The Impacts of Demographic Variables on Technological and Contextual Challenges of E-learning Implementation

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Abstract. Information technology has achieved robust growth which has made it possible for learning to occur quickly. The rapid development of information, communication and technologies (ICT) has initiated an unparalleled transformation in universities all over the world. E-learning is a result of the implementation of e-learning systems in universities is not an easy task because of some challenges related to context, technology, and other challenges. This paper studied the impacts of demographic data and reported the critical points for the decision makers to consider when planning and implementing e-learning in universities. A quantitative approach was used to study the effects of technological and contextual challenges on e-learning implementation in which a questionnaire was used for the data collection. According to the findings of the study, the most important challenges of the implementation of e-learning are related either to organizational (Contextual) and technological (technical) issues. The demographic variables have been found to play a direct and indirect role with the technological and contextual challenges of implementing e-learning. This paper showed that there are some significant differences in the two challenges faced by instructors in terms of the demographic variables. The result revealed that some significant differences exist between demographic variables and the two challenges of e-learning in terms of gender, age, teaching experience, ICT experience and e-learning experience. However, there is no significant difference in terms of e-learning experience. The obtained data, from such study, can provide information about what academic institutions can do before implementing e-learning to reduce and overcome the challenges in implementing e-learning in universities. So, university administrators interested in implementing e-learning should recognize the challenges that their instructors are facing and to provide the necessary policy and support to help overcome these challenges.

1. Introduction

Information technology has achieved robust growth which has made it possible for learning to occur quickly. The rapid development of information, communication and technologies (ICT) has initiated an unparalleled transformation in universities all over the world. E-learning is a result of the
integration of technology in education, which enables the creation of innovative research and delivery mechanisms which is one of the features of modern learning [1]. Innovative thinking about acquiring necessary skills and knowledge as well as the ability to manage efficiently within the available resources are required to meet new issues and challenges [2].

In the last ten years, the use of e-learning has been increasing rapidly and has become an important system offered by most colleges and universities all over the world. This comes as the consequence of the innovative transfer of knowledge and learning which has been influenced by the advent of the Internet and other ICT [2]. E-learning is currently the common term used to describe the various uses of information and communications technologies to enhance learning and teaching. It takes the form of online courses and training, by which the courses and training are delivered via the Internet [3, 4].

Universities have been motivated to adopt e-learning to transform traditional learning environments and create more efficient and attractive learning experiences [5]. Successful implementation of e-learning requires an understanding of the issues that promote and support the effective use of the new technology [6-8]. The implementation of e-learning in universities should be as part of educational reform process. For effective application of e-learning, a great deal of attention needs to be given its implementation [9]. When universities promote e-learning use, they need to understand their instructors’ and students’ attitudes towards its use. Instructors’ attitudes are considered as a major predictor of the use of new technologies in instructional settings [10].

While e-Learning provides several benefits to educational settings which enhance the quality of education and develop the learning environments, there remain many challenges and issues which hinder the exploration and utilization of its opportunities [11-13].

Technological and contextual challenges are considered two of the main challenges that face the implementation of e-learning in universities. Technological challenges are defined as the challenges surrounding issues of familiarity with new technology and technical problems encountered by instructors and other users [14] such as, Internet bandwidth, and computer facilities. While contextual challenges refer to the issues and problems that are related to the context of e-learning includes the context of the delivering organization (university setting) and the context of society in which e-learning take place including culture, rules and regulations [8]. It requires adjustments not only from the organization’s side but also from the instructors’ and student’s sides [15]. A lack of easy access to these technologies as well as a lack of skills necessary to use available computer and communication technology has hindered instructors’ use of e-learning [16].

[17] and [18] have pointed out that the technological challenges of the e-learning framework involving issues of technology infrastructure in e-learning environments. A lack of easy access to necessary computer equipment, Internet connectivity and other technologies are among the critical problems in the implementation of e-learning [16, 19].

It also refers to the quality and reliability of the connectivity [20] as well as the bandwidth will affect the users’ ability to access the full range of the content needed [2]. Along with challenges such as electricity, skills, and training of staff on the use of new technology [8].

Moreover, the cost of the technologies needed in setting up the e-learning system is considered a limitation to the successful implementation of e-learning [8, 20, 21]. According to [15], technology is dominant in e-learning, yet it is also expensive. This makes the initial costs of buying computers, especially in the early implementation stages as well as the ongoing costs of upgrading systems, very high. Therefore, this factor is frequently mentioned in the literature as one of the most significant barriers to e-learning.

