# Barriers Perceived by Teachers for use of Information and Communication Technology (ICT) in the Classroom in Maharashtra, India

## Chandan Singhavi and Prema Basargekar
## K. J. Somaiya Institute of Management Studies and Research, India

## ABSTRACT

Information and Communication Technology (ICT) in school education is considered as one of the important tools to make education learner centric and helps to reduce the digital divide between different socio-economic classes in a developing country like India. The government is implementing policies to encourage schools to adopt ICT and integrate in the school curriculum, but the response is lukewarm from the schools.

School teachers have a decisive role to play in the effective implementation of ICT in the classroom. Their level of acceptance of new pedagogy using ICT is a key to successful implementation. The existing research shows that the lack of willingness of the teachers to use ICT in the classroom is one of the major hurdles in its implementation at the ground level. At present, there are very few studies that identify these perceived barriers of the teachers.

This paper focuses on identifying the barriers to use of ICT from the teachers' perspectives by using the rank order method for English and Regional medium school teachers. The paper uses logistic regression analysis to find out how the willingness to use ICT can be improved if some barriers are mitigated for both types of schools.

*Keywords: ICT; Barriers of ICT; Logistic regression; ICT in schools; teachers' barriers*

## INTRODUCTION

Emerging countries like India face a unique challenge of development as the fruits of rapid economic growth are not shared equitably by all the sections of society. Information Technology (IT) and Information Technology Enabled Services (ITES) have been a driver of Indian growth since 1991. While on one hand, it has opened doors to a large number of IT firms and thousands of IT professionals, this growth has not penetrated deeper in the society due to a high level of the digital divide. Access to IT and IT-related education and training is not easily available to all. This limits the opportunities in higher education and jobs for many young aspirants.

Use of information and Communication Technology (ICT) in education is considered to be one of the important tools to mitigate the digital divide in the country. "ICT is used as an umbrella term that includes any communication device or application, encompassing: radio, television, cellular phones, computer and network hardware and software, satellite systems, as well as the various services and applications associated with them, such as video conferencing and distance learning"[1].

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[1] Centre for Commonwealth Education & Aga Khan University Institute for Educational Development – Eastern Africa Research Report – 2010

Using ICT in education has multiple benefits besides mitigating the digital divide. ICT requires the use of pedagogy that is learner-centric as against teacher-centric which is more common in mass education. The students are more engaged in the learning process as it is more interactive and the students can follow the self-paced process. It can provide regular, timely feedback and one can monitor students' progress over time.

Maintaining the quality of education is one of the very important challenges in India. Mass education is plagued by a lack of access to sufficient resources. Public schools set-up in villages and remote areas are severely affected by the lack of basic infrastructure and good quality of teachers. Pratham Education Foundation prepares the Annual Status of Education Report (ASER) every year. The 2016-17 ASER report shows that nearly 22 million children were enrolled in schools in India. However, they were lacking in basic foundations. For instance, nearly 27 percent of Standard VIII children were not able to read the Standard II text or solve 3 digits by 1 digit division[2]. ICT in education can also address this challenge by providing access to high-quality educational content via distance mode and in remote places where children do not have access to good schools and teachers.

Taking all this into consideration, the Government of India has decided to promote ICT in schools through policy implementation. The policy supports all states and union territories to set up computer labs in all public schools at the secondary and higher secondary level. ICT is also taken as a separate subject in the school curriculum to build students' computer skills. At the same time, the implementation of ICT at the school level has not been very successful. It is not as yet fully integrated into the school curriculum. The existing research cites many reasons such as inadequate resources, lack of proper vision, lack of trained personnel, lack of monitoring and feedback systems, lack of maintenance and repairs of the tools and equipment, as well as lack of ICT based good quality educational content. These problems mainly focus on the 'resource' side constraints.

One of the major stakeholders of ICT implementation is the teacher, as this is who implements ICT in the classroom. Implementation of ICT requires changing teaching pedagogies in the classrooms from teacher-centric to student-centric. The role of the teacher has to change from ICT user to ICT leader in a technology-enabled classroom. The teacher needs to find a suitable tool, experiment with the tool and then use it in the classroom. Without the active participation of the teachers, it is not possible. Changing the mindset of the teachers is essential to bring about this change. The existing literature highlights the lack of willingness of the teachers to use ICT in the classroom as one of the major hurdles in implementing ICT at the ground level. At present, there are very few studies done to identify these perceived barriers of the teachers and find out how these can be removed or at least mitigated. This paper attempts to find out what are the perceived barriers that prohibit/limit teachers in the implementation of ICT in the classroom and identify the environmental factors that impact these perceived barriers. It also attempts to find out the ways to mitigate these barriers.

