Demography India
Vol. 51, No. 1 (2022), pp.78-92 ISSN 0970-454X

# Socio-Economic Determinants of Digital Divide in India

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**Abstract:** The dependency on information is one of the main features of the fourth industrial revolution. With rapid growth of information technology, the internet emerged as a critical medium for economic and social exchanges. With this, access to ICT is recognised as basic rights of every individual for influential and efficient participation in socio-economic and political processes. The research on the digital divide in India is quite recent and started gaining attention after government's increasing interest in digital inclusion. The present article analyses the two dimensions (physical access and skill access) of digital inclusion in India. Further, how these two kinds of access to digital technology (computer and internet) is associated with gender, space, caste, economic class and religious groups. The study used the second round of nationally represented data collected by the Indian Human Development Survey (IHDS-2, 2011-12) for quantitative analysis. The findings reveal that there is a huge gap in computer knowledge, computer & internet use and English language skill across previously persisting social and economic marginalities in India. Digital knowledge & use of internet and English comprehensive ability are substantially low in India among SC, ST caste groups, Muslims, Female, married, illiterate and rural resident - after controlling for other variables.

**Keywords:** ICT Knowledge, Digital divide, Socio-economic Marginalisation, Physical and Skill access, Inequality in access

## Introduction

The diffusion of Information technology particularly internet has seen as a crucial factor in all spectrum of development at individual and global level. Considering the fact, in September 2015 United Nations general assembly acknowledged that the spread of ICT plays vital role in achieving education, gender equality, infrastructure and partnership (Broadband Commission, 2017). Likewise, sustainable development goals (SDGs) 9 C is committed to increase affordable universal access to the Internet by 2020 in less developed countries (UN, 2017). While the Internet and allied technologies have seen as an equalizing tool for production, distribution of resources and development, the uneven distribution of the medium itself across social and economic groups emerged as a critical challenge. There is big chunk of population deprived of access to this new technology, hence, it's important to study the factors determining access to internet technology.

With the rapid growth of the internet as a medium for critical economic and social information exchanges, access to ICT is the basic right of every individual. This helps in individual's effective participation in socio-economic and political processes - be it rural or urban, rich or poor, male or female developing or developed economy (Castells, 2000). Van Dijk, (1999) defined access in

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broader context where access to information is an individual ability of transforming the information into opportunities and use it significantly for individual development (Dijk, 1999; Dijk, 2003)

In 2015, Government of India launched a Digital India Programme with a vision to transform the country into a digitally empowered society and knowledge economy. The programme aims to bring digital empowerment of citizens through promoting universal digital literacy, universally accessible digital resources, and availability of digital content in regional language. Keeping in mind country's commitment for digital inclusion, the present study aims to examine the role of socio-economic characteristics on individual's computer knowledge (digital literacy), computer use and use of internet either in computer or mobile (digital access).

Much has been debated and discussed about the theoretical appropriateness of digital divide and digital inclusion. The initial popular discourse on ICT and society begins with the dichotomy between those who have access to the internet in contrast to those who are deprived of it. This dichotomous classification of access has been termed as *digital divide* (Dewan, 2005; World Bank , 2016). The divide of the population on the basis of access to ICT across socio-economic and geographical locations has been termed as the *first-order divide*. Later on, this digital divide has been conceptualized considering wider factors associated with access to digital technology i.e. physical, human, social and economic. This wider approach of defining digital divide termed as second order divide ( Warschauer, 2003; Sanjeev Dewan, 2005; Min, 2010). Hence, later on ICT exclusion started gaining attention within the framework of social exclusion. For instance, education enables people with the skill to adapt, create and maximise the utilization of ICT, likewise access to education is interplay of gender roles, socio-economic locations of an individual (Wilson, 2003; Kennedy, 2003; Quibria, 2003; Rashid, 2016). Further, physical, digital, human and social resources are contributors to effective access to ICT, on the other hand, each resource itself is a result of effective use of ICT-hence it's a two-way relationship (Warschauer, 2003). Previous studies emphasized illiteracy and high rate of poverty as two main barriers in access to Internet; as most of the internet content is in English language, combined with less or almost no content available in local languages. Given the fact that the majority of the world's population still illiterate, merely the spread of digital technology has less trickle-down effects for the overall development of the population. For instance, looking at the Indian picture, only 12% people speaks English, nearly half of the population speaks Hindi (41%), another large group speaks Bengali (8.11%), Tamil (6.32), Telugu (7.19%), Kannada (3.91%) and Marathi (7.45), however, English has emerged as dominant language of all internet content in India (RGI, 2001).

Technologies are not free from social, economic and political institutions of a system, rather need to be analyzed within a given structure. The formation, evolution and impact of technologies are highly affected by the political and economic structures, societal values and codes. On the other hand,

perception, adoption, and efficient use of technology is influenced by institutionalised way of thinking and practicing (Agre, 2000). Social, economic and political institutions shape the functions of technology and technology shapes the functions of institutions.

