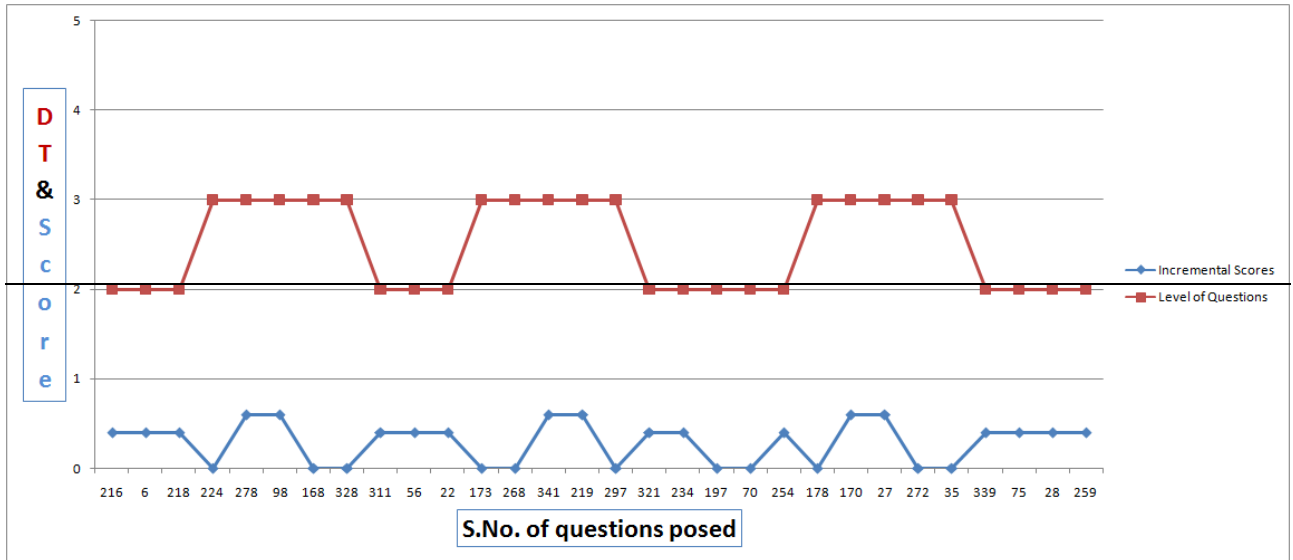


Figure 4: Sequence of questions posed and scores obtained by the candidate No.102

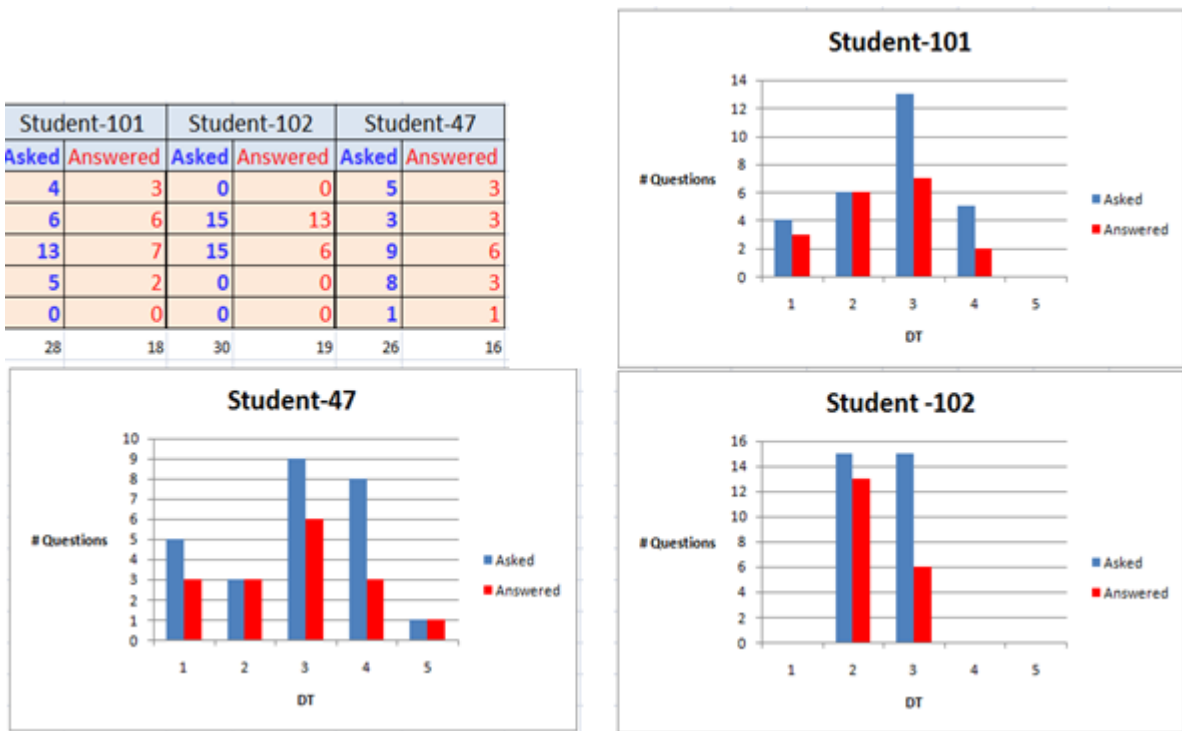


Figure-5: Comparison of scoring patterns by the top three scorers

CONCLUSION

The adaptive strategy made use of to assess the proficiency of several batches of students in one institution has brought out the effectiveness of such strategy for on-line assessment. It gives flexibility to students and provides good discrimination over a range of proficiency levels. Among the score calculation options, the score based on proportion of successful answers to each class of questions is found to be more dependable than the conventional scores with or without negative markings to wrong answers. The present adaptation strategy has been found successful in retaining the interest of the entire range of learners during the test. However the question bank size, quality and classification over difficulty levels need lot of attention. This needs to be done in each of the diverse

courses offered in massive online programs. Also the best adaptation strategy might vary with the diversity in the backgrounds of learners for the same course and the subject matter for the course.

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MEASURING THE IMPACT OF STUDENT DIVERSITY ON PERFORMANCE WITH CLASSROOM RESPONSE SYSTEMS

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Abstract: The diversity of undergraduate students within a given lecture is on the increase – both in terms of their personal traits and their performance. The latter development presents a challenge to lecturers, who may have difficulty adapting their teaching methodology because the students’ actual performance often materialises only at the end of the term.

Based on practical experience, this paper shows how classroom response systems, using so-called ‘clickers’, can be employed to meet this challenge in several ways. A brief test of the material already taught in the first few lectures can provide the lecturer with a rough impression of the performance level in the class right at the start of the term. Yet, more interesting information is to be obtained from a simultaneous survey of potentially performance-related characteristics of the students. Simple statistical analysis will then reveal whether and, if so, which characteristics actually drive student performance. In the best case, the insights thus gained can be used to adapt teaching styles. The paper further argues that short response periods should suffice to elicit meaningful information from the students, meaning that the procedures discussed here do not consume too much lecture time.

INTRODUCTION

Classroom response devices, so-called clickers (see, e.g., Kundisch et al. 2013), are experiencing ever wider use and have been associated with a number of benefits in teaching (Kay/LeSage 2009, Caldwell 2007, Simpson/Oliver 2007, Schmucker 2015). For example, clickers enable a lecturer to conduct single or multiple choice tests, whose questions and corresponding answer choices will be made visible for all students. The students use the clickers to select and to transmit their choices. All responses are recorded and – later on – analysed. Based on the example of a practical application, this paper will show how such analysis can shed light on student diversity, performance, and the relationship between these two phenomena. In doing so, the paper will thus demonstrate a further benefit of the use of clickers, which has so far received little attention.

This agenda is to be seen against the background that the diversity of student bodies is increasing – certainly in Germany (Willich et al. 2011, DSW 2014), but presumably also in many other countries. From this development springs the concern that in large classes it may become increasingly difficult to pursue a teaching style that does justice to most if not all students (Krüger-Basener et al. 2013, Wielepp 2013). This is because we may assume that certain characteristics of the students correlate with their performance and thus, increasing diversity in terms of those characteristics may be expected to entail an increasing divergence of performance.

Lecturers who encounter a new class would well like to have some reliable data on the composition of the student body so as to be able to adapt their teaching styles. Relevant information might for example include the level of performance, prior education (e.g. A-levels or equivalent), or language proficiency. Such information will typically not be available, or at best in unsatisfactory quality, such as might be gained from simply eyeballing the group of students. Information on student performance is altogether lacking, and any attempt to predict performance based on visible student characteristics is prone to error and prejudice. The desired information will usually only materialise during the term (from oral participation) or even at the end of it (from exams) – by which time it is too late to make any use of it.

For these reasons, the authors wish to propose the following procedure: Right at the start of a term in which the lecturer takes on a new class and as soon as sufficient material has been taught for a short test, such a test is conducted using clickers. The test of the actual teaching contents is preceded by a set of questions designed to retrieve information on student characteristics which the lecturer suspects may correlate with performance. Within hours of the test, the lecturer will thus be able to generate the following insights about the class:

- 1) **DESCRIPTION OF THE STUDENT BODY.** How diverse is the class with respect to the chosen sociodemographic traits? Simple descriptive statistics can already be quite informative, e.g. if the lecturer learns that only 10% of students in a quantitative methods course specialised in mathematics in their prior education.
- 2) **APPRAISING THE LEVEL OF PERFORMANCE.** Primary interest is on the number of lecture-related questions correctly answered – both in terms of the average and the level of dispersion. A high average and low dispersion (the best case) will suggest a different teaching style than a low average and high dispersion (worst case). A certain level of teaching experience in the lecture course in question is required, though, to correctly assess the results.
- 3) **RELATIONSHIP BETWEEN SOCIODEMOGRAPHIC FACTORS AND PERFORMANCE.** It might be of interest, for example, to learn (from ‘1’ above) that for two-thirds of the class, the language of instruction is not their native language. This could be interpreted as a problem. Statistical analysis may show, however, that performance is actually independent of language skills.

A lecturer who possesses valuable information in these three fields already at the start of the term will be able to adapt her teaching accordingly and, thus, to achieve better learning outcomes. Using the example of trials conducted in the class *Einführung Personal* (Introduction to Human Resource Management) at the University of Hamburg during the winter term 2013/2014, we shall demonstrate how clickers can be employed to collect such information.

Besides providing some exemplary answers in the three areas of interest, this article will argue that the collection of the underlying information is practical and suitable for widespread application in the sense that it requires only a small amount of lecture time: A few minutes of a single lecture suffice to retrieve meaningful data.

DIVERSITY

Four sociodemographic characteristics were selected for the present study at the University of Hamburg. In practical terms, prior to answering the set of questions that relate to the lecture content, the students were presented with four questions concerning their personal traits, and they were asked to transmit the answers (in terms of categories, e.g. age bracket) via the clickers. In other contexts, depending on the lecturer’s aims, other characteristics than the ones described here – and different numbers of them – will be appropriate. In the following, we will elaborate on the backgrounds of these characteristics and present some simple descriptive statistics of their manifestation within the group of students examined.

The first characteristic concerns the students’ gender, which, however, is only of subordinate interest to the present investigation as in this specific context there is in fact little reason to suspect a correlation of gender with the students’ performance. The case may, by contrast, be quite different in other contexts. Consider, for example, a study course that is strongly dominated by students of one sex (e.g. naval engineering versus midwifery). One might expect that the members of the minority have a particular motivation to pursue the course and that their performance therefore exceeds that of the majority. It might be worthwhile for the lecturer to anticipate such a potential effect.

While the students’ sex is probably the characteristic that is most easily determined visually, its later association with performance is only possible if the data is recorded electronically, i.e. via clickers. In the class examined, 102 out of 121 students responded to all four sociodemographic questions. The group comprised 46 females and 56 males.

Next, the student’s age was recorded, resulting in the frequency distribution displayed in Figure 1. Information on this characteristic, too, would be obtainable from a mere visual inspection of the classroom. Analogously, the added value of data collection via clickers also lies in the subsequent statistical association between age and performance. Once again, the course examined provides no reason to suspect any age effect. Yet imagine, for example, teaching the English language at an Eastern European university, where the language was very rarely taught in high schools before the early 1990s. In such a situation, mature students may have significantly lower prior language skills and may thus be disadvantaged in their studies.

