Gender digital divide in India: a case of inter-regional analysis of Uttar Pradesh

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Abstract

Purpose – This study aims to endeavor to explore the extent of gender digital divide(GDD) in Uttar Pradesh (U.P., IT-Hub of North India), a most populous state of India, with a particular focus on the first and second order of digital divide, including availability, access time and use of the internet.

Design/methodology/approach – The authors have adopted stratified multistage sampling procedure for this research and conducted an empirical study on the data set of 600 respondents of six districts of U.P. to perform the inter-regional analysis. Furthermore, χ^2 method has been used to reveal the factors responsible for the GDD among selected districts of UP.

Findings – Statistical results clearly indicate that out of 12 sub-districts, most of the districts suffered from first order as well as second order of GDD, and this gender disparity within an increasing digitization environment is due to the existence of exclusion from basic technological skills, social norms and financial constraints.

Practical implications – The results have implications for the U.P. Government in general and policymakers behind digitization projects in particular as well as the promoters of gender equality including researchers and fellows.

Originality/value – This study is the first to illustrate the orders of the digital gender gap in a developing economy such as India and to gain an insight into the factors behind it. This research will also consider a promising avenue for future work.

Keywords Availability, Access, Usage, First-order digital divide, Gender digital divide, Second-order digital divide

Paper type Research paper

1. Introduction

Digital information and communication technology (ICT) including the computer, internet and mobile phones has enormous potential to unify the entire humanity and connect the whole world into one big family. The digital revolution has expanded the base of ICT use by lowering information cost and has facilitated greater convenience in sharing of information both at the global and local level. It can also act as a tool to overcome numerous intimidating socioeconomic and cultural issues, such as spread of literacy to the remote areas, reduction in poverty, expansion of knowledge across the globe, financial empowerment of women and also bridging of the gender digital divide (GDD). The digital revolution has perhaps brought the major stakeholders of society comprising individuals, businesses and the governments,

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to a closer proximity, wherein the citizens of a nation can not only interact with their government but also share their problems, ideas and opinions on social, economic or political issues. This helps the government to frame appropriate policies and take steps to solve unresolved issues. Thus, it is quite evident that digital ICT has occupied a prominent position in the daily life of each and every citizen of the nation and possesses an indispensable power for them.

World Development Report 2016 reported that digital technologies are spreading so quickly that developing countries are acquiring better access to mobile phones faster than electricity or clean water. Moreover, globally the number of internet users has more than tripled within the span of a decade, growing from 1 billion in 2005 to an estimated 3.2 billion by the end of 2015. Despite this, it has been found that nearly 2 billion people do not own a mobile phone, approximately 60 per cent of the world's population has no access to the internet and only about 15 per cent can afford access to broadband internet. This is what creates the difference between "haves" and "have-nots" of ICT benefits and leads to the digital divide which proves detrimental to the inclusive growth of the nation. The digital gender gap is one of the most pernicious aspects of the global digital divide. The International Telecommunication Union's (ITU's) report 2016 Facts & Figures, reckoned that this gap grew from 11 per cent (2013) to 12 per cent (2016) and for least developed countries, it is 31 per cent. Pew Global Survey (2015) further revealed the double-digit gender gaps on the internet access in India, where 27 per cent men compared to only 17 per cent women accept their access to the internet. Unfortunately, this gender disparity cannot be resolved by these statistics alone and it requires a herculean effort to bridge the gap so that digital technologies can play a vital role.

Digital inclusion in developing countries can only be achieved by leveraging ICT for disadvantaged groups and sections of society. In this "information economy," with the easy availability, access, and use of ICT, women can break the vicious circle of skill gap and a gap of physical access to IT. These are two essential components of the digital divide (Kularski and Moller, 2012). The authors (Mbarika *et al.*, 2007; Terry and Gomez, 2011) also claimed from the ITU report that, limiting the access of women to ICTs will not only hamper their family's income but also restrict the growth and development of the nation. Even in "care economy," where women are involved in lot of unpaid care work like care of children, the elderly and the sick, and in some places bearing the responsibility of water and energy supplies, better access to ICT can reduce or redistribute their work (OECD, 2011). As stated by the Intel report (2013), global GDP can also be enhanced by getting more women and girls online. But, despite this critical importance, very few women and girls have access to digital ICT, resulting in the problem of "gender digital divide" across the nations and societies, implying an uneven distribution of the digital technologies and creating an imbalance in gender equality. This is mainly influenced by the exclusion of women from technology education, high cost of technologies, financial/institutional constraint, lack of conventional skills, remoteness of locations, etc. Though, by providing easily accessible and affordable ICT infrastructure, this grave issue of digital gender gap can be resolved up to a vast extent. Along with this, national and international, collaborative and innovative efforts are also required. Considering the above-stated background and facts, this study is an effort to explore the extent of GDD in Indian society with following objectives.

The aim of this study is fourfold:

(1) to study the inter-regional analysis of first- and second-order digital divide from the gender perspective among the six selected districts of Uttar Pradesh (U.P.);

(2) to estimate the level of basic technological skill for the internet use in men and women;

(3) to identify the influence of social norms on ICT access from the gender perspective in the U.P. state of India; and

(4) to explore the impact of financial constraint on men and women that influences the availability of ICT.