In addition, there are contextual challenges (organizational and societal/cultural challenges) which include: the effect of instructors perception and attitude toward e-learning, the effect of beliefs of decision makers on e-learning, lack of understanding the new roles of instructor and student, and the need for proper rules and regulation for e-learning implementation[16, 22].

Unfortunately, universities are still away from getting the full benefit and advantage of e-learning because of these technological and contextual challenges [4, 23]. These challenges are fundamental
and critical that need to be identified and addressed for the successful implementation of e-learning [4, 17, 24].

The literature indicates that these challenges are associated with the instructors' cultural background and attitudes towards e-learning; the high cost of technological infrastructure; the often prohibitive cost of educational technologies and the lack of local expertise in curriculum development for e-learning [8, 25-27] which are asserted by previous studies [2, 20, 28].

Many researchers have argued that examining individual differences or aspects is a significant research area in e-learning [29]. In addition, the impacts of demographics on e-learning implementation and the use of e-learning in higher education are well documented [30, 31]. The developers of e-learning environments are constantly advised by the researchers to address demographic differences regarding the use of e-learning. The differences are based on the individual-characteristics of gender, age, ICT experience, and e-learning experience [1, 30, 31].

2. Research Objective
The main objective of this study is:

- To examine if there are significant differences in the technological and contextual challenges faced by the instructors in terms of the demographic variables of:
  i. Gender
  ii. Age group
  iii. Teaching Experience
  iv. ICT Experience.
  v. E-learning Experience

3. Research Question
The research question of this study is:

RQ 1 Are there significant differences in the technological and contextual challenges faced by the instructors in terms of the demographic variables of:

i. Gender
ii. Age group
iii. Teaching Experience
iv. ICT Experience
v. E-learning Experience.

The following hypothesis was generated by the researcher from the research question:

H0: There are no significant differences in the technological and contextual challenges faced by the instructors in terms of the demographic variables of: Gender; Age group; teaching experience; ICT experience; e-learning experience.

4. Methodology
The objective of this research paper is to examine if there are significant differences between the technological and contextual challenges of implementing e-learning and the demographic profiles of instructors. The population of the study comprises 107 instructors of Hodiedah University, Yemen (2014/2015). These 107 instructors are from all the sixteen faculties of the university and the sample included males / females, and junior / senior instructors. The instrument consists of 53 items and the participants are asked to rate their agreement of each item of the survey on a 4-point Likert Scale 1-4.

Validity was first conducted to measure if the questionnaire structure and content accurately achieves the purpose for which it was designed. To achieve this purpose, research experts and academicians group assessed the instrument and the homogeneity of the variables before it was used.
Thirty questionnaires were sent to experts and academicians group of faculty members in different schools and centres in USM (Universiti science Malaysia) in the field of e-learning, Computer Science and Instructional Technology to ensure content validity. The instrument also reviewed by the experts in the e-learning centre at Hodiedah University who with wide experience and keen interest in e-learning.

The research instrument’s reliability was assessed using Cronbach’s alpha (α). Alpha values for the two constructs exceeded the 0.70 lower limit of acceptability [32]. For technological challenges construct is 0.837, and for contextual challenges is 0.858.

In this study, inferential statistics were used to identify any significant differences between the technological challenges and contextual challenges of implementing e-learning and the demographic variables of the participants. In this study, there are five demographic variables involving:

Gender, Age, Teaching experience, ICT experience, E-learning experience (instructors who have already had teaching experience with e-learning courses.

The technological challenges of implementing e-learning include three factors as follows:

1. Access to computer and Internet
2. Cost of technology
3. Power Supply.

The contextual challenges of implementing e-learning included two main constructs, involving organizational and social/cultural. The organizational construct (Org.CH) consists of three factors:

1. knowledge management,
2. economy and funding,
3. training of instructors.

The second construct is societal/cultural (So.CH). It consists of five factors:

1. roles of instructors and students,
2. participants attitude on e-learning & IT,
3. roles and regulation.

In this paper, the significant differences between the technological challenges and contextual challenges of implementing e-learning with the demographic variables were analyzed by using Analysis of variance (ANOVA) and T-test. The one-way ANOVA and T-test were employed to identify the effects of demographic variables on the technological challenges of implementing e-learning.