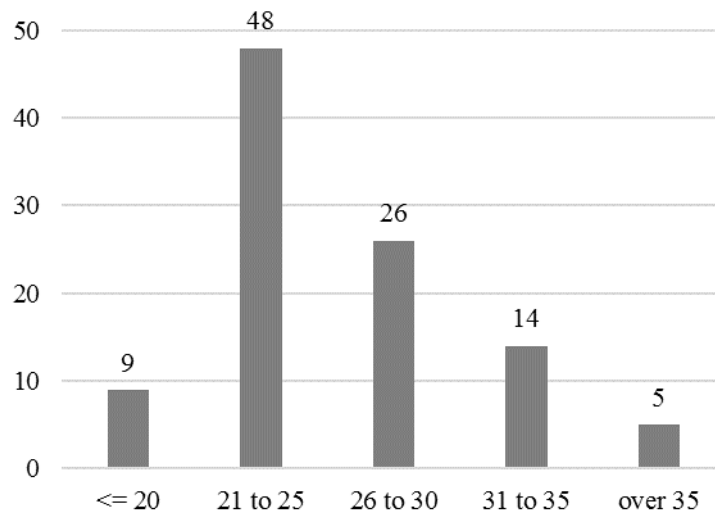


Figure 1. Age

The third characteristic concerns the manner in which the students qualified for entrance to the university. At least in Germany, universities and courses of studies are increasingly opening up to applicants who have not passed the *Abitur* (high school leaving exam equivalent to A-levels) (KMK 2014). It is not far-fetched to suspect an association between the students' prior education and their performance in class (Erdel 2010, Jirjahn 2007). A lecturer may wish to know whether the class she faces for the first time comprises 90% or only 50% students with A-levels. The descriptive statistics for the class examined are shown in Figure 2. In this case, three entrance options besides *Abitur* were distinguished: "*Fachabitur*" (a specialised form of *Abitur* that can be obtained with one year less of education) in conjunction with an oral entrance exam; written and oral "entrance exam"; and "other" (e.g. master craftsmen).

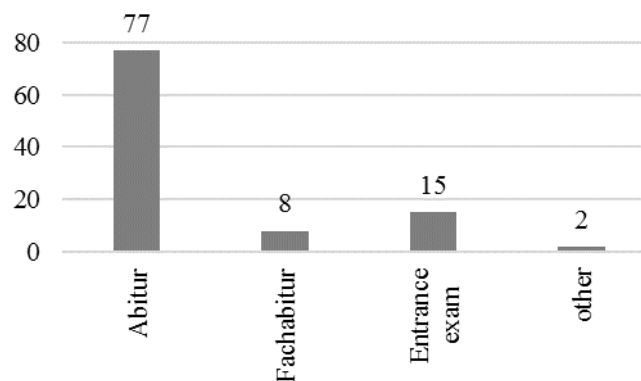


Figure 2. University entrance qualification

Finally, the students were asked about their migratory background. Plausibly, students who were not, or whose parents were not or only partially socialised in the country where the instruction takes place may have greater difficulty getting their bearings in the specific organisational, social and educational environment they find themselves in. A lecturer who ascertains a relatively large share of non-native students in the class and who, in the course of the analysis described in the next section, also learns that such a background can impede the students' academic success, might pay special attention to such students' needs, for example by providing them with additional information to help them navigate their studies. Figure 3 shows the frequency distribution as pertaining to the student body examined, distinguishing between students without any migratory background ("no MB"), students with German citizenship and "1st / 2nd generation migratory background", respectively, and students with a "foreign citizenship".

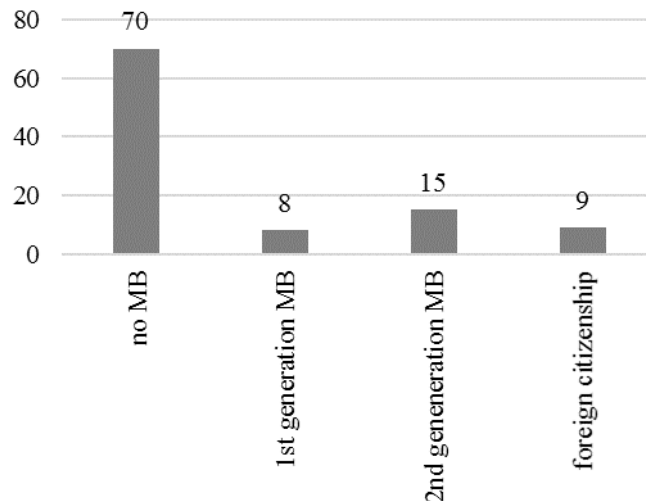


Figure 3. Migratory background (MB)

In other contexts, the lecturer’s information needs will suggest the retrieval of different characteristics, including for example:

- prior education, e.g. certain areas of specialisation in high school
- prior professional experience, e.g. having worked as a nurse before studying medicine
- A query of the students’ language skills (be it by way of self-assessment or through a short language test using clickers) can help the lecturer decide whether to incorporate foreign-language literature in the course.

PERFORMANCE

In our application at the University of Hamburg, the four sociodemographic questions were followed by a set of eight questions on contents already taught in the introductory HRM course. Each question was accompanied by four to five answer choices, of which the students were to select one using their clickers. The questions and answers are available on request. The ensuing frequency distribution of the number of correct responses is depicted in Figure 4. We do not differentiate between wrong answers and cases in which the students failed to provide any response. The average value is 4.14; the curve is reminiscent of a normal distribution. Measures of dispersion are not informative in this case since we lack the opportunity for comparison – across time or across multiple groups of students.

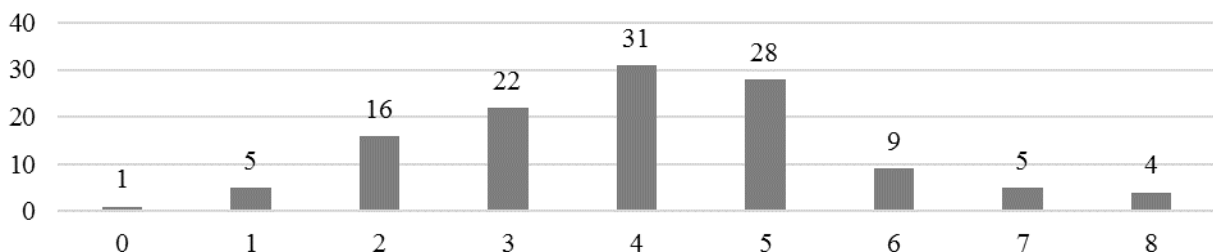


Figure 4. Number of correct responses

In a next step, we relate the students’ sociodemographic characteristics to their performance. For this purpose, the number of correct responses becomes the dependent variable in a regression of performance on the four sociodemographic factors. The regression covers the 102 students who responded to all four sociodemographic questions. The answers to each of these four questions forms a categorical or nonmetric variable (age classes, male/female, etc.), which cannot directly be included in a regression. Instead – with the exception of a base (or omitted) category for each variable –, each category is assigned a newly-created dummy variable which can only assume the values of 1 (category applies) and 0 (does not apply). Thus, splitting the four categorical variables into the necessary number of dummy variables, we obtain a total of 11. Table 1 shows the assignment of the

different categories of each of the four characteristics to new dummy variables, where “---” denotes the omitted categories.

Personal traits	Categories	Dummies Model I	Dummies Model II
Gender	male	---	---
	female	female	female
Age	up to 20 years	---	young
	21 to 25 years	25	
	26 to 30 years	30	---
	31 to 35 years	35	
	over 35 years	35+	
University entrance qualification	Abitur	---	Abitur
	Fachabitur	FA	---
	Entrance exam	EE	
	other	other	
Migratory background (MB)	no MB	---	no MB
	MB 1 st generation	MB1	---
	MB 2 nd generation	MB2	
	foreign citizenship	other	

Table 1.
Transforming the sociodemographic characteristics into dummy variables

In ‘Model I’ the categories were transformed to dummies one-for-one. To estimate the model, we purposely relied on the simplest OLS procedure, which can be executed in Microsoft Excel, so as not to create any artificial obstacles to imitation by lecturers with only a limited knowledge of statistics. The results are not reproduced here – for the sole reason that no statistically significant effect on performance was found for any of the characteristics or its categories.

In ‘Model II’, the dummy variables were assigned in such a way that each characteristic now only consists of two categories, e.g. age up to 25 years (“young” = 1) or above (“young” = 0). This assignment was done in light of the regression coefficients obtained in model 1 in such a fashion that the probability of finding significant results was maximised. The estimation results of model II, too, are quickly summarised: The only statistically significant outcome suggest that students without any migratory background marginally outperform those with foreign roots ($z = 2.259$).

At this point, readers may raise the objection that our failure to find performance effects (with one exception) is not due to the actual lack of such effects but rather to the unsophisticated methodology employed, be it with respect to the quality of the sample, the measurement of performance or the estimation strategy. While such an objection could not be altogether rejected, it would, however, miss the point of the present exercise. The point is to provide lecturers with a means of quickly and easily discovering any potential strong relationships between the students’ characteristics and their performance so that, in the best case, lecturers may be able to respond to such relationships by adopting their teaching styles. Performance effects that are so weak that they can only be detected with sophisticated methods – as may be the case in the setting described here – are therefore hardly of interest.

Furthermore, it must be noted that this (in a statistical sense) negative result of insignificant performance effects is indeed rather good news for the lecturer, as well as for the university: The observable, pronounced (and arguably increasing) diversity of students does not appear to systematically entail a divergence of performance levels. According to our data at least, the concern that increasing diversity may pose a challenge to teaching is therefore unwarranted.

RESPONSE TIMES

The use of clickers has repeatedly been criticised for its consumption of lecture time (Kay/LeSage 2009, Freeman et al. 2007, Caldwell 2007). This investigation suggests, however, that the provision of relatively brief response times is quite sufficient to achieve meaningful results.

Figure 5 shows the distribution of a total of 856 responses to the eight questions over intervals of ten seconds. Most responses were transmitted after 10 to 20 seconds. The increased frequency in the final interval may be explained as follows: Those students who do not know the correct response but who also hesitate to simply guess will tend to use up all the available time (the students were shown the countdown of time) to search their memories for any clues that might permit an informed response after all. The number of responses that were given in the first ten seconds is quite remarkable. Indeed, 76 responses were even transmitted within the first five seconds. Such extremely short response times are attributable to the fact that when introducing some of the questions, the lecturer permitted a few second to elapse between showing the question with its answer choices and starting the countdown.

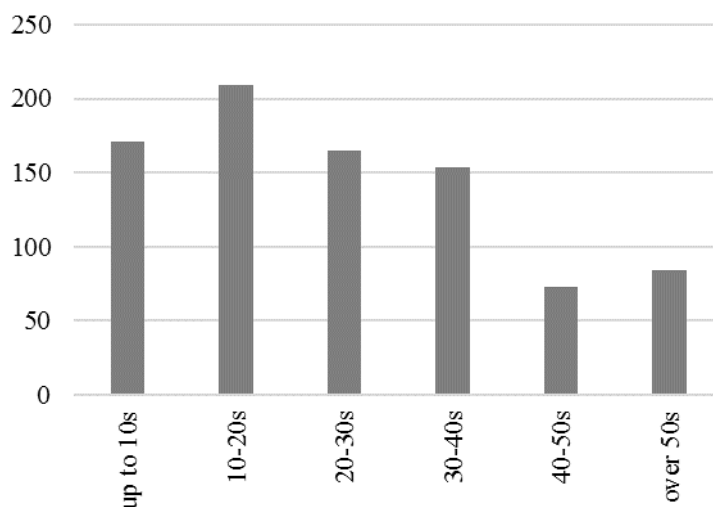


Figure 5. Histogram of response times

Of greater interest though for the purpose of this study is the relationship between the actual response times and the quality of the responses. Comparing the average response time of all correct answers (22.7 seconds) with that of all incorrect answers (28.7 seconds), we find the difference to be highly significant ($t = 5.56$).

This impression is confirmed by Figure 6, which shows the percentage of correct answers in each time interval. The probability of a correct response falls persistently as students take longer to transmit their answers. Once again, the final interval is an exception – and the reason for this could be the same as above: Towards the end of the available time, the students who respond are primarily those who do not know the correct answer but who have at least used the 60 seconds to exclude some choices with the help of what little knowledge they have.

