E-Learning in a Mega Open University: Faculty attitude, barriers and motivators

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In the distance teaching institutions where e-learning initiatives are underway and where the planners and administrators grapple with effective adoption and deployment of technology-enabled education, faculty attitude and motivation assume considerable significance. Attitudinal pre-dispositions and institutional and allied barriers (including appropriate policy initiatives) are assumed to play a crucial role in making an effective shift from traditional distance education delivery to web-enabled education and training. Such issues are especially critical to single mode mega universities like the Indira Gandhi National Open University (IGNOU). This article reports the findings of a study conducted to examine the attitudes of faculty members from IGNOU towards e-learning, and to identify barriers and motivators of e-learning adoption and use. IGNOU, with about 1.5 million students scattered over 32 countries, has been offering e-learning programs for almost a decade. The findings suggest that extensive use of computers and email has a high relationship with positive attitudes towards e-learning. The most significant barriers perceived by the faculty included poor internet access by students and lack of training on e-learning, followed by institutional policy on and instructional design for e-learning. The important motivators included personal interest to use technology, intellectual challenge, and sufficient provision for technology infrastructure.

L'E-Learning dans une Mega Université Ouverte: les attitudes du corps enseignant, les barrières et les facteurs de motivation
Dans les institutions d'enseignement à distance où des initiaitves de mise en place de l'e-learning sont en cours et où les planificateurs et les administrateurs luttent pour faire adopter et lancer des formations assistées par la technologie, l'attitude et la motivation des professeurs revêtent une signification considérable. On a tendance à penser que les attitudes acquises et les barrières institutionnelles ou autres (y compris les choix de politiques appropriées) jouent un rôle crucial pour effectuer le passage d'une distribution traditionnelle de l'enseignement à distance vers un enseignement et une formation assurés grace à Internet. Ces questions ont une importance critique particulière dans les mega universités «univoques» comme l'Indira Gandhi National Open University (IGNOU). Le présent article communique les résultats d'une enquête menée auprès des enseignants dans plusieurs facultés de l'IGNOU et portant sur leur attitude vis à vis de l'e-learning et sur les facteurs de blocage ou de motivation par rapport à l'adoption et à l'usage de l'e-learning. Cette université qui compte environ 1,5 millions d'étudiants répandus dans 32 pays, offre des programmes d'e-learning depuis près d'une décennie. A ce stade, cette enquête est primordiale et les résultats permettent de penser que

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l'usage très répandu des ordinateurs et du courrier électronique a influé fortement sur les attitudes positives vis à vis de l'e-learning; quant aux obstacles les plus marquants que notent les professeurs, on relève un mauvais accès à Internet pour les étudiants et le manque de formation pour l'e-learning suivis par les politiques institutionnelles et la conception des cours en fonction de l'e-learning. Au nombre des facteurs de motivation importants on relève l'intérêt personnel pour l'emploi de la technologie, le défi intellectuel et la mise en place de moyens suffisants pour une infrastructure d'enseignement assisté par l'informatique.

E Lernen an einer 'Mega Open University': Einstellung des Lehrkörpers, Barrieren und Ermutigungen

In den Fernlehreinrichtungen, in denen e-learning Initiativen üblich sind, und wo die Planer und Verwalter mit wirksamer Adoption und dem Einsatz von technisch möglicher Unterrichtstechnik ringen, gewinnen die Einstellungen der Fakultät und Motivationen beträchtliche Bedeutung. Man kann annehmen, dass Voreinstellungen und institutionelle und artverwandte Hemmnisse (einschließlich entsprechender Politikinitiativen) eine entscheidende Rolle beim Umstieg von traditioneller Fernlehr-Kommunikation zu web-aktiver Bildung und Ausbildung spielen. Solche Streitfragen sind besonders kritisch bei 'single mode mega'-Universitäten wie der Indira Gandhi National Open University (IGNOU). Dieser Artikel berichtet über die Ergebnisse einer Studie über die Einstellungen verschiedener Fakultäten von IGNOU in Bezug auf ihre Einstellung zu e-Learning, verschiedenen Barrieren und auch Motivationen zur Einführung und Verwendung von e-Learning. Die Universität mit etwa 1,5 Millionen Studenten, die über 32 Ländern verteilt sind, hat seit fast einem Jahrzehnt e-Learning Programme angeboten. Eine Studie dieser Art ist entscheidend auf dieser Entwicklungsstufe: Die Ergebnisse zeigen, dass weitreichende Verwendung von Computern und E-Mail-Einrichtungen hohe Beziehung zu positiver Einstellung zu e-Lernen hatte. Die am deutlichsten wahrgenommenen Hemmnisse ergaben sich durch geringe Internetnutzung von Studenten und Mangel an Ausbildung in e-Learning, gefolgt von institutioneller Politik und Fehlen von beispielhaften e-Learning-Programmen. Die wichtigen Motivatoren schlossen persönliches Interesse zur Nutzung von Technik, intellektuelle Herausforderung und ausreichende Möglichkeit zur Nutzung von CMC Infrastruktur ein.