Digitisation is a recent phenomenon, the research on digital inclusion and seclusion simultaneously, received great attention in developing countries for assisting policy formulation- as a tool to address different forms of social-economic inequalities and marginalisation. Along with macro factors such as economic wealth of country, institutional and legal environment play a critical role in differential regional usage of internet (Hargittai, 1999). Further, it also brings into consideration to understand the diffusion and distribution of this new information technology across social and economic intersections at an individual level. The previous research has established two-way relationship between adoption of ICT and individual factors, where the use of ICT depends upon individual factors (education, employment, health care) and vise-versa (Wilson, 2003; Warschauer, 2003 Haenssagen, 2018). Moreover, facts highlight that there are some people who are more likely to use the internet than others. For instance, teenagers play a crucial role to motivate the family to purchase a home computer and are the heaviest users of computer and internet in American households (Kraut, 1996; ITU, 2016). Further, education level helps in exploiting the internet and helps to overcome the skill barrier in the adoption of internet use. Previous literature highlighted that there is overlapping pattern in literacy divide and digital divide particularly in developing countries (Warschauer, 2003; Psacharopoulos, 2004). Hence, basic literacy is essential to acquire ICT literacy. Similarly, social and ethnic identity like race, Gender, Caste are the important determinants of access and use of the internet (DiMaggio & Hargittai, 2001; Bimber, 2000; Kennedy, 2003). For instance, in US Black, rural and female population significantly less likely to own a home computer than White, male and urban Population (Wilson, 2003; Kraut, 1996; Kim, 2011). Another longitudinal study conducted in the UK highlighted that lone parents, female, uneducated and poor people are the last to adopt internet technology (Anderson, 2011). Another study in India highlighted that education, poverty, and low electrification remains the main determinants of low internet access in India (Singh, 2016). Apart from unskilled human resource, the lack of technological infrastructure (low tele-density, low electrification, internet provider) is another challenge in efforts to shrink digital divides in country (Rao, 2005). Further, Warschauer (2003) found that social relations are critically linked with the decision making of access to a computer, learning skills. For instance, the installation of a computer in a household includes various phases including a decision of buying, installing the hardware and running software, in same process support of a community and social relations is vital. Similarly, ICT further involves critically in managing the social relations- internet invariably used by an individual to communicate and keep connected to acquaints, relatives and also expanding new social relations (Collier, 1998; Lin, 2002; Warschauer, 2003). Hence, the supportive social

environment and community and neighborhood perception and action towards technology encourage decision of purchasing a computer at home (Stanley, 2003).

Present study aims to understand the effects of socio-economic factors on computer literacy and use of internet (either in mobile or computer). Further, in this study I examined whether *access* to the internet (through mobile or computer) and *knowledge* of computer is associated with gender, place of residence, caste, class, and religion. This may help to understand the deprived population in the process of digitisation and issues need to be addressed for attaining universal access of internet and computer in India.

**Data and Methods**

To meet the above stated objectives the present study uses the second round of "Indian Human Development Survey (IHDS II-2011-12)". The survey covers a wide range of household and individual features on a various dimension of social, economic, political, spatial and technological aspects. Specifically, the survey (second round, IHDS-II) questionnaire inquires for key information from respondents on their knowledge and access to computer and internet (either in computers or mobiles). The present study has used this information from the nationally represented sample survey (IHDS II-2011-12) to analyze the extent of digital divide in India. Precisely, the section of "mass-media" in the questionnaire was designed to access the extent to which citizens of India has *knowledge* and *use* of a computer along with access to internet either in computer or mobile.

The study uses survey data (IHDS II) with a sample size of 102703 individuals for studying the digital divide in India for *knowledge* and *use* of computer and Internet. Likewise, the article uses the sample size of around 50000 individuals in India for usage of mobile Internet and Internet either on mobile or computer (see table 1).

In this study digital literacy has been defined as individual's ability to use digital artifacts (computer/mobile) and evaluate information available on digital platforms. The study the *computer knowledge* has been taken as proxy for *digital literacy*. Similarly, the *use of computer and internet* (either in computer or mobile) has been taken as proxy for *digital access*. The *English comprehensive ability* has been also examined as proxy for *digital literacy*. The operational definitions of these variables are explained below:

***Measurements***

*Dependent Variables:* The study has used five dependent variables: Computer Knowledge, Computer Use and Internet in Computer, Internet in Mobile, and Internet either in Computer or Mobile. For all the variables the response was coded 0 for "No" and 1 for "Yes".