The chronology of this paper is as follows:

- First, a literature review is provided on the digital divide including GDD with its influencing factor. Literature about first- and second-order digital divide is included in the same section along with the explanation of ICT potential for empowering women.
- Second, the proposal of the research methodology including sampling area and process is described. The following section comprises descriptive statistic and inter-regional analysis and also checks the hypothesis empirically to identify the gender disparities in digital access.
- Finally, the conclusion and policy recommendations are given.

2. Literature review

Drucker (1969) in 1969 coined a term called "Knowledge Society," based on the concept of public good "Knowledge," meaning no one should be excluded and it should be accessible to each and every individual. Unlike traditional economy functions, knowledge is not scarce in the world, rather, it grows with its usage and application. Knowledge has become the third factor of production in principal economies (Romer, 1986;1990), and these new technologies could be helpful for equal and universal access in knowledge societies (UNESCO, 2005). Digital ICT acts as an enabler of new forms of knowledge and information exchange for women (Gurumurthy, 2006). ITU (2016a, 2016b) report further signified the relevance of ICT and specified that it furnishes us with the capacity to access, apply information and disseminate knowledge in all kinds of human activities, thereby giving rise to the information or knowledge-based economies and societies. For the development of knowledge-based economy, use of ICT is of grave importance (Singhal *et al.*, 2014).

2.1 Digital divide in India

The digital divide is defined as:

> The gap between individuals, households, businesses, and geographic areas at distinct socio-economic levels, with regard to both their opportunities to access ICTs and to their use of the internet for a wide variety of activities (OECD, 2001).

The digital divide refers to the unequal access of citizens to ICT and uneven possession of skills and experience required for consuming it. The digital divide assumes many forms and can be described variously in terms of gender, location, skills and income. It is also related to the social and economic differences between the developed and developing countries, access to computers and the internet and to the quality of access and use of ICT (AL-Rababah and Abu-Shanab, 2010; Orbicom, 2005). The digital divide has become a dynamic problem with the continuous development of information technologies (Singh, 2015).

One of the indicators of assessing the societal and technological development of a country is the extent of penetration of ICT through the internet and the mobile phone subscriptions in a country. According to "World Economic Forum (2016)," India is at 96th position in Network Readiness Index and only 15 of 100 households have access to the

internet, whereas mobile broadband remains a privilege of the few, with only 5.5 subscriptions for every 100 people and lack of infrastructure and moderate levels of skills among the population remains the key bottlenecks to the widespread ICT adoption, especially in terms of individual use. ITU (2016a, 2016b) also illustrated that India is at 138th position in ICT Development Index (IDI). IDI is a composite index that combines 11 indicators into one benchmark measure, which can be used to monitor and compare developments in ICT between countries and over time. IDI of India (2016) is shown in Table I, with its rankings and value:

2.2 Gender digital divide in India

GDD can be defined as the unequal opportunity for ICT use between men and women in social, political, economic and cultural domains. UNESCO interpreted the GDD as "one of the most significant inequalities to be amplified by the digital revolution" (Primo, 2003). GDD is also defined as an under-representation of women in the ICT sector (Gargallo-Castel *et al.*, 2010). ICT possesses the enormous power to bridge this divide. If women have physical access and sufficient skills, they can connect to digital space (Cooper, 2006). Women can use ICT as an empowerment tool, which can lead to gender equality (Khan and Ghadially, 2010). By recognizing the significance of ICT for women, United Nations placed ICT at the center of its new sustainable development goals for 2030, with countries assuring to amplify the gender equitable ICT access and usage for women.

To harness the complete potential of ICT for comprehensive growth, women need to have the knowledge and liberty to use new technologies. Various United Nations Development Programme (UNDP) and World Economic Forum (WEF) indexes also reflect the condition of liberty of women to exhaust the available resources. India's ranking and value of these indexes are shown in Table II.

Indicator	Ranking	Value
ICT Development Index	138	2.69
IDI access sub-index 2016	139	3.32
IDI use sub-index ranking	142	1.25
Skills sub-index ranking	122	4.29

Source: Measuring the Information Society 2016, ITU

Table I.
ICT Development Index of India (2016)

Indicator	India ranking (year)	Value	Source
Human Development Index (HDI)	131/188 (2015)	0.624	UNDP
Gender Inequality Index(GII)	125/188 (2015)	0.530	UNDP
Global Gender Gap index (GGG)	87/144 (2016)	0.683	WEF
Gender Development Index(GDI)	Group = 5* (2015)	0.819	UNDP

Notes: *Gender Development Index groups: Countries are divided into five groups by absolute deviation from gender parity in HDI values. Group 5 comprises countries with low equality in HDI achievements between women and men (absolute deviation from gender parity of more than 10 per cent)
Source: UNDP 2016 and WEF 2017

Table II.
India's ranking and value in different gender indexes

These indexes confirm that in India, women retain less liberty to access the available resources in comparison to men. According to the report titled "Internet in India 2016," jointly published by the Internet and Mobile Association of India (IAMAI) and Market Research Survey and Business consultancy firm (IMRB), in urban India, there were estimated 269 million internet users in December 2016, whereas in rural India, there were 163 million internet users; reports also predicted that the number of internet users is expected to reach between 450 and 465 million by June 2017. Among the urban internet users, the ratio of men to women internet users is 60:40, whereas for rural users, it is 75:25, which clearly indicates the gender disparity in ICT usage. "Digital in 2017- Southern Asia," a report by a UK-established firm stated that India's Facebook population consists of 76 per cent men and 24 per cent women and the ratio of e-commerce use is 80:20. Global System Mobile Association (GSMA), a global mobile association, also confirms this fact and reports that Indian men have 25 per cent more SIM cards than women. National Sample Survey Office (NSSO) 68th round (2011-12) data signified the relevance of this concept by stating that approximately only 30.4 per cent of urban women underwent their formal vocational training in computer trades work. The spread of new technologies, along with an increase in an educated workforce, can fill the gap of the digital divide and are likely to transfer the employment in the service sectors.