El e-Learning dentro de una mega Universidad Abierta: las actitudes del cuerpo docente, las barreras y los incentivos

Dentro de las instituciones de educación a distancia donde iniciativas de e-learning están en curso, mientras que los administradores y técnicos de planifiación están afrontando la problemática de una adopción efectiva y del despliegue de una educación asistida por la tecnología, las actitudes y la motivación del cuerpo docente están asumiendo una fuerte relevancia. Se supone que las actitudes preexistentes y las barreras institucionales y otras semejantes (incluso la elección de políticas adecuadas) desempeñan un papel decisivo en una transición efectiva del modo tradicional de distribución de la educación a distancia hacia cursos y formaciones asistidos por la web. Esa problemática es particularmente crítica dentro de las mega universidades de modo único como la Universidad Nacional Abierta Indira Gandhi (IGNOU). Este artículo presenta los resultados de una encuesta sobre el cuerpo docente que se hizó en varias Facultades y departamentos de la IGNOU sobre las actitudes acerca del e-learning y las diferentes barreras e incentivos para su adopción y uso. Esta universidad con casi 1,5 millones de estudiantes diseminados en más de 32 países ha sido ofreciendo programas de e-learning desde hace casi una década. En esta fase este tipo de investigación es fundamental; y los resultados nos permiten pensar que el uso extensivo de los ordenadores y del correo electrónico está fuertemente vinculado a actitudes positivas acerca del e-learning; entre las barreras más destacadas, los profesores mencionaban el malo acceso de los estudiantes a Internet y la falta de formación para el e-learning seguidos por las políticas institucionales y el diseño curricular para ese mismo e-learning; entre los incentivos fuertes destacaban el intéres personal en el uso de la tecnología,el desafío intelectual y los recursos suficientes para una infraestructura destinada a la enseñanza asistida por ordenador.

Introduction

In comparison to the long history of distance education, e-learning is a relatively new phenomenon. Though etymologically e-learning covers any electronic mediated learning, it

has really caught the imagination of the educators with the emergence of the World Wide Web (WWW) in 1991. The WWW integrates text, audio, and video and provides opportunities for both synchronous and asynchronous interaction (Mason, 1998). Thus, it provides greater benefits to both learners and teachers by sharing resources, and also promotes collaborative learning (Wheeler, 2001). Some of the major advantages attributed to e-learning include (Bates, 2001; Goldberg, Salari, & Swoboda, 1996; McCormack & Jones, 1998; Piskurich, 2006; Rossen & Hartley, 2001; Starr, 1997; Weller, 2000):

- Access to educational resources from outside the institution on a global and instant basis.
- Quick and easy way to create, update and revise course materials through low-cost off-the-shelf software.
- Increased and flexible interaction with students through e-mail and discussion forums.
- Location and time independent delivery of course materials such as course notes, diagram, reading lists, etc.
- Ability to combine text, graphics and a limited amount of multimedia enabling institutional designers to prepare quality learning materials.
- Ability to allow real-time access to subject matter experts with minimal loss of their productivity.
- Interactive and dynamic learning experience through online assessment tools, simulations and animated learning objects.
- Platform independent delivery, accessible through any computer with a simple browser interface.
- Increased learner control through hypertext-based presentation of information.
- Opportunities for international cross-cultural and collaborative learning.
- Ability to serve a large number of students at a potentially reduced cost.