*Independent Variables:* The study has used fourteen independent variables to analyse the determinants of *access* to internet and *knowledge* of computer in India. Among all, Religion, Caste, Gender, Education, Parent's Education, Age, Marital status and Income Group was included in the study. Further, the study also intended to explore the association of determinants like Job status, English Proficiency, Mass Media (exposure to) Female, Mass Media (exposure to) Male, and Group Membership with dependent variables. For estimation, the response for Job security status was coded as 0 for "Permanent", 1 for "Contract", 2 for "Casual", 3 for "Student". The variable for English Proficiency was coded as 0 for "Fluent", 1 for "Little", 2 for "None". The variable "Mass Media Female" was constructed to indicate the exposure of women towards Mass Media such as radio, newspaper or television; where 0 indicates "Never", 1 indicates "Sometimes", 2 for "Regular". The variable "Mass Media Male" was constructed in a similar manner. The variable Group Membership (GrMM) indicates the membership association or affiliation of the respondent with development, social & political, and professional groups; 0 indicates for "Development groups" such as SHG, NGO or Co-operatives; 1 indicates for "Social & Political" such as religious group, caste association, political party; 2 indicates for "Professional Groups" such as sports group, employee union or business group, Rotary club or others.

For analysis, the present study has used logistic regression for respective dependent variables with a set of independent variables. For interpretation, we have been stuck to *odds-ratio*, which will give us a constant likelihood of X on Y.

Table.1 Summary Statistics of Indian Human Development Survey, 2nd (IHDS II), India, 2011-12

| Variables | Obs | Mean | Std. Dev | Min | Max |
|---|---|---|---|---|---|
| **Dependent Variables** | | | | | |
| Computer Knowledge | 204424 | 0.24 | 0.43 | 0 | 1 |
| Computer Use | 204568 | 0.08 | 0.27 | 0 | 1 |
| Internet on Computer | 204569 | 0.06 | 0.23 | 0 | 1 |
| Internet on Mobile | 88233 | 0.12 | 0.33 | 0 | 1 |
| Internet (either on Mobile or Comp.) | 90849 | 0.17 | 0.37 | 0 | 1 |
| **Independent Variables** | | | | | |
| Group Membership | 202704 | 1.23 | 1.17 | 0 | 3 |
| Religion | 204569 | 0.26 | 0.57 | 0 | 2 |
| Caste | 204115 | 1.13 | 0.93 | 0 | 3 |
| Gender | 204568 | 0.50 | 0.50 | 0 | 1 |
| Sector | 204569 | 0.66 | 0.47 | 0 | 1 |
| Place of Residence | 204569 | 1.59 | 0.62 | 0 | 2 |
| Age | 204569 | 1.39 | 1.27 | 0 | 3 |
| Marital | 204565 | 0.58 | 0.61 | 0 | 2 |
| Job Status | 108345 | 2.29 | 0.92 | 0 | 3 |
| English Proficiency | 204362 | 1.68 | 0.57 | 0 | 2 |
| Education | 204336 | 1.52 | 0.63 | 0 | 2 |
| Parent Education | 202898 | 1.34 | 0.51 | 0 | 2 |
| Mass Media Female | 202497 | 1.41 | 0.77 | 0 | 2 |
| Mass Media Male | 199219 | 1.40 | 0.72 | 0 | 2 |
| Income Group | 204569 | 3.00 | 1.41 | 1 | 5 |

*Source:* 2nd Indian Human Development Survey (IHDS) II

## Results

*Digital Literacy and Use of Computer*

Lack of knowledge to handle a computer is one of the main barriers in use of internet. The results of logistic regression analysis of computer knowledge are presented in table highlights that income, religion, caste, age marital status, English ability, education and job status are significantly associated with computer knowledge (see table 2). The probability of knowing computer and using computer increases with the rise in income status of a family. The richest people are 3.7 times more likely to possess computer knowledge and 2.3 times more likely to use computer relative to the lowest quintile income group. Moreover, the social location of individual i.e. religion and caste are significantly associated with computer knowledge and usage. For instance, relative to Hindu, Muslim are 20% less likely to have computer knowledge and 25% less likely to use a computer. While individuals of 'Other' religion have almost 50% more chances to know and use computer compared to Hindu. Caste being crucial determinants of social access to various resources has a significant bearing on computer knowledge and use. Hence, social underprivileged sections in society are deprived of knowledge and usage of technologies. For instance, in terms of computer knowledge and usage General caste are more privileged than OBCs (other backward castes), SCs (schedule castes) and STs (schedule tribes) caste groups. Moreover, STs (38 percent), SCs (23 percent) and OBCs (15 percent) are far less likely to have computer knowledge and usage than General Caste. The age is another significant predictor of computer knowledge and uses, a probability of computer knowledge increases with age, although computer use decrease with increasing age. The likelihood of using computer decrease by 42% for 40+ age group relative to 19 and below age group, which signifies youngsters are more likely to use computer technology, however less likely to have computer knowledge than adults. Marital status is another critical factor, which determines the time to use and need of using a particular technology. Results highlight that being unmarried is significantly associated with computer knowledge and usage. Computer knowledge and usage are higher among unmarried individuals relative to married by 40 and 58 percent, respectively.