## LITERATURE REVIEW

The existing research covers various aspects such as the importance of ICT in school education, barriers faced by the schools and the teachers in its implementation in the classroom, perceptions of teachers' related to its effectiveness and their attitudes towards using ICT in the classroom. The

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http://img.asercentre.org/docs/Publications/ASER%20Reports/ASER%202017/aser2017nationalppt.pdf

literature also covers factors affecting the perceptions of the teachers and a few solutions to bring about change in the attitudes.

ICT in education plays an important role, especially in India. The IT sector has been one of the drivers of economic growth in India since 1991. Its contribution to India's GDP has increased from 1.2 percent in 1998 to 7.8 percent in 2017[3]. Indian IT and ITES companies are further likely to spread their wings across the world. Future growth of the sector depends on the investment in skill building and human power development. In an era of globalization, more and more jobs are becoming knowledge oriented. In such a case, the importance of ICT cannot be undermined. In a developing country, the potential job seekers are not equipped with relevant skills for these knowledge-centric jobs. Though India is one of the few countries which experienced substantial growth by introducing ICT in governance and the public sector, its ICT development index is still 138 out of 175 countries[4].

ICT in education is supposed to bridge this digital gap. Most of the researchers agree that ICT plays a very vital role in education. It makes the learning process more learner-centric as compared to the earlier teacher-centric processes (Gholami et. al., 2010, Watson and Watson, 2011). It can disseminate knowledge from various sources and create a more conducive teaching and learning environment (Smith, 2002). ICT can provide access to quality education to the students who were refrained due to geographical location, time, and scarcity of money (Marina, 2001). ICT can also improve some of the soft-skills such as cooperation, teamwork, peer learning and problem-solving. (Plomp et al.,1996, Vougt, 2003).

At the same time, the effective implementation of ICT in the classroom faces lots of challenges. Bingimlas (2009) categorizes these barriers into extrinsic (related to the availability of resources, time, support system, training facilities, among other factors, and intrinsic (such as attitudes, beliefs, practices, and the resistance of the teachers).    Snoeyink and Ertmer (2001) and Keengwe, Onchwari, & Wachira (2008) also state that barriers can be classified into 'first order' and 'second order'. First order barriers include scarcity of required infrastructure, untrustworthy equipment, deficiency of technical support and other 'resource' related issues and second-order barriers comprise of both school-level factors such as organizational culture and teacher level factors such as belief about teaching and technology and willingness to change.   Afshari, Bakar, Luan, Samah, & Fooi (2009) classify them into manipulative and non-manipulative categories. Non-manipulative factors are external to the school where the school does not have any control. Some of them are age and experience of the teacher, government policy and the external support available to the schools. Manipulative factors refer to the teachers' attitude towards the use of ICT, knowledge about ICT and the skillsets of the teachers, and favorable culture of the school towards the use of ICT (Ten Brummehuis, 1995). Watson (1993) mentions a lack of access to hardware/ software, insufficient technical support, insufficient time for hands on experience with ICT, higher cost and limited availability of e-content as some of the major extrinsic barriers. Duhaney, (2001) mentions poor administrative support, lack of appropriate and quality training for teachers, lack of positive attitude of school leaders, unavailability of qualified ICT coordinators and unfavorable school culture as few of the barriers. Benzie (1995) identifies three barriers to the use of ICT in education as pedagogical, psychological and cognitive barriers. Lack of time, timely onsite support and technical support are the major barriers of ICT implementation in education.

Few evaluation studies provide critical analysis of the problems faced at the ground level. One such study by NCERT (2015) for Karnataka State shows that inadequate training facilities for the teachers, lack of differentiated programmes for subject teachers, ICT teachers, and head teachers are among the major causes of limited use of ICT at schools. At the same time it was noted that if

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[3] https://en.wikipedia.org/wiki/Information_technology_in_India
[4] International Telecommunication Unit, 2016 report

ICT is fully integrated into existing educational processes and if the state government encourages building intellectual capabilities of the teachers, ICT can become an empowering tool for the teachers.

As a part of the increased focus on ICT in education, the Western Cape Education Department (WCED South Africa) launched the Khanya initiative in 2001. The aim of the Khanya project was to empower every teacher from underprivileged schools to use technology in their classroom by 2012. Though the overall impact of the programme was not found to be very positive, the schools which possessed good leadership and motivated teachers showed positive outcomes. One of the drawbacks of the project was the difficulty experienced by teachers with the integration of ICT into curriculum delivery. Charles Buabeng-Andoh, and Yidana (2015) studied second cycle institutions in Ghana where it was found that inadequate training, no or limited school support, a low number of computers available in school, power supply issues and lack of Internet facility are major hindrances to integrating ICT in the classroom.