The selection of the appropriate statistics was based on the distribution of the dependent variable as well as on the number of groups being compared. One-way ANOVA measures the mean of one or more groups based upon independent demographic variables. On the other hand, t-test is usually employed to evaluate the difference in the means between two groups. In the present research, one-way ANOVA is used for age, field of teaching (faculty), teaching experience, whilst t-test is used for gender, ICT experience, and e-learning experience. A p value of less than 0.05 (p<0.05) indicated when the differences are significant.

4.1. Effect of Gender on E-learning Challenges

\textbf{H}_0: \text{There are no significant differences in the technological and contextual challenges faced by the instructors in term of gender.}\n
For this null hypothesis, the t-test was used to determine the significant differences among the mean scores of the independent groups (Male and Female). The results are shown in Table 1.
The result indicates a significant difference in technological challenges among male and female (t: 2.02, p: 0.046) with the male instructors perceived that e-learning has more technology challenges than female instructors (male: 3.54, female: 3.34).

In term contextual challenges, the result also indicates a significant difference among male and female (t: 2.44, p: 0.016) with the male instructors perceived that e-learning has more contextual challenges than female instructors (male: 3.59, female: 3.40). Both results imply to males have given more importance to these challenges than females Thus, the null hypothesis was rejected.

4.2. Effect of Age on E-learning Challenges

H02: There are no significant differences in the technological and contextual challenges faced by the instructors in terms of age.

In this study, five age groups have been investigated as shown in Table 2.

| Table 2. Age of respondents |
|-----------------------------|
| Age group | Frequency | Percent |
| 25-35 | 42 | 39.3 |
| 36-46 | 40 | 37.4 |
| 47-57 | 23 | 21.5 |
| More than 57 | 2 | 1.9 |
| Total | 107 | 100.0 |

For this null hypothesis, the analysis of variance (ANOVA) was used. The results are shown in Table 3.
Table 3 indicates there is no significant difference in technological challenges among the different age groups (f: 1.09, p: 0.356). However, the result indicates that there is a significant difference in contextual challenges among the age groups (f: 3.29, p: 0.024). Therefore, the null hypothesis was partially rejected. Table 4 shows the mean scores for all age groups.

All the age groups in terms of technological challenges and contextual challenges recorded high scores as shown in Table 4.

| Challenges      | Age group   | Sum of Squares | df  | Mean Square | F     | Sig. * |
|-----------------|-------------|----------------|-----|-------------|-------|--------|
| Technological   | Between     | 0.853          | 3   | 0.284       | 1.09  | 0.356  |
| Challenges      | Within      | 26.828         | 103 | 0.260       |       |        |
|                 | Total       | 27.681         | 106 |             |       |        |
| Contextual      | Between     | 1.539          | 3   | 0.513       | 3.290 | 0.024  |
| Challenges      | Within      | 16.060         | 103 | 0.156       |       |        |
|                 | Total       | 17.599         | 106 |             |       |        |

95% Confidence Interval of the difference *sig (p<005)

Table 3. The result of significant differences between e-learning challenges and age

| Categories      | Age Group | N   | Mean | Std. Deviation |
|-----------------|-----------|-----|------|----------------|
| Contextual      | 25-35     | 42  | 3.44 | 0.362          |
| Challenges      | 36-46     | 40  | 3.67 | 0.375          |
|                  | 47-57     | 23  | 3.42 | 0.484          |
|                  | More than 57 | 2  | 3.22 | 0.157          |
| Total           | 107       | 3.52| 0.407|
| Technological   | 25-35     | 42  | 3.37 | 0.512          |
| Challenges      | 36-46     | 40  | 3.51 | 0.542          |
|                  | 47-57     | 23  | 3.58 | 0.454          |
|                  | More than 57 | 2  | 3.25 | 0.000          |
| Total           | 107       | 3.47| 0.511|

Table 4. Description of mean scores of e-learning challenges with age
4.3. Effect of Teaching Experience on E-learning Challenges

H₀: There is no significant difference in the technological and contextual challenges faced by the instructors in term of teaching experience.

