LIRNEasia
Pro-poor. Pro-market.

Gender gaps in internet access and digital skills in India and Sri Lanka

1 Introduction

Compared to two decades ago, today, digital access gaps are being given increasing amounts of attention by researchers, governments, and industry alike. Women consistently lag behind men when it comes to technology adoption and use. This has been seen in mobile phone adoption internet use, social media use, digital skills and beyond (GSMA, 2021a; ITU, 2021; ITU, 2017; LIRNEasia, 2019; United Nations Division for the Advancement of Women, ITU & UN ICT Task Force Secretariat, 2002; World Bank, 2016; World Wide Web Foundation, 2020; Zainudeen, Iqbal & Samarajiva, 2010).

Disparities in women's access to digital technology limit women's ability to benefit from and be empowered by the technology in the numerous ways that have evolved. This can include access to networks, resources, livelihood opportunities, voice, and agency among others (GSMA, 2021a; Broadband Commission, 2017; Scott Balasubramanian & Ehrke, 2017; World Wide Web Foundation, 2016 UNCTAD & ILO, 2014; Moyo & Deen-Swarray, 2013). These benefits not only accrue at the individual level, but at a society level also (such as better health and education outcomes for children). Achieving many of the SDGs is tied to connectivity in an increasingly digitized world, therefore the impetus for women –of all walks– to be meaningfully connected is even greater.

With technology becoming increasingly central to all spheres of life, women who are not able to take advantage of these benefits will risk being doubly excluded; not just from digital services themselves, but from core services like government services, ecommerce, as well as earning opportunities, amongst others which rely on digital access in some way or the other. Research suggests that they could even face bigger difficulties in managing their lives than in a pre-digital era (Scott et al., 2017; Cummings & O'Neil, 2015; Galperin Mariscal & Barrantes, 2014; Broadband Commission, 2013).

The South Asia region has seen significant improvements in internet connectivity in the past decade. Between 2018 and 2021, India saw the percentage of its population online grow from 19% of its 15-65 age group to 47% of the 15+ age group in 2021, as per LIRNEasia's nationally representative surveys (LIRNEasia, 2019; LIRNEasia, 2021). Sri Lanka's growth between the same period was not as dramatic, going from 37% to 44%, for the same age groups, respectively. A fair percentage of this can be attributed to the Covid-19 pandemic: 43% and 31% of new internet users in India and Sri Lanka (respectively) indicated that they had come online due to reasons related to the pandemic. Along with this growth, gender gaps in access have also seen improvements. The genders gaps in internet use dropped from 57% to 37% in India and 34% to 7% in Sri Lanka by 2021 as per the survey data (Figure 1). The first research question that this paper tries to answer relates to whether gender intrinsically is a contributing factor to determining whether an individual is online or not, i.e., has access.

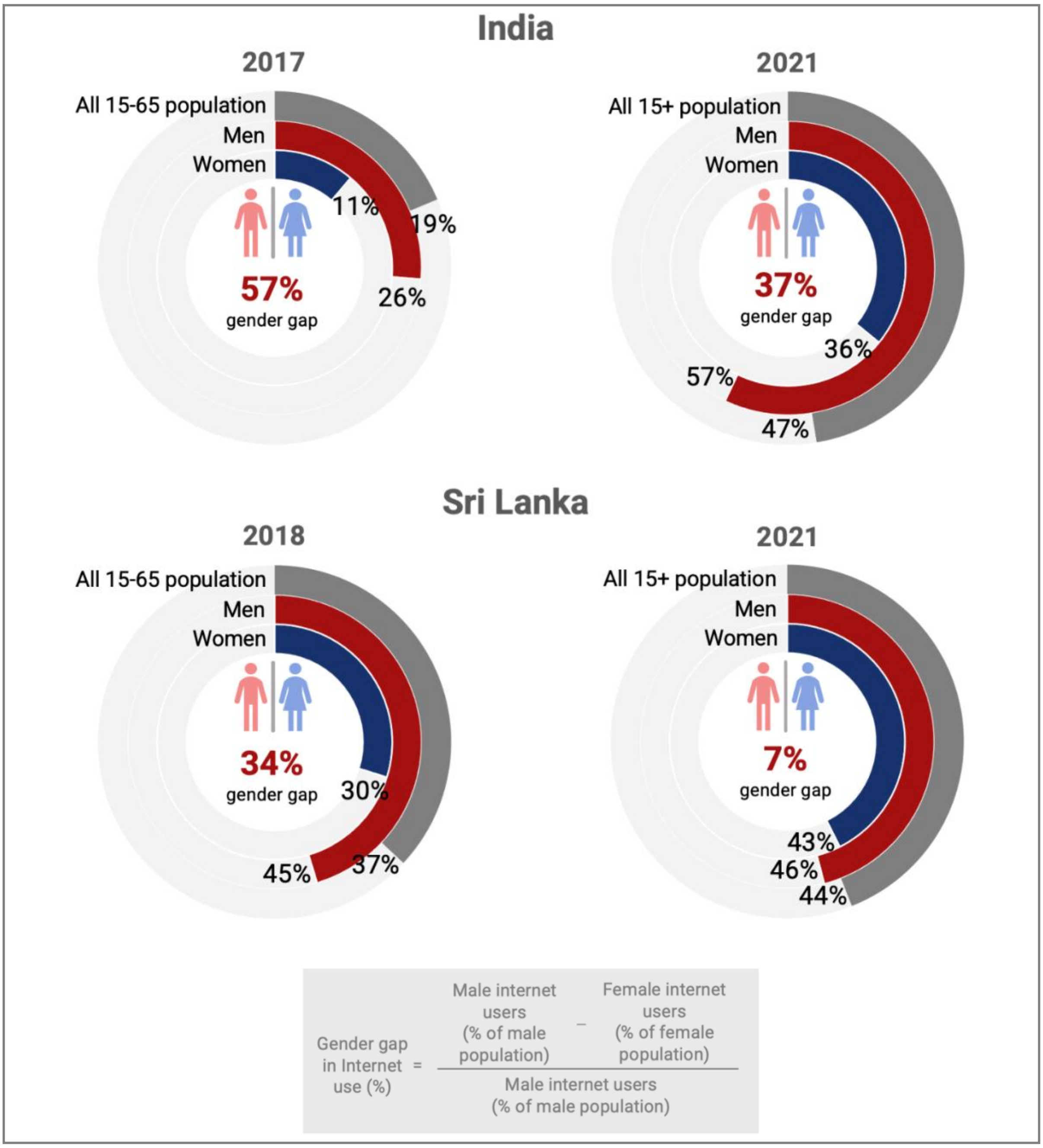

Figure 1: Internet use (% of 15-65 population [2017-18] and % of 15+ population [2021])

Source: AfterAccess and LIRNEasia nationally representative surveys, 2017-2021
Notes: (1) 2017 and 2018 percentages given on the base of the age of 15-65 population of each country respectively; 2021 percentages given on the base of the age 15+ populations of each country respectively. (2) 2021 survey sample excludes Kerala, which had to be excluded due to the ensuing pandemic.