Few studies focus on teachers' perspectives. As the teacher's role in ICT based classroom is more challenging and demanding, teachers themselves should be convinced of the need for ICT in education. They should act as a catalyst for the use of ICT in the classroom. Most of the researchers agree that teachers' attitudes and beliefs are the major barriers as well as a predictor of successful implementation of ICT. ICT integration is influenced by various factors such as self-efficacy perceived by teachers and their attitude towards the use of computers to teach their subject which is further reinforced by their thinking process (Sang, Valcke, Braak &Tondeur, 2009). Hennessy, Harrison, and Wamakote (2010) note that teacher factors such as their perception related to the use of ICT, their motivations to use ICT as well as their attitudes towards its impact in the classroom play an important role in determining their involvement. The authors mention two important barriers such as reluctance of the teachers to take responsibility for their own learning and the lack of priority given for same. It was also found that teachers were intimidated by technology and also felt threatened by loss of control in the classrooms. Tondeur et al (2008) found that teachers who were less skilled in the use of computers had a negative attitude toward the use of computers and hence their acceptance level was also found to be low. Some teachers were reluctant to use ICT due to anxiety and lack of motivation (Duhaney, 2001).

The literature also mentions the factors affecting the perceptions and the attitude of the teachers towards the use of ICT in the classroom. Hennessy, Harrison, and Wamakote (2010) point out that these perceptions are affected by various factors such as availability of technical support, training facilities to use ICT as a different pedagogy as well as the integration of ICT in curricula. Marshall (2000) found that the scarcity of time, lack of skills and knowledge were prominent barriers to integration of ICT in the classroom. Teachers' age, education, gender, overall experience, experience with the computer, financial position were the influencing factors for the adoption of any innovation (Schiller 2003). Berner (2003) identified seven independent variables for computer use in the classroom. These are the perceived relevance of ICT, lifelong learning attitude, emotional attitude towards technology, their own belief about computer competency, technical support, administrative support, and peer support. Some other factors can be the cooperative relationship with colleagues, self-esteem, student-centric teaching, conviction about the impact of ICT, entrepreneurial nature, professional engagement, self-confidence and willingness to change. It is further noted that personal factors like gender, subject specialization (technical/ non-technical) and teaching experience play an important role in formulating teachers' beliefs about the use of ICT in the classrooms (Jimoyiannis and Komis, 2007). Studies also point out the role of gender and its impact on the attitude of the teachers. Volman, et al., (2005) noted that girls are less interested or unenthusiastic about learning ICT based skills from the secondary school itself, which makes them less enthusiastic about using computers

One of the important ways to overcome barriers related to teachers' perceptions and attitudes towards ICT is the provision of training. Many authors believe that teachers' training programmes will be very helpful in bringing about a positive change in attitudes (Kearsley & Lynch, 1992, Bingimlas, 2009). Kearsley & Lynch (1992) note that training should not be on teaching about technology but it should be on teaching with technology and teachers should have sufficient time to understand, observe, reflect and discuss how to integrate ICT in their subjects, in order to develop technology integrated pedagogical skills. Timely availability of technical support is also identified as one of the crucial support requirements (Afshari et al., 2009, Tong &Trinided, 2005, Bangkok, 2004).

The existing literature proves that though most of the schools have adopted ICT in accordance with government regulations, its impact on improving literacy or bringing about a paradigm shift in education has remained limited. One of the limiting factors is the role of teachers. The literature throws light on the perceived barriers faced by school teachers in implementing ICT in the classroom. It can be seen that there is scope for an independent study based on the Indian school environment. The existing literature also does not try to establish the connection between teachers' willingness to use ICT and the barriers perceived by teachers. The present study tries to bridge this gap.

**OBJECTIVES OF THE STUDY**

The study objectives are:

- To find out the important barriers affecting the use of ICT from school teachers' perspective and to find out whether the perceived barriers differ due to the language of delivery in the school.
- To find out the relationship between these barriers perceived by teachers and their willingness to use ICT in the classrooms in the types of schools.
- To find out the predictive value of using ICT willingly if these barriers are reduced.

**METHODOLOGY**

A questionnaire was used for school teachers with design based on the literature review and it was validated by industry experts such as educators, NGOs working in the field of education, and a statistician. The study covers the survey of 515 randomly selected teachers from the 5th to the 10th grade, from various schools in the Greater Mumbai Metropolitan Region. The surveyed teachers were from schools with different boards of education and different languages of delivery such as English or Regional language (vernacular medium).