Notwithstanding these and other benefits of e-learning, it is considerably viewed with caution, skepticism and resistance, primarily because of an attitude of techno-phobia and lack of familiarity with its technology (Rossen & Hartley, 2001). The dynamic and evolving nature of e-learning technologies has also created tension for teachers in higher education due to changing work patterns and in some cases poor integration of technology (Singh, O'Donoghue, & Worton, 2005). Not surprisingly, therefore, there is also lack of clear consensus on the attitude and ability of academic staff in higher education to participate in e-learning (Newton, 2003). Wilson (2001) suggests that three characteristics of teachers do control their degree of learning: attitude towards technology, teaching style and the control over technology.

It has been pointed out that faculty attitude towards online instruction affects their willingness to teach online (Kosak et al., 2004). It is, therefore, important to analyse faculty attitude towards e-learning in any institution to develop strategies towards diffusion of innovative use of technology for learning (see Rogers, 1995). In order to implement e-learning effectively in an institution, it is also important to ascertain the existing barriers to and possible motivators of e-learning adoption. Keeping these concerns in view, the objectives of this study were set out as follows:

- To explore faculty attitude towards e-learning.
- To analyse the relation, if any, between their attitude and their demographic, professional and technology background viz., gender, age, past teaching experience, use of computers, etc.
- To identify perceived barriers and motivators to use e-learning in a system-wide context.

For this study, e-learning is defined as an Internet- or intranet-based and web-delivered teaching–learning system with or without face-to-face contact between the teacher and the learner. It encompasses related terms like online learning, virtual learning, web-based learning and so on. We recognize three types of e-learning: completely web-based without face-to-face contact, web-based with little face-to-face contact, and face-to-face delivery with web delivery as a support mechanism (Berge, Collins, & Dougherty, 2000); and the present research was concerned with all these three types of e-learning in an open university context.

Review of Literature

A large amount of literature exists on e-learning covering technical features, pedagogical processes, advantages, and problems associated with designing web-based courses. In this section, we review some of the select studies related to faculty and student attitude towards learning, and barriers to participate in it. While there are many studies on faculty attitude towards distance education (see Bashir, 1998; Clark, 1993; Milheim, 2001; Siaciwena, 1989), there are relatively few studies on how faculty reacts to the concept of e-learning, particularly in the developing world. However, studies on faculty attitude towards e-learning in single mode distance teaching institutions are rare.

Students

Keller and Cernerud (2002) examined students' perceptions of e-learning at Jonkoping University in Sweden and concluded that the strategy of implementing e-learning may play a significant role in students' perception of new technology. Drennam, Sarski, and Kennedy (2005) concluded that positive perception towards technology influences students' satisfaction with the course. Students' attitude towards computers also influences, to some extent, their performance in web search, online discussion and online assessment (Graff, 2003). Paris (2004) reported secondary school students' attitude towards online web-assisted learning as positive, but found no significant difference between male and female students. However, Muilenburg and Berge (2005) reported a large number of studies that found significant differences in learning, attitude, motivation and experience in relation to gender, age, ability to use online technologies, type of institution attended, and students' perception of success in online learning. Their factor analytic approach to identify barriers to online learning revealed eight factors: administrative issues, social interaction, academic skills, technical skills, learner motivation, time and support for studies, cost and access to Internet, and technical problems. Vaughan and MacVicar (2004) identified lack of employee–students' time as the biggest barrier to learning online, and listed accessibility, relevance to career progression and user-friendliness as three top motivators to use e-learning in the context of the banking industry.

Faculty

Most of the studies that analysed faculty opinions on e-learning discussed perceived barriers to participation in the e-learning enterprise. Studies related to faculty attitudes toward e-learning are hard to find, though there are studies on technology integration with faculty

teaching. Jamlan (2004) used a questionnaire to assess faculty opinion at the University of Bahrain towards introduction of e-learning, and found that faculty members tended to view e-learning positively, though expressed concern over its economic viability. The researcher also reported that faculty members believed that introduction of e-learning:

- Provides rich resources to students and teachers.
- Can make teaching more efficient.
- Can save teachers and students time and effort.
- Provides greater access to educational opportunities to students.

Newton (2003) reviewed related literature on development and integration of new technology in higher education and identified five distracting factors: increased time commitment for academic staff (both development and delivery time), lack of extrinsic incentives/rewards, lack of strategic planning and vision, lack of support in terms of training on technology as well as pedagogy, and philosophical, epistemological and social objections. However, in a recent study Lee and Busch (2005) concluded that faculty willingness to participate in web-based distance education was not related to effort and time needed to develop course materials; rather that was a function of their perception of the recognition received. Many instructors feel that their online teaching achievements are not valued adequately at the institutional level (Wilson et al., 2003).