While the improvements in access are necessary, access along is insufficient. Access to a device and a connection (even of the best quality) alone are not sufficient to meaningfully transform the lives of women and girls. There is a clear need to move beyond the focus on access and ensure that women--- across all segments and intersections--- are equipped with knowledge, skills and agency to be able to use that access toward their economic and social empowerment. The second research question that this paper tries to answer relates to similarly understanding whether gender intrinsically contributes to an individual's capabilities to carry out digital tasks, i.e., their digital skills capabilities.

Through a series of statistical models, the paper unpacks these questions, looking at what role gender plays after controlling for the disparities in other factors between women and men, such as education levels and employment status.

The remainder of this paper is organized as follows: Section 2 of this paper reviews some of the literature on digital gender gaps as well as digital skills; Section 3 details the data on which this paper is based and outlines the statistical methods underlying the analysis; Section 4 presents the findings; Section 5 concludes.

2 Literature review

In an era marked by rapid technological advancements, the interconnectedness of the digital landscape has transformed the way we interact, learn, and work. Digital technologies have become integral to daily life, impacting diverse aspects of society, from communication and education to business and governance (Fitzgerald et al., 2014; Hargittai, 2005; Yoo, 2010).

2.1 Gender and internet access

The empirical evidence indicates major differences between men and women in the volume, frequency, and quality of ICT access, particularly among those in developing countries. For instance, ITU data showed that in 2019 globally, 57% of women were online, compared to 62% of men; when considering least developed countries ITU estimates that just 19% of women were online in 2019, compared to 86% in developed countries (ITU, 2022). Other available gender disaggregated data on access and usage indicates similar disparities between men's and women's digital access (e.g., A4AI, 2016; GSMA, 2015a, 2021a; Scott et al., 2017 World Bank, 2016; World Wide Web Foundation, 2020, among others).

The GSMA's most recent global gender gap study indicates that women in low- and middle-income countries were 15% less likely to use mobile internet (almost the entirety of internet use is through mobiles in many Global South countries) than men in 2020 (GSMA, 2021a). Regionally, South Asia has seen some of the widest gender gaps (with the exception of the Middle East region), in terms of mobile adoption during the 2000's (LIRNEasia, 2011; Zainudeen et al., 2010), though the data presented by Zainudeen show that Sri Lanka's gender gap was more consistent with that of Southeast Asian countries. The GSMA's estimate of the gender gap in South Asia was 36% in 2020 (GSMA, 2021a). As internet access has spread over the region, similar patterns have emerged, with South Asian countries like Bangladesh and India seeing gender gaps in internet access as high as 62% in Bangladesh and 57% in India by 2019 among the 15-65 age group. Sri Lanka, as well as Nepal both showed lower gender gaps in internet access, at 34% and 33%, respectively in the same 23-country Global South study (LIRNEasia, 2019). Further disaggregation of the data shows that the gaps are not uniform. Women who also belong to other marginalized groups (such as rural populations and lower socioeconomic segments) are even less connected, and therefore likely to be further disadvantaged than women on average.

The importance of the underlying social norms within the South Asian region become apparent when considering the GNI per capita of the 23 countries versus their levels of connectivity and gender gaps; South Asia appears to be an outlier, with its gender gaps at similar levels, if not higher than poorer African countries.

Statistical modelling can help to uncover the underlying drivers of the gender gap. While gender gaps in mobile adoption are less of a concern in present times, past empirical studies to understand the role that gender plays in determining mobile adoption can still inform the present question of what role gender plays in determining internet access. Examining several studies which either model mobile adoption or internet/data service use, it is evident that the disparities in education and income levels (between men and women), can explain a considerable part of the gender disparities in digital access in developing countries, especially Asia. Once the gender disparities in education and/or income have been statistically accounted for (along with other variables such as age, location, etc.), in several studies, gender still is a statistically significant determinant of the likelihood of digital adoption. Simply put, being a woman *does* make one less likely to be digitally included. For instance, Perampalam et al. show that once the differences in education and employment status between men and women are (statistically) taken into account, being a woman in Myanmar reduced an individual's odds of owning a mobile by 42 (Perampalam, Zainudeen & Galpaya, 2016; Rajapakse, Zainudeen, Galpaya & Perampalam, 2016; Deen-Swarray, Gillwald & Morrell, 2012; de Silva, Ratnadiwakara & Zainudeen, 2011; Milek, Stork & Gillwald, 2011; Hilbert, 2011; Zainudeen & Ratnadiwakara, 2011). Similar evidence has also been seen in developed markets, with respect to adoption of mobile phones and Internet in the late 1990s/early 2000's (Wasserman & Richmond-Abbott, 2005; Rice & Katz, 2003; Bimber, 2000, among others). Interesting regional contrasts have become evident when comparing these findings to those of Research ICT Africa, where in a 2012 study, gender was a significant determinant of the gender gap in mobile adoption only in 6 of 17 countries (Gillwald, Milek & Stork, 2010).

2.2 Gender and digital skills

The emergence of the digital age has highlighted the significance of digital skills which have become crucial for personal and professional success. As per the Broadband Commission, skill tiers encompass basic functional skills, generic skills for meaningful use, and higher-level skills for empowerment (Broadband Commission for Sustainable Development, 2017). Hargittai (2005, p. 372) described digital skills as a "user's ability to locate content on the web effectively and efficiently". West et al. (2019) discuss digital skills such as consisting of copying or moving a file or folder, using copy and paste tools to duplicate or move information within a document, sending emails with attached files, using basic arithmetic formulas in a spreadsheet, connecting and installing new devices, finding, downloading, installing and configuring software, creating electronic presentations with presentation software and transferring files between a computer and other devices in their studies. Furthermore, van Deursen and van Dijk (2010) classified and explained digital skills under four broader categories: operational (the ability to operate hardware and software); information (the ability to search, select, and process information in a computer); strategic (the ability to use a computer and the Internet to achieve specific goals); and formal (the ability to navigate in a hypermedia context). In contrast, Hargittai and Hinnant (2008), Hargittai and Hsieh (2012), and Hargittai and Walejko (2008) have explored digital skills in terms of scaling the awareness of: advanced search, PDF, spyware, Wiki, JPG, mlog, Malware, Tag, and firewall. As 21st century digital skills Laar et al (2019) categorize digital skills into: information (skills to search, evaluate and manage digital information), communication (skills to transmit and reflect information online), collaboration (ability to work effectively and respectfully online), critical-thinking (ability to make informed judgments about information and communication based on sufficient reflection and evidence), creative (skills to appropriately use online tools to create online content), and problem-solving (skills to use digital platforms to analyze problem situation and deploy knowledge in finding a solution).

There are numerous techniques for gathering data on digital skills. Standardized tests and observations can give the most accurate assessment of one's skills, but they are expensive and difficult to scale up (Hargittai 2002; van Deursen & van Dijk, 2010; West et al., 2019). Prominently in observational studies, cost is a significant barrier to large-scale data collection (van Deursen & van Dijk, 2010). The majority of current statistics on digital skills are acquired from self-reported questionnaires in which individuals rate their degree of expertise in a variety of digital activities. Larres et al. (2003), Hakkarainen et al. (2000), and Hargittai, (2005) have opined that this self-reporting method has significant problems of validity. Some studies have used binary response (yes/no) self-reporting questions on digital skills (Hargittai, 2005) while some have focused on rating themselves following a Likert scale (Hargittai, 2005; Hargittai & Hsieh, 2012; Hargittai & Hinnant,2008; van Laar et al., 2019). Other approaches include multiplechoice tests, and assignment-based evaluations to examine digital literacy (Hargittai, 2002; Martínez-Cantos, 2017; van Deursen & van Dijk, 2010).