2.3 Factors influencing gender digital divide

In India, there are various factors which impede the gender parity in digital access. This paper considers three important factors which influence the availability, access time and use of ICT for women. These factors are exclusion from basic technology skills, social norms of society and financial constraints, which are briefly explained as follows:

2.3.1 Exclusion from basic technological skills. According to the census of India 2011, the overall literacy rate is 72.98 per cent and the literacy rate for women and men are 64.63 per cent and 80.9 per cent, respectively. Although the gender gap in literacy has been reducing year by year, it is not adequate. Census data reflect that since 2001 to 2011, there has been a 24.4 per cent decline in the literacy gender gap of the U.P. state. A recent study on "Gaps in education and the world of work: A Gender perspective" (Bala, 2017a, 2017b) identified that men prefer career through technical education, whereas women enrollment in technical and vocational education was found lower than the men in all the districts under the study. Melhem *et al.* (2009) also highlighted in their study that women have less access to scientific and technical education specifically and to education in general. Without this fundamental skill, the internet and the benefits of the online world will remain out of the reach for women (Intel, 2013). With the help of Pearson χ^2 (non-parametric) test, this study explores the relationship between gender and basic technology skills. Hence, the following hypothesis was proposed:

H1. Basic technological skills to use the internet and gender are not independent of each other.

2.3.2 Social norms. World Bank's (2016) world development report on "Digital Dividends" indicated that women's access to ICT is the third most important issue for women after poverty and violence. Entrenched patriarchal attitude and traditional social norms of society are the predominant factors behind most of the gender disparities across the nations, including family resistance to women and girls using ICT and phones (GSMA, 2015). Women's preference for engaging in work is largely influenced by assigned gender role as caregivers (Badgett and Folbre, 1999) and work–family balance is a principal driver of gender gaps in labor force participation (ILO, 2017). The Intel (2013) revealed that due to the

family mindset, one in five women in India believe that the internet is not appropriate for them, and some families disapprove the ICT usage by saying that engaging online would not be beneficial. These attitudes are presumably derived from their socio-cultural conditioning. The present research identifies statistically by administering a test of independence to determine whether social norms, including family pressure, friends influence and lack of interest, are related to gender or not. Accordingly, it can be hypothesized that:

H2. Influence of social norms to access ICT and gender are associated with each other.

2.3.3 Financial constraints. In developing countries such as India, there are various economic inequalities that widen the gap of the digital divide, which includes low personal income and savings, high cost of ICT infrastructure, large number of dependents in a family and inherited debt. Due to these inequalities, women are unable to purchase ICT equipment or make monthly payments to internet service providers. These financial constraints lead to a vicious circle of lack of skills, unemployment, limited income and lack of technologies which invariably prevent them from attaining economic independence (Hafkin and Taggart, 2001). ILO's (2017) study estimated that the global unemployment rate for women is 6.2 per cent, whereas for men, it is 5.5 per cent; this reflects the gender gap of 0.7 per cent. Census Report, 2011a, 2011b data of India also revealed that even though the women work participation rate (25.5 per cent) has increased over time, it is far less than the men work participation rate (53.3 per cent). It is essential to put an end to this tradition of inequality of skill and technology and equip women with ICT access to overcome the existing gender inequalities. As employment is directly related to income and expenditure level, this study explores the relationship between gender and employment. Thus, the authors proposed the following hypothesis:

H3. Employment and gender are closely associated with each other.

2.3.4 Potential of information and communication technology for empowering women. ICT involvements are imperative for economic empowerment of women as these technologies have immense potential to provide networking and knowledge tools for women. These networking tools act as a bridge between women and the new virtual market which expand their social network and imparts valuable information that unlocks significant economic prospect. Since 1972, Self Employed Women's Association of India has been working for mainstreaming the marginalized and underprivileged women in the informal sector. It was one of the first organizations internationally to recognize the potential of using IT in providing capacity development and supporting cooperative efforts by escalating access to information. It was one of the leading promoters of the process which led to the ILO Convention 177 (1996) focus on the rights of home-based workers (OECD, 2011). By integrating new technologies in providing information to powerless, the problem of "digital divide" can be reduced considerably. Kelkar and Nathan (2002) looked beyond ICT's contributions to economic well-being and explained that ICT retains the capacity to redefine traditional gender roles, particularly for women, who possess inadequate skills or who lack the resources to finance higher education. However, in developing economies, this capacity of ICT to empower women rests on access to and actual use of these technologies (Scott, 2001).

The United Nations (UN) identifies that, despite national and international efforts of economies to close the access gap, the digital divide is rising (UN 2010). Inequality in ICT access is termed as the first-order digital divide and inequality in the ability to use ICT is named as the second-order digital divide (Jin and Cheong, 2008). This study considers the

gender gap between "haves" and "have-nots" of the computer and the internet access as the first-order digital divide and the gender gap in the use of ICT as second-order digital divide.