Amongst many barriers to e-learning, cultural and technical barriers are identified as predominant (Berge, 1998; Berge & Mrozowski, 1999). While the cultural factors include faculty resistance to innovation and change, and negative attitude towards technology, the technical factors cover issues related to technology reliability, connectivity, adequate infrastructure and technical support. Pajo and Wallace (2001), using factor analysis, identified three groups of factors: *personal barriers* (lack of knowledge, skills, training, role models and time), *attitudinal barriers* (no faith in technology, unwillingness to work with technology, concern about student access) and *organizational barriers* (inadequate technical support, hardware, software, instructional design, no recognition of the value of online teaching). In their study, time required to learn how to use technology came out as the top-most barrier to use e-learning. Lack of time was echoed in another study of faculty attitude at the Manchester Metropolitan University, UK (Naidu, 2004), whereas lack of technical support was reported to be the top barrier followed by inadequate availability of hardware and software (Daugherty & Funke, 1998).

A few studies have concentrated on intrinsic and extrinsic motivators to e-learning. In the study by Schifter (2000) 'concern about faculty workload' was the top barrier to use e-learning, while 'personal motivation to use technology' was the top motivating factor. Maguire (2005) categorized this as intrinsic factors that also include 'feeling of self-satisfaction from teaching online'. According to the author, intrinsic motivators were stronger than extrinsic motivators, viz., recognition by peers, tenure and promotion, and role modeling. There are also institutional extrinsic motivators like policy, infrastructure and technical support which do affect faculty attitude towards e-learning.

The above review of literature reveals that faculty attitude toward e-learning has never been looked at before as a separate entity from a psychological perspective. The available studies focused more on barriers and motivators to e-learning assessed through opinions and perceptions. It is interesting and useful also to note that barriers to e-learning could be attitudinal,

personal and organizational (Pajo & Wallace, 2001). Removing personal and organizational barriers coupled with a positive attitude may not be sufficient conditions for introducing e-learning in an organization. It is also necessary to create conditions that reinforce the motivating factors. The present study was undertaken against this backdrop to identify barriers and motivators to e-learning at Indira Gandhi National Open University (IGNOU), India along with the study of faculty attitude towards e-learning. IGNOU represents a strong case for a research study of this kind since it is not only the largest mega (open) university in the world, but more importantly it acts as the national accrediting body for promoting and assuring quality of distance education systems in the country.

Method

Context of the Study

IGNOU is a single mode distance teaching institution with over 1000 courses in 125 (certificate, diploma and degree) programs and a cumulative enrollment of 1,433,490 students (IGNOU, 2006). It has the additional responsibility of acting as the national distance education quality assurance agency, with international jurisdiction, and as a national resource centre for open and distance learning to produce high quality learning materials used even by many students and teachers of conventional campus-based universities (Panda, 2005). IGNOU is a leader in the use of information and communication technologies (ICT) for instructional delivery. A wide range of technologies including print, audiotapes, videotapes, radio lessons, television lessons, interactive radio counseling, two-way video conferencing, CD-ROMs and web-content delivery are used in the university (Chaudary & Bansal, 2000; Panda, 2002; Sharma, 2001), with a predominant focus on print. The media-mix in a course/program is decided by the faculty who in consultation with in-house instructional designers and outside IGNOU subject matter experts decide the use of various communication technologies. In 1999, the university launched two online programs—Bachelor of Information Technology (BIT) and Advanced Diploma in Information Technology (ADIT) in collaboration with Edexel, UK and the Ministry of Information Technology, Government of India, respectively. A social science certificate program on resettlement and rehabilitation was launched online in 2001 with financial support received from the World Bank (Mishra & Jain, 2002). The university has also undertaken several online projects: food safety (Thomas, Kapur, & Kumar, 2004), WINSIS bibliographic package (Kanjilal, Ghosh, & Kumar, 2004), a program for the training of Foreign Service diplomats (Bhusan, 2004), online research resources for college and university teachers (Panda & Bala, 2004), and development of a virtual research environment (Panda, Librero, & Batpurev, 2005). Despite being a technology leader and despite the availability of these online programs, the university is yet to have a comprehensive policy on e-learning, and therefore the common practice is to look into each case (i.e., technology-enabled program) in isolation.