These digital skills are influenced by several determinants such as gender, age, socioeconomic status, ethnicity, geography, level of education, employment status, and training (van Laar, 2019; Helsper, 2010; Mossberger et al., 2003). Scholars have utilized regression models including linear regression, logistic regression, multiple regression, and OLS (Ordinary Least Square) regression to analyze the relationship of the determinants with digital skills (Gui & Argentin, 2011; Hargittai, 2002, 2005; Meneses & Momino, 2010; Van Laar et al., 2019; van Deursen & van Dijk, 2009). Van Laar et al. (2019) and van Dijk and Hacker (2003) have explained that age has a negative influence on digital skills while education has a positive impact on digital skills. Higher digital skills disparities are more marked among higher-educated and middle-aged individuals (Martínez-Cantos, 2017). For some categories, men and women do not differ significantly in their digital access and digital skills (Hargittai, 2002; Van Deursen & Van Dijk, 2011; Van Deursen et al., 2011). For instance, some women who are self-employed or who have completed their education have the same level of digital skills or beyond, compared to males (van Laar, 2019).

However, an examination of the literature reveals that gender disparities persist in digital usage and digital skills, impacting various aspects of engagement, access, and utilization. According to the ITU (2017) (International Telecommunication Union), the gender gap in digital skills is as high as 25% in some Asian and Middle Eastern countries (ITU, 2017). Structural inequalities related to demography, income, education, and employment perpetuate barriers to access and performance in terms of digital skills, which women often experience more acutely (Kuroda et al., 2019; van Deursen & van Dijk, 2009, 2010; West et al., 2019). Women's limited access and utilization are exacerbated by factors such as age, low education, rural residence, disabilities, and refugee status (Kuroda et al., 2019; West et al., 2019). For instance, in rural areas, women may own mobile phones but lack the skills to fully utilize them, underscoring the multifaceted nature of gender disparities in digital skills (West et al., 2019). As per Martínez-Cantos (2017), lower levels of digital skills reveal pronounced gender gaps in older and less educated cohorts. Conversely, the observation of gender-based digital disparity holds even among younger cohorts (Gui & Argentin, 2011; Hargittai, 2010; Helsper & Eynon, 2010). As per Meneses and Momino (2010), among school students, skills like an online search or downloading a file, male students outnumber female students by 49% and 118%, respectively. Thus, the gender digital skills gap interacts with and is exacerbated by concerns of age, residence, poverty, disabilities, and education (West et al., 2019).

Even after adjusting for other socioeconomic characteristics, certain gender disparities persist. One prominent fact is that women's self-assessment of their digital know-how is usually lower than men's (Hargittai & Shafer, 2006; Helsper & Eynon, 2013; Van Deursen & Van Dijk, 2015; Whitley, 1997). Thus, women tend to undervalue their digital know-how compared to men (Helsper & Eynon, 2013). Notably, studies such as those by Hargittai (2002), Van Deursen and Van Dijk (2011), and Van Deursen et al. (2011) highlight this parity. Gender stereotypes and differentiated expectations regarding digitized fields contribute to limiting women's engagement in technology-related activities (OECD, 2018; Sáinz et al., 2016). Gender stereotypes profoundly impact girls' and boys' confidence in digital skills (Sáinz et al., 2016). The self-efficacy gender gap widens in secondary and tertiary education, revealing that despite promising initial performance, girls demonstrate lower levels of confidence even when they outperform boys (West et al., 2019). Hargittai and Shafer (2006) emphasize that this self-assessment dynamic can hinder women's digital engagement, information seeking (Helsper & Eynon, 2013), content sharing (Hargittai & Walejko, 2008), and even contributions to collaborative platforms like Wikipedia (Hargittai & Shaw, 2015).

Hence, lack of digital skills leads to digital inequality (van Dijk 2002; Hargittai 2002). Digital skills are required for effective use; skills determine the benefit that people get from using the internet (van Dijk

2002; Hargittai 2002; Zillien and Marr 2013); and digital skills have a moderator effect on digital adaptation behaviors (Yu et al. 2017). Thus, in many cases, women utilize digital skills less and profit less from them in contrast to males (Kuroda et al., 2019).

3 Data and method

3.1 Data

The data that this paper is based on was collected through nationally representative surveys conducted by LIRNEasia in Sri Lanka and India between March and October 2021. The nationally representative samples for the survey consisted of 7,000 households across India including 350 villages and wards,[1] and 2,500 households across 125 Grama Niladhari Divisions in Sri Lanka. Multi-stage stratified random sampling methods were used to ensure representation of the target group (population aged 15+) at a national level[2] with a confidence level of 95-percent and a +/-1.7% margin of error in India, and +/-2.8% in Sri Lanka. The data also allows for disaggregation by urban/rural divide, gender and socio-economic classification at the national level and at the sub-national level for major states/provinces in the two countries.[3] The sample sizes are contained in Table 1.

Table 1: Sample details

	Full sample	Internet users
India	6,995	3,299
Sri Lanka	2,501	1,098

Source: LIRNEasia survey data (2021)

The survey included questions on demographics, socioeconomic characteristics, internet access and digital skills, among others. This data is used in the analysis. A broad definition of internet access was used, to include uses such as Facebook, WhatsApp, email, etc.

Digital skills were measured through self-reported responses to a set of questions on whether or not the respondent can perform a certain task independently:

1. *Can you search for information or other content on the internet/online?*
2. *Can you post any information on the Internet/online. This can include commenting on something that you see, or posting or sharing status update, photo or link*
3. *Can you install an application on mobile phone?*
4. *Can you create log-in details (user) and a password to use a particular service or a website online. Some examples are Facebook, Viber, Instagram, Twitter, etc.*
5. *Can you locate and adjust settings on an application or service on mobile phone?*
6. *Can you make a payment or complete a transaction online or by mobile (e.g., this can include card payments using mobile phone, mobile money services such as ________[India: PayTM, PhonePay, GooglePay/Sri Lanka: EasyCash, MCash], and using payment gateway apps such as PayPal)*

[1] Excluding the state of Kerala, where the survey could not be conducted at the time due to the Covid-19 pandemic.

[2] Excluding the state of Kerala in India.

[3] Delhi, Assam, Tamil Nadu, and Maharashtra in India, and the Western Province in Sri Lanka. Detailed methodology information for the India dataset can be found here: https://lirneasia.net/2021/11/impact-of-covid-19-on-households-and-the-workforce-in-india-survey-methodology-notes/ and for the Sri Lanka dataset, here: https://lirneasia.net/2021/12/impact-of-covid-19-on-households-and-the-workforce-in-sri-lanka-survey-methodology-note/

The questions were asked from all respondents but for the analysis in this paper, responses of internet users only (Table 2) were considered. While this set of skills is not comprehensive, it covers a basic set of skills which would be required to operate in the digital economy, as a consumer, citizen or even a digital micro-entrepreneur.