The school teacher's questionnaire used for the survey identified 25 barriers in using ICT in the classroom. The teachers were also asked questions specific to their willingness in using ICT. These were as follows:

1) ICT is integrated into my subject because of curriculum requirement or
2) I would like to integrate ICT into my subject because I chose to do so without any compulsion.

Respondents that the responses will be used for academic research only and individual responses will not be shared anywhere.

The Rank Order method was used to find out the major barriers perceived by teachers to use of ICT in the classroom.

One of the objectives of the present study was to find out the impact of perceived barriers of the teachers on their willingness to use ICT in the classroom. As the dependent variable "willingness to use ICT" is a dichotomous variable, the study attempts to fit a Logistic Regression model to determine the predictive value for improving the willingness of teachers to use ICT in the classroom.

## DATA ANALYSIS

### Descriptive analysis

*Table 1: Age-wise Distribution of Teachers Surveyed*

| Age Group | Number | Percent |
|---|---|---|
| 21-30 years | 110 | 21% |
| 31-40 years | 164 | 32% |
| 41-50 years | 153 | 30% |
| More than 50 years | 48 | 9% |
| NR | 40 | 8% |
| Total | 515 | 100% |

As shown in Table 1 above, nearly 32 percent of the teachers surveyed were in the age group of 31 to 40 years. 30 percent of teachers were in the age group of 41 to 50 years. 21 percent were in the 21 to 30 age group. 9 percent were more than 50 years old. 8 percent of the teachers surveyed did not report their age.

*Table 2: Gender Wise Distribution of Teachers Surveyed*

| Gender | Number | Percent |
|---|---|---|
| Male | 122 | 24% |
| Female | 393 | 76% |
| Total | 515 | 100% |

As shown in Table 2 above, female teachers were in the majority among those surveyed at 76 percent, while 24 percent of the teachers were male. In India, the teaching profession in schools is mostly preferred by females.

To understand the impact of the language of delivery on willingness to use ICT in the classroom, this data was further analyzed with results shown in Table 3 below.

*Table 3: Willingness to use ICT in the classroom by the teachers by the language of delivery in the classroom*

| The language of delivery in the classroom | Total no. of teachers | Willingness | |
|---|---|---|---|
| | | Yes | No |
| English | 369 (72%) | 233 (63%) | 136 (37%) |
| Regional | 146 (28%) | 70 (48%) | 76 (52%) |
| Total | 515 (100%) | 303 (59%) | 212 (41%) |

Of the 515 respondents, 369 (72 %) were from English medium schools whereas 146 (28 %) were from regional medium schools. In English medium schools, 63% of teachers are willing to use ICT in the classroom without any compulsion from the school or curriculum. In regional medium schools, only 48% of teachers are willing to use ICT in the classroom. This finding shows that although the Government is supporting all types of schools in promoting ICT in the classrooms, English medium schools are more likely to adopt it due to the higher willingness of the teachers. This could be occurring because of the higher and better ICT content available in the English language.

Chi-Square analysis was done to find out whether the difference between English and Regional medium schools is statistically significant or not. The findings are presented in Table 4 below.

*Table 4: Chi-Square Tests*

|  | Value | df | Asymptotic Significance (2-sided) | Exact Sig. (2-sided) | Exact Sig. (1-sided) |
|---|---|---|---|---|---|
| Pearson Chi-Square | 9.977[a] | 1 | .002 |  |  |
| Continuity Correction | 9.359 | 1 | .002 |  |  |
| Likelihood Ratio | 9.883 | 1 | .002 |  |  |
| Fisher's Exact Test |  |  |  | .002 | .001 |
| Linear-by-Linear Association | 9.958 | 1 | .002 |  |  |
| N of Valid Cases | 515 |  |  |  |  |

The data in Table 4 above indicates that the difference in willingness to adopt ICT in schools is statistically significant. The questionnaire lists 25 barriers perceived by the teachers in using ICT in the classrooms. The responses of all the teachers were analyzed by calculating the weighted score. The Rank Order method gives maximum weight to the barrier mentioned as most important by the teachers and respectively less weight to other barriers based on the importance given by the teachers. The data in Tables 5 and 6 below rank these perceived barriers from highest to lowest by the teachers from English medium schools and regional medium schools respectively.