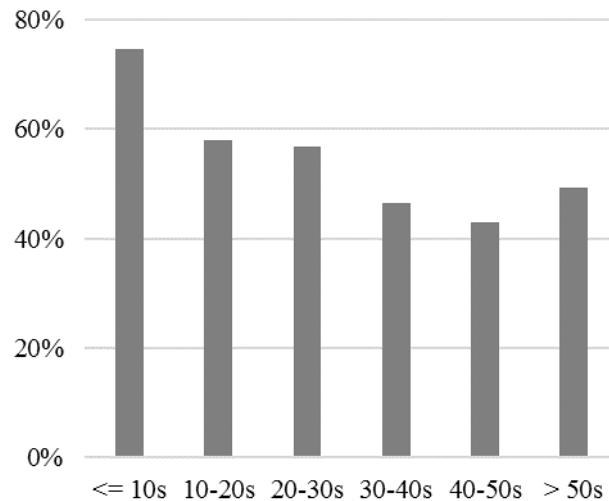


Figure 6. Percentages of correct answers

To support the visual impression of Figure 6 with a statistical test, we ran a probit regression in which a transformation of the (binary) quality of all submitted responses forms the dependent variable. The independent variables consist of the actual response times, their squared values, and seven dummy variables for the lecture-related questions. The detailed results are available upon request and are thus not reproduced here, yet the upshot is quickly summarised: Obtaining highly significant regression coefficients, we find that the likelihood of a correct response falls as response time increases. However, this effect weakens over time and is in fact even reversed for response times in excess of 40 seconds, at which point the probability of a correct response begins to increase again with every additional second that the students take to respond. The regression results thus almost exactly mirror our visual impression.

Yet what does this mean for lecturers who wish to quickly and easily appraise their class? The results suggest that even fairly short periods of available response time suffice for an accurate evaluation of the students' performance. Depending on the length and difficulty of the questions and their associated response options, those who know the correct answer will take no longer than 10 to 20 seconds to read and solve the task. Beyond this time horizon, we likely see an increasing amount of guesswork, which however carries little information value for the lecturer. It ought to be quite possible to conduct a test comprising eight challenging single-choice questions within no more than 15 minutes – including, if desired, a preceding set of sociodemographic questions and the subsequent feedback of the correct responses to the students. Preparing such a test should consume no more than half an hour. With a minimum level of experience, the statistical analysis should take less than two hours. Note that such analysis is in place only once, at the beginning of each term.

CONCLUSION

This article has aimed to provide lecturers with a simple tool to help them appraise a new group of students already at the start of the term and, ideally, to adapt their teaching accordingly. We have shown how clickers, in conjunction with a set of lecture-related questions and a survey of the students' potentially performance-related characteristics, can serve to generate a wealth of valuable information, whose many possible modes of analysis we have only touched upon.

In terms of areas for future research, the influence of response time on performance appears to be the most pressing issue. The present study has merely investigated the association between the quality of the answers and the response time actually needed – while the *available* response time remained constant. It would be interesting to see whether – as we have only been able to presume so far – meaningful results could still be obtained if the available time were reduced to, say, 30 seconds.

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PREDICTORS OF STUDENT PREFERENCES FOR BLENDED LEARNING: AN EMPIRICAL INVESTIGATION

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Abstract: This study investigates engineering student preferences for blended learning adoption in higher education. No major study to date, however, has taken into consideration the influence of interaction, digital technology, social presence, and internet self-efficacy on student preferences for blended learning approach. This study is based on a sample of 126 students who can use Moodle platform at University Politehnica of Bucharest in Romania. Hierarchical multiple regression was employed to test hypotheses. Results revealed a significant effect of most predictors on student preference for blended learning. The findings are expected to enhance the understanding of blended learning for teachers and students.

Keywords: Blended learning, higher education, online learning.

INTRODUCTION

Distance learning refers to the use of information and communication technology (ICT) in teaching and learning processes (Salmon, 2005). Online learning is less expensive, it provides access to education for students who aren't located near university, and it also offers more flexibility to students in terms of how and when they attend classes. Blended learning or hybrid learning combines traditional classroom or face-to-face with online education (Graham, 2013). This approach is a fundamental change in the way teachers and students interact and how they meet new learning experiences. Limited interaction may affect students' satisfaction without the utilization of appropriate technologies in fully online learning settings (Kuo et al, 2014). Blended learning incorporates technology to customize student learning. Student-centered learning process means that students know how to collaborate, communicate, and solve problems in group and individually. Online learning requires students to be willing and able to self-manage their learning process (Sun and Rueda, 2012).

New technologies based on internet provide teachers and students tools that can be used to improve the teaching and learning processes. E-learning platforms or virtual learning environments (VLE) support teaching and learning processes. They provides over internet different tools such as uploading of content, students assessment, communication, wikis, blogs, forums, tracking, manages the students' database, quizzes, and other activities in each top section. Quizzes are a useful tool for students to test their level of knowledge. An example of open-source platform is Moodle (Modular Object-Oriented Dynamic Learning Environment). This platform has been used as a modular and open source learning management system (LMS) for sharing information and knowledge management in teaching and learning processes. LMS is used to manage delivery of course material. Moodle offers a wide range of functionalities for students and teachers. Asynchronous communication technologies would be best suited for collaborative learning approaches. Every student has unlimited access to Moodle resources. One interesting tool of Moodle is the fact that students can ask questions to their teachers or their colleagues (Martín-Blas and Serrano-Fernández, 2009). This study examines a case of using Moodle platform at the University Politehnica of Bucharest, Romania, to develop online courses as a complement or an extension of the face-to-face courses. Reliable and robust infrastructure must be in place to support students demand for convenient online education delivery.

While a number of studies have explored the drivers and barriers to blended learning adoption in higher education (Porter et al, 2016). Further, little research has explored factors associated with student preferences for blended learning, especially in technical universities. Student preferences for hybrid teaching may influence their engagement, and consequently, the effectiveness of teaching and learning processes. Accordingly, we identified and explored factors that influence the engineering student preferences for adopting blended learning. Specifically, we sought information concerning how students perceive hybrid learning as a valuable alternative to traditional face-to-face teaching approach influenced their willingness to adopt blended learning. For this

purpose, an empirical study has been conducted using a survey to ask the engineering students from sample to tell us their preference about different kind of teaching and learning approaches.

The present research aims to enhance our understanding of how engineering students may benefit from traditional face-to-face teaching combined with online course provided them using Moodle platform. In addition, we are interested in exploring the indirect effects of control variables on student preferences for blended learning. The results of the study have important implications for faculty members, students, researchers, and ICT developers.

Next follows a literature review and hypotheses development. Then a section is dedicated to test our model and hypotheses on data collected from respondents. Next section provides details about the empirical results. Finally, a concluding section presents implications, limitations, and directions for future research.

THEORY AND HYPOTHESIS DEVELOPMENT

The integration of face-to-face and online learning enhanced active learning possibilities of the online environment and gives teachers the flexibility to work with students one-on-one. Thus, with the learning management system, one teacher can work with students in small groups or individually by organization the content and facilitate communication. Asynchronous learning is a student-centered teaching method that uses online learning resources to facilitate learning in traditional brick-and-mortar university. This asynchronous learning network supports online interaction, resource sharing, content development, and so much collaboration allowing users to organize discussions, upload courses and access multimedia. Today, one of the most important ideas in education is that students do not acquire, but instead construct new knowledge (Bjork et al, 2013). In this section, we explore the influence of interactions, technology, social presence, and self-efficacy on student preferences for blended learning in higher education institutions. We next propose a conceptual model to investigate the relationships between these factors and student preferences for hybrid learning.

Watson advanced the idea that blended learning is the result of convergence of online and face-to-face education methods. Teachers have increased their use of internet-based content and other digital resources in their classrooms. Traditional higher education learning environments are characterized by desks, black boards, and lecture halls. The organization of student learning has tended to follow traditional approach through face-to-face taught sessions. The percentage of the student population seeking a fully distance-based education will remain relatively low.

Interaction refers to a two-way communication between students and teachers. It is important factors in all forms of education. Interaction allows students to link existing knowledge with new knowledge and make new meaning through analysis and integration (Jawah, 2006). Through interactions students cognitively elaborate, organize, and reflect on the new knowledge. Other studies indicated that interaction among students or between students and teachers is a predictive factor of student satisfaction (Rodriguez Robles, 2006). Students in a collaborative interaction have higher satisfaction and can support the engineering student preferences for blended meaning. We thus propose:

H1: *Interactions among students and teachers are positively related to the engineering student preferences for blended learning*

Universities must provide a computer network infrastructure, including software, servers, and other hardware needed to develop a powerful asynchronous learning environment. In addition, students must also have the digital skills required to participate in the asynchronous learning environment. The value of technology has great power to influence teaching process. The software is following a problem-solving approach engaging students in inquiry-based activities, including collaboration tools, wikis, polling tools, as well as various content-specific applications, this is essential for ensuring an effective learning environment for students. Digital technologies provide an interactive and dynamic environment within which students and teachers engage in collaborative learning. Digital technology plays the role of a mediator in blended learning. Students may organize their learning program in terms of their time requirements and job schedules. Student collaboration and teacher interactions are facilitated by connectivity, mobility, and online support. Due to the importance of technology tools in web-based learning, determining exactly which technology tools best enhance learning process is essential to continue integration computer interaction with traditional classroom activities. Therefore, it is hypothesized:

H2: *Digital technology is positively related to the engineering student preferences for blended learning*

Online communications is used to support learning but the lack of facial expressions, tone of voice, and non-verbal cues is one common difficulty in online learning environments. Interactivity is a potential quality of communication and it is necessary to increase effect of education in face-to-face and online courses. The possible delays in asynchronous online environments can affect levels of student participation and interaction. This situation can be explained by the lack of social presence (Kear, 2011). Thus, in order to increase the level of online interaction, the degree of social presence must be increased because social presence can influence the participation in the online learning process. Unless students feel comfortable when communicating online this may result in low levels of engagement and can affect their preferences for blended learning. Some exploratory and confirmatory factor analyses consistently revealed five factors what characterizes social presence in online environments: social respect, social sharing, open mind, social identity, and intimacy (Suny and Mayer, 2012). On the basis of the above discussion, the following hypothesis is proposed:

H3: *Social presence is positively related to the engineering student preferences for blended learning*

Students may differ substantially in their skills, especially in their interne experiences and capabilities. Internet self-efficacy refers to one's belief in his or her capability to accomplish online tasks or assignments, including understanding of internet software and hardware (Eastin and LaRose, 2000). Online learning environments are designed to promote personalization and adaptability to the students' needs. Still, many students do not use the available digital tools because the lack of appropriate digital skills. Liang and Wu (2010) indicated that higher internet self-efficacy led to higher motivations for web-based learning and show preference for blended learning. Therefore, it is hypothesized:

H4: *Internet self-efficacy is positively related to the engineering student preferences for blended learning*

To reduce the variance caused by other factors, we controlled for the age and gender of respondents. Relationships among the constructs were empirically tested as follows.

METHOD

Research context: To test the conceptual model and hypotheses, we conducted a survey using a paper-based questionnaire and some interviews with faculty members at University Politehnica of Bucharest, Romania. This study used cross-sectional survey data. In this regard, a survey instrument was created using a combination of existing and newly development measures. University Politehnica of Bucharest (UPB) is the largest and the oldest technical university in Romania. The use of technological information in education and professional training are elements that define the university profile. A few years ago, UPB offered its students the possibility to use in their education process a combination between face-to-face and online learning through using Moodle platform.

Sample: Data were collected from a sample of engineering students (N=126) were recruited from UPB, during March and May 2015. All of engineering students have returned the filled in questionnaire, and after rejecting eight partially filled in questionnaires 118 could be used for analysis. The response rate was 93.7 percent. The data were assessed for the extent of missing values. This assessment found missing values for 14 of the 126 possible responses (11%) and determined that these values were missing completely at random. Therefore, the means substitution method was used to replace missing values. All of the items were measured on a 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree). About 62 percent of the respondents were males and 38 percent of the respondents were females. The age of the respondents ranged from 20 to 24 (SD=1.7 years). About 70 percent of the respondents were between 21 and 23 years old. The average age was 22.6 years.