The data shows that while overall Indian internet users report higher levels of digital skills than Sri Lankan counterparts, there is a considerable gender gap in these skills levels, with Indian women lagging (Table 2). For instance, among Indian internet users in the 15+ age group, 68% of males compared to 59% of female internet users are able to create log-in details and set up a password to use an online service or app by themselves (LIRNEasia, 2021).

*Table 2: Digital skills (% of aged 15+ internet users that **can** perform task)*

	India			Sri Lanka		
	Men	Women	% gap	Men	Women	% gap
Search for information or other content	77%	67%	13%	67%	61%	9%
Post any information on the Internet/online	72%	60%	17%	66%	65%	2%
Install an application	75%	65%	13%	68%	58%	15%
Create log-in details (user) and a password to use a particular service or a website online.	68%	59%	13%	59%	53%	10%
Locate and adjust settings on an application or service on mobile phone	64%	54%	16%	53%	48%	9%
Make a payment or complete a transaction online or by mobile	55%	43%	22%	22%	20%	9%

Source: LIRNEasia survey data (2021)

Note: Based on self-reported ratings of ability to complete the relevant task online either independently

Sri Lankan internet users show less pronounced gender gaps in digital skills, however, the survey indicates that there are still significant numbers of men and women that are unable to set up and manage accounts for services online and engage in transactions (Table 2). For instance, 31% of women internet users and 28% of men internet users in Sri Lanka did not know how to create log-in details and passwords for services and apps online (while many were just not aware of such tasks in the first place). Over 75% of internet users in Sri Lanka --male and female-- were not able to complete payments and transactions online (LIRNEasia, 2021).

3.2 Method

Using the data described in Section 3.1, this paper explores two questions:

1. Is gender a significant predictor of the likelihood of an individual in India and Sri Lanka using the internet?
2. Is gender a significant predictor of the likelihood of an internet user in India and Sri Lanka possessing a series of digital skills?

Binary logistic modeling is used to investigate these research questions, following the approaches of previous work where technology adoption has been modeled as a binary outcome (Chabossou et al., 2009; Deen-Swarray et al., 2011; de Silva et al., 2011; Lokanathan, Gamage and Senenayake, 2014; Rajapakse, Zainudeen, Galpaya and Perampalam, 2016), and further where the possession of digital skills has also been modeled as a binary outcome (Meneses & Momino, 2010; Min, 2010; Zillien & Hargittai, 2009).[4]

[4] For a detailed discussion of the binary logistic regression methodology see de Silva et al. (2011).

Logistic regression ensures that the predicted values of the outcome variable (Y) are bounded by one and zero. The probability of "success" (internet use in the case of Research Question 1 or the ability to perform a specific task in the case of Research Question 2) is predicted through the model. For each respondent there is a set of predictor (or explanatory) variables (which may be continuous or categorical) that determine the final probability. The "logits," natural logs of the odds, of the probabilities are modeled as a linear function of the predictor (or explanatory) variables. From the parameter estimates, corresponding odds ratios can be calculated. The odds ratio implies for each unit increment of the given explanatory variable, the odds of the concerned dependent variable (internet use and digital skills in this case) changes by a percentage of [odds ratio – 1]. Odds ratios can provide insight into the relationships between predictor variables and the odds of the outcome variable, but when the associated p-value is high, the confidence in those relationships is reduced.

The probability of outcome Y is given by:

$$P(Y) = \frac{1}{1 + e^{-\sum_{i=0}^{n} B_i X_i}}$$

Where X_i are the explanatory variables 0 through *n*, B_i are the coefficients of the respective explanatory variables 0 through *n*, which measure the value and direction of each explanatory variable's contribution to variations in the outcome variable, holding other variables constant.

Eight models were developed for each country, to investigate the research questions. Model (1) investigates the factors which affect the odds of having used the internet before or not. Models (2)-(8) investigate the factors which affect the odds of being able to fulfil the six skills described in Section 4.1; Model (2) investigates the odds of being able to perform *at least one* of the six skills that are asked about., while Models (3)-(8) investigate the skills individually, starting with simple skills such as being able to search for or post information online, to more complex ones such as being able to make payment or complete a transaction online. The outcome variables are given in Table 3.

Table 3: Outcome variables, Models (1) – (8)

	Outcome variable	Values
Model (1)	Internet use	0 = no internet use 1= internet use
Model (2)	Ability to perform at least one of the tasks (1)-(6)	0 = not able to perform any task 1 = able to perform at least one task
Model (3)	Ability to search for information or other content	0 = not able to perform task 1= able to perform task
Model (4)	Ability to post any information on the Internet/online	
Model (5)	Ability to install an application	
Model (6)	Ability to create log-in details (user) and a password to use a particular service or a website online.	
Model (7)	Ability to locate and adjust settings on an application or service on mobile phone	
Model (8)	Ability to make a payment or complete a transaction online or by mobile	

Other variables that are controlled for (i.e., explanatory variables) include the respondent's:

1. Gender
2. Location (urban or rural)
3. Age
4. Level of education
5. Socioeconomic classification (SEC) group
6. Employment status
7. Marital status
8. Device ownership (including type of mobile device owned)
9. Presence of school-aged children in the household

Based on this framework, and the variables listed are pre-supposed to influence the probability the outcomes of interest in the respective models in each country. Detailed descriptions of the variables are contained in Annex 1. For categorical explanatory variables, the reference category (where the value takes a zero) was assigned as the more "privileged" category, for easier interpretation of odds ratios (coefficients). For example, the odds ratio for the gender variable can be interpreted as how less likely a female is compared to a male, when all other variables are held constant. As such expected signs of the coefficients would be negative, for instance indicating that a rural respondent would be less likely to be online than an urban one (reference category), and so on.

As an initial step, and the correlations of the explanatory variables with the outcome variables of interest were examined through Chi-squared tests, revealing statistical correlation and thus justification (beyond the theoretical justification) to be included in the models for all explanatory variables *except* gender and the presence of children in the household. In the case of the latter two, they were still included in the models since they can potentially have a bearing on the research questions. Variables were tested for multicollinearity before running the models also; none of any significance was detected.

4 Findings

Tables 4 and 5 present the most relevant elements of the regression outputs, relating to the question of the role of gender in predicting the outcome variable in the model.[5]

4.1 Internet access and gender

The statistical modeling shown in this section allows for the isolation of the gender effect in determining the likelihood of an individual owing a mobile or being online. Statistically controlling for the gender differences in observable characteristics (such as age, education, employment status, etc.) implies that the differences between men and women in these characteristics have all been controlled for, or evened out. So, what the gender variable captures is *other* differences between men and women which are not controlled for in the models. This can include various factors, including other unobservable factors relating to social and cultural norms, which is visible in the differences in the magnitude of this effect across cultures and regions. Unpacking the intrinsic role of gender and understanding what this gender 'effect' means is beyond the remit of statistical modelling, a task which requires context-specific understanding of the specific country or population to which it applies to, which can be gained through qualitative research approaches, which is outside of the scope of this paper.

[5] The full binary logistic model outputs for all models can be found in Tables A2-A5 in Annex 1.

Model (1) indicates that the gender variable does not make a significant contribution to the model, i.e., determining the odds of internet use in Sri Lanka,[6] with a p-value value greater than 0.05.[7] while in India, gender makes a significant contribution. Compared to men, women in Sri Lanka with equivalent characteristics are *as* likely to use the internet, while in India a woman with equivalent characteristics is 35% *less* likely to have ever used the internet than a man.