*Table 5: Rank order Analysis of Barriers perceived by the teachers in using ICT in the classroom: English medium schools:*

| Sr. No. | Barriers | Mean Score |
|---|---|---|
| 1 | Insufficient internet bandwidth or speed | 2.39 |
| 2 | Insufficient number of internet-connected computers | 2.36 |
| 3 | Lack of flexibility due to time constraint and overload of work | 2.36 |
| 4 | Insufficient number of the interactive whiteboard or any other educational software | 2.33 |
| 5 | Lack of pedagogical models on how to use ICT for learning | 2.29 |
| 6 | Inadequate space and infrastructural facilities | 2.25 |
| 7 | Lack of contents in regional languages | 2.24 |
| 8 | Inadequate training is given to the teachers for using ICT in the classroom | 2.24 |
| 9 | Restrictive timetable | 2.24 |
| 10 | The pressure to prepare students for exams and tests | 2.23 |
| 11 | Lack of contents in national (Hindi) language | 2.16 |
| 12 | Insufficient number of computers | 2.14 |
| 13 | School computers out of date or need repair | 2.12 |
| 14 | Insufficient pedagogical support for teachers | 2.09 |

| 15 | Lack of adequate contents or material for teaching | 2.08 |
|----|---|---|
| 16 | Lack of knowledge of how to use ICT effectively in teaching and learning | 2.08 |
| 17 | Lack of confidence regarding the use of ICT | 2.07 |
| 18 | Using ICT in teaching and learning not being a goal of the school | 2.04 |
| 19 | Too difficult to integrate ICT use into the curriculum | 2.01 |
| 20 | Insufficient technical support for teachers | 2.01 |
| 21 | Lack of interest of teachers | 1.99 |
| 22 | Most teachers not in favor of the use of ICT at school | 1.94 |
| 23 | Most parents not in favor of the use of ICT at school | 1.94 |
| 24 | Lack of adequate skills of teachers | 1.92 |
| 25 | No or unclear benefits of using ICT for teaching | 1.87 |

**Table 6**: *Rank order Analysis of Barriers perceived by the teachers in using ICT in the classroom: regional medium schools:*

| Sr. No. | Barriers | Mean Score |
|----|---|---|
| 1 | Lack of flexibility due to time constraint and overload of work | 3.12 |
| 2 | Insufficient number of internet-connected computers | 3.01 |
| **3** | Lack of contents in national (Hindi) language | 2.80 |
| 4 | Insufficient number of the interactive whiteboard or any other educational software | 2.77 |
| 5 | The pressure to prepare students for exams and tests | 2.73 |
| 6 | School computers out of date or need repair | 2.63 |
| 7 | Insufficient pedagogical support for teachers | 2.61 |
| 8 | Insufficient internet bandwidth or speed | 2.54 |
| 9 | Lack of contents in regional languages | 2.51 |
| 10 | Inadequate training is given to the teachers for using ICT in the classroom | 2.48 |
| 11 | Restrictive time table | 2.45 |
| 12 | Lack of adequate contents or material for teaching | 2.41 |
| 13 | Lack of pedagogical models on how to use ICT for learning | 2.41 |
| 14 | Inadequate space and infrastructural facilities | 2.41 |
| 15 | No or unclear benefit of using ICT for teaching | 2.31 |
| 16 | Insufficient number of computers | 2.17 |
| 17 | Most parents not in favor of the use of ICT at school | 2.15 |
| 18 | Lack of knowledge of how to use ICT effectively in teaching and learning | 2.07 |
| 19 | Lack of adequate skills of teachers | 1.98 |
| 20 | Most teachers not in favor of the use of ICT at school | 1.95 |
| 21 | Lack of interest of teachers | 1.94 |
| 22 | Insufficient technical support for teachers | 1.75 |
| 23 | Lack of confidence regarding the use of ICT | 1.73 |
| 24 | Too difficult to integrate ICT use into the curriculum | 1.54 |
| 25 | Using ICT in teaching and learning not being a goal of the school | 1.54 |

According to the data in Tables 5 and 6 the most important and the least important barriers affecting the use of ICT in the school from teachers' perspectives are as follows:

The **most important barriers** for English medium schools:

1. Insufficient Internet bandwidth or speed

2. Insufficient number of internet-connected computers
3. Lack of flexibility due to time constraint and overload of work
4. Insufficient number of the interactive whiteboard or any other educational software
5. Lack of pedagogical models on how to use ICT for learning

The **most important barriers** for regional medium schools:

1. Lack of flexibility due to time constraint and overload of work
2. Insufficient number of internet-connected computers
3. Lack of contents in national (Hindi) language
4. Insufficient number of interactive whiteboard or any other educational software
5. The pressure to prepare students for exams and tests

It can be seen that out of the first five barriers, three are common in both the schools. They are related to infrastructural facilities and lack of flexibility and limited time availability to implement ICT in the classroom. Lack of content in the regional language has come as the third major barrier in regional medium schools, which is not mentioned by teachers at the English medium schools.