2.3.4.1 First-order digital divide from gender perspective. Primary research on the digital divide stresses on the disparity in internet access. Hafkin (2002) highlighted that communication infrastructure is concentrated in urban areas. In India, 68.4 per cent (Census Report, 2011a, 2011b) of people live in villages (out of which 48.6 per cent are women) and far-flung remote areas that still lack technological infrastructure along with other basic facilities, such as education, electricity, proper drinking water, health care and transportation. Internet connectivity is often accessible only within capital and major secondary cities in many developing countries (Hafkin, 2002). In India, the top four metros (Mumbai, Delhi, Kolkata and Chennai) have 23 per cent penetration of the internet. The other four metros (Bangalore, Hyderabad, Ahmedabad and Pune) have 11 per cent penetration of internet users, with Bangalore registering the highest growth (IAMAI, 2016). At present, a vast gender gap occurs in terms of access to communication due to the fact that a majority of women are living in rural areas (Hafkin, 2002). National Telecommunications and Information Administration (NTIA, 1995) also stated that internet access penetrates at varying rates between different sectors of the population. Urban India has around 60 per cent internet penetration, whereas rural India has only 17 per cent internet penetration with just 25 per cent of daily internet users from rural areas being females (IAMAI, 2016). Women, with their responsibilities of household tasks and care work for children and the elderly, find less time to access the internet and it is hard for them to migrate to metros or cities. UNIFEM (2000) signified the fact that due to the lack of urban technological infrastructural facilities, women are deprived of their universal right to communicate more than men.

2.3.4.2 Second-order digital divide from gender perspective. The significance of ICT has been increasing, as more and more people are using the internet to search, communicate, entertain and remain occupied in social participation and political awareness (DiMaggio and Hargittai, 2001; Hargittai, 2002; Van Dijk, 2005). Second-order digital divide emphasizes the use of ICT in the information society. ICT not only plays a pivotal role in social inclusion but also is imperative in all dimensions of digital society (Warschauer, 2003). Despite these facts, women have limited access to ICT facilities (Hafkin, 2002); the condition is worse in rural areas where most of the communication facilities such as telecenters and cybercafés are for public access and women feel uncomfortable in that environment. Along with this, there is a range of socio-economic constraints, including work-life balance, marital status and lack of transportation, which acts as factors driving gender gaps (ILO, 2017). Heeks (1999) pointed out that women lag behind men in information literacy. Digital literacy is not only essential for financial and economic activities, but it can also enhance their livelihood. Cost of access further restricts the entry of women in ICT usage. In developing economies, laws and policies restrict women from possessing the property and getting loans for technology purchases. Even in developed countries where access is not an issue, disparities in actual practice can hamper women's opportunities on both economic and social fronts. Access is essential, but not adequate, to bridge the GDD (Hafkin, 2007).

3. Research methodology

Being the IT-HUB of North India, the state of U.P. has the second largest economy in India after Maharashtra with Noida and Greater Noida as major IT/ITes destinations of the country. However, Telecom Regulatory Authority of India (TRAI, 2016) data revealed that the state's internet subscribers base (mobile and landline) per 100 population as on September 30, 2016 was 17.97 per cent only. Therefore, it is meaningful to explore this state

for the purpose of current research and this study selected six districts of U.P., i.e. Gautam Buddha Nagar, Ghaziabad, Sitapur, Gorakhpur, Rae Bareli and Sultanpur. The key indicators used for the selection of the districts were the percentage of households having a computer/laptop with and without internet (Census Report, 2011a, 2011b) and female literacy. From Table III, we can perceive that households with computer and internet penetration in three of the selected districts are more than 2 per cent, whereas in remaining three are less than 2 per cent. Female literacy in all the selected districts is more than 50 per cent. To obtain regional differences, districts were carefully chosen from diverse geographical locations with two districts each from eastern, western and central U.P. Furthermore, sub-districts were selected on the basis of literacy rate and households having a computer/laptop with the internet. Out of each district, one sub-district was selected whose percentage of households having computer/laptop with internet was highest among total sub-districts of that district and other sub-district was that, whose percentage was least. Finally, for the selection of cities and villages, the population was considered as the key indicator. The city had been selected from the sub-district which was urban in nature and village had been selected from the sub-district which was rural in nature. The city whose population was more than 1 lakh and highest among other cities of that sub-district was considered for the survey. In the same way, village with population less than 1 lakh was considered for the study. For this purpose, data of the 15th Indian census (Census Report, 2011a, 2011b) were considered as a base as it could provide detailed information about the members of a given population.

The authors constructed a tool to capture the dimensions of GDD in U.P. The instrument consisted of a survey (with varying scale types) divided into three sections including demographic items, social and educational items and issues related to ICT access and use. The instrument was tested for content validity on Noida households possessing adequate knowledge of digital divide as well as GDD. This step was significant for the rationalization of the statement of objectives and for the accuracy of variables in the questionnaire. All remarks obtained at this stage were incorporated into the instrument before it was used for the purpose of this study.

3.2 Sample and sampling process

A stratified multistage sampling procedure was used in the study a it was carried out in various stages. The first-stage units were districts, second-stage units were sub-districts and the third stage consisted of households from cities and villages. Households were selected according to the NSSO method of household surveys, i.e. leaving three houses, every fourth house was selected (NSS, 2013). This study targeted 600 responses from 12 regions (50 per region) including 25 men and 25 women per region to ensure equal representation of gender. On the basis of missing value, nine surveys were excluded and the total number of usable surveys was 591. Collected responses were subjected to the statistical package for social sciences.