Table 4: Summary of gender variables for Models (1)-(8): Sri Lanka

		SRI LANKA							
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Ever used internet	**Able to perform at least one skill**	**Search for information or other content on the Internet,online**	**Post any information on the Internet,online**	**Install an application**	**Create login details (user) and a password to use a particular service or a website**	**Locate and adjust settings on an application or service**	**Make a payment or complete a transaction online or by mobile**
Gender (=0 if male, = 1 if female)	Sign	(+)	(+)	(-)	(+)	(-)	(-)	(-)	(-)
	Significance	0.261	0.845	0.886	0.737	0.147	0.061	0.286	0.741
	Odds ratio (Exp(b))	**1.396**	**1.061**	**0.964**	**1.086**	**0.688**	**0.627**	**0.778**	**0.917**
Nagelkerke R square		0.698	0.222	0.254	0.216	0.286	0.296	0.275	0.153
% of correctly classified cases		86%	78%	70%	70%	71%	71%	70%	81%

Table 5: Summary of gender variables for Models (1)-(8): India

		INDIA							
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Ever used internet	**Able to perform at least one skill**	**Search for information or other content on the Internet,online**	**Post any information on the Internet,online**	**Install an application**	**Create login details (user) and a password to use a particular service or a website**	**Locate and adjust settings on an application or service**	**Make a payment or complete a transaction online or by mobile**
Gender (=0 if male, = 1 if female)	Sign	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)
	Significance	0.003	0.012	0.012	0.001	0.021	0.003	0.016	0.000
	Odds ratio (Exp(b))	**0.649**	**0.614**	**0.651**	**0.594**	**0.674**	**0.622**	**0.690**	**0.595**
Nagelkerke R square		0.663	0.300	0.259	0.268	0.276	0.273	0.282	0.280
% of correctly classified cases		85%	84%	78%	75%	78%	74%	71%	69%

As per the model outputs (Tables A2-A5 in Annex 1), the key contributors to internet access in both countries are age (with younger age groups more likely to be online), smartphone ownership, education (more educated more likely to be online), and other device ownership (computer, TV, etc.). Spatial effects are also visible in both countries, with rural individuals less likely to be online than their urban counterparts. Socioeconomic classification group has a contribution toward internet access in India (higher groups more likely to be online), while being employed or not in Sri Lanka has a contribution to being online (those not employed are less likely to be online).

The impact of being married in both countries on internet access appears not to make significant contributions to the likelihood of being online, interestingly; though directionally, the coefficients indicate a negative impact of marriage on being online. An interaction term between the gender and marital status variables was included in the models to understand if the odds of ever having used the internet are different for married women compared to unmarried women (as a possible proxy for the presence of domestic responsibilities, as well as power dynamics; see Tables A2 and A3). In both countries, the interaction term does not significantly contribute to the model, but once again,

[6] Directly related to the probability of internet use.

[7] The significance values for each explanatory variable indicates whether the respective variable makes a significant contribution to the model; values equal to or below 0.05 indicate a statistically significant contribution at the 95% level of confidence. Regardless of significance values, the direction and magnitude can also provide some indication of the relationship, even if weak.

directionally, the combinations of the gender, marital status and gender*marital status variables indicate that being a married woman negatively contributes to the likelihood of having used the internet, compared to a single man, all else held constant.[8]

The presence of school-aged children in a household was included as an explanatory variable to capture possible effects on internet access; this could be due the need for children to be online during the pandemic period for online school, which could potentially have a spill-over effect of bringing their primary care givers (often women) online. The results indicate a small effect present in India (but not Sri Lanka), whereby an individual from a household where there are school-aged children are present is less likely to be online, holding all other factors constant. However, this variable does not significantly contribute to the model.

4.2 Internet access and digital skills

Model (2) investigates the factors which affect the odds of being able to fulfil at least one digital skill from a set of seven that are asked about in the survey; Models (3)-(8) conduct the same investigation on each of the seven skills individually, starting with simple skills such as being able to search for or post information online, to more advanced ones such as being able to make payment or complete a transaction online.

Models (2)-(8) reveal similar effects of gender on the likelihood of having any of the digital skills in question (Table 4), as seen in the previous sub-section. Gender does not make a significant contribution to the ability to perform any of the tasks (i.e., digital skills) questioned in Sri Lanka, while it makes a significant contribution to digital skills capabilities in India. The odds ratios indicate that in India a female compared to the reference male (i.e., holding all other explanatory variables constant) is between 35% and 41% to be able to perform any of the given tasks in question; put simply, being a woman in India leads to a considerably lower likelihood of being able to perform at least one of the tasks in question.

Comparing the odds ratios between the six tasks questioned, does not show any variation with the level of complexity of the task as might be expected. For instance, simple tasks such as searching for and posting information online, the gender effect might be expected to be lower than for more complex tasks which require a higher level of skill such as completing a payment or transaction online; however, this is not the case as Table A5 indicates. The gender effects are highest for posting information online, payments/transactions, and creating login details. This could suggest apprehension or a lack of confidence to perform certain tasks activities online to mitigate potential digital harms (e.g., online harassment based on posting comments on social media; contact information being.

As per the model outputs (Tables A2-A5 in Annex 1), in both countries, device ownership is a key enabler of digital skills. Those that own smartphones and/or personal computers are more likely to be able to perform all the tasks. Age is also a key predictor in both countries, with the likelihood of being able to perform any of the tasks reducing with age. Education and socioeconomic classification (SEC) group in the case of some skills (especially in India) also appear to be enabling factors, with odds ratios indicating lower likelihood with lower levels of education and SEC. Being employed has a positive effect on the likelihood of being able to perform the digital tasks among Sri Lankan internet users, but not so much among Indian counterparts.

Being married (for men and women as a whole) does not have any impact on digital skills in Sri Lanka, but has a negative impact on the likelihood of having the more 'complex' skills examined in Models (5)-(8) in India (installing an application, creating login details/passwords, locating/adjusting settings;

[8] For guidance on interpretation see: https://www.youtube.com/watch?v=LX2HBvCKjBY

completing payments/transactions). The interaction term for marital status and gender does not reveal any gender-specific patterns related to this in any of the models.

The presence of school-aged children in the household does not appear to make a significant contribution to the skills models, though directionally in several of them, the coefficients suggest a positive relationship, i.e., the presence of school-aged children int he household has a positive effect on the abilities to perform the tasks in question.

5 Conclusion

This paper explored the role of gender in predicting internet access and digital skills among the aged 15+ population in India and Sri Lanka. There is evidence of a gender 'effect' in India, in internet access and digital skills capabilities, but not in Sri Lanka, once other gender differences (e.g., in education levels) have been accounted for.

A possible explanation for the country differences could be, as evidenced by prior work, a different, stronger set of gender norms in India, versus Sri Lanka, such that women are less constrained in their use of technology in the latter (Zainudeen, et al., 2008).

In both countries, the key drivers of being online and possessing digital skills are device ownership, age and education. Interventions to improve digital skills therefore should be accompanied by interventions to improve affordability of devices. Interventions should also be more targeted toward older age groups and less educated groups also in both countries, but women specifically in India.