The **least important barriers** perceived by the English medium teachers are as follows:

1. No, or unclear benefit of using ICT for teaching
2. Lack of adequate skills of teachers
3. Most parents not in favor of the use of ICT at school
4. Most teachers not in favor of the use of ICT at school
5. Lack of interest of teachers

The **least important barriers** perceived by the regional medium teacher are as follows:

1. Using ICT in teaching and learning not being a goal of the school
2. Too difficult to integrate ICT use into the curriculum
3. Lack of confidence regarding the use of ICT
4. Insufficient technical support for teachers
5. Lack of interest of teachers

It can be concluded that both groups of teachers consider that lack of interest either from the teachers or parents or inadequate skills as the least important barriers. It can be concluded that the teachers surveyed have given higher rank to the obstacles which are related to external or extrinsic factors as compared to internal or intrinsic factors. In fact, insufficient Internet bandwidth and unavailability of Internet-connected computers are found to be the most important barriers.

**Inferential analysis**

The study intended to find out to what extent the willingness of teachers to use ICT in the classroom would improve if the barriers are removed for the teachers who are teaching in a regional language school or an English medium school. The dependent variable 'willingness to use ICT in the classroom' is a dichotomous variable, so Logistic Regression is used in order to find out to what extent the willingness of teachers to use ICT in the classroom will increase after mitigating some of the major barriers. Two logistic regressions were done based on the language of delivery.

*Hypothesis I*

$H_0$ (1): There will be a statistically insignificant change in improving willingness to use ICT in the classroom where the language of delivery is English even after the barriers are reduced.

H$_1$(1): There will be a statistically significant change in improving willingness to use ICT in the classroom where the language of delivery is English even after the barriers are reduced.

Table 7 below details the classification table of logistic regression. This model is able to predict willingness to use ICT by 65.0%.

**Table 7:** *Classification table – English Medium Schools*

| Observed | | | Predicted | | |
|---|---|---|---|---|---|
| | | | Willingness to use ICT in the classroom | | Percentage Correct |
| | | | Yes | No | |
| Step 1 | Willingness to use ICT in the classroom | YES | 200 | 33 | 85.8 |
| | | No | 96 | 40 | 29.4 |
| | Overall Percentage | | | | 65.0 |

a. The cut value is .500

The classification table shows 85.8% were correctly classified as ready to use ICT in the classroom. 29.4 % are unwilling to use ICT in the classroom. Overall 65.0 % were correctly classified. The Model assumes that barriers have no impact on the willingness of teachers in using ICT in the classroom.  It could be inferred that predictors have a significant impact on the willingness of teachers to use ICT in the classroom.

Table 8 below provides details of the output of logistic regression.

**Table 8:** *The output of Logistic Regression for English Medium Schools*

| Sr. No. | Predictors of use of ICT in the classroom | B | Sig. | Exp(B) |
|---|---|---|---|---|
| 1 | Insufficient number of computers | -.155 | .380 | .747 |
| 2 | Insufficient number of internet-connected computers | -.071 | .740 | .987 |
| 3 | Insufficient internet  bandwidth or speed | .122 | .531 | 1.335 |
| 4 | Insufficient number of the interactive whiteboard or any other educational software | -.119 | .331 | .850 |
| 5 | School computers out of date or need repair | .192 | .276 | .924 |
| 6 | Lack of adequate skills of teachers | .555 | .020 | 1.301 |
| 7 | Insufficient technical support for teachers | -.081 | .768 | 1.015 |
| 8 | Insufficient pedagogical support for teachers | .100 | .678 | 1.287 |
| 9 | Lack of adequate contents or material for teaching | .217 | .310 | 1.132 |
| 10 | Lack of contents in national (Hindi) language | -.530 | .080 | .625 |
| 11 | Lack of contents in regional  language | .157 | .542 | 1.341 |
| 12 | Too difficult to integrating ICT into curriculum | .099 | .644 | .964 |
| 13 | Lack of pedagogical models on how to use ICT for learning | -.515 | .021 | .684 |
| 14 | Restrictive time table | .467 | .010 | 1.554 |