The database of this study is the product of V.V. Giri National Labor Research Institute (VVGNLI), Noida (U.P.). In India, since 1974, VVGNLI is a leading national institution involved in research, training, education, publication and consultancy on gender- and labor-related issues. The Institute is an autonomous body of the Ministry of Labor and Employment, Government of India and it has conducted the various gender-based studies on the issues of education, employment, literacy, the world of work, etc. Its Center for Gender and Labour studies has endeavored through innovative research initiatives to connect all those who are concerned with various aspects of gender disparity in India. For this present research, with the intimation to VVGNLI, a household database of the study of

Table III. Selection of districts, sub-districts, cities and villages for the survey in U.P.

Districts (geographical region)	Households having computer/laptop-with internet (%)	Female literacy rate (%)	Sub-districts	Literacy rate (%) Male	Female	Households having computer/laptop-with internet (%)	Cities and villages (with population)
Gautam Buddh Nagar (western UP)	16.81	70.8	Dadri	80	68	20.33	Noida (6.4 lakh)
			Jewar	75.95	56.68	1.35	Dayantpur Village (9722)
Ghaziabad (western UP)	9.41	69.8	Ghaziabad	85.42	69.79	13.83	Ghaziabad municipal corporation (16.5 lakh)
			Garhmukteshwar	66.84	48.12	1.28	Bahadur Garh village (13586)
Gorakhpur (eastern UP)	2.1	59.4	Gorakhpur	80.30	55.35	3.93	Gorakhpur municipal corporation (6.7 lakh)
			Campierganj	64.76	41.74	0.75	Basantpur village (7887)
Sultanpur (eastern UP)	0.95	58.3	Sultanpur	80.19	58.28	1.41	Sultanpur Nagar Palika Parishad (1.1 lakh)
			Jaisinghpur	67.56	50.07	0.64	Phtahpur village (6560)
Rae Bareli (central UP)	0.84	56.3	Rae Bareli	77.6	56.3	1.39	Bareilly municipal corporation (9 lakh)
			Maharajganj	67	45	0.41	Bachhrawan village (9692)
Sitapur (central UP)	0.49	50.7	Sitapur	70.3	50.7	0.97	Sitapur Nagar Palika Parishad (1.8 lakh)
			Laharpur	47	34	0.22	Nabi Nagar village (8055)

Source: Calculated from Census Report (2011b)

this center titled "ICT Imperatives to Bridge the Digital Divide: Gender Perspective" (Bala, 2017a, 2017b) had been used.

4. Data analysis and discussion

The respondents were asked to indicate their agreement or disagreement with the survey instrument using varying scale types. Some questions were answered with Yes/No option, whereas some were replied from the list of categories and others with five-point Likert-type scale. The returned questionnaires were analyzed by a statistical program. First, descriptive statistics was applied to analyze the respondents' demographic data. Second, the inter-regional analysis was performed followed by identification of the first and second order of digital divide among the selected regions of study. Finally, the hypotheses were tested by the χ^2 method.

4.1 Descriptive statistic

The first step in the analysis process was to investigate the demographics of respondents. Demographic details of respondents given in Table IV clearly show that the sample consists of diverse age, family structure and residential areas. Data depict that most of the respondents are graduate (42.32 per cent) and belong to the age group of 23-35 years (47.7 per cent). To ensure equal representation, 50 per cent households were selected from urban

Item	Frequency	(%)
Gender		
Man	297	50.3
Woman	294	49.7
Total	591	100
Age		
<23	97	16.4
23-35	282	47.7
36-50	175	29.6
>50	37	6.3
Total	591	100
Education		
High school or less	252	42.81
Graduation	256	42.32
PG	73	12.35
PhD	9	1.52
Total	591	100
Residence		
City	295	49.91
Village (rural areas)	296	50.08
Total	591	100
Family type		
Joint	382	64.63
Nuclear	209	35.36
Total	591	100

Table IV.
Demographics of respondents

Source: Author's interpretation based on VVGNLI Study "ICT imperatives to Bridge the Digital Divide: Gender Perspective", 2017

areas and 50 per cent from rural areas. Family type plays a vital role in decision-making and data reflect that 35 per cent respondents belong to nuclear families (*the immediate group of father, mother, and children living together)*, whereas 65 per cent belong to joint families (*nuclear family, plus other relatives, like grandparents, uncles and aunts, cousin and parents-in-law*s). It can be seen that increasing resources of women and shift toward nuclear families are providing more decision-making power in the hands of women.

4.2 Inter-regional analysis

Ragnedda and Muschert (2013) identified the internet use as the most extensively used indicator for gauging digital divide. Along with this indicator, this study considers other indicators, such as the availability of personal computer and internet, access time span on internet and use of ICT. Table V reveals the condition of physical availability of ICT infrastructure, different ICT access time and usages by men and women of selected districts of U.P.