While the gaps in internet access have been narrowed considerably in recent years, and there is no apparent 'gender effect' n Sri Lanka, it is still notable that there are still considerable numbers of the population that remain offline, and with insufficient skills to engage meaningfully online. The country still has a considerable way to go in ensuring its online population –both men and women—are equipped with the necessary skills to take advantage of digital opportunities at hand, to better their lives.

6 References

Alliance for Affordable Internet. (2016). The 2015-2016 Affordability Report. Available at: https://a4ai.org/wp-content/uploads/2022/03/A4AI-2015-16-Affordability-Report.pdf

Bimber, B. (2000). Measuring the Gender Gap on the Internet. Social Science Quarterly, 81: 868–876.

Broadband Commission for Sustainable Development. (2013). Doubling digital opportunities: Enhancing the inclusion of women and girls in the information society. Available at: https://www.broadbandcommission.org/Documents/publications/bb-doubling-digital-2013.pdf

Broadband Commission for Sustainable Development. (2017). Working Group on the Digital Gender Divide. Recommendations for action: bridging the gender gap in Internet and broadband access and use. Available at http://broadbandcommission.org/Documents/publications/WorkingGroupDigitalGender Divide-report2017.pdf

Cummings, C. & O'Neil, T. (2015). Do digital information and communication technologies increase the voice and influence of women and girls? A rapid review of the evidence. ODI. Available at:https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/9622.pdf.

de Silva, H., Ratnadiwakara, D., & Zainudeen, A. (2011). Social Influence in Mobile Phone Adoption: Evidence from the Bottom of the Pyramid in Emerging Asia. Information Technologies & International Development, 7(3), 1-18. Available at http://itidjournal.org/itid/article/view/757/317

Deen-Swarray, M. Gillwald, A. & Morrell, A. (2012). Lifting the veil on ICT gender indicators in Africa. Evidence for ICT policy Action: Policy paper 13. Available at: www.researchictafrica.net.

Deen-Swarray, M., Gillwald, A. & Morrell, A. (2013). Lifting the Gender Veil on ICT Indicators in Africa. In: CPRsouth8/CPRafrica2013 conference. Available at SSRN: http://ssrn.com/abstract=2363776.

Fitzgerald, M., Kruschwitz, N., Bonnet, D., & Welch, M. (2014). Embracing digital technology: A new strategic imperative. MIT sloan management review, 55(2), 1.

Galperin, H.; Mariscal, J. & Barrantes, R. (2014). The Internet and Poverty: Opening the Black Box. IRSi. Available at: https://dirsi.net/web/files/files/Opening_the_Black_Box.pdf.

Gillwald, A.; Milek, A. & Stork, C. (2010). Gender Assessment of ICT Access and Usage in Africa 2010. RIA Policy Paper Vol 1 Paper 5. Available at: https://goo.gl/8behvk.

GSMA (2015a). Bridging the gender gap: mobile access and usage in low- and middle- income countries. Available at: http://www.gsma.com/connectedwomen/wp-content/uploads/2015/02/GSM0001_02252015_GSMAReport_FINAL-WEB-spreads.pdf.

GSMA. (2021a). The mobile gender gap report 2021. Available at: https://www.gsma.com/r/wp-content/uploads/2021/06/The-Mobile-Gender-Gap-Report-2021.pdf

Gui, M., & Argentin, G. (2011). Digital skills of internet natives: Different forms of digital literacy in a random sample of northern Italian high school students. New media & society, 13(6), 963-980.

Hakkarainen, K., Ilomäki, L., Lipponen, L., Muukkonen, H., Rahikainen, M., Tuominen, T., & Lehtinen, E. (2000). Students' skills and practices of using ICT: Results of a national assessment in Finland. Computers & Education, 34(2), 103-117.

Hargittai, E. (2002). Beyond logs and surveys: In-depth measures of people's web use skills. Journal of the American Society for Information Science and technology, 53(14), 1239-1244.

Hargittai, E. (2005). Survey measures of web-oriented digital literacy. Social science computer review, 23(3), 371-379.

Hargittai, E. (2010). Digital na (t) ives? Variation in internet skills and uses among members of the "net generation". Sociological inquiry, 80(1), 92-113.

Hargittai, E., & Hinnant, A. (2008). Digital inequality: Differences in young adults' use of the Internet. Communication research, 35(5), 602-621.

Hargittai, E., & Hsieh, Y. P. (2012). Succinct survey measures of web-use skills. Social Science Computer Review, 30(1), 95-107.

Hargittai, E., & Shafer, S. (2006). Differences in actual and perceived online skills: The role of gender. Social science quarterly, 87(2), 432-448.

Hargittai, E., & Walejko, G. (2008). The participation divide: Content creation and sharing in the digital age. Information, Community and Society, 11(2), 239-256.

Helsper, E. J., & Eynon, R. (2010). Digital natives: where is the evidence?. British educational research journal, 36(3), 503-520.

Helsper, E. J., & Eynon, R. (2013). Distinct skill pathways to digital engagement. European Journal of Communication, 28(6), 696-713.

Hilbert, M. (2011). Digital gender divide or technologically empowered women in developing countries? A typical case of lies, damned lies and statistics. Women's studies International forum, 6, pp. 479-489. Available at: http://dx.doi.org/10.1016/j.wsif.2011.07.001

Kuroda, R., Lopez, M., Sasaki, J., & Settecase, M. (2019). The digital gender gap. W20 Japan, EY-GSMA.

ITU. (2022). Bridging the Digital Divide. Available at: https://www.itu.int/en/mediacentre/backgrounders/Pages/bridging-the-gender-divide.aspx#:~:text=According%20to%20ITU's%20latest%20data,gender%20gap%20stands%20at%208%25.

ITU. (2021). Measuring digital development Facts and figures 2021. Available at: https://www.itu.int/en/ITU-D/Statistics/Documents/facts/FactsFigures2021.pdf

LIRNEasia (2019). AfterAccess: ICT access and use in Asia and the Global South (Version 3.0). Colombo: LIRNEasia. Available at: https://lirneasia.net/2019/05/afteraccess-asia-report3/

LIRNEasia. (2021). A new digital deal for an inclusive post-COVID-19 social compact: developing digital strategies for social and economic reconstruction [Unpublished raw data]. LIRNEasia.

Martínez-Cantos, J. L. (2017). Digital skills gaps: A pending subject for gender digital inclusion in the European Union. European Journal of Communication, 32(5), 419-438.

McCourt Larres, P., Ballantine, J., & Whittington, M. (2003). Evaluating the validity of self-assessment: measuring computer literacy among entry-level undergraduates within accounting degree programmes at two UK universities. Accounting Education, 12(2), 97-112.

Meneses, J., & Mominó, J. M. (2010). Putting digital literacy in practice: How schools contribute to digital inclusion in the network society. The Information Society, 26(3), 197-208.

Milek, A., Stork, C. & Gillwald, A. (2011) Engendering communication: a perspective on ICT access and usage in Africa, info, Vol. 13 Issue: 3, pp.125-141, https://doi.org/10.1108/14636691111131493

Moyo, M. & Deen-Swarray, M. (2013). Gender and Entrepreneurship in the Informal Sector: An African Perspective; In the CPR South 8/CPRafrica 2013 Conference on Innovation & Entrepreneurship in ICT: Changing Asia/Africa, Mysore, India; September 2013Mossberger, K., Tolbert, C. J., & Stansbury, M. (2003). Virtual inequality: Beyond the digital divide. Georgetown University Press.