| 15 | Inadequate space and infrastructural facilities | -.241 | .156 | .887 |
|----|--------------------------------------------------|-------|------|------|
| 16 | The pressure to prepare students for exams and test | -.170 | .359 | .735 |
| 17 | Most parents not in favor of use of ICT at school | -.420 | .069 | 1.051 |
| 18 | Most teachers not in favor of use of ICT at school | .001 | .997 | .958 |
| 19 | Lack of interest of teachers | -.253 | .308 | .688 |
| 20 | No or unclear benefit of using ICT for teaching | .084 | .717 | 1.454 |
| 21 | Lack of knowledge of how to use ICT effectively in teaching and learning | .122 | .599 | .823 |
| 22 | Lack of confidence regarding the use of ICT | -.023 | .934 | .841 |
| 23 | Lack of knowledge of how to use ICT effectively in teaching and learning | .396 | .203 | 1.326 |
| 24 | Lack of flexibility in organizing ICT related classes | -.402 | .036 | .766 |
| 25 | Inadequate training is given to the teachers for using ICT in the classroom | .079 | .717 | 1.104 |
|    | Constant | .271 | .391 | 1.517 |
|    | | | | |
|    | Nagelkerke Pseudo R Square | 20.00% | | |
|    | Chi Square | 58.312, DF 25, p<0.001 | | |

The model's Chi-square at 25 degrees of freedom is 58.312 at p <0.001 (Table 8). It could be inferred from the Chi-square value that the predictors/independent variables have a significant effect on the use of ICT in the classroom.

The H-L statistics goodness of fit test value is 0.128 which is statistically insignificant. Therefore the model is a good fit.

The Wald criteria show the use of ICT in the classroom as per the teacher's perception is significantly dependent on inadequate skills of teachers, lack of pedagogical models on how to use ICT for learning, inadequate time allotted for using ICT in the classroom, and lack of flexibility in organizing ICT related classes.

### *Hypothesis II*

$H_0$ (2): There will be a statistically insignificant change in improving willingness to use ICT in the classroom where the language of delivery is regional even after the barriers are reduced.

$H_1$ (2): There will be a statistically significant change in improving willingness to use ICT in the classroom where the language of delivery is regional even after the barriers are reduced.

Table 9 below details the classification table of logistic regression. This model is able to predict willingness to use ICT by 76.0%.

***Table 9:*** *Classification table – Regional Medium Schools*

| Observed | | | Predicted | | Percentage Correct |
|---|---|---|---|---|---|
| | | | Willingness to use ICT in the classroom | | |
| | | | Yes | No | |
| Step 1 | Willingness to use ICT in the classroom | YES | 51 | 19 | 72.9 |
| | | No | 16 | 60 | 78.9 |
| | Overall Percentage | | | | 76.0 |

a. The cut value is .500

The classification table (see Table 9) shows that 72.9% were correctly classified as ready to use ICT in the classroom. Nearly 78.0% were unwilling to use ICT in the classrooms. Overall 76.0 % were correctly classified. The model assumes that barriers have no impact on the willingness of teachers to use ICT in the classroom. It could be inferred that predictors have a significant impact on the willingness of teachers to use ICT in the classroom where the language of delivery is regional. Table 10 below provides details of the output of logistic regression.

***Table 10:*** *The output of Logistic Regression- Regional Medium Schools*

| Sr. No. | Predictors of use of ICT in the classroom | B | Sig. | Exp(B) |
|---|---|---|---|---|
| 1 | Insufficient number of computers | -.450 | .129 | .638 |
| 2 | Insufficient number of internet-connected computers | .238 | .426 | 1.269 |
| 3 | Insufficient internet bandwidth or speed | .081 | .781 | 1.084 |
| 4 | Insufficient number of the interactive whiteboard or any other educational software | -.413 | .091 | .662 |
| 5 | School computers out of date or need repair | -.209 | .438 | .811 |
| 6 | Lack of adequate skills of teachers | .185 | .586 | 1.203 |
| 7 | Insufficient technical support for teachers | .239 | .516 | 1.270 |
| 8 | Insufficient pedagogical support for teachers | .452 | .228 | 1.571 |
| 9 | Lack of adequate contents or material for teaching | -.203 | .570 | .816 |
| 10 | Lack of contents in national (Hindi) language | -.336 | .431 | .715 |
| 11 | Lack of contents in regional language | .304 | .463 | 1.355 |
| 12 | Too difficult to integrating ICT into curriculum | -.076 | .810 | .927 |

| 13 | Lack of pedagogical models on how to use ICT for learning | -.282 | .327 | .754 |
|----|-----------------------------------------------------------|-------|------|------|
| 14 | Restrictive time table | .707 | .033 | 2.028 |
| 15 | Inadequate space and infrastructural facilities | .145 | .544 | 1.156 |
| 16 | The pressure to prepare students for exams and test | -.975 | .003 | .377 |
| 17 | Most parents not in favor of use of ICT at school | .541 | .198 | 1.717 |
| 18 | Most teachers not in favor of use of ICT at school | -.001 | .998 | .999 |
| 19 | Lack of interest of teachers | -.543 | .195 | .581 |
| 20 | No or unclear benefit of using ICT for teaching | 1.012 | .007 | 2.752 |
| 21 | Lack of knowledge of how to use ICT effectively in teaching and learning | -.449 | .116 | .638 |
| 22 | Lack of confidence regarding the use of ICT | -.482 | .192 | .618 |
| 23 | Lack of knowledge of how to use ICT effectively in teaching and learning | .251 | .418 | 1.286 |
| 24 | Lack of flexibility in organizing ICT related classes | -.207 | .456 | .813 |
| 25 | Inadequate training is given to the teachers for using ICT in the classroom | -.147 | .630 | .863 |
| | Constant | 1.231 | .086 | 3.425 |
| | | | | |
| | Nagelkerke Pseudo R Square | 38.3% | | |
| | Chi Square | 49.382, DF 25, p<0.001 | | |