Table V illustrates three kinds of the inequalities between men and women in percentage points. It shows that there is a gender gap pertaining to availability, access time and use of ICT across six regions of U.P. in India. First, regarding the availability of ICT, among all the six districts, Dadri district that includes Noida Census Town is much more advanced where 92 per cent women have computers and 88 per cent have access to the internet, which is more than men. But this situation is quite different from the other less developed regions such as Jaisinghpur and Laharpur where both men and women have 0 per cent computer and internet ownership. Furthermore, in case of ICT access time, more men and women are spending approximately less than 2 h on the internet, but here also gender disparity persists in each region and is increasing in rural areas. In rural areas where men and women do not have an internet connection, they are taking the services of the cyber café and telecenters. Data also reveal that few men are spending more than 6 h on the internet and approximately 0 per cent women are there in this category. Next, in case of use of ICT, one interesting fact can be analyzed from the given table, which shows that although men lead in each category of ICT use, they are mostly using it for entertainment purpose followed by e-communication, studies, shopping, bill payments and then massive open online courses (MOOC), respectively. On the other hand, women are using the internet mostly for studies followed by e-communication, shopping, entertainment, payment of bills and then for MOOC purpose. In this category also, men and women of the Noida region are using the internet extensively as reflected in the given *table.*

4.3 Identification of first order and second order of digital divide from gender perspective

To identify the first-order digital divide, mean value of the availability of computer and internet had been calculated (from Table IV) for men and women of each sub-district. For the second order, a mean value of each ICT use (including study, shopping, e-communication, entertainment, payment of bills and MOOC) was calculated for all the selected regions of U.P. Figure 1 shows the calculated values for each sub-district.

The above table discloses that in case of physical access to ICT, except Dadri and Ghaziabad, most of the regions are suffering from first-order digital divide, as their people have less than 50 per cent accessibility to computer and internet. The situation is critical in Jaisinghpur and Laharpur. Regarding the second order of digital divide, except the male category of Dadri, the values of ICT use for all the regions are below 50 per cent and confronted with this inequality. Data also depict that women are better in ICT access in comparison to its usage due to their household and caring responsibilities. Consequently, it can be analyzed from

Table V.
Availability, access time and use of ICT by men and women of six selected districts of U.P. (in percentage)

Availability, access and use of ICT	Sex	Gautam Buddha Nagar		Ghaziabad		Gorakhpur		Sultanpur	
		Dadri	Jewar	Ghaziabad	Garhmukteshwar	Gorakhpur	Campierganj	Sultanpur	Jaisinghpur
Availability of ICT									
Computer	M	88.0	28.0	76.0	9.0	52.0	32.0	28.0	0.0
	F	92.0	24.0	84.0	10.0	48.0	30.4	33.3	0.0
Internet	M	84.0	32.0	76.0	12.0	48.0	40.0	44.0	0.0
	F	88.0	24.0	76.0	11.0	43.0	21.7	33.3	0.0
Access of ICT – Time span on internet									
	M	24.0	32.0	40.0	10.0	30.0	24.0	28.0	4.0
Less than 2 h	F	20.0	16.0	28.0	9.0	17.0	17.4	25.0	1.0
	M	40.0	8.0	24.0	2.0	17.0	12.0	12.0	0.0
2-4 h	F	56.0	8.0	16.0	2.0	17.0	4.4	8.3	0.0
	M	16.0	8.0	8.0	1.0	13.0	8.0	4.0	0.0
4-6 h	F	12.0	4.0	8.0	1.0	13.0	0.0	4.2	0.0
	M	4.0	0.0	8.0	1.0	4.0	0.0	8.0	0.0
>6 h	F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Use of ICT – Purpose of using internet									
Study	M	60.0	16.0	56.0	8.0	39.0	28.0	24.0	0.0
	F	68.0	36.0	48.0	10.0	35.0	17.4	33.3	0.0
Shopping	M	64.0	32.0	56.0	11.0	30.0	8.0	24.0	0.0
	F	52.0	20.0	40.0	7.0	39.0	0.0	12.5	0.0
Entertainment	M	76.0	28.0	52.0	8.0	43.0	16.0	24.0	12.0
	F	48.0	32.0	32.0	6.0	17.0	8.7	20.8	0.0
Payments of bills	M	76.0	28.0	48.0	7.0	17.0	8.0	12.0	0.0
	F	24.0	0.0	16.0	2.0	4.0	0.0	0.0	0.0
e-communication	M	80.0	8.0	80.0	5.0	39.0	20.0	40.0	0.0
	F	64.0	5.0	68.0	0.0	17.0	13.0	29.2	0.0
MOOC – online course	M	12.0	1.0	4.0	0.0	0.0	0.0	4.0	0.0
	F	8.0	0.0	8.0	1.0	0.0	0.0	8.3	0.0

Source: Authors own calculation based on VVGNLI Study "ICT imperatives to Bridge the Digital Divide: Gender Perspective", 2017

(*continued*)

Table V.

Availability, access and use of ICT	Rae Bareli		Sitapur		Total
	Rae Bareli	Maharajganj	Sitapur	Laharpur	
Availability of ICT					
Computer	36.0	16.7	36.0	0.0	36.0
	36.0	25.0	32.0	0.0	37.0
Internet	40.0	20.8	28.0	0.0	38.0
	32.0	33.3	12.0	0.0	33.0
Access of ICT – Time span on internet					
	44.0	25.0	28.0	20.0	30.0
Less than 2 h	24.0	25.0	8.0	0.0	18.0
	8.0	25.0	8.0	4.0	14.0
2-4 h	12.0	12.5	8.0	0.0	13.0
	8.0	8.3	8.0	0.0	7.0
4-6 h	0.0	4.2	0.0	0.0	4.0
	4.0	0.0	4.0	0.0	3.0
>6 h	0.0	0.0	0.0	0.0	0.0
Use of ICT– Purpose of using internet					
Study	32.0	8.3	39.0	12.0	29.0
	44.0	16.7	32.0	0.0	31.0
Shopping	20.0	8.3	0.0	0.0	24.0
	8.0	8.3	0.0	0.0	17.0
Entertainment	36.0	29.2	20.0	20.0	32.0
	8.0	4.2	8.0	0.0	17.0
Payments of bills	16.0	16.7	0.0	0.0	21.0
	4.0	4.1	0.0	0.0	5.0
e-communication	32.0	12.5	16.0	0.0	31.0
	16.0	0.0	4.0	0.0	19.0
MOOC– online course	0.0	8.3	0.0	0.0	3.0
	4.0	4.1	0.0	0.0	3.0