   The available research studies on student reactions to online learning of the university show mixed responses. While the study by Dikshit, Gaba, Bhushan, Garg, and Panda (2003) reported that students did not like exclusive online courses but appreciated content in interactive multimedia CDs and support through both online and offline modes, the study by Mishra

(2005) reported that learners (87.5%) preferred delivery of programs exclusively online. In this context, it was all the more important to ascertain the faculty attitude to e-learning so that a holistic picture may emerge for further policy decisions. These findings could also be enlightening for other single mode distance teaching institutions.

Participants

Data for the study were obtained from the members of the IGNOU faculty using the survey method. At the time of the study in early 2005 there were 150 full time faculty members teaching at the university headquarters. A questionnaire developed by the researchers was distributed to all of them. Eighty ($n = 80$) faculty members returned the filled in questionnaire; and after rejecting two partially filled in questionnaires 78 could be used for analysis. Thus, the response rate was 52% with 33.3% female ($n = 26$) and 66.7% male ($n = 52$) respondents. As indicated in Table 1, about 50% of the respondents were in mid-career positions as readers and senior lecturers. The average age of the sample was 43.7 years with the mode falling in the 41–45-year age group. Most of the respondents (48.7%) were from the faculty of social sciences ($n = 38$) followed by sciences (23.1%), technology (17.9%), and humanities (10.3%). A Chi-square test of the discipline-wise responses revealed that the responses were in tune with the population percentages of the discipline concerned ($\chi = 0.287$, df = 3, $p = 7.82$ at 0.05 significance level). The average teaching experience of the sample was 15.97 years with the mode falling in the range of 16 to 20 years. The respondents were highly experienced in the distance education system with an average of 11.69 years. Most of the respondents (43.6%) had 16–20 years of experience in the university. Table 2 shows the respondents' use of computers for word processing, presentations, email and web search. The data show that a majority of the respondents were familiar with computers and used them almost on a daily basis. Only 7.7% ($n = 6$) had undergone some courses through e-learning.

Measures

A questionnaire was constructed to undertake the survey, and had three components: attitude towards e-learning scale, possible barriers and motivators, and personal data. A general review of literature revealed the existence of only one standard scale to assess readiness for e-learning (Watkins, Leigh, & Triner, 2004) which is available for use; studies on barriers and motivators have generally used self-designed questionnaires. Thus, we identified possible statements for inclusion in the scale for measuring faculty attitude towards e-learning through the literature survey (and also based on the contexts of the national open university), and requested nine expert reviewers to validate those. Based on their feedback, a five-point Likert-type scale was prepared containing 22 items including seven negatively worded statements. The five-point scale ranged from '5' (strongly agree) to '1' (strongly disagree), with '3' as 'undecided'. The scale had a Cronbach-alpha co-efficient of 0.81 indicating high internal consistency of the items (Mishra & Panda, 2007).

For the barriers and motivators, the respondents were asked to tick the barriers/motivators and also rate the strength of the same on a five-point scale (where a score of '5' was 'very strong' and '1' 'very weak').

Table 1.   Profile of the respondents

Demographic data	Frequency	Percent
Gender		
Female	26	33.3
Male	52	66.7
Age group (Average Age: 43.7 Years)		
26-30	6	7.7
31-35	7	9.0
35-40	8	10.3
41-45	26	33.3
46-50	18	23.1
51-55	8	10.3
55-60	3	3.8
61-65	2	2.6
Position		
Professor	20	25.6
Reader	38	48.7
Sr. Lecturer	6	7.7
Lecturer	14	17.9
Discipline		
Sciences	18	23.1
Technology (including Computer Science)	14	17.9
Humanities	8	10.3
Social Sciences (including Management)	38	48.7
Total experience in years (Average Experience: 15.97 Years)		
1-5	6	7.7
6-10	12	15.4
11-15	12	15.4
16-20	35	44.9
21-25	3	3.8
26-30	6	7.7
31-35	2	2.6
35-40	2	2.6
DE experience in years (Average DE experience: 11.69 Years)		
1-5	14	17.9
6-10	12	15.4
11-15	18	23.1
16-20	34	43.6