The model's Chi-square at 25 degrees of freedom is 49.382 at p <0.001 (Table 10). It could be inferred from the Chi-square value that predictors/independent variables have a significant effect on the use of ICT in the classroom.

The H-L statistics goodness of fit test value is 0.232 which is statistically insignificant. Therefore the model is a good fit.

The Wald criteria show the use of ICT in the classroom as per the teacher's perception is significantly dependent on inadequate time allotted for using ICT in the classroom, limitation due to exam-oriented curriculum, and the unclear benefit to use of ICT for teaching.

**CONCLUSION**

The present study can draw the following inferences:

- The descriptive analysis suggests a higher proportion of willingness to implement ICT in the classrooms among English medium school teachers as compared to regional medium

school teachers. The Chi-Square test also proves that the difference between the two groups is statistically significant.

- Rank order method suggest that the most important obstacles perceived by the surveyed teachers either in English or in regional medium schools are extrinsic or external in nature. These obstacles are insufficient Internet bandwidth, insufficient Internet connected computers, and insufficient software for education, lack of sufficient time and lack of appropriate pedagogical models. One important barrier specifically relevant for regional medium schools is lack of e-content in the regional languages. The teachers have given a low ranking to other obstacles such as lack of confidence in using ICT, lack of priority given to ICT by the school and by the parents, negative attitude of the teachers and unclear benefits of ICT. It can be concluded that most of the surveyed teachers are convinced of the importance of ICT in classroom teaching and are also confident to implement same.

- The Logistic regression output for English medium schools suggest that if a few of the important barriers such as: inadequate skills of the teacher, lack of pedagogical models, inadequate time for the teachers and lack of flexibility in implementing ICT are removed, teachers' willingness to use ICT in the classroom will improve.

- The Logistic regression output for Regional medium schools suggest that if a few of the important barriers such a: inadequate time allotted for using ICT in the classroom, limitation due to exam-oriented curriculum and the unclear benefit to using ICT for teaching are removed, teachers' willingness to use ICT in the classroom will improve.

## RECOMMENDATIONS

Based on the present study and the existing research in this field, a few recommendations as follows may be appropriate.

(1) Teachers' training programmes play a very positive role not only in building computer skills and competencies but also in building positive attitudes and beliefs, which are extremely important for the successful implementation of ICT. Schools should consider ICT as an integral component of the school curriculum and encourage teachers from all faculties to undertake training and adopt ICT in their classrooms.

(2) It is recommended that schools make sufficient investment in facilitating ICT related education in terms of the number of computers, and access to the Internet. Schools can consider the use of a Public Private Partnership as an option for raising the required funds.

(3) One of the main challenges is the lack of appropriate academic content in regional languages. In recent years a number of social organizations such as the Pratham Info-Tech Foundation, and the Kotak Education Foundation, have been actively working in the field of digital education in vernacular languages. It is recommended that schools consider collaborating with such organizations to create and adopt the content.

(4) It is also recommended that state governments should encourage the development of an educational eco-system to adopt ICT in education by subsidizing and organizing teachers' training programmes, subsidizing computer infrastructure and integrating ICT further in the school curriculum.

(5) The effective implementation of ICT in the classroom will also require more flexibility for teachers in terms of content management, time management and evaluation of the students. For effective implementation of ICT, the overemphasis on exam-oriented curriculum also needs to be reduced and teaching pedagogy needs to be learner-centric.

## LIMITATIONS AND FUTURE SCOPE OF THE STUDY

This study limits itself to the Greater Mumbai Metropolitan region which is one of the advanced and developed regions in Maharashtra and in India. Though most of the schools covered in the study represent a good mix of all the socio-economic classes, it is possible that teachers surveyed in the study are more aware and are competent to use ICT in the classrooms as compared to the teachers working in rural areas or in remote schools. It will be interesting to do a similar study in a different context to see if the perceptions of the teachers will be different or the same.

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