			Gautam Buddh Nagar		Ghaziabad		Gorakhpur		Sultanpur		Rae Bareli		Sitapur	
			Dadri	Jewar	Ghaziabad	Garhmukteshwar	Gorakhpur	Campierganj	Sultanpur	Jaisinghpur	Rae Bareli	Maharajganj	Sitapur	Laharpur
First Order Digital Divide	Mean ICT Access (Computer +Internet)	M	86.00	30.00	76.00	42.00	46.00	36.00	36.00	0.00	38.00	18.00	32.00	0.00
		F	90.00	24.00	80.00	42.00	42.00	24.00	32.00	2.00	34.00	22.00	22.00	0.00
Second Order Digital Divide	Mean ICT Usage	M	61.33	18.83	49.33	6.50	28.00	13.33	21.33	2.00	22.67	13.88	12.50	5.33
		F	44.00	15.50	35.33	4.33	18.67	6.52	17.36	0.00	14.00	6.23	7.33	0.00
			Second Order (Female)	First Order+ Second Order	Second Order (Male + Female)	First Order+ Second Order	First Order+ Second Order	First Order+ Second Order	First Order+ Second Order	First Order+ Second Order	First Order+ Second Order	First Order+ Second Order	First Order+ Second Order	First Order+ Second Order

Figure 1.
First order and second order of the digital divide in selected districts of U.P. (in percentage)

Source: Calculations are based on Table 5 (in percentage)

the given table that approximately all the districts of U.P. state are confronting the issue of both the divides, but the condition is drastic for the women.

This inter-regional analysis clearly demonstrates that there is less availability, less access time and less utilization of ICT by women across all six regions of U.P., except few developed regions.

4.4 χ^2 test of independence

The χ^2 test was used to test the research hypotheses which are as follows (Table VI):

4.4.1 H1. A χ^2 test of independence was performed comparing the frequency of basic technological skills to use the internet by men and women. Table VII discloses that the relation between these variables is significant, χ^2 (1, N = 591) = 4.183, $p < 0.05$. From Table VI, it can be identified that men are more skilled in using ICT (55 per cent per cent) than women (45 per cent). Therefore, it can be concluded that the variables, gender and basic technological skills to use the internet are not independent. Hence, *H1* is accepted (Table VIII).

4.4.2 H2. To observe the association between gender and influence of social norms to access ICT, a χ^2 test of independence was calculated. Table IX clearly shows that the relation between these variables is significant, χ^2 (4, N = 369) = 12.644, $p < 0.05$. Family

Table VI.
Cross-tabulation statistics: gender and basic technological skills to use the internet

Gender		Basic technological skills to use the internet: Yes	No	Total
Men	Count	143	154	297
	Expected count	130.7	166.3	297.0
Women	Count	117	177	294
	Expected count	129.3	164.7	294.0
Total	Count	260	331	591
	Expected count	260.0	331.0	591.0

pressure is the key obstacle for women (57.2 per cent) to access ICT and for men, lack of opportunity (55.5 per cent) is the primary factor which can be depicted in Table VIII. Thus, it can be analyzed that the variables, gender and social norms are associated with each other. Consequently, *H2* is accepted (Table X).

4.4.3 H3. To perceive the relation between gender and employment, χ^2 test of independence was applied. Table XI illustrates that the relation between these variables is significant, χ^2 (1, N = 369) = 50.87, $p < 0.05$. More men are employed (61.9 per cent)

Test and valid cases	Value	Df	Asymp. Sig. (2-sided)
Pearson χ^2	4.183	1	0.041
N of valid cases	591		

Table VII. χ^2 test

Gender		Influence of social norms to access ICT					Total
		Lack of opportunity	Family pressure	Parents pressure	Friends influence	Others	
Men	Count	60	53	17	15	30	175
	Expected count	51.2	58.8	26.6	12.8	25.6	175.0
Women	Count	48	71	39	12	24	194
	Expected count	56.8	65.2	29.4	14.2	28.4	194.0
Total	Count	108	124	56	27	54	369
	Expected count	108.0	124.0	56.0	27.0	54.0	369.0

Table VIII. Cross-tabulation statistics: gender and influence of social norms to access ICT

Test and valid cases	Value	Df	Asymp. Sig. (two-sided)
Pearson χ^2	12.644	4	0.013
N of valid cases	369		

Table IX. χ^2 test

Gender		Employment		Total
		Employed	Not employed	
Men	Count	184	113	297
	Expected count	140.7	156.3	297.0
Women	Count	96	198	294
	Expected count	139.3	154.7	294.0
Total	Count	280	311	591
	Expected count	280.0	311.0	591.0

Table X. Cross-tabulation statistics: gender and employment

than women (32.65 per cent) as shown in Table X. Thus, it can be concluded that the variables gender and employment are associated with each other and *H3* is accepted.