Procedures

The data gathered through the questionnaire were initially entered into an MS-Excel worksheet and then transferred to SPSS for comprehensive analysis based on the objectives of the study. The data were analysed for descriptive statistics, and also a set of tests was conducted

Table 2.   Use of computers

Frequency of use	Use of computers for WP and presentations	Use of e-mail	Use of web for information search
Daily	53 (67.9)	70 (89.7)	52 (66.7)
Weekly	12 (15.4)	5 (6.4)	18 (23.1)
Monthly	9 (11.5)	–	4 (5.1)
Never	4 (5.1)	3 (3.8)	4 (5.1)

Note: Figure in brackets indicates percentage

for analysis of variance (ANOVA) to compare group means for the attitude component of the study. Rank order analyses were performed for the barriers and the motivators. The results of the study are discussed in the next section. The negatively worded statements were reverse scored. For analyzing attitude, we used the following range of scores:

- 4.5 and above = Positive.
- 3.5–4.49   = Moderately positive.
- 2.5–3.49   = Neither positive nor negative.
- 1.5–2.49   = Moderately negative.
- 1.49 and less = Negative.

Results and Discussion

Attitude towards E-Learning

The descriptive statistics of the 22 items in the attitude towards e-learning scale are reported in Table 3. The mean attitude score for the sample was calculated as 3.81 indicating that the sampled faculty at IGNOU had a moderately positive attitude towards e-learning. Since the negatively worded items were reverse scored, a higher mean score indicated that the respondents did not agree with the statement and a lower mean score indicated agreement with the statement.

Four items were in the range of 2.5 to 3.49 suggesting that the respondents were neither positively nor negatively disposed. These statements are:

- E-learning can engage learners more than other forms of learning (3.1).
- E-learning improves communication between students and teachers (3.4).
- E-learning enhances the pedagogic value of a course (3.2).
- E-learning experiences cannot be equated with face to face teaching or even distance education (2.6).

The above result indicates serious concern regarding awareness about the qualitative aspects of e-learning amongst the sample respondents. This concern needs to be addressed through a comprehensive program of continuing professional development.

None of the items in the scale went up to a mean score of 4.5 showing that the respondents were moderately positive towards e-learning, though they have been using technology-mediated teaching for quite some time. Caution has been observed in their approach to

Table 3.   Attitude towards e-learning

Statements	Mean	Std. Dev.
E-Learning will never replace other forms of teaching and learning.	3.6	1.30
E-Learning makes me uncomfortable because I do not understand it.★	4.1	.93
E-Learning is a de-humanizing process of learning.★	3.6	1.23
E-Learning can solve a lot of our educational problems.	3.8	1.08
I feel intimidated by e-learning.★	3.9	1.05
E-Learning will bring new opportunities for organizing teaching and learning.	4.3	.76
E-Learning is difficult to handle and therefore frustrating to use.★	3.6	1.10
There are unlimited possibilities of e-learning that have not yet been thought about.	4.2	.82
E-Learning saves time and effort of both teachers and students.	3.6	1.12
E-Learning increases access to education and training.	4.2	.92
E-Learning will increase my efficiency in teaching.	3.8	.99
E-Learning enables collaborative learning.	4.1	.73
E-Learning can engage learners more than other forms of learning.	3.1	1.12
E-Learning increases quality of teaching and learning because it integrates all forms of media: print, audio, video, animation.	3.8	1.07
E-Learning increases the flexibility of teaching and learning.	4.0	.82
E-Learning improves communication between students and teachers.	3.4	1.05
E-Learning enhances the pedagogic value of a course.	3.2	1.08
I get a sinking feeling when I think of trying to use e-learning for my courses.★	4.0	1.06
E-Learning is not effective for student learning.★	3.9	.93
E-Learning experiences cannot be equated with face to face teaching or even distance education.★	2.6	1.2569
It is essential that e-learning material is of high quality.	4.1	1.07
Open universities should adopt more and more of e-learning.	3.7	1.15

★ Reverse scoring for these statements

adoption of e-learning, though some faculties as early adapters in the university had already initiated online courses of their own. There might also be some external influence on the responses: subsequent to the distribution of the questionnaire the university intranet was down for a week making the respondents extra conservative in their attitudes. The phenomenon was observed to have been repeated many times in the past.