Measures and instrument development: When possible, construct measures were created based on previously validated survey instrument. In addition, individual measures were averaged to obtain a simple value for each construct. *Engineering student preferences for blended learning* (dependent variable) were measured using 4 items adapted from Moss, O'Connor and White (2010) and Mishra and Panda (2007): "In comparison to the traditional classroom teaching (face-to-face), blended learning offers student greater flexibility to complete her or his tasks any place and any time", "Blended learning enhances the pedagogic value of a course", "Blended learning experiences cannot be equate with other forms of learning", "Blended learning improves communication between students and teachers", and "Blended learning can engage students more than other forms of learning". *Internet self-efficacy* (independent variable) was measured using 2 items developed by Eastin and LaRose (2000) and adapted for this study: "The extent to which students feel confident with the internet hardware and software", and "The extent to which students can gather data through internet". *Interactions*

(independent variable) were measured using 3 items derived from scale developed by Kuo (2009): “Activities during class gave me chances to interact with my classmates”, “I received enough feedback from my teachers when I needed it”, and “Online course materials helped me to understand better the class content”. *Digital technology* (independent variable) from student’s perspective was measured using a scale consisting of 3 items: “Technology makes teaching and learning processes more flexible”, “Technology improves the interactivity and collaboration between students and teachers by customized interface”, and “Technology need to make the learning process more enjoyable and easy of navigation”. *Social presence* (independent variable) was measured using 3 items developed by Suny and Mayer (2012): “I was able to form distinct social identity”, “I enjoyed myself of social respect and intimacy”, and “I felt comfortable interacting with other students and teachers”. Three additional variables were included in the analysis – gender, digital skills and age (control variables). *Gender*, as dummy variable, was included to control for the specific impact on the engineering student preferences for blended learning. We coded male respondents as 0 and female as 1. The students’ *digital skills* were measured using 3 items derived from scale developed by Kennedy’s et al (2008). The respondents was asked to rank their digital skills on a scale where 1 was “not very skilled”, 2 was “moderately skilled”, and 3 was “highly skilled”. Student *age* was represented as the log of the number of years.

ANALYSES AND RESULTS

Data was analyzed with SPSS 20.0 software with maximum - likelihood estimation. Cronbach’s alpha was used to determine the internal consistency of items in each scale. Statistical procedures were used to establish the reliability and validity of the measures with all items. Reliability of the factors was measured using Cronbach’s alpha for each construct and was found to be greater than the recommended minimum of 0.7 indicating high reliability (Hair et al. 2007). The Cronbach’s alphas ranged between 0.847(for internet self-efficacy) and 0.753 (for student preferences). Descriptive statistics and scale reliabilities are presented in Table 1.

Table 1 - Descriptive statistics and scale reliabilities.

Constructs	Mean	SD	Cronbach’s alpha
Student preferences	5.87	1.46	0.753
Interactions	5.34	1.23	0.804
Digital technology	6.18	1.79	0.786
Social presence	4.38	1.22	0.823
Internet self-efficacy	5.26	1.17	0.847

The correlation coefficients of all constructs are within acceptable levels (no bivariate correlation is greater than 0.56). The highest correlation coefficient is between digital technology and the student preferences for blended learning. This correlation coefficient is equal to 0.563. The measures of interaction, digital technology, social presence, internet self-efficacy, gender, digital skills, and age were positively correlated with the measures of student preference for blended learning, with correlation coefficients ranging from 0.001 to 0.563. The correlation analysis show that most coefficients are low, which minimizes concern with multicollinearity issues in our analysis. Correlations greater than or equal to 0.186 are significant at $p < 0.05$. Correlations greater than or equal to 0.231 are significant at $p < 0.01$. Table 2 presents the correlation matrix of all the variables used in this study.

Table 2 - Correlation matrix among independent variable and student preferences for blended learning

Constructs	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Student preferences (1)	-						
Interaction (2)	0.343	-					
Digital technology (3)	0.216	0.563	-				
Social presence (4)	0.124	0.386	0.237	-			
Internet self-efficacy (5)	0.473	0.189	0.492	0.157	-		
Gender (6)	0.021	0.002	0.034	0.231	0.179	-	
Digital skills (7)	0.186	0.237	0.513	0.183	0.534	0.326	-
Age (8)	0.041	0.001	0.017	0.09	0.392	0.002	0.187

Note. * $p < 0.05$, ** $p < 0.01$

Student preferences towards blended learning were investigated using a hierarchical multiple regression. Gender, students’ digital skills and age were entered in first stage of the regression as control variables (Model 1). The independent variables (interaction, digital technology, social presence, and internet self-efficacy) were entered in the second stage of the regression (Model 2). In the third stage, the hypothesized interaction terms (Interaction x Digital technology, Interaction x Social presence, Interaction x Internet self-efficacy, Digital technology x Social presence, Digital technology x Internet self-efficacy, and Social presence x Internet self-efficacy) were entered

(Model 3). The interaction terms were calculated by multiplying and centered the corresponding construct values. The hierarchical linear regression results are summarized in Table 3.

The individual reliability of all constructs was estimated with R square because this coefficient indicates how well a model fits data. The adjusted R square is used to compare models with different numbers of predictors as our case. The results of the regression analysis show that Hypothesis 1 is accepted. To test Hypothesis 2, we examine whether digital technology has a positive and significant effect on the engineering student preferences for blended learning. The results of research show that Hypothesis 2 must be rejected.

Hypothesis 3 proposes that social presence into teaching and learning processes is a good driver for the engineering student preferences for blended learning. Social presence explains important social relationships among students and teachers and the social climate that contributes to success of learning. Thus, on the basis of our research we accept this hypothesis. Finally, on the basis of study results, Hypothesis 4 have been accepted, this states that internet self-efficacy significantly affect engineering student preferences for blended learning. Results showed that gender and digital skills are not significant factor in terms of influencing the student preferences for blended learning.

Table 3 - Regression results.

Constructs	Model 1		Model 2		Model 3(full model)	
	b	SE	b	SE	b	SE
<i>Control variables</i>						
Gender	-0.076	0.048	-0.051	0.039	-0.049	0.042
Digital skills	-0.049	0.031	-0.033	0.031	-0.026	0.037
Age	0.134*	0.059	0.048	0.056	0.052	0.048
<i>Direct effects</i>						
Interaction			0.197*	0.064	0.199	0.052
Digital technology			0.041	0.021	0.054	0.0038
Social presence			0.196*	0.084	0.203	0.065
Internet self-efficacy			0.213*	0.074	0.287	0.067
<i>Interaction terms</i>						
Interaction x Digital technology					0.108	0.045
Interaction x Social presence					0.037	0.028
Interaction x Internet self-efficacy					0.089	0.036
Digital technology x Social presence					0.167	0.052
Digital technology x Internet self-efficacy					0.263	0.053
Social presence x Internet self-efficacy					0.048	0.032
R ²	0.143		0.267		0.368	
R ² (Adjusted)	0.12		0.22		0.289	
R ² change	-		0.124		0.101	

Note. N=118 engineering students; b = unstandardized regression coefficient; SE = standard error of b; *p<.05; **p<.01 and ***p<.001 (two-tailed)

CONCLUSIONS

This research has investigated the impact of interactions, digital technology, social presence, and the internet self-efficacy on the engineering student preferences for blended learning. We found that students' preferences for blended learning are influenced of interactions between teachers and students, social presence and internet self-efficacy. The quality of learning depends on the level of student engagement in the learning process.

Several limitations should be noted. First, the respondents came from one university (UPB), so results may not generalize well to other higher education institutions, only with caution. Second, the sample size provides the minimum number of participants required, the result would be more reliable with additional respondents. As regards the sample, a larger sample would reduce the influence of random variation. Future research using larger samples should aim to examine the robustness of our findings, preferably by simultaneously testing them. Third, future research is indeed needed to more precisely understand the effects of dynamic nature of influence of various factors on innovation. The present research assumes that relationships between variables are in some kind of statistical equilibrium. Nonetheless, we encourage researchers to engage in longitudinal research on mediating effects of the relationship between predictors and student preferences for blended learning. Researchers using a longitudinal study can provide more specific information about the stability and change of the variables, and thus could complement the present empirical finding. Fourth, any theoretical model could be improvement. Nonetheless, more variables can be added to our research model. Also, other measurements such

as blended learning adoption and service education quality need to be taken into account. Future studies look to refine this variable through further pilot testing with faculty members, students, and employers, or by selecting a different set of items to represent this construct.

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SELF-MOTIVATED PACKET SHIFTING IN MULTICHANNEL NETWORK

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Abstract The range admittance in Adhoc Network by allowing the inferior user nodes to use the channel as extended as the broadcast does not affect the main user. This paper involves a new Point squash based Precedence Development system with Self-motivated Packet Shifting which is planned for dispersed multichannel system to improve the system performance. It also presents the Channel Intelligence and essential Intelligence techniques before the progress of the channels. Based on biased queue-balancing and entropy flow control which might be suited for self motivated changing packets in Adhoc networks, this system proposes a Self motivated Packet Shifting algorithm for most favourable packet shifting between different channels during the packet broadcast. The projected protocol will directly observe the channel to make a decision where the packet is to be shifted within the n-channels for most favourable throughput. Factors of these projected systems are configured to sustain the network permanence. The results show that the proposed system improves the presentation in conditions of throughput and packet delivery ratio by borrowing the certified range and protects main users from interference.

Keywords Adhoc, Self-motivated, queue-balancing, entropy flow control, favourable.

1. Introduction

An Adhoc is a wireless communication method in which the transceiver is proficient of Intelligence and its neighbouring environment. Adapting its broadcast factors including transmit authority and occurrence as a result. The basic model about the cognitive network is that the approved users may not be using the scale always. Hence, this spectrum hole can be utilized by other users who are unlicensed (secondary). The secondary users are allowed to use the spectrum in such a way that they do not disturb the primary users. So it is necessary that the secondary users should have the spectrum Intelligence capabilities to sense the presence of the primary users in the channel.

An Adhoc Network is a decentralized wireless network where the set of nodes with equal priority are free to associate with any other devices within the range. In these types of networks, the nodes compete among themselves for access to shared wireless medium, often resulting in collisions, also termed as interference. Since the mobility is high in these networks, interferences are likely to occur. Using cooperative wireless communications, the immunity to interference can be improved by having the destination node combine self-interference and other node interference to improve decoding of the desired signal.

1.1 Spectrum Intelligence

Spectrum Intelligence is the process of identifying the spectrum space that is free from usage. The free spaces can be used opportunistically by the ADHOC users. This ensures the packet delivery and throughput of secondary users in a ADHOC environment. The Channel Intelligence technique is used where the secondary users sense the environment opportunistically and have the set of empty channels. This information is used by Imperative Intelligence technique, to select the channel with less Intelligence time. Based on the Intelligence results, the Instance Adhoc based Priority scheduling chooses the channel for source node and starts the packet broadcast. In case of any interference by the primary user or due to network overflow, the packets may be Adhoc resulting in data loss.

1.2 Self Motivated Packet Shifting Algorithm

The Self Motivated Packet Shifting algorithm (SPS), a low-overhead mechanism to avoid channel outage that can be cheaply incorporated within scheduling protocol is proposed to minimize data losses. This scheme has been proposed considering the network size that varies time to time and to balance the load instantaneously and avoid channel outage. Self Motivated Packet Shifting protocol will closely monitor the channel to find where the packet is to be shifted within the channels to obtain the optimal throughput. The results show that this scheme

improves the performance in terms of throughput and packet delivery ratio by borrowing the licensed spectrum and protects primary users from interference. The SPS algorithm may cause slight delay in larger networks. Despite of the delay, the percentage of packet delivery ratio is more. The proposed scheme works fine for smaller networks where a slight delay is negligible.

A comparison is made between the normal scheduling and the scheduling incorporated with the SPS algorithm.

2. Literature Review

The works proposed in adhoc networks operate on multiple channels in order to fully utilize the spectrum access opportunity without a centralized controller. The concept of a centralized channel, which is used to coordinate nodes in different channels are used in this paper. This was based on single half-duplex radio. This paper also includes decentralized cognitive MAC protocols that opportunistically senses, when an ADHOC node needs to transmit traffic. A partially Observable Markov Decision Process is developed in the proposed. This work improves spectrum utilization while limiting the interference imposed on the licensed users.

Adaptive Intelligence cycle scheme was proposed to prioritize the multichannel Intelligence and access the channel based on interference estimation from packet statistics. This scheme has assumed and formulated under the constraint that the overall Intelligence rate is constant for all the nodes. Busy tone channel that was also proven to be collision free of data packets for a single channel. Similar tone channel where each channel to be sensed is granted immediately by the scheduler when availability is reported from a certain spectrum Intelligence algorithm every fixed time period. This scheme works well against internal interference but has significant performance degradation when there is time-varying interference from outside networks.