The content of a computer is mainly in English, as a consequence education and English ability are directly associated with usage and knowledge of computer. The likelihood of computer knowledge and usage are 76% and 89% (respectively) lower for individuals who don't have any understanding of the English language relative to those who are fluent in the English language. Likewise, there is a significant difference in computer knowledge and usage between those who have little understanding of English than those who don't understand the language - 33% in knowledge and 39% in usage, respectively. Moreover, an increasing level of education is associated with higher knowledge and usage of a computer. The likelihood of knowing and using a computer is 57% and 47% lower for illiterate people relative to individuals who are highly educated. Household environment and characteristics are significantly associated with information and technology adaptation. Thus,

individuals whose parents are highly educated are 41% more likely to possess knowledge of a computer than to those with secondary education. For computer usage, this difference is of 30%. Nature of employment substantially affect exposure to ICT, also students are at the forefront to indulge in a techno-savvy lifestyle. In this regard, the internet is not an exception. Students are 2.2 times more likely to have computer knowledge and have 43 percent higher chances of computer usage in contrast to individuals employed in permanent jobs. Furthermore, a likelihood of knowing and using the computer for individuals employed in causal basis is lower by 20 and 55 percent relative to those who are permanently employed.

The exposure to mass media keeps individual updated about various government and non-government schemes to promote ICT knowledge and its implications. The results highlights that the effect of mass media on computer knowledge and usage are higher for women compared to men. For instance, women who regularly exposed to at least one medium of media are 2.13 times more likely to have computer knowledge and usage compared to women never exposed to any medium of media. Similarly, in context of a male the likelihood of computer knowledge (is 96 percent) and usage (is 36%) higher for a male having regular exposure to at least one medium of mass media relative to male never exposed to any medium. In the literature, the role of social capital in the adoption of technology and techno-savvy behavior have been well discussed.

Our results of logistic regression highlight that likelihood/chances of computer knowledge and usage is higher for individuals who are member of development, social & political and professional groups in contrast to those who are not a member of any group. Though, memberships of a developmental group are not statistically significant for computer knowledge. Moreover, among development, social & political and professional groups; professional group plays a more influential role in computer knowledge and usage. Those who are a member of professional groups are 56 percent more likely to have computer knowledge than who are not a member of any group.

Table 2: Odds ratio for computer knowledge, computer use and internet use by background characteristics of individual, India, 2011-12