A set of 10 one-way analysis of variance (ANOVA) tests was conducted. The variables included gender, age groups, teaching position, discipline, total teaching experience, distance education experience, length of use of computer, use of email, use of web search, and completion of any e-learning courses as a learner so as to know how the attitudes are related to these variables. The F values of the ANOVA tests are shown in Table 4. At 95% significance level, the F value is significantly higher only for 'use of computers' and 'use of emails', indicating the respondents' attitudes towards e-learning to have been affected by experiences in computer and email usages. Post hoc tests of these two variables revealed a significant difference in the attitude mean scores of daily users of computers and email and non-users at 0.05 level.

Table 4.   ANOVA for attitude towards e-learning and other variables

Variables	df	F value
Gender	1	.021
Age Groups	7	1.792
Teaching Position	3	.512
Discipline	3	.459
Total Teaching Experience	7	.820
Experience in DE	3	.794
Use of Computer (WP, presentations)	3	3.634*
Use of E-mail	3	3.632*
Use of Web	3	2.604
Completion of a course through e-learning	1	1.383

* Significant at 0.05 level with p value 2.68

Barriers to E-Learning

The respondents were asked to identify and rate the strength of possible barriers from a list of 15 items. Table 5 shows the frequency, percentage and barrier strength for these items. Rank order of the barriers reveals that poor access to Internet by students was the top-most barrier as perceived by the faculty members. This was followed by their lack of training on

Table 5.   Barriers towards e-learning

Rank	Barriers	Frequency	Barrier strength (mean)
1	Concern about access to students	72 (92.30)	4.24
2	Lack of training on e-learning	69 (88.46)	4.03
3	Poor Internet access and networking in the university	60 (76.92)	3.88
4	Lack of technical support in the university	69 (88.46)	3.83
5	Lack of instructional design support for e-learning	48 (61.53)	3.69
6	Lack of institutional policy for e-learning	60 (76.92)	3.62
6	Inadequate availability of hardware and software	60 (76.92)	3.62
7	Concern about faculty workload	54 (69.23)	3.57
8	Lack of time to develop e-courses	50 (64.10)	3.48
9	Concern about the quality of e-courses	52 (66.66)	3.38
10	Lack of incentives to use e-learning	41 (52.56)	3.37
11	Concern about security issues on Internet	41 (52.56)	3.29
12	Lack of credit towards promotion	35 (44.87)	3.11
13	Self intimidated by technology	38 (48.71)	2.97
14	No role models to follow	38 (48.71)	2.76
15	Lack of professional prestige	31 (39.74)	2.58

Note: Figure in brackets indicates percentage

e-learning, indicating a strong training need at the institutional level. Lack of training as a barrier was also reported to be within the top three barriers in the study by Pajo and Wallace (2001). Poor Internet access and networking in the university and lack of technical support were the third and the fourth important barriers to e-learning. The next barrier identified was related to lack of instructional design support for e-learning. Interestingly 'faculty workload' as a barrier was only seventh in the list, whereas in the study by Schifter (2001) it was considered as the top-most barrier. Lack of institutional policy for e-learning received 76.92% choice, and in terms of percentage it was ranked third, though it was sixth in the barrier strength rank. Lack of role models and lack of professional prestige were at the bottom of the barrier list.

Motivators to Use E-Learning

Though removal of barriers to e-learning is necessary, it is not sufficient in itself to adopt e-learning and participate in the e-learning enterprise. Therefore, we had also asked the respondents to identify possible motivating factors in a similar manner as barriers. Table 6 depicts the frequency, percentage, motivator strength and the rank of the 12 items in the list. Like the study by Schifter (2000), the present study also revealed 'personal interest to use technology' as the top-most motivating factor; followed by 'intellectual challenge' that might come up with the use of e-learning. The respondents also indicated that provision and effective development of infrastructure (i.e., both hardware and software) could be another strong motivator (third rank) at the workplace. This is also an item in the barrier list. Similarly, training on e-learning was the fourth ranked motivator indicating high need for continuous training in this area. Incentives to use e-learning, credit towards promotion, and peer recognition were at the bottom of the motivator list. Their ranks were also similar in the barrier list, thereby showing consistency of the results.