The multiple channel and “channel pool” concept is used in several works. A slotted CSMA-based multichannel MAC protocol is proposed under the assumption of time synchronization. There is a collaboration of secondary users by sharing this decision through a centralized fusion centre in the network. The Opportunistic Spectrum Access in Multiple-Primary-User Environments under the Packet Collision Constraint is also discussed. The Resource allocation for balancing the queue in multi-hop ADHOC networks is also mentioned. From the related works, this system has adopted the idea of Intelligence node, taking the responsibility of Intelligence the channel and collecting the list of empty channels before scheduling and the idea of resource sharing in a decentralized network.

The main contributions of this paper are:

1. A new Instance Adhoc based Priority Scheduling
2. Self - Motivated Packet Shifting algorithm.

3. System Model

The adhoc network is considered for using multiple channels. The general architecture of the proposed model is shown in Fig.1.

There are one control channel and N data channels within the network. It is assumed that the primary node is set with high transmission, it has the legal rights to the data channel and the secondary users can opportunistically use it. Before transmission, the secondary node senses the data channel for the presence of primary users and have a list of empty channels. The empty channel is the one in which the primary user’s activities are absent. If the channel is empty then the secondary nodes are allowed to transmit the data.

In our scheduling scheme, once the packets arrive at the scheduler the data with the highest priority are transmitted first followed by the packets with the lowest priority. Here the packets along with priority, they are time stamped. Once the channel capacity and length are verified by the secondary user network the packet is moved to the queue which is empty. The application of Self - Motivated Packet Shifting algorithm to identify the performance of the each queue at the runtime and shift the packets based on the availability of channel bandwidth. This will ensure and reduce the packet delay.

With this model, a secondary node that has found the primary user’s presence during the transmission does not need to crash the packets to avoid intervention, instead it shifts the channel, thereby increasing the packet delivery ratio and the throughput.

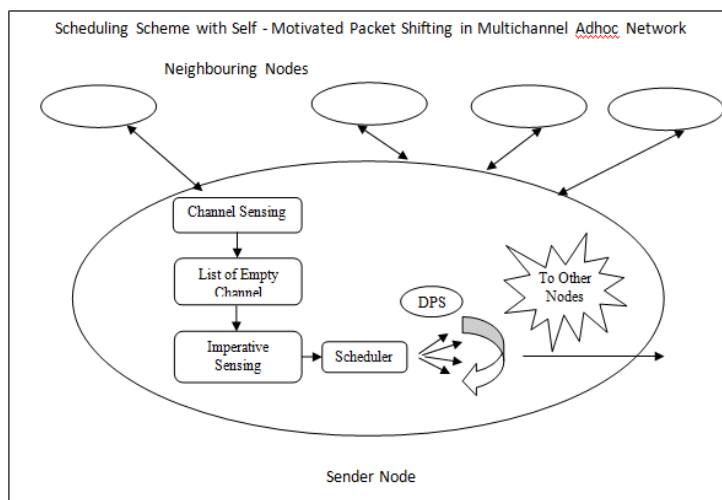


Fig.1 - Architecture of the proposed system

4. Intelligence and Scheduling Modules

There are five Intelligent and Scheduling modules.

They are as follows:

- Channel Intelligence
- Imperative Intelligence
- Instance crush based Priority
- Scheduling protocol
- Self - Motivated Packet Shifting

4.1 Channel Intelligence

This can also be termed as opportunistic intelligence, which is applied to idle channels can be performed only when the node does not have any data packets to transmit. Secondary node maintains the information required about each channel. When a channel is empty, all one-hop neighbours including itself regards the channel as neighbour-widely empty and, the node-only empty channel means the channel which is empty at the node but is not empty at any one-hop neighbour(s). When a node k detects the primary user signal on channel i through opportunistic intelligence, it becomes the responsible node of the channel by broadcasting the packet. When selecting the channel for opportunistic intelligence, the node should give preference to the idle channels for which the intelligence has been suspended. It uses round robin algorithm to select the channel.

Thus, if there are such one or more channels, the node selects the channel having the shortest remaining intelligence time. When there is no idle channel for which the intelligence has been suspended, the node chooses the channel with the highest opportunistic intelligence priority among the idle channels.

4.2 Imperative intelligence

In imperative intelligence, the secondary node first checks whether there is a channel for which the urgent intelligence is required. If there are one or more channels with the intelligence urgency request packet, the node should carry out the urgent intelligence although it has data packets waiting for transmission. The result of number of channels sensed is given as input to the scheduler.

4.3 Instance crush based priority scheduling protocol

A set of packets arrive at the scheduler and for each packet a channel is assigned. When the packet arrives at the scheduler, it checks whether the packet is from a primary node or secondary and accordingly they are moved to the transmission plan. For each node, a channel scheduling transmission plan is constructed, which specifies which data to be transmitted at that particular moment. The transmission plan is assumed as a queue and the proposal and implementation of this technique can be taken as future work. For each packet, based on channel availability (minimum weighted length and queue capacity), each node will add data for each period to its plan. The time is assigned in order to transmit packet from transmission plan. The assignment will rely on our preliminaries of Packet Labelling and Node priority. This phase is the key part for scheduling each packet.

Algorithm 1

Instance crush based priority packet scheduling protocol

Input: A set of Packets to the scheduler.

For each packet do

Construct a channel;

For i instance of each packet do

For each node do

If it is primary node then

Add the data to transmission plan;

Else If it is a secondary node then

Allocate priority low and adds data to s Transmission plan;

Else

Packet will be reviewed

For each channel (weight and length) do

For each packet at i (assign packet to channel) do

Include assign time;

Return Time to transmit for each packet will send to source of each node

4.4 Self - Motivated packet shifting

Self - Motivated Packet Shifting is initiated by primary user’s activities and different queue sizes of the nodes. It accommodates the given link capacities passively. In this paper, the channel shifting is adjusted for better transmission by distributed resource allocation. When the packet comes inside the queue, it is generally processed by the scheduler and assigns a channel by using the scheduling algorithm. During packet transmission, if there is an unexpected interference by the primary user or due to any unavoidable circumstances like congestion in the channel, the packet may be crashed. By using the proposed algorithm we can avoid the packet crash and allow the packets to be shifted to some other channels which are free to transmit. The SPS algorithm checks the weight and length of the data available in each channel. If any channel is found to have the minimum entropy (K), that channel is assigned for transmission, the packets are shifted to the selected channel and the transmission continues. The figure 2.depicts the SPS model for optimal packet shifting between the channels.

When the scheduler receives a packet Pk, it checks the channel for minimum entropy (Weight Wo and Length Lo) of the data that already exists in the channel. If the queue in the channel is found to be empty or with minimum entropy, the packet is assigned to that channel or else it is kept to wait until the queue has minimum entropy. Both the weight and length of the data are considered because there are situations where a single packet can have more length. Before allocation of the channel each channel is checked for its minimum entropy. Packets are assigned to such channels which satisfies such conditions.

In multihop wireless networks, it is difficult to synchronously execute a distributed algorithm at different nodes. The parameters should be configured appropriately to guarantee the network stability while considering asynchronous scenarios. Additional coordination of nodes is needed because of the complex wireless environment, where the primary users moving in and out of channels. Scheduling Scheme with Self - Motivated Packet Shifting in Multichannel Adhoc Network

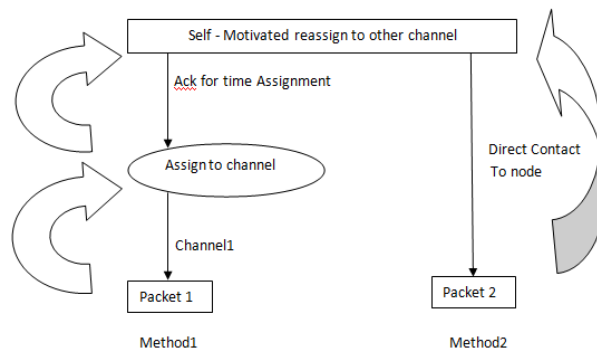


Fig.2- Self - Motivated packet shifting model

Algorithm 2:

Self - Motivated packet shifting

If WoLo –min **then**

Assign Pk to channel

Else if wait till queue to min capacity **then**

Assign Pk to channel

End if

For each (number of channels Ch) **do**

Set j as inAdhocement of I

If value i is 1 then set first minimum value

If Chi (WoLo) < Chj (WoLo) at the runtime channels are calculate **then**

Set channel Ki (Set Chj (WoLo = Min) as minimum value

End if

End if

Else if Chi (Wolo) < Ki (Wolo)

Set channel Ki (Set WoLo = Min) as minimum value

End Id

4.5 Throughput estimation

The approximate model to find the value of τ that maximizes the amount of information that is transferred over the channel is mentioned below. The data rate is assumed to be at constant rate. The relationship between the value of $\tau_{avg} = E[\tau]$ that maximizes the throughput that is referred to as τ^*_{avg} , and the number of neighbours at any given node, n_v .

This system has the following assumptions:

1. Neglecting the delay as it has a negligible impact on the throughput performance.
2. Assume that there will be interruption by the primary users and the packets are crashed.
3. Assume that the nodes are unaware of location and the total number of neighbours within the transmission range. In order to obtain the information about the channels the intelligence techniques is used.

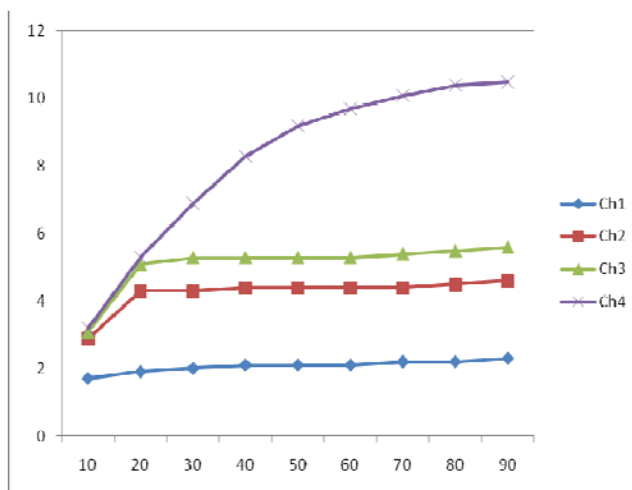


Fig. 3 - Self – Motivated shifting of packets between the channels

5. Experimentation and Results

This paper has assumed a smaller network with 90 numbers of nodes. By using the normal scheduling the success delivery ratio quickly crashes from 0.8 to 0.6. By using the Instance crush based Priority Scheduling with self - Motivated Packet Shifting the packet crash is minimized as there is shifting of channels when the interference is detected. The result shows that the success ratio is increased to 0.9.

The graph in Fig 3 represents the Self - Motivated Packet Shifting within the channels based on the channel availability at runtime. Here, the packets in channel will be reallocated to other channel based on availability. So, it will balance the load in the channel and avoid channel outage.

The graph in Fig 4(a) and (b) shows the packet delivery ratio, when the network is overflowed. Fig 4(a) Represent the normal scheduling flow, which shows decrease in the delivery ratio when the network is not stable or network overflows. Fig 4(b) represents the Self - Motivated Packet Shifting which will maintain the channel in and out flow and increase the packet delivery ratio.