| | Computer Knowledge | | | Computer Use | | |
|---|---|---|---|---|---|---|
| **Covariates** | **Odds Ratio** | **95% CI** | | **Odds Ratio** | **95% CI** | |
| **Religion** | | | | | | |
| Hindu ® | | | | | | |
| Muslim | 0.80** | 0.76 | 0.86 | 0.75*** | 0.69 | 0.81 |
| Others | 1.47*** | 1.37 | 1.57 | 1.56*** | 1.43 | 1.70 |
| **Social Group Membership** | | | | | | |
| No Membership ® | | | | | | |
| Development | 1.02 | 0.95 | 1.09 | 0.88** | 0.80 | 0.98 |
| Social & Political | 1.19*** | 1.15 | 1.25 | 1.04 | 0.98 | 1.10 |
| Professional | 1.56*** | 1.49 | 1.64 | 1.24*** | 1.16 | 1.32 |
| **Age** | | | | | | |
| Below 19 ® | | | | | | |
| 20-29 | 1.72*** | 1.59 | 1.86 | 1.49*** | 1.37 | 1.63 |
| 30-39 | 1.84*** | 1.63 | 2.07 | 0.94 | 0.81 | 1.10 |
| <40 | 3.61*** | 3.22 | 4.04 | 0.43*** | 0.36 | 0.50 |
| **Marital Status** | | | | | | |
| Married ® | | | | | | |
| Unmarried | 1.40*** | 1.29 | 1.53 | 1.59*** | 1.42 | 1.78 |
| Div/Widow | 1.09 | 0.96 | 1.25 | 0.85 | 0.62 | 1.18 |
| **Job Status** | | | | | | |
| Permanent ® | | | | | | |
| Contract | 0.98 | 0.88 | 1.11 | 0.98 | 0.80 | 1.09 |
| Casual | 0.81*** | 0.76 | 0.86 | 0.45*** | 0.41 | 0.51 |
| Student | 2.27*** | 2.06 | 2.50 | 1.44*** | 1.28 | 1.61 |
| **English Ability** | | | | | | |
| Fluent ® | | | | | | |
| Little | 0.57*** | 0.53 | 0.62 | 0.49*** | 0.47 | 0.54 |
| None | 0.25*** | 0.23 | 0.27 | 0.108*** | 0.10 | 0.12 |
| **Education** | | | | | | |
| Highly Educated ® | | | | | | |
| Illiterate | 0.28*** | 0.25 | 0.30 | 0.01*** | 0.01 | 0.02 |
| Up to HS | 0.38*** | 0.36 | 0.42 | 0.23*** | 0.21 | 0.24 |
| Parents's Education | | | | | | |
| Highly Educated ® | | | | | | |
| Illiterate | 0.43*** | 0.38 | 0.49 | 0.53*** | 0.46 | 0.60 |
| Up to HS | 0.59*** | 0.52 | 0.67 | 0.72*** | 0.63 | 0.81 |
| **Caste** | | | | | | |
| Brahmin ® | | | | | | |
| OBC | 0.86*** | 0.82 | 0.90 | 0.84*** | 0.79 | 0.88 |
| SC | 0.77*** | 0.74 | 0.82 | 0.76*** | 0.70 | 0.82 |
| ST & Other | 0.63*** | 0.58 | 0.67 | 0.64*** | 0.55 | 0.69 |
| **Mass Media for Female** | | | | | | |
| Never ® | | | | | | |
| Sometimes | 1.83*** | 1.64 | 2.04 | 2.11*** | 1.76 | 2.53 |
| Regular | 2.13*** | 1.91 | 2.38 | 2.57*** | 2.15 | 3.09 |
| **Mass Media for Male** | | | | | | |
| Never ® | | | | | | |
| Sometimes | 1.19*** | 1.07 | 1.35 | 0.97 | 0.80 | 1.17 |
| Regular | 1.96*** | 1.74 | 2.21 | 1.36*** | 1.13 | 1.65 |
| **Gender** | | | | | | |
| Male ® | | | | | | |
| Female | 1.01 | 0.97 | 1.04 | 0.65*** | 0.62 | 0.69 |
| **Place of Residence** | | | | | | |
| Metro Urban ® | | | | | | |
| Other Urban | 1.14*** | 1.07 | 1.21 | 1.154*** | 1.07 | 1.25 |
| Village | 1.07 | 0.43 | 2.66 | 0.72 | 0.16 | 3.31 |
| **Income Group** | | | | | | |
| Poorest ® | | | | | | |
| Poor | 1.16*** | 1.08 | 1.24 | 1.00 | 0.90 | 1.12 |
| Middle | 1.36*** | 1.27 | 1.45 | 1.15*** | 1.04 | 1.28 |
| Rich | 2.07*** | 1.94 | 2.21 | 1.59*** | 1.44 | 1.76 |
| Richest | 3.79*** | 3.55 | 4.05 | 2.38*** | 2.16 | 2.62 |