In this study, six age groups have been investigated as shown in Table 5.

| Year group | Frequency | Percent |
|------------|-----------|---------|
| 1-5        | 30        | 28.0    |
| 6-10       | 35        | 32.7    |
| 11-15      | 26        | 24.3    |
| 16-20      | 12        | 11.2    |
| 21-25      | 2         | 1.9     |
| 26-30      | 2         | 1.9     |
| Total      | 107       | 100     |

In order to test this null hypothesis, a one-way ANOVA was performed between-groups. The results are shown in Table 6.

| Challenges         | Teaching experience | Sum of Squares | df | Mean Square | F       | *Sig.   |
|--------------------|----------------------|----------------|----|-------------|---------|---------|
| Technological      | Between Groups       | 1.481          | 5  | 0.296       | 1.142   | 0.343   |
|                    | Within Groups        | 26.200         | 101| 0.259       |         |         |
|                    | Total                | 27.681         | 106|             |         |         |
| Contextual         | Between Groups       | 3.732          | 5  | 0.746       | 5.436   | 0.000   |
|                    | Within Groups        | 13.867         | 101| 0.137       |         |         |
|                    | Total                | 17.599         | 106|             |         |         |

95% Confidence Interval of the difference *sig (p<005)

Results in Table 6 indicate that there is no significant difference in the technological challenges with the different teaching experience groups (F: 1.14, p: 0.343). However, the result indicates that there is a significant difference in contextual challenges among the teaching experience groups (F: 5.43, p: 0.000). Therefore, the null hypothesis was partially rejected. Table 7 shows the mean scores for all teaching experience groups.

Finding in Table 7 indicates that instructors with difference number of years of experiences faced a high level of technological challenges where the mean scores ranged from 3.00 to 3.61. The highest mean score recorded by those who have teaching experience between “11-15” and the lowest mean score is 3.00 for the those who have teaching experience between “21-25” which still considers high challenges faced by instructors in the university.

In terms of contextual challenges, the mean scores ranged from 2.83 to 3.70. In addition, the result indicated that those who have teaching experience between “11-15” years of teaching recorded the highest mean score 3.70, while those who have teaching experience between “21-25” recorded the lowest mean score 2.83.
4.4. Effect of E-learning Experience on E-learning Challenges

H₀ₜ: There is no significant difference in the technological and contextual challenges faced by the instructors in terms of e-learning experience.

In order to test this null hypothesis, a t-test was performed to determine the significant differences among the mean scores of the independent groups. The results are shown in Table 8.

Table 7. Description of mean scores of e-learning challenges with Teaching Experience

| Challenges          | Years | n  | Mean | Std. Deviation |
|---------------------|-------|----|------|----------------|
| Technological       |       |    |      |                |
| Challenges          | 1-5   | 30 | 3.35 | 0.429          |
|                     | 6-10  | 35 | 3.48 | 0.576          |
|                     | 11-15 | 26 | 3.61 | 0.496          |
|                     | 16-20 | 12 | 3.52 | 0.548          |
|                     | 21-25 | 2  | 3.00 | 0.354          |
|                     | 26-30 | 2  | 3.25 | 0.000          |
| Total               | 107   |    | 3.47 | 0.511          |
| Contextual          |       |    |      |                |
| Challenges          | 1-5   | 30 | 3.32 | 0.341          |
|                     | 6-10  | 35 | 3.64 | 0.362          |
|                     | 11-15 | 26 | 3.70 | 0.371          |
|                     | 16-20 | 12 | 3.44 | 0.434          |
|                     | 21-25 | 2  | 2.83 | 0.707          |
|                     | 26-30 | 2  | 3.22 | 0.157          |
| Total               | 107   |    | 3.52 | 0.408          |

Table 8. The result of significant differences between e-learning challenges and e-learning experience

| Challenges          | E-learning | N  | Mean | Std. Deviation | df  | t    | sig  |
|---------------------|------------|----|------|----------------|-----|------|------|
| Total               | Yes        | 43 | 3.52 | 0.497          |     |      |      |
|                     | No         | 64 | 3.43 | 0.521          | 105 | 0.967| 0.336|
| Technological       | Total      | 107| 3.47 | 0.511          |     |      |      |
| Challenges          | Yes        | 43 | 3.55 | 0.440          |     |      |      |
|                     | No         | 64 | 3.50 | 0.386          | 105 | 0.701| 0.485|
| Contextual          | Total      | 107| 3.52 | 0.407          |     |      |      |

95% Confidence Interval of the difference *sig (p<0.005)
Findings in Table 8 indicate that there is no significant difference in terms of technological challenges between those with e-learning experience and those without e-learning experience ($t: 0.967, p: 0.336$). Similarly, there is no significant difference was found in terms of contextual challenges between those with e-learning experience and those without e-learning experience ($t: 0.70$, $p: 0.485$). Therefore, the null hypothesis was completely supported.