Table 6.   Motivators to use e-learning

Rank	Motivators	Frequency	Barrier strength (mean)
1	Personal interest to use technology	70 (89.74)	4.27
2	Intellectual challenge	61 (78.20)	3.97
3	Improved infrastructure (hardware and software) deployment	59 (75.64)	3.92
4	Training on e-learning	58 (74.35)	3.84
5	Self-gratification	40 (51.28)	3.83
6	Better Internet bandwidth at workplace	62 (79.48)	3.81
7	Technical support	62 (79.48)	3.71
8	To be a trendsetter by early adoption	44 (56.41)	3.55
9	Release time/Reduction in existing workload	47 (60.25)	3.36
10	Professional incentives to use e-learning	50 (64.10)	3.32
11	Credit towards promotion	43 (55.12)	3.30
12	Peer recognition, prestige and status	41 (52.56)	3.00

Note: Figure in brackets indicates percentage

Conclusion

Though the results of the study considerably confirm those of the earlier studies, it further brings to light many important findings that can be used to institutionalize e-learning initiatives at the university level. The study has made an attempt to develop a theoretical framework on e-learning adoption at the university level by looking at faculty attitudes, barriers, and motivators of e-learning.

As in an earlier study by Jamlan (2004), the faculty members showed a moderately positive attitude towards e-learning indicating that they were more than willing to adopt and use it, though at the same time sitting on the fence of such a decision. Unless the moderate positive attitude is effectively pushed towards the positive direction, there is every chance of these going the reverse way. A comprehensive program of continuing professional development on e-learning should be a welcome strategy to attract the fence sitters as willing adopters of e-learning in their courses. Only an e-learning experience can change the faculty perceptions such as 'e-learning experiences cannot be equated with face-to-face teaching or even distance education' (Mean attitude score = 2.6). Therefore, the faculty training program should preferably be designed and delivered on the web. It may also be noted here that the study also revealed positive effects of computer and email use on attitude, indicating the role of technology experience as a predictor of positive attitude, which is possible through organized training of faculty members and regular use of the technologies.

While a positive attitude towards e-learning enables individuals to take initiatives to adopt it, removal of institutional barriers becomes a necessary condition. True to the learner-centeredness of the teaching–learning at IGNOU, and contrary to many other studies, faculty members identified poor Internet access by the students as the biggest barrier to adopt e-learning. However, the study supported the findings of Pajo and Wallace (2001) on lack of training on e-learning as one of the barriers, and listed at the second top position. Faculty workload, which was a top barrier in an earlier study (Schifter, 2001), was ranked seventh in this study, indicating faculty concern over other major barriers such as 'poor internet access and networking' in the university, and lack of technical support (Daugherty & Funke, 1998). Similar to the study by Naidu (2004), lack of time to develop e-courses was also identified as one of the barriers.

If removal of barriers to e-learning is a necessary condition, than ensuring the availability of motivating factors is a sufficient condition to see e-learning progress in any institution. The list of motivating factors identified in this study was in line with earlier studies by Schifter (2001) and Maguire (2005). Personal interest to use technology was the top motivating factor, followed by intellectual challenge. This study revealed that both intrinsic (e.g., personal interest, intellectual challenge) and extrinsic motivators (e.g., infrastructure and technical support) are important to the faculty members. Personal interest can be reinforced by making provisions for functional infrastructure, continuous training followed by definite provisions for implementation towards course development and learner support, and intellectually challenging online learning design.

Based on the findings of this study, we would proffer the following practical recommendations that should be of use to any university considering e-learning as a teaching–learning strategy.

- Have a comprehensive system-wide implemental policy on e-learning with definite provisions for design, implementation, evaluation, reflection, and cumulative expansion (Panda, 2007).

- Conduct online faculty development programs to provide training on both technology and pedagogy of e-learning.
- Provide easy access to computer and e-mail; and encourage their daily use by faculty.
- Ensure reliable access to network and technology support for maintenance.
- Remove barriers to e-learning (Table 5), especially by providing Internet access to students. This is essential for the developing countries like India.
- Create an environment of sustainable e-learning by encouraging the motivating factors (Table 6).

The study also leads us to think (and rethink) about the role institutional policy plays in the adoption and effective use of e-learning. IGNOU being a technology leader in education and also the largest open university in the world, it is but natural for the university to progress in the direction of virtualization and provide access to its huge academic resources to clients across the globe. This is an area for all the distance teaching institutions for further reflection, collaborative R&D and mutual learning.

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