***Table 2: Continuing…….***

| Covariates | Internet in Computer | | | Internet in Mobile | | | Internet (Computer or Mobile) | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Odds Ratio** | **95% CI** | | **Odds Ratio** | **95% CI** | | **Odds Ratio** | **95% CI** | |
| **Religion** | | | | | | | | | |
| Hindu ® | | | | | | | | | |
| Muslim | 0.74*** | 0.67 | 0.82 | 0.86*** | 0.77 | 0.95 | 0.82*** | 0.74 | 0.89 |
| Others | 1.32*** | 1.19 | 1.46 | 1.25*** | 1.12 | 1.39 | 1.35*** | 1.23 | 1.50 |
| **Social Group Membership** | | | | | | | | | |
| No Membership ® | | | | | | | | | |
| Development | 0.88* | 0.78 | 1.00 | 1.12 | 0.98 | 1.27 | 1.07 | 0.96 | 1.21 |
| Social & Political | 1.01 | 0.95 | 1.09 | 0.93 | 0.87 | 1.01 | 0.97 | 0.91 | 1.05 |
| Professional | 1.15*** | 1.07 | 1.24 | 0.95 | 0.88 | 1.03 | 1.16*** | 1.08 | 1.25 |
| **Age** | | | | | | | | | |
| Below 19 ® | | | | | | | | | |
| 20-29 | 1.65*** | 1.50 | 1.82 | 1.74*** | 1.59 | 1.93 | 1.61*** | 1.47 | 1.77 |
| 30-39 | 1.02 | 0.86 | 1.20 | 1.12 | 0.95 | 1.31 | 1.03 | 0.88 | 1.20 |
| <40 | 0.45*** | 0.38 | 0.53 | 0.52*** | 0.44 | 0.62 | 0.46*** | 0.40 | 0.55 |
| **Marital Status** | | | | | | | | | |
| Married ® | | | | | | | | | |
| Unmarried | 1.53*** | 1.35 | 1.73 | 1.75*** | 1.56 | 1.96 | 1.72*** | 1.53 | 1.91 |
| Div/Widow | 0.92 | 0.64 | 1.31 | 1.37 | 1.00 | 1.89 | 1.22 | 0.90 | 1.66 |
| **Job Status** | | | | | | | | | |
| Permanent ® | | | | | | | | | |
| Contract | 0.97 | 0.82 | 1.14 | 0.90 | 0.77 | 1.07 | 1.01 | 0.86 | 1.17 |
| Casual | 0.47*** | 0.43 | 0.54 | 0.63*** | 0.57 | 0.70 | 0.57*** | 0.52 | 0.64 |
| Student | 1.22 | 1.08 | 1.38 | 1.37*** | 1.22 | 1.55 | 1.52*** | 1.35 | 1.71 |
| **English Ability** | | | | | | | | | |
| Fluent ® | | | | | | | | | |
| Little | 0.45*** | 0.42 | 0.48 | 0.49*** | 0.46 | 0.54 | 0.43*** | 0.40 | 0.47 |
| None | 0.09*** | 0.08 | 0.10 | 0.16*** | 0.15 | 0.18 | 0.13*** | 0.12 | 0.14 |
| **Education** | | | | | | | | | |
| Highly Educated ® | | | | | | | | | |
| Illiterate | 0.01*** | 0.01 | 0.02 | 0.09*** | 0.06 | 0.13 | 0.07*** | 0.05 | 0.10 |
| Up to HS | 0.22*** | 0.20 | 0.24 | 0.36*** | 0.33 | 0.39 | 0.26*** | 0.24 | 0.28 |
| **Parent's Education** | | | | | | | | | |
| Highly Educated ® | | | | | | | | | |
| Illiterate | 0.51*** | 0.45 | 0.59 | 0.66*** | 0.57 | 0.77 | 0.53*** | 0.46 | 0.62 |
| Up to HS | 0.69*** | 0.61 | 0.80 | 0.86* | 0.74 | 0.99 | 0.76*** | 0.66 | 0.87 |
| **Caste** | | | | | | | | | |
| Brahmin ® | | | | | | | | | |
| OBC | 0.83*** | 0.77 | 0.88 | 0.82*** | 0.76 | 0.88 | 0.92*** | 0.85 | 0.97 |
| SC | 0.79*** | 0.73 | 0.86 | 0.80*** | 0.73 | 0.87 | 0.83*** | 0.77 | 0.90 |
| ST & Other | 0.63*** | 0.55 | 0.72 | 0.71*** | 0.62 | 0.82 | 0.71*** | 0.63 | 0.80 |
| **Mass Media for Female** | | | | | | | | | |
| Never ® | | | | | | | | | |
| Sometimes | 1.86*** | 1.48 | 2.34 | 1.45*** | 1.18 | 1.79 | 1.47*** | 1.22 | 1.78 |
| Regular | 2.37*** | 1.89 | 2.98 | 1.55*** | 1.25 | 1.91 | 1.61*** | 1.34 | 1.95 |
| **Mass Media for Male** | | | | | | | | | |
| Never ® | | | | | | | | | |
| Sometimes | 1.08 | 0.85 | 1.38 | 1.24 | 0.98 | 1.58 | 1.10 | 0.90 | 1.35 |
| Regular | 1.43*** | 1.13 | 1.83 | 1.68*** | 1.28 | 2.09 | 1.36*** | 1.10 | 1.68 |
| **Gender** | | | | | | | | | |
| Male ® | | | | | | | | | |
| Female | 0.52*** | 0.49 | 0.56 | 0.46*** | 0.43 | 0.50 | 0.50*** | 0.47 | 0.54 |
| **Place of Residence** | | | | | | | | | |
| Metro Urban ® | | | | | | | | | |
| Other Urban | 0.85*** | 0.78 | 0.93 | 0.89 | 0.82 | 0.97 | 0.78*** | 0.72 | 0.85 |
| Village | 0.26 | 0.06 | 1.22 | 1.34 | 0.00 | . | 0.26 | 0.05 | 1.41 |
| **Income Group** | | | | | | | | | |
| Poorest ® | | | | | | | | | |
| Poor | 0.93 | 0.82 | 1.08 | 1.02 | 0.89 | 1.18 | 0.95 | 0.84 | 1.08 |
| Middle | 1.09 | 0.96 | 1.25 | 1.15 | 1.01 | 1.32 | 1.08 | 0.97 | 1.22 |
| Rich | 1.52*** | 1.34 | 1.72 | 1.58*** | 1.40 | 1.81 | 1.55*** | 1.38 | 1.73 |
| Richest | 2.35*** | 2.08 | 2.65 | 2.37*** | 2.09 | 2.69 | 2.44*** | 2.19 | 2.74 |

*Note: Odds ratios are adjusted for socio-economic co-variates.*
*Level of significance *=p<0.10, **=P<0.05, ***=P<0.001*

*Socio-Economic Determinants of Internet Use*

We have constructed three variables for inquiring the internet user divide; i) use of internet in a computer, ii) use of internet in mobile, iii) use of internet either in computer or mobile. The odds of using the internet are given in the following table 2. The results indicate the digital exclusion of individuals with respect to their level of income groups, gender, religion, caste, age, English ability, education level, education level of parents, mass media exposure. The finding suggests significant association and variation in internet usage among different groups. The likelihood of internet usage increase with income level, though only rich and richest income categories are statistically significant. The individuals belonging to richest income groups are two times more likely to use internet relative to the poorest income group. Findings suggest that female are 50 percent less likely to use the internet in mobile or computer relative to a male counterpart. Moreover, compared to Hindu, Muslim are 20 percent less likely to use the internet in mobile or computer, however, individuals belonging to other caste group have 35 percent higher likelihood of using internet relative to Hindu.