Table 8 also shows the mean scores for the two groups (instructors with e-learning experience and those without any e-learning experience).

5. Discussion of the Effect of Instructors Profiles on the Technological and Contextual Challenges of E-learning Implementation

The demographic profiles of instructors have been found to play an important role with the challenges of implementing e-learning. Much research is dedicated to investigating the effect between individual differences and e-learning implementation [23, 28]. These differences emerge from individual characteristics such as gender, age, teaching experience, previous training and experiences. Thus, this section discusses the results of the differences between the technological and contextual challenges of implementing e-learning based on selected demographics variables. Some demographics of instructors that have been selected for this study included gender, age, teaching experience, ICT experience and e-learning experience.

The findings of this research paper revealed that there is a significant difference between male and female instructors views regarding the technological and contextual challenges that effect the implementation of e-learning. In the current research, male instructors faced more challenges than instructors female. This may be due to male instructors taking these challenges into consideration when deciding whether or not to implement e-learning into their teaching. A significant gender variation was found supporting prior research [33, 34].

In term of age, the findings revealed that there are significant differences between the instructors’ views from different age groups regarding the contextual challenges of implementing e-learning. These results imply that the age of respondents has an effect on contextual challenges, which include perception and attitude of instructors toward the implementation of e-learning. However, the results also showed that the age of respondents has no significant difference with technological challenges of e-learning implementation. The effect of age on e-learning challenges was found in previous research by [35, 36]. This is true with the majority of participants between 25 to 46 years old. These age groups have less challenge regarding technological issues.

With regards to teaching experience, the result revealed that there is significant differences for contextual challenges with different teaching experience groups. This outcome is in agreement with previous research [1, 37]. These findings suggested that teaching experience affects the implementation of e-learning in terms of context. The results also revealed that there is no significant difference with technological challenges of e-learning implementation. This is because majority of the participants are from less experience groups. Thus, this finding implies that participants with less teaching experience face less technological challenges. This result is consistent to the U.S National center for Education Statistics (2000) which reported that instructors with less experience in teaching faced less challenges related to technology and they are more likely to use and implement technology in their teaching than instructors with more experience in teaching.

With regards to ICT experience, all but one respondent reported having ICT experiences and high level of technological challenges. Although ICT experience plays an important role in the implementation of e-learning, the technical skills that are necessary to implement e-learning are different. It can be concluded from this finding that instructors need intensive course-based technology training, which takes them beyond the basic computer skills to effectively embed technology into the learning process. [2, 31].
In term of e-learning experience, the instructors sampled recorded no significant difference between the e-learning experience and the technological and contextual challenges of implementing e-learning. In other words, the findings revealed that instructors with e-learning experience and those without any e-learning experience hold the same views in relation to the technological and contextual challenges of implementing e-learning. This may be due to the fact that instructors with e-learning experience faced more challenges in terms of technological challenges than those who without any experience. This implies that previous experience in e-learning does not effect in the implementation of e-learning. To put differently, whether there is an e-learning experience or no experience the challenges still exist. This is consistent with prior research [1].The findings of this research revealed that there was no significant differences between e-learning challenges with different levels of e-learning experience.

It can be concluded from this finding that the skills that are necessary in e-learning systems differ when the system is in the implementation phase or when it is in the normal operation. Integrating e-learning process into the university or any organization is not an easy task and requires specialist with various skills to be in the implementation team. An e-learning project should bring together specialist with pedagogical, technical, creative skills. This outcome is in agreement with previous research [38].

6. Conclusion

This paper investigated the impacts of demographic data and reported the critical points for the decision makers to consider when planning and implementing e-learning in universities. According to the findings of the study, the most important challenges of the implementation of e-learning are related either to organizational (Contextual) and technological (technical) issues. Administrators should consider the needs of instructors when implementing e-learning in any university. For instance, they will need training programs on computers and e-learning. Moreover, instructors need to have a technical support while they interact in the e-learning environment. Taking into account the negative impact of all the technological and contextual challenges that might affect the implementation of e-learning. In addition, instructors’ experiences with using e-learning technologies were low. Therefore, instructors should be trained in order to keep them current with the emerging educational technologies. This can be accomplished by providing training courses about e-learning technology tools such as training programs on some important software and/or hardware for e-learning. In addition, providing workshops on e-learning for instructors is much needed to encourage them to be familiar with the modern teaching approaches.

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