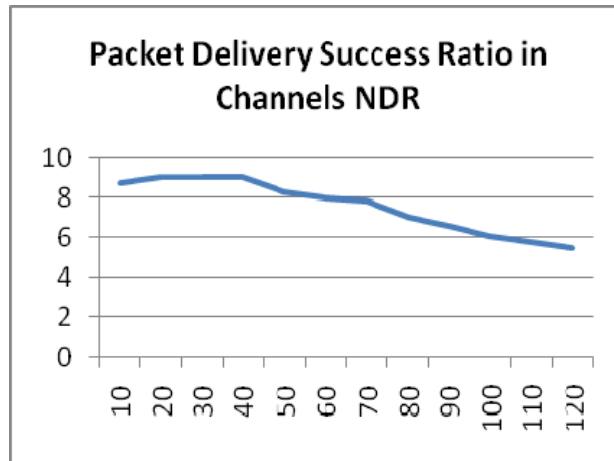


Fig4 - (a) Packet delivery ratio for normal scheduling

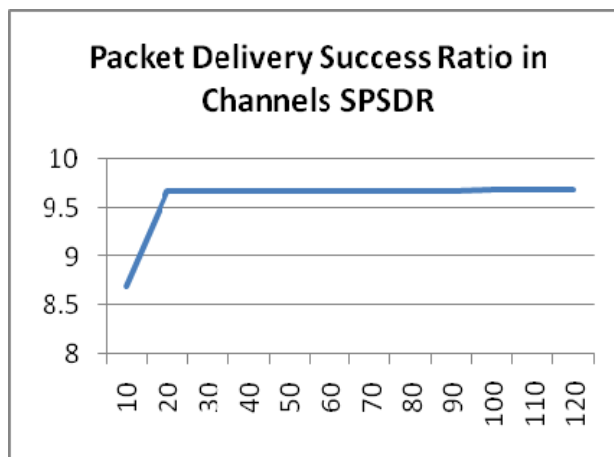


Fig4 - (b) Packet delivery ratio for self - Motivated packet shifting

Scheduling Scheme with Self - Motivated Packet Shifting in Multichannel Adhoc Network

Table1. Percentage of packet delivery ratio (Between the normal delivery and SPS delivery of packets)

Percentage of delivery ratio SPS delivery Packets			
No of Packets	Normal Delivery Ratio	SPS Delivery Ratio	Difference in the percentage of delivery ratio
10	8.7	8.7	0
20	9	9.67	0.67
30	9	9.67	0.67
40	9	9.67	0.67
50	8.3	9.68	1.38
60	8	9.68	1.68
70	7.8	9.68	1.88
80	7	9.68	2.68
90	6.6	9.68	3.08
100	6.1	9.69	3.59
110	5.8	9.69	3.89
120	5.5	9.69	4.19

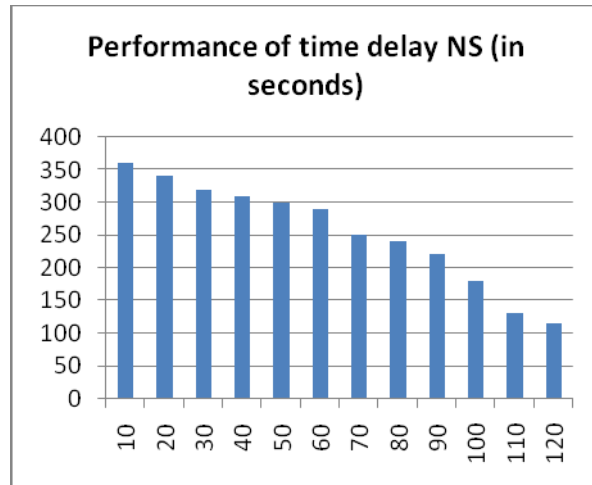


Fig.5 - (a) Throughput with respect to time delay in normal scheduling.

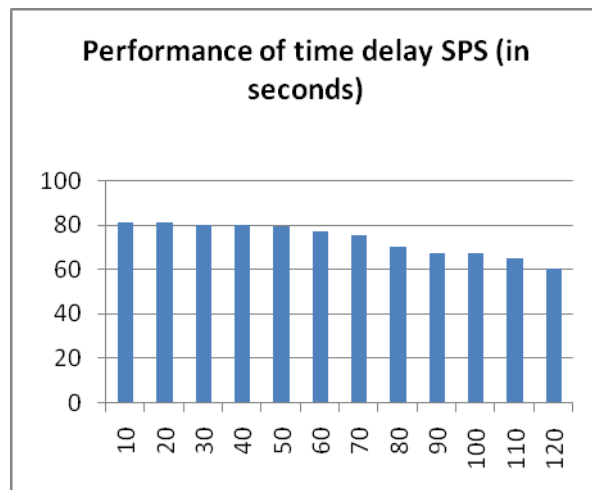


Fig.5 - (b) Throughput with respect to time delay in Instance crush based priority scheduling with SPS.

From the table we infer that the packet delivery ratio is the same for normal and proposed scheduling at the beginning. The packet delivery ratio is calculated as,

Packet Delivery Ratio = Number of packets delivered to the destination / Number of packets generated by the source

As the number of packets is increased the delivery ratio is gradually decreased in the normal scheduling as there may be congestion in the channels. It is noted that it is stable at the beginning and when the number of packets is increased the delivery ratio is also increased as this scheme involves packet shifting between the channels.

The graph in the Fig 5(a) shows the time delay with number of channels during the normal scheduling. Fig 5(b) show the time delay with the proposed scheme. From both the graph it is noted that in normal flow time delay may extend up to 300.0 seconds but SPS will maintain and improve the ratio as 75.0–100.0 seconds.

6. Conclusion

This paper considers the utilization of the spectrum access opportunity by allowing the secondary nodes to use the channel as long as the transmission does not disturb the primary user. This scheme uses the Channel and Imperative intelligence techniques to sense the environment, to have the list of empty channels and the Instance crush based Priority Scheduling allocates one of the channels from the empty list and the data are allowed to transmit. The Self - Motivated Packet Shifting is incorporated with the scheduling algorithm so as to minimize the packet crash during the interference with the primary user. The scheme proposed in this paper enhances the performance in terms of throughput and packet delivery ratio by minimizing the packet crash.

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THE DEMOGRAPHIC FACTORS ON ONLINE/DISTANCE PROGRAM OF ASHE FOR DEEMED UNIVERSITIES IN TAMIL NADU, INDIA: SERVQUAL APPROACH

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Abstract: This study attempts to examine the Demographic Factors on Online/Distance Program of ASHE inflecting service quality dimensions (tangibility, responsiveness, reliability, assurance and empathy). Furthermore, this study is also examining critical factors in service quality dimensions (tangibility, responsiveness, reliability, assurance and empathy) that contribute most to the satisfaction of the students. This study was conducted using a set of questionnaire to 610. The study will provide results from empirical test of these relationships. The empirical results of this study can provide support for the Parasuraman's SERVQUAL (1985), which related to the factors contributing to students' satisfaction.

Keywords: Online/Distance Program, ASHE, SERVQUAL, Demographic factors.

INTRODUCTION

The number of online/distance mode institutions is increasing every year. Therefore, the focus on evaluation of learners' towards quality initiatives, should be given paramount importance, which will further help in strengthening the overall brand of the Arts and Science Higher Education (ASHE) of Deemed Universities, in Tamil Nadu, India. Online/Distance learning programs in higher education tend to care about learners' satisfaction because of its potential impact on learners motivation, retention, recruitment efforts, and fund raising. Educational reforms have been taking place for many years in India, as successive governments have encouraged massive expansion of education in the country. Deemed university is a single institution, which is empowered to confer its own educational degrees to its graduating learners. Increasing attention is being paid to service quality and this has resulted in more progress and profit to organizations.

The challenges of quality in Indian Higher Education include: (1) inability to attract sufficiently large number of talented young people to teaching; (2) separation of education from research; (3) inadequate financing; (4) belief in the adequacy of investor run private Deemed Universities, and the financial and political power of such investors; (5) short term profit orientation on Education in a large part of the business community; (6) administrative weaknesses and wasteful expenditures. Abdulai Abukari & Trevor Corner (2010) propose that the quality of Higher Education in the developing world should be centered on how the system can be more pragmatic in policy, scope and delivery that reflect current challenges and translate into core activities of teaching and learning and, research and community engagement; which should then be supported by a well designed quality audit system that is appropriate in assessing, in the practical sense, the impact of the university activity on its socio economic and cultural environment.

This is because the course of development has no specific or well defined pattern, and communities can alter the pattern by being strategic, proactive and innovative by leapfrogging through dealing simultaneously with both internal and external challenges. Improvisation sparred by need is often noticed in communities that are on the path of development. Ahmadreza Shekarchizadeh et al (2011) studied the service quality perception and expectation of international postgraduate learners studying in selected Malaysian Deemed Universities. A gap analysis based on a modified SERVQUAL instrument was used on 522 international postgraduate learners who

were selected based on stratified sampling of the top five public Deemed Universities. Five factors in the form of professionalism, reliability, hospitality, tangibles, and commitment were uncovered. The single mean t-tests for the three methods of gap analysis indicated that all the items of perception were perceived as significantly negative as compared to expectations. Also, the findings from the study will assist in designing a quality system that involves not just the employees, but also the learners. Ironically, most studies on service quality at institutions of Higher Education tend to concentrate on the undergraduate learners and/or the Education providers. As the international postgraduate segment is more profitable, this research is timely and is expected to present significantly different results from those found in most literature.

Al Khattab & Fares Fraij (2009) studied the satisfaction of the learners at Al-Hussein Bin Talal University, Jordan, related with the quality of e-services. It mainly concentrated on the student satisfaction with the in house developed Student Information System (SIS). The study opens the door to conduct similar studies across public and Deemed Universities and compare the results with this study. Furthermore, the results of this study have started efforts to measure and compare student satisfaction regarding SIS services among Jordanian Deemed Universities. Replication studies using large samples would be useful in order to confirm this study finding.

REVIEWS

Alistair Inglis (2008) in his work has attempted the framework of quality. Framework applicable to the field of e-learning are described and the methods used to validate each of the frameworks are identified and compared. Six methods of validation were found to have been used in relation to development of the seven frameworks that were examined: reviewing the research literature related to effectiveness in online learning; seeking input from an expert panel; undertaking empirical research; undertaking survey research; conducting pilot projects; and drawing on case studies. From the variety of approaches used and the ways in which they were used it was concluded that a recognized set of procedures for validation of quality frameworks has not yet emerged.

Ana Brochado (2009) in her research of Educational literature suggests how imperative it is for HE institutions to actively monitor the quality of the services they offer and to commit themselves to continuous improvements. Therefore, it is important to use a reliable instrument to measure service quality. This study compared the performance of five alternative measures of service quality by gathering data from Portuguese Learners belonging to a Arts school in Lisbon. The alternative scales considered, respectively, SERVPERF, SERVQUAL, importance weighted SERVPERF, importance weighted SERVQUAL and HEDPERF (Higher Education Perception) were compared in terms of univariability, reliability, validity and explained variance of five instruments.

Angell et al (2008) measured educational service quality based on a sample of UK postgraduate learners. Initially, the authors elicited twenty important service attributes from in depth interviews. These service attributes were then grouped into four service factors (i.e. academic, leisure, industry links, and cost) by using exploratory factor analysis. The results of analysis suggested that academic and industry links were more important than leisure and cost. The authors contended that postgraduates viewed their postgraduate experiences as a critical step to a career. As a result, these learners placed great importance on the academic aspects and industry linked service factors.

Antonia Stefani et al (2006) in their study nevertheless shifted the focus on its technological variable in Higher Education. Designing, developing and supporting a large scale e-learning application for Higher Education is still a challenging task in many ways. E-learning is data intensive, user driven, and has increasing needs for multiculturalism, efficiency, and competitiveness. Although the complexity of such systems has increased exponentially, the design process still lacks a systematic quality control procedure. In this work, the authors addressed increasing need for new methods that maximize usability, and thus end user satisfaction. They analyzed the technological, managerial and economic factors that affect the design and deployment of a large e-

learning platform with advanced services and propose a set of new metrics for assessing its quality. The metrics are based on the four external quality characteristics (functionality, usability, efficiency and reliability).

Atul Gupta et al (2005) found that the possible motivations for outsourcing are cost savings and budgetary constraints, improvement of quality of services and staffing, lack of capability, safety concerns or liability of service, command from governing bodies, and pressure from peer institutions. This is not an exhaustive survey of all the public schools in the USA and it surveyed only the opinions of presidents and/or vice-presidents of the selected schools.

Azizah Rajab et al (2011) elaborate on the post graduate learner's perspective on Education service quality based on effectiveness of managing the quality of teaching and learning in High Educational Institution. Two methods of collecting data focusing on quantitative and qualitative method are used. The Analysis Model of SERVPERF had been used for Questionnaire about service quality. A simple random sampling is used among international post-graduate learners. This paper discusses the findings and the implications of the study towards generating good Educational services whilst concurrently producing qualified post-graduate learners by providing an elevated, sophisticated and acclaimed service quality towards its international learners.