Among the caste groups, STs are least likely (30 percent relative to Brahmin) to use internet compared to General Caste, OBC and SCs. Moreover, STs are 37 percent less likely to use the internet on a computer. Furthermore, individuals from the age group of 40+ are 54 percent less likely to use the internet either in mobile or computer. Most of the internet content is in the English language, so education level of an individual and proficiency in the English language becomes a crucial determinant for computer knowledge, usage and internet use. The likelihood of using the internet (in mobile or computer) decreases by 87 percent for the people who don't have any understanding of the English, 56 percent for those who have little understanding of the English language, relative to those who are fluent in the English language. Similarly, the likelihood of using the internet is 93% lower for illiterate and 74 % for the secondary educated people compared to the highly educated individuals. Further, children of illiterate parents are least likely to use the internet compared to parents with secondary and higher education level. This educational divide gets wider in case of using the internet in a computer, as children of illiterate parents are 49 percent less likely to use and children of secondary educated parents are 31 percent less likely to use the internet in computers, in contrast to children of highly educated parents.

Further, students and individual members of a professional organization are more likely to use the internet than a permanent employee or people who are not a member of any group. The likelihood of using the internet is higher for both male and female who at least use one means of mass media (newspaper, radio or television) regularly. In general, the chances of using the internet increases with exposure to mass media; though, the impact of mass media on internet usage is higher for female (61 percent) than male (36 percent).

The findings suggest that wide inequality exists across socio-economic groups in *computer knowledge*, computer use and *internet use*. Hence, the study establishes the multiple digital divides and exclusion among socio-economic identifiable groups in India. One of the common and eminent factors (but certainly not the only one), which explains this digital exclusion and divides is the differences in *skill* to use computer or internet. Most of the programing language as well as the *content* of the internet and computer is English dominating (Warschauer, 2003). Previous studies also highlighted "content & language of internet" as a barrier in use (Singh, 2010). Considering the fact that ability to understand English contributes and enhance the *skill* of an individual to use the internet. The study further tries to examine the determinants of the English language ability across socio-economic groups. The odds ratio of knowing the English language is 1.9 times higher for individuals belonging from richest income (highest quintile) group than to individuals belonging from poorest (lowest quintile) group (see table 3). In other words, keeping individuals of the poorest group as a base the findings suggest that the likelihood of English ability increases with the increasing level of income.

Furthermore, compared to male, females are 15 percent less likely to understand the English language in India. Social deprivation often leads towards deprivation in many ways like education, income and other opportunities in their life course. Across the religious groups, 'Muslims' are 23 percent less likely to understand English than a Hindu, while individuals from 'Other' religious group are 62 percent more likely to have an understanding of English compared to 'Hindu'.

Along caste lines, Brahmins have the highest understanding of English, which significantly declines by 33 percent for SCs, and 35 percent for STs. Likewise, the likeliness of understanding the English language is 23 percent higher for unmarried individuals compared to married ones. Similarly, there is a strong association between understanding English language with a higher level of education. An individual with secondary level education is 89 percent less likely to have an English understanding in comparison to highly educated individuals. The differences get wider between highly educated and illiterate people (by 98%).

Parental education level is another factor, which not only affects the use of the internet but enhances the *skill* among children. Thus, the likeliness of English ability is 35 percent lower for children's whose parents are secondary educated compared to those who are highly educated. While for children's whose parents are illiterate are 50 percent less likely to understand English than those parents who are highly educated. While looking at English ability across job status (including students) indicates that students are more likely to possess proficiency in English than an employer with permanent, contract, or casual job status. Similarly, among 'Group Membership' individuals who

have a membership with social political and professional group are more likely to possess proficiency in English than those who don't have any membership or are a part of development groups (in the form of SHG, NGO, etc.). Among socio-environmental variables, exposure to mass-media positively associated with English ability for both male and female. Individuals who are regularly exposed to at least one medium of media are 1.4 times more likely to have English ability. Likewise, when compared odds of English ability is higher for individuals residing in Non-metro urban and lower for a village.