5. Conclusion and policy recommendations

An economy that wants to attain sustainable development, inclusive growth and wants to build a global equitable information society, cannot afford to overlook the significance of new technologies in the mainstreaming of gender that paves the way for equitable opportunities enabling women to grow. ICT has provided a new landscape of development for everyone and women should get equal benefits provided by the technology. Moreover, the advantages generated from the intertwining of knowledge and ICT should not be limited to some developed nations or cities but it should reach to the unreached also.

This empirical study explored the GDD in the U.P. state of India by studying the perceptions of 591 respondents, from six districts of the state. The U.P. state can be considered as a suitable choice for the study as this state owns prime IT destinations of the country. Accordingly, it is significant to identify the situation of digital divide from the gender perspective in the most prominent state of India.

Inter-regional analysis of the study demonstrates that out of all 12 regions of the study, in most of the urban areas, more women acquire the ownership of computers than men (92 per cent of women and 88 per cent of men in Dadri) but still, they are struggling for the availability of internet facilities. Due to household chores and prevalent socio-cultural mores, they cannot devote much time to the internet and high rate of ownership of the computer does not imply the high rate of usage. Therefore, their time span on the internet is also less than that of men. But, one of the most illuminating findings of the study was about the usage of ICT; women are mostly using it for education (31 per cent of women and 29 per cent of men), whereas men are using it for entertainment (32 per cent of men and 17 per cent of women). Moreover, the research identified that almost all the selected districts of U.P. are facing the problem of first-order as well as of second-order digital divide and because of the challenging social norms and gender stereotypes, women situation is more critical.

Empirical results of this study specify that approximately 55 per cent of women lack basic technological skills to use the internet which makes them uncomfortable to use new internet technologies and advantages of the digital world will remain out of reach for them. In developing countries, socio-cultural norms give low priority to the literacy of women, which limits their digital learning as well. This also discourages them to acquire the ownership of the computer and the internet which impacts not only the second order but first order digital divide as well. Social norms have a direct impact on gender gaps in digital usage. This study also demonstrated the influence of social norms on ICT access by women. The most important factor in this regard is the family members' approval (36.5 per cent of women) for the women to undertake internet access and usage. In regional areas due to conservative thinking and patriarchal attitude, women's access to public ICT facilities is also restricted. Some women cited that they are not allowed to obtain the help of internet cafés and telecenters as they are considered unsafe by their family members, which widens the second-order digital divide. This not only restricts their learning and sharing but also impacts their economic well-being. In this digital era, every employment demands IT-skilled

Table XI.
χ^2 test

Test and valid cases	Value	Df	Asymp. Sig. (two-sided)
Pearson χ^2	50.875	1	0.000
N of valid cases	591		

people, but due to lack of fundamental digital skills, women cannot enter into the labor market and remain unemployed. The present research also explored that in the most populous state of India, only 32.65 per cent women are employed and due to this economic constraint, women cannot afford the cost of net services. Resultantly, this influences the women's possession of digital devices and they remain entangled in the vicious circle of the skill gap and a gap of physical access to ICT.

Conventionally, longstanding gender disparities in India prevent women from accessing ICT, which affects their potential to advance economically. But the availability, access, and usage of ICT can convert this vicious circle into a virtuous circle, which can empower women to fight against the existing gender inequalities. Various initiatives have been taken by the Indian Government in this direction. To overcome complicated information problems and to promote the inclusion of the disadvantaged group, the Government of India introduced a digital identification system in 2009, known as "Aadhaar." India's performance in terms of providing online services and allowing e-participation is improving, but not adequate globally. To bridge this gap, in 2015, Government of India launched the "Digital India" program, fostering investment in digital infrastructure, improving digital literacy and increasingly providing online services to citizens. Recently in 2017, an Aadhaar-based mobile payment application called the Bharat Interface for Money (BHIM) app was launched by the Prime Minister of India, Mr Narendra Modi, which allows users to make digital payments without credit or debit card. On July 1, 2017, a single common "Goods and Service Tax" (GST), was implemented in India, which is the biggest tax reform of India in the 70 years of independence. Implementation of GST is completely based on IT infrastructure. Although this initiative will amplify the usage of ICT in business, it will generate a counter effect on Digital India initiative as the GST Council of India has fixed the tax rate on laptops and desktops at 18 per cent, compared with the current levy of 14-15 per cent (ET, 2017), which will hamper the consumer market.

Despite all the efforts by the Government of India, women still struggle with the disparity in the usage of these information technologies, which leads to the widening gap of "digital divide." Hence, the need of the hour is to frame new "gender centric ICT policies" which can provide easy availability, more access time and use of ICT. Such policies should focus on the development of digital literacy and technological skills of women so that they can overcome their financial constraints and would be able to afford the latest ICT enablers to gain knowledge. These policies should emphasize on more access and connectivity centers for women in remote areas so that in rural areas also women will get more access time to ICT and share their views worldwide. Policies must concentrate on more women-centric ICT training centers where women would be able to learn the use of ICT and can use it not only for studies and communication but also for bill payments, shopping, and entertainment. In conclusion, there is a need for collaborative and innovative action among government ministries, NGOs, gender specialist, international women's organizations, etc. to bridge this "gender digital divide." Along with this, the most crucial thing is to minimize the first and second order of the GDD by allowing more women to get access to ICT, not only for the upliftment of family and society but also for the development of the nation as a whole.

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