Cecilia Temponi (2005) attempts to analyze the main elements of continuous improvement (CI) in Higher Education and the concerns of academia's stakeholders in the implementation of such an approach. The author suggests guidelines for the development of a culture more receptive to the implementation and maintenance of a CI approach in Higher Education. Future research should explore more to identify core issues needing to be addressed to speed up the shift towards a CI culture. Required accreditations in colleges and Deemed Universities offer an increasingly important role to a CI approach in Higher Education and its impact on academic stakeholders and fulfil identified information/resources need and offers practical help to colleges of business seeking accreditations and institutions of Higher Education pursuing CI initiatives.

Service quality is considered an important tool for a firm's struggle to differentiate itself from its competitors. The relevance of service quality to companies is emphasized here especially the fact that it offers a competitive advantage to companies that strive to improve it and hence bring customer satisfaction. Service quality has received a great deal of attention from both academicians and practitioners. Understanding service quality must involve acknowledging the characteristics of service, which are intangibility, heterogeneity and inseparability. In that way, service quality would be easily measured. The possibilities of increasing the market competence of a company depend on how soon it understands and accepts the importance of providing customer consistency. Customer perceived service quality has been given increased attention in recent years, due to its specific contribution to business competitiveness and developing satisfied customers.

This makes service quality a very important construct to understand by firms by knowing how to measure it and making necessary improvements in its variables where appropriate especially in areas where gaps between expectations and perceptions are wide. In the context of higher education, the researchers are not only interested in learning more about the factors associated with service quality perceived by learners' and how service quality is measured but also provide a direction for improvement of service quality in order to bring learners' satisfaction. Hence, there is a need to find answer to the following questions: Whether the perception of service quality differences among the various profiles of the respondents?

METHODS

This study was adopted from Parasuraman's SERVQUAL dimensions. The dimensions included in this variable are tangibility, assurance, responsiveness, reliability, and empathy. The samples in this study were ASHE students studying at a deemed universities in Tamil Nadu. We have distributed 700 questionnaires for every institution. Finally, 610 respondents completed and returned the questionnaires, which represents about 87% response rate. Using the five dimensions in service quality (tangibility, assurance, reliability, responsiveness and

empathy) using the Likert scale from 1 for not satisfied at all to 5 for very satisfied. The data analysis for this study conducted through ‘Statistical Package for Social Science’ software / IBM SPSS version 20. The study also tested reliability of the instrument so that it enables to produce a robust and valid result.

RESULTS AND DISCUSSION

The term ‘analysis’ refers to the computation of certain measures along with searching for patterns of relationship that exist between data groups (Kothari,C.R. 2010). During analyses, the emphasis is on identifying themes and patterns in the data. This chapter deals with analysis and discussion of the information collected from 610 respondents who belonged to Deemed Universities in Tamil Nadu.

The collected data was tabulated, analyzed and interpreted using descriptive and inferential statistics. Analysis and interpretation of the data were classified according to objectives of the study. Percentage analysis was performed for each question in the questionnaire, mainly to ascertain the distribution of respondents under each category. This section deals with the data pertaining to the demographic variables of the respondents, as presented in the research gap section.

Table 1: Demographic classification of the respondents

Demographic variables		Frequency	Total Percentage
Gender	Male	448 (73.44)	610 (100)
	Female	162 (6.56)	
Age	22 - 30 years	529 (86.72)	610 (100)
	31 - 35 years	38 (6.23)	
	>35 years	43 (7.05)	
Faculty of Study	Science	193 (31.64)	610 (100)
	Arts	417 (68.36)	
Course of Study	Maths	61 (10.00)	610 (100)
	Physics	265 (43.44)	
	Chemistry	53 (8.69)	
	Economics	33 (5.41)	
	Sociology	198 (32.46)	
Year of Study	First Year	25 (4.10)	610 (100)
	Second year	585 (95.90)	

Note: (Numbers in brackets represents percentage)

The analysis of the demographics in Table 4.1 shows that 73.44 percentages of respondents are Male and 26.56 percentages are Female. The percentage of women in post graduation is showing a decline.

According to the age group of respondents, it shows that 86.72 percentages of respondents were in the age group of 22 - 30 years, 6.23 percentages were 31-35 years old and 7.05 percentages of them were above 35 years. Thus it can be interpreted that highest percentage was in the age group of 22-30 years, as it is the normal age of enrolment of learners in continued higher education.

Faculty of respondents shows that 31.64 percentages of respondents were from Science and 68.36 percentages were from Arts courses. Thus it can be interpreted that highest percentage was in the Faculty of Arts, which is in proportion to the nature of courses offered in the study area.

Course of study shows that 10 percentage of the respondents were pursuing Maths, 43.44 percentage of respondent's course of study was Physics, 8.80 percentage of the respondents were doing Chemistry, 8.69 percentage of them were doing Economics, by Research and 32.46 percentage of them were pursuing Sociology. Thus it can be interpreted that highest percentage of course of study was Physics, as the percentage of enrolment in Post Graduate Programmes. The year of study of respondents shows that 4.10 percentage of respondents were in First year and 95.90 percentage were in second year. Thus it can be interpreted that highest percent respondents was in the second year of study, as they could express a better about opinion about Service Quality of their institutions.

By referring to demographic characteristics of Arts and Science learners in Online/Distance learning programs, Tamil Nadu and SERVQUAL scores in Tables two to six; percentages analysis, independent sample t-test and one way ANOVA tests were conducted in order to examine the significance of relationships between them. Five hypotheses were tested and they are given below:

H₀1: There is no significant difference between Gender and SERVQUAL scores

Table 2 presents the t-test analyses of perception of respondents among gender. In the tangible variable, mean value of male is (M =3.65, SD = 0.499), female is (M =3.67, SD = 0.477), and there is no significant relationship between gender and tangibility because the sig. value is 0.603<0.05. In the reliability variable, mean value of male is (M =3.60, SD = 0.680), female is (M =3.75, SD = 0.603), and there is no significant relationship between gender and reliability because the sig. value is 0.363<0.05.

Table 2: T-test for Gender and SERVQUAL Scores

SERVQUAL Variables	Gender	N	Mean	SD	t	p	Sig.
Tangibility	Male	448	3.65	0.499	0.52	0.603	NS
	Female	162	3.67	0.477			
	Total	610	3.66	0.488			
Reliability	Male	448	3.70	0.680	0.91	0.363	NS
	Female	162	3.75	0.603			
	Total	610	3.73	0.655			
Responsiveness	Male	448	3.83	0.599	0.07	0.947	NS
	Female	162	3.83	0.690			
	Total	610	3.83	0.644			
Assurance	Male	448	3.67	0.678	0.04	0.971	NS
	Female	162	3.67	0.706			
	Total	610	3.67	0.692			
Empathy	Male	448	3.73	0.754	0.34	0.731	NS
	Female	162	3.71	0.694			
	Total	610	3.72	0.724			

Note: NS (Not Significant)

In the responsiveness variable, mean value of male is (M =3.83, SD = 0.599), female is (M =3.83, SD = 0.690), and there is no significant relationship between gender and tangible factors because the sig. value is 0.947<0.05. In the assurance variable, mean value of male is (M =3.67, SD = 0.678), female is (M =3.67, SD = 0.706), and there is no significant relationship between gender and assurance because the sig. value is 0.971<0.05. In the empathy variable, mean value of male is (M =3.73, SD = 0.754), female is (M =3.71, SD = 0.694), and there is

no significant relationship between gender and empathy because the sig. value is $0.731 < 0.05$. Independent t-test analyses conducted shows that SERVQUAL scores for respective gender categories did not differ significantly.

Therefore, the null hypothesis (H_0) is accepted. Respondents of both the gender perceived the SERVQUAL variables equally.

H₀2: There is no significant difference between Age and SERVQUAL scores

Table 3 is the ANOVA analysis of perception of respondents among different age group.

In the tangibility variable highest mean value of age group is 22-30 years ($M = 3.67$, $SD = 0.487$), lowest mean value of age group is > 35 years ($M = 3.53$, $SD = 0.556$), and there is no significant relationship between age group and tangibility because the sig. value is $0.221 < 0.05$. In the reliability variable highest mean value of age group is 22-30 years ($M = 3.73$, $SD = 0.669$), lowest mean value of age group is 31- 35 years ($M = 3.57$, $SD = 0.583$), and there is no significant relationship between age group and reliability because the sig. value is $0.141 < 0.05$. In the responsiveness variable highest mean value of age group is 31-35 years ($M = 3.90$, $SD = 0.484$), lowest mean value of age group is > 35 years ($M = 3.73$, $SD = 0.467$), and there is no significant relationship between age group and responsiveness because the sig. value is $0.473 < 0.05$.

Table 3: ANOVA for Age range and SERVQUAL Scores

SERVQUAL Variables	Age	N	Mean	SD	F	p	Sig.
Tangible	22 - 30 years	529	3.67	0.487	1.51	0.221	NS
	31 - 35 years	38	3.63	0.499			
	> 35 years	43	3.53	0.556			
	Total	610	3.66	0.493			
Reliability	22 - 30 years	529	3.73	0.669	1.97	0.141	NS
	31 - 35 years	38	3.57	0.583			
	> 35 years	43	3.58	0.596			
	Total	610	3.71	0.660			
Responsiveness	22 - 30 years	529	3.83	0.643	0.75	0.473	NS
	31 - 35 years	38	3.90	0.484			
	> 35 years	43	3.73	0.467			
	Total	610	3.83	0.624			
Assurance	22 - 30 years	529	3.69	0.690	1.31	0.271	NS
	31 - 35 years	38	3.62	0.629			
	> 35 years	43	3.52	0.655			
	Total	610	3.67	0.685			
Empathy	22 - 30 years	529	3.74	0.751	0.77	0.462	NS
	31 - 35 years	38	3.60	0.660			
	> 35 years	43	3.67	0.645			
	Total	610	3.73	0.738			

Note: NS (Not Significant)

In the assurance variable highest mean value of age group is 22-30 years ($M = 3.69$, $SD = 0.690$), lowest mean value of age group is > 35 years ($M = 3.52$, $SD = 0.655$), and there is no significant relationship between age group and assurance because the sig. value is $0.271 < 0.05$. In the empathy variable highest mean value of age group is 22-30 years ($M = 3.74$, $SD = 0.751$), lowest mean value of age group is 31-35 years ($M = 3.60$, $SD = 0.660$), and there is no significant relationship between age group and empathy because the sig. value is $0.462 < 0.05$.

The results of ANOVA show that there is no significant difference in the perception of SERVQUAL variables among the age groups considered for the study. Therefore, null hypothesis (H_0) is accepted.

H₃: There is no significant difference between Faculty of Study and SERVQUAL scores

Table 4 is the independent t-test analyses of perception of respondents among different faculty of study. In the tangibility variable mean value of science is ($M = 3.65$, $SD = 0.485$), Arts is ($M = 3.66$, $SD = 0.497$), and there is no significant relationship between the faculty of study and tangible because the sig. value is $0.884 > 0.05$. In the reliability variable mean value of science is ($M = 3.64$, $SD = 0.722$), Arts is ($M = 3.74$, $SD = 0.628$), and there is no significant relationship between the faculty of study and reliability because the sig. value is $0.091 > 0.05$. In the responsiveness variable mean value of science is ($M = 3.90$, $SD = 0.592$), Arts is ($M = 3.80$, $SD = 0.636$), and there is no significant relationship between the faculty of study and tangible because the sig. value is $0.067 > 0.05$.

Table 4: T-test for Faculty of Study and SERVQUAL Scores

SERVQUAL Variables	Faculty	N	Mean	SD	T	p	Sig
Tangibility	Science	193	3.65	0.485	0.15	0.884	NS
	Arts	417	3.66	0.497			
	Total	610	3.66	0.491			
Reliability	Science	193	3.64	0.722	1.69	0.091	NS
	Arts	417	3.74	0.628			
	Total	610	3.69	0.675			
Responsiveness	Science	193	3.90	0.592	1.84	0.067	NS
	Arts	417	3.80	0.636			
	Total	610	3.85	0.616			
Assurance	Science	193	3.62	0.686	1.13	0.258	NS
	Arts	417	3.69	0.684			
	Total	610	3.66	0.685			
Empathy	Science	193	3.65	0.761	1.83	0.068	NS
	Arts	417	3.76	0.725			
	Total	610	3.71	0.743			

Note: NS (Not Significant)

In the assurance variable mean value of science is ($M = 3.62$, $SD = 0.686$), Arts is ($M = 3.69$, $SD = 0.684$), and there is no significant relationship between the faculty of study and assurance because the sig. value is $0.258 > 0.05$. In the empathy variable mean value of science is ($M = 3.65$, $SD = 0.761$), Arts is ($M = 3.76$, $SD = 0.725$), and there is no significant relationship between the faculty of study and empathy because the sig. value is $0.068 > 0.05$.