Table 3: Odd ratio for English ability by background characteristics of individual, India, 2011-12

| Covariates | Odds Ratio | | Odds Ratio |
|---|---|---|---|
| **Income Group** | | **Parents Education** | |
| Poorest® | | Highly Educated ® | |
| Poor | 0.9416792** | Illiterate | 0.508165*** |
| Middle | 1.029939 | Up to HS | 0.6408159*** |
| Rich | 1.297898*** | **Job Status** | |
| Richest | 1.900063*** | Permanent ® | |
| **Gender** | | Contract | 0.6601448*** |
| Male ® | | Casual | 0.4094169*** |
| Female | 0.8575935*** | Student | 1.483635*** |
| **Religion** | | **Group Membership** | |
| Hindu ® | | No Membership ® | |
| Muslim | 0.7657182*** | Development | 0.9822486 |
| Others | 1.627816*** | Social Political | 1.316727*** |
| **Caste** | | Professional | 1.415896*** |
| Brahmin ® | | **Mass Media Exposure** | |
| OBC | 0.8296068*** | Never ® | |
| SC | 0.673043*** | Sometimes | 1.138789*** |
| ST& Other | 0.6447947*** | Regular | 1.407301*** |
| **Age** | | **Mass Media Male** | |
| Below 19 ® | | Never ® | |
| 20-29 | 2.419503*** | Sometimes | 1.231927*** |
| 30-39 | 2.317845*** | Regular | 1.433547*** |
| <40 | 1.690404*** | **Area of Residence** | |
| **Marital Status** | | Metro Urban ® | |
| Married ® | | Other Urban | 1.3747*** |
| Unmarried | 1.23277*** | Village | 0.871769*** |
| Div/Widow | 0.8113328*** | | |
| **Education** | | | |
| Highly Educated ® | | | |
| Illiterate | 0.0130668*** | | |
| Up to HS | 0.119584*** | | |

*Note: Odds ratios are adjusted for socio-economic co-variates.*
*Level of significance *=p<0.10, **=P<0.05, ***=P<0.001*

## Discussion

The social determinants of digital divide in India is not sufficiently explored till date. The present study is a scholarly attempt to enquire and identify individual's characteristics that contribute in multiple digital divides (inequality in *access* to ICT and *skill* to use ICT) using nationally representative sample survey (IHDS[3] I & II) data. The study advocates that access to ICT in India is unequal across socio-economic, gender, age, religion and caste lines. Further, multiple digital divides remain a vital question of the 21st century's information age, because uneven access to ICT may lead

[3] Indian Human Development Survey I (2004-05) & II (2011-12) round survey data.

to multiple deprivations for the marginalised group in society (Min, 2010). Moreover, along with physical access, it's important to develop skills (to use digital resources) among population who already have access. This huge gap in *computer knowledge, usage of computer & internet* also known as *skill divides* are overlapping with previously persisting *social* and *economic marginalities* in India. Despite, assuming equal materialistic possession of information technology, unequal distribution of general literacy and digital literacy remains a main challenge in reaping the benefits of information technology. Given the fact, that nearly 25 percent of countries population (with huge regional and social variation) is illiterate, it's challenging to exploit this information revolution for the better life course opportunities for citizens and improving the quality of life in developing countries.

Since in India, basic literacy is distributed unequally across socio-economic lines, therefore, promoting digital literacy considering these marginalities should be an important goal from policy perspective. In 2016-17, the government launched a digital literacy programme with a vision to empower at least one person per household with crucial digital literacy skills by 2020. However, the present study could not see the role of digital literacy mission due to paucity of updated statistics. Hence, there is a need for further research to explore the role of digital literacy mission in improving analytical and information skill among the population and closing digital divides. One can examine further the role of community resources and infrastructure in development of personal resources, skills and attitude in adoption of new technologies. Moreover, the digital divide is complex interplay of social-economic and availability of infrastructural resources. However, due to paucity of data we only looked at socio-economic and demographic factors in use of computer and internet. Further, there is two-way linkages between use of ICT, education and skill. Whereas, the access to ICT give more opportunity to enhance skill and access to broader education resources, similarly for exploiting ICT to its best one need to have basic skill and education. Nonetheless, due to unavailability of longitudinal statistics this study could only examine the one side of this interaction. The impact of ICT on education, employment and other developmental aspect need further exploration.

Moreover, at a policy level, there is a need to emphasis on both information literacy along with digital literacy. Information literacy involves both computer specific knowledge using software and browsing and broader critical literacy skills i.e. analytical and information sources. Information literacy is crucial to transform information into knowledge. Further, critical literacy (information literacy) determines for what people depends on the internet and what benefits they achieve from it to improve their life. Hence, the mere presence of the internet will not create a population seeking for knowledge. Further, socio-economic location of person plays a crucial role in access to digital technology both directly and indirectly. Its important to address the socio-economic intersectionality in digital divide research. However, this study only focused on socio-economic determinants of access to digital technology. The role of intersectionality needs further inquiry and exploration.

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