Organisation for Economic Co-operation and Development (OECD). (2018). Bridging the digital gender divide: Include, upskill, innovate. OECD.

Perampalam, S., Zainudeen, A. & Galpaya, H. (2016). Understanding Gender Variance in Mobile Ownership in Myanmar, presented at CPRsouth 2017 conference, Myanmar.

Rajapakse, C., Zainudeen, A., Galpaya, H., and Perampalam, S. (2016). Factors influencing use of mobile data services among women in Myanmar. Paper presented at CPRsouth 2016: Inclusive Innovation,8-10 September 2016, Zanzibar. http://www.cprsouth.org/wp-content/uploads/2016/09/CPRsouth-2016_PP79_Rajapakse.docx

Rice, R.E. & Katz, J.E. (2003). Comparing Internet and mobile phone usage: digital divides of usage, adoption, and dropouts, Telecommunications Policy 27(8-9): 597-623.

Sáinz, M., Meneses, J., López, B. S., & Fàbregues, S. (2016). Gender stereotypes and attitudes towards information and communication technology professionals in a sample of Spanish secondary students. Sex Roles, 74, 154-168.

Scott, S., Balasubramanian, S. & Ehrke, A. (2017). Ending the Gender Digital Divide in Myanmar: A Problem-Driven Political Economy Assessment. IREX. Available at: https://www.irex.org/sites/default/files/node/resource/gender-digital-divide-myanmar-assessment.pdf

Union, I. (2015). ICT facts and figures 2017. Geneva: International Telecommunication Union.

United Nations Division for the Advancement of Women, International Telecommunication Union and UN ICT Task Force Secretariat. (2002, November). Information and communication technologies and their impact on and use as an instrument for the advancement and empowerment of women. Report presented in Seoul, Republic of Korea, November 2002. Available at: https://www.un.org/womenwatch/daw/egm/ict2002/reports/EGMFinalReport.pdf

Van Deursen, A. J. A. M., Courtois, C., & Van Dijk, J. (2010). Internet skills. Vital assets in an information society. Enschede, the Netherlands: University of Twente.

Van Deursen, A. J., & Van Dijk, J. A. (2009). Improving digital skills for the use of online public information and services. Government information quarterly, 26(2), 333-340.

Van Deursen, A. J., & Van Dijk, J. A. (2015). Toward a multifaceted model of internet access for understanding digital divides: An empirical investigation. The information society, 31(5), 379-391.

Van Deursen, A., & Van Dijk, J. (2011). Internet skills and the digital divide. New media & society, 13(6), 893-911.

Van Dijk, J. A. G. M. (2002). A framework for digital divide research. Electronic journal of communication, 12(1), 2.

Van Dijk, J., & Hacker, K. (2003). The digital divide as a complex and dynamic phenomenon. The information society, 19(4), 315-326.

Van Dijk, J., & van Deursen, A. (2010). Inequalities of digital skills and how to overcome them. In Handbook of research on overcoming digital divides: Constructing an equitable and competitive information society (pp. 278-291). IGI Global.

van Laar, E., van Deursen, A. J., van Dijk, J. A., & de Haan, J. (2019). Determinants of 21st-century digital skills: A large-scale survey among working professionals. Computers in human behavior, 100, 93-104. – Regression analysis

Wasserman, I.M., & Richmond-Abbott, M. (2005). Gender and the Internet: Causes of variation in access, level, and scope of use. Social Science Quarterly 86(1): 252–270.

West, M., Kraut, R., & Ei Chew, H. (2019). I'd blush if I could: closing gender divides in digital skills through education.

World Wide Web Foundation (2016). Beyond gender commitments: OGP needs to 'walk the talk' (blog). Available at: http://webfoundation.org/2016/12/beyond-gender-commitments- ogp-needs-to-walk-the-talk/

World Wide Web Foundation. (2020). World Wide Web Foundation (2020). Women's Rights Online: Closing the digital gender gap for a more equal world. Web Foundation. http://webfoundation.org/docs/2020/10/Executive-Summary-English.pdf

World Bank. (2016). World Development Report 2016: Digital Dividends. Available at: http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2016/01/13/090224b08405ea05/2_0/Rendered/PDF/World0developm0000digital0dividends.pdf

Yoo, Y. (2010). Computing in everyday life: A call for research on experiential computing. MIS quarterly, 213-231.

Yu, T. K., Lin, M. L., & Liao, Y. K. (2017). Understanding factors influencing information communication technology adoption behavior: The moderators of information literacy and digital skills. Computers in Human Behavior, 71, 196-208.

Zainudeen, A. and Amarasinghe, T. (2019). Information sharing behavior on social media in the Asian Global South. Paper presented at ITS 2019, October 2019. http://itsbangkok2019.com/download/191029/4-2-29-2%20Information%20sharing%20behavior%20on%20social%20media%20in%20the%20Asian%20Global%20South%20.pdf

Zainudeen, A. & Galpaya, H. (2016). Mobile phones, Internet, and gender in Myanmar. GSMA Connected Women & LIRNEasia. London: GSM Association. Available at https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2016/02/Mobile-phones-internet-and-gender-in-Myanmar.pdf

Zainudeen, A., & Ratnadiwakara, D. (2011). Are the Poor Stuck in Voice? Conditions for Adoption of More-Than-Voice Mobile Services. Information Technologies International Development, 7(3), 45–59. Available at: http://itidjournal.org/index.php/itid/article/view/760/320

Zainudeen, A., Iqbal, T. & Samarajiva, R. (2010). Who's got the phone? Gender and the use of the telephone at the bottom of the pyramid, New Media and Society, 12: 549-66. http://nms.sagepub.com/cgi/content/abstract/12/4/549

Zillien, N., & Marr, M. (2013). The digital divide in Europe. The digital divide, 55.

Annex 1

Table A1: Explanatory variable details

Variable	**Values**
Gender	0 = male 1= female
Location	0 = urban 1 = rural
Age	0 = 15-25 years 1 = 26-35 years 2 = 36-45 Years 3 = 46-55 Years 4 = 56-65 Years 5 = 66 and above
Education	0 = up to tertiary education complete 1 = only up to secondary education complete 2 = only up to primary education complete 3 = no education
Socioeconomic classification	0 = SEC A 1 = SEC B 2 = SEC C 3 = SEC D 4 = SEC E
Employment status	0 = employed 1 = unemployed
Marital status	0 = unmarried 1 = married
Interaction term (marital status & gender)	Marital status * gender
Mobile device	0 = smartphone 1 = basic or feature phone 2 = no phone
Desk/laptop ownership (individual)	0 = own 1= do not own
Desk/laptop ownership (household)	0 = own 1= do not own
Fixed phone ownership	0 = own 1= do not own
Radio ownership	0 = own 1= do not own
TV ownership	0 = own 1= do not own
Satellite decoder ownership	0 = own 1= do not own
Presence of school-aged children in the house	0 = present 1= absent
Constant	