Independent t-test analyses conducted shows that SERVQUAL scores for respective faculty categories did not differ significantly. Therefore, the null hypothesis (H_0) is accepted. Respondents of both the faculty perceived the SERVQUAL variables equally.

H₀₄: There is no significant difference between Course of study and SERVQUAL scores

Table 5: ANOVA for Course of study and SERVQUAL Scores

For the tangible variable, the highest mean value of course of study is Economics. (M =3.81, SD = 0.439), lowest mean value of course of study is Maths. (M =3.57, SD = 0.526), and there is no significant relationship between course of study and tangibility because the sig. value is 0.229<0.05.

For the reliability variable, the highest mean value of course of study is Economics. (M =3.80, SD = 0.603) and Sociology, (M =3.80, SD = 0.608) lowest mean value of course of study is Chemistry (M =3.45, SD = 0.691), and there is a highly significant relationship between course of study and reliability because the sig. value is 0.008>0.05. Based on this result the researcher found that, ability of the professor and staff to performance the promised services comparatively Maths, Chemistry course and Economics and Sociology services are good.

SERVQUAL Variables	Course of Study	N	Mean	SD	F	p	Sig.
Tangible	Maths	61	3.57	0.526	1.41	0.229	NS
	Physics	265	3.64	0.497			
	Chemistry	53	3.65	0.505			
	Economics	33	3.81	0.439			
	Sociology	198	3.68	0.480			
	Total	610	3.66	0.493			
Reliability	Maths	61	3.61	0.736	3.45	0.008	HS
	Physics	265	3.71	0.668			
	Chemistry	53	3.45	0.691			
	Economics	33	3.80	0.603			
	Sociology	198	3.80	0.608			
	Total	610	3.71	0.660			
Responsiveness	Maths	61	3.98	0.614	1.47	0.209	NS
	Physics	265	3.81	0.640			
	Chemistry	53	3.82	0.586			
	Economics	33	3.94	0.432			
	Sociology	198	3.79	0.636			
	Total	610	3.83	0.624			
Assurance	Maths	61	3.60	0.706	1.89	0.111	NS
	Physics	265	3.69	0.688			
	Chemistry	53	3.45	0.668			
	Economics	33	3.74	0.462			
	Sociology	198	3.71	0.702			
	Total	610	3.67	0.685			
Empathy	Maths	61	3.58	0.728	2.39	0.050	S
	Physics	265	3.76	0.738			
	Chemistry	53	3.51	0.782			
	Economics	33	3.72	0.547			
	Sociology	198	3.80	0.747			
	Total	610	3.73	0.738			

Note: NS (Not Significant), S (Significant), HS (Highly Significant)

For the responsiveness variable, the highest mean value of course of study is Maths, (M =3.98, SD = 0.614) lowest mean value of course of study is Physics. (M =3.81, SD = 0.640), and there is no significant relationship between course of study and responsiveness because the sig. value is 0.209<0.05.

For the assurance variable, the highest mean value of course of study is Economics. (M =3.74, SD = 0.462) lowest mean value of course of study is Maths, (M =3.60, SD = 0.706), and there is no significant relationship between course of study and assurance because the sig. value is 0.111<0.05.

For the empathy variable, the highest mean value of course of study is Sociology. (M =3.80, SD = 0.747) lowest mean value of course of study is Chemistry. (M =3.51, SD = 0.782), and there is a significant relationship between course of study and empathy because the sig. value is equal 0.050<0.05. In this result the researcher construct that, affectionate and individualized deliberation given by professors and administrative staff are discrepancy fairly Maths, Chemistry course are poor, Economics and Sociology services are admirable.

The above all result of ANOVA reveals that there is no significance difference in the course of study and perception of SERVQUAL variables in Tangibility, Responsiveness and Assurance. However, significant difference was observed in Reliability and Empathy variables.

H₅: There is no significant difference between Year of study and SERVQUAL scores

Table 6 presents the t-test analysis on perception of respondents and year of study. In the tangible variable mean value of first year is 3.58, (SD = 0.542), second year is 3.66, (SD = 0.491), and there is no significant relationship between year of study and tangible because the significance value is 0.410<0.05. In the reliability variable mean value of first year is 3.65, (SD = 0.732), second year is 3.71, (SD = 0.677), and there is no significant relationship between year of study and reliability because the sig. value is 0.629<0.05.

In the responsiveness variable mean value of first year is 3.74, (SD = 0.562), second year is 3.83, (SD = 0.632), and there is no significant relationship between year of study and tangible because the sig. value is 0.485<0.05.

Table 6: T- test for Year of study and SERVQUAL Scores

SERVQUAL Variables	Year of Study	N	Mean	SD	t	P	Sig.
Tangible	First Year	25	3.58	0.542	0.82	0.410	NS
	Second year	585	3.66	0.491			
	Total	610	3.66	0.517			
Reliability	First Year	25	3.65	0.732	0.48	0.629	NS
	Second year	585	3.71	0.662			
	Total	610	3.71	0.677			
Responsiveness	First Year	25	3.74	0.562	0.70	0.485	NS
	Second year	585	3.83	0.632			
	Total	610	3.83	0.597			
Assurance	First Year	25	3.60	0.782	0.52	0.601	NS
	Second year	585	3.67	0.681			
	Total	610	3.67	0.731			
Empathy	First Year	25	3.63	0.821	0.69	0.493	NS
	Second year	585	3.73	0.742			
	Total	610	3.73	0.781			

Note: NS (Not Significant)

In the assurance variable mean value of first year is 3.60, (SD = 0.681), second year is 3.67, (SD = 0.681), and there is no significant relationship between year of study and assurance because the sig. value is $0.601 < 0.05$. In the empathy variable mean value of first year is 3.63, (SD = 0.821), second year is 3.73, (SD = 0.742), and there is no significant relationship between year of study and empathy because the sig. value is $0.493 < 0.05$. Independent t-test analysis conducted for year of study and SERVQUAL scores for respective categories shows that there is no significant difference in the perception of SERVQUAL variables and the year of study. Therefore, null hypothesis H_{05} is accepted.

FINDINGS

The research objective is determine the service quality variables with respect to the demographic factors influencing ASHE in Online/Distance learning programs, This objective was partially satisfied by examining the means of service quality constructs among each of the seven demographic groups (Gender, Age, Faculty of study, Course of study and Year of Study). The following sections discuss the results pertaining to hypotheses one to seven with help of Independent t-test and ANOVA analyses were accomplished. The results concerning hypothesis 1 value of SERVQUAL scores for respective gender categories did not differ significantly. With help of this hypothesis the researcher may conclude that, the Online/Distance learning programs are providing same services to both ends.

The results regarding hypothesis 2 value of SERVQUAL scores for respective age groups did not differ significantly. In this result outcome researcher very clearly revealed that, Online/Distance learning programs giving similar services to whole age groups. The results regarding hypothesis 3 value of SERVQUAL scores for respective faculty of study did not differ significantly. In this hypothesis result the researcher visualizes that, deemed universalities never doing any discrimination between the faculty of Arts and Science.

The results regarding hypothesis 4 value of SERVQUAL scores for respective of course of study. The significance value of SERVQUAL scores for Reliability and Empathy categories did not differ significantly. Therefore, null hypotheses are accepted and remaining SERVQUAL scores for categories like Tangibility, Responsiveness, and Assurance are rejected. Based on the hypothesis outcome, the researcher predict that, the Online/Distance learning programs learners are getting course wise discrimination services like to access lab, internet amenities, lack of enthusiasm, knowledge, courtesy, ability of the professors and staff to inspire trust and confidence among the learners about their assignment.

The results regarding hypothesis 5 value of SERVQUAL scores for respective of year of study did not differ significantly. In this assumption result the researcher envisions that, deemed universalities never doing any discrimination between years of study learners.

SUGGESTIONS

The researcher, presents the following suggestions from the study, deemed university which will standard and assure learner's empowerment. The important role of measuring service quality in achieving learner's satisfaction is often understated, misunderstood, or disregarded in higher education.

The deemed university must strive hard to expansion and sustain a powerful reputation and brand image in the society. The image speaks trust, reliability, quality, excellence and consistency. The deemed university must also have extended impact on the large society through involvement in social and cultural uplifting. This information is previously confirmed by Alistair Inglis (2008) in their findings.

Learners' feedback is a vital part of effective learning process. It helps learners understand the subject being studied and gives them clear guidance. In this association give importance of learners' perception. The aim of the deemed university must not only be providing employment but to make its learners' fit to be employed in

competent public sector concerns and global companies. The capabilities to do this will enhance the image of the institution and increase learners trust and loyalty (Anu Brochado 2009).

The success of a quality strategy depends on the acceptance and involvement of everybody concerned in its implementation and this requires an organizational culture. The Online/Distance learning programs ASHE is very complex, where knowledge is fragmented into specialized areas and educators are engaged in a highly individual activity of teaching.

Bringing about changes in such a complex system requires commitment and acceptance of a holistic, integrated approach to quality so that it permeates throughout the institution and becomes everyone's responsibility.

At the initial stages of a learner's relationship with the Online/Distance learning programs forms an idea about it. As Online/Distance learning programs witnessed heterogeneous masses from diverse backgrounds, several learners feel inhibited and insecure in the Online/Distance learning programs. The staff members and administrators must take initiative in promoting the learning curve of the learner's by instilling self confidence and positive attitude in them.

Learning is an activity that transcends the class room. Learners learn valuable lessons through campus events and activities. It is essential that Online/Distance learning programs must engage their learners in such events at specified intervals. Such event both technical and non technical provide exposure to learners and enhance their leadership skills, team dynamics and management skills. It is a sure step to make learners confident and satisfied. The intention of every course is to provide employability to the learner. Providing employment opportunities to learners before they exit the campus is the dream of every deemed university. The percentage of placement that a university provides to its learners is an importance yardstick of determining its quality and efficiency. The Online/Distance learning programs should set up a placement cell by responsible and training faculty members to assist and guide learners in their placement procedures with reasonable approach.

Enhanced social awareness and social interdependence is necessary for the all round growth of a learner. The Online/Distance learning programs must provide ample opportunities for learners to interact explore and exchange ideas. These activities can be within the campus or spill over to longer sections of the society. These interactions will help in making learners conscious of their social responsibilities, duties and help them in becoming better citizen. During the course of study, learners may experience instance of procedure block due to ignorance regarding norms. This may relate to instance such as submission of relevant documents, applying for scholarships, receiving certificates and so on. The Online/Distance learning programs must delegate administrative staff members to address the concerns of the learners and simply difficult procedures.

CONCLUSION

Learners' perceptions of the quality of their service experiences should be assessed. Each time a learner experiences some occurrence of an institution's service, that service is judged against their expectations (Parasuraman, Zeithaml & Berry, 1991). In an increasingly competitive higher education arena, research indicates that service quality is an important determinant of learner satisfaction. The study established that academic staff and employers place the greatest emphasis on the core academic factors; i.e. teaching and learning, academic standards and the curriculum. They share the perception that enhancing standards, learner motivation and commitment of the learning process and environment, thereby requiring learners to be active participants in the educational process are most important. The survey also found that the most significant purpose of ASHE is to develop qualities in learners that will allow them to act with a high degree of autonomy by equipping them with the skills to think critically. However, it also revealed that it is undesirable and perhaps impossible to arrive at a single definition of quality or purpose for ASHE. In order to improve level of learners' satisfaction, the Online/Distance learning programs should focus its attention on the variables of service quality that can influence learners' satisfaction and affect their word of mouth communication. However, the Online/Distance learning programs should evaluate service quality continuously in order to create a perception

of uniqueness in the minds of customers (learners') and to gain aggressive improvement in the market place. This can be done through implementing and formulating an effective service quality policy. The policy will lead to different levels of service quality provided by the Online/Distance learning programs and the substantial provision of better services to learners'. This will help the Online/Distance learning programs to enhance the number of its learners' and compete with the other Deemed Universities.

LIMITATION

Service quality has been widely accepted as an antecedent of satisfaction and neglecting it may jeopardize the competitiveness of an organizations as satisfaction and competitiveness of a service related organizations are inter-related. A serious preparation towards the unexpected situation is needed thus that it is in the ability researcher to face and in control of the situation.

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