Source: Authors

Table A2: Model (1) full binary logistic output: Sri Lanka

Sri Lanka: Model (1)			
	Outcome variable: Ever used internet		
Predictor variables	**Sign**	**Significance**	**Odds ratio (Exp(b))**
Gender (0=male; 1=female)	(+)	0.261	**1.396**
Location (0=urban; 1=rural)	(-)	0.002	**0.671**
Age (reference category = 15-25 years)		0.000	
26-35 years	(-)	0.000	**0.401**
36-45 Years	(-)	0.000	**0.138**
46-55 Years	(-)	0.000	**0.084**
56-65 Years	(-)	0.000	**0.043**
66 + years	(-)	0.000	**0.033**
Level of education (reference category = tertiray education)		0.000	
Secondary	(-)	0.000	**0.462**
Primary	(-)	0.000	**0.236**
No education	(-)	0.000	**0.177**
SEC (reference category = SEC A)		0.051	
SEC B	(+)	0.789	**1.096**
SEC C	(-)	0.909	**0.961**
SEC D	(-)	0.727	**0.882**
SEC E	(-)	0.155	**0.599**
Employed (0= employed; 1= not employed)	(-)	0.003	**0.643**
Married (0=unmarried; 1=married)	(-)	0.343	**0.760**
Marital status * gender (interaction)	(-)	0.312	**0.715**
Type of mobile phone owned (reference category = smartphone owned)		0.000	
Basic phone or feature phone	(-)	0.000	**0.047**
No phone owned	(-)	0.000	**0.082**
Personal desktop or laptop computer ownership (0= own, 1= don't own)	(-)	0.000	**0.252**
Household desktop computer ownership (0= own, 1= don't own)	(-)	0.001	**0.522**
Fixed phone ownership (0= own, 1= don't own)	(+)	0.107	**1.316**
Radio ownership (0= own, 1= don't own)	(-)	0.123	**0.813**
TV ownership (0= own, 1= don't own)	(-)	0.001	**0.517**
Satellite decoder or cable TV ownership (0= own, 1= don't own)	(-)	0.058	**0.746**
Presence of school aged kids in the house (0 = absent; 1 = present)	(-)	0.582	**0.923**
Constant	(+)	0.000	**652.345**
Nagelkerke R square			0.698
% of correctly classified cases			86%

Table A3: Model (1) full binary logistic output: India

India: Model (1)			
	Outcome variable: Ever used internet		
Predictor variables	**Sign**	**Significance**	**Odds ratio (Exp(b))**
Gender (0=male; 1=female)	(-)	0.003	**0.649**
Location (0=urban; 1=rural)	(-)	0.000	**0.738**
Age (reference category = 15-25 years)		0.000	
26-35 years	(-)	0.000	**0.550**
36-45 Years	(-)	0.000	**0.286**
46-55 Years	(-)	0.000	**0.101**
56-65 Years	(-)	0.000	**0.084**
66 + years	(-)	0.000	**0.049**
Level of education (reference category = tertiray education)		0.000	
Secondary	(-)	0.000	**0.437**
Primary	(-)	0.000	**0.203**
No education	(-)	0.000	**0.106**
SEC (reference category = SEC A)		0.000	
SEC B	(-)	0.000	**0.566**
SEC C	(-)	0.000	**0.371**
SEC D	(-)	0.000	**0.325**
SEC E	(-)	0.000	**0.180**
Employed (0= employed; 1= not employed)	(-)	0.367	**0.924**
Married (0=unmarried; 1=married)	(-)	0.553	**0.926**
Marital status * gender (interaction)	(-)	0.506	**0.892**
Type of mobile phone owned (reference category = smartphone owned)		0.000	
Basic phone or feature phone	(-)	0.000	**0.081**
No phone owned	(-)	0.000	**0.055**
Personal desktop or laptop computer ownership (0= own, 1= don't own)	(-)	0.907	**0.967**
Household desktop computer ownership (0= own, 1= don't own)	(-)	0.059	**0.662**
Fixed phone ownership (0= own, 1= don't own)	(-)	0.165	**0.837**
Radio ownership (0= own, 1= don't own)	(-)	0.414	**0.904**
TV ownership (0= own, 1= don't own)	+	0.604	**1.059**
Satellite decoder or cable TV ownership (0= own, 1= don't own)	(-)	0.406	**0.934**
Presence of school aged kids in the house (0 = absent; 1 = present)	(-)	0.005	**0.801**
Constant	+	0.000	**213.796**
Nagelkerke R square			0.663
% of correctly classified cases			85%

Table A4: Models (2)-(8) (skills models) full binary logistic outputs: Sri Lanka

	SRI LANKA																				
	(2)			(3)			(4)			(5)			(6)			(7)			(8)		
	Performing at least one skill			**Search for information or other content on the Internet,online**			**Post any information on the Internet,online**			**Install an application**			**Create login details (user) and a password to use a particular service or a website**			**Locate and adjust settings on an application or service**			**Make a payment or complete a transaction online or by mobile**		
	Sign	Sig.	Odds ratio (Exp(b))	Sign	Sig.	Odds ratio (Exp(b))	Sign	Sig.	Odds ratio (Exp(b))	Sign	Sig.	Odds ratio (Exp(b))	Sign	Sig.	Odds ratio (Exp(b))	Sign	Sig.	Odds ratio (Exp(b))	Sign	Sig.	Odds ratio (Exp(b))
Gender (0=male; 1=female)	+	0.845	1.061	(-)	0.886	0.964	+	0.737	1.086	(-)	0.147	0.688	(-)	0.061	0.627	(-)	0.286	0.778	(-)	0.741	0.917
Location (0=urban; 1=rural)	(-)	0.326	0.853	(-)	0.682	0.943	(-)	0.596	0.928	(-)	0.369	0.878	(-)	0.053	0.758	(-)	0.101	0.794	+	0.973	1.006
Age (reference category = 15-25 years)		0.000			0.003			0.000			0.000			0.000			0.000			0.595	
26-35 years	(-)	0.129	0.642	+	0.777	1.073	(-)	0.128	0.687	(-)	0.155	0.701	(-)	0.056	0.626	(-)	0.166	0.723	(-)	0.801	0.933
36-45 Years	(-)	0.004	0.416	(-)	0.354	0.782	(-)	0.001	0.402	(-)	0.004	0.459	(-)	0.000	0.310	(-)	0.000	0.360	(-)	0.721	0.897
46-55 Years	(-)	0.000	0.271	(-)	0.092	0.586	(-)	0.000	0.333	(-)	0.000	0.227	(-)	0.000	0.201	(-)	0.000	0.239	(-)	0.920	0.963
56-65 Years	(-)	0.000	0.193	(-)	0.013	0.363	(-)	0.000	0.212	(-)	0.000	0.161	(-)	0.000	0.083	(-)	0.000	0.185	(-)	0.461	0.694
66 + years	(-)	0.001	0.216	(-)	0.004	0.280	(-)	0.002	0.263	(-)	0.000	0.158	(-)	0.000	0.070	(-)	0.000	0.176	(-)	0.071	0.297
Level of education (reference category = tertiray education)		0.204			0.004			0.652			0.000			0.328			0.005			0.056	
Secondary	(-)	0.281	0.818	(-)	0.001	0.590	(-)	0.538	0.906	(-)	0.001	0.567	(-)	0.068	0.745	(-)	0.013	0.675	(-)	0.035	0.665
Primary	(-)	0.143	0.601	(-)	0.032	0.494	(-)	0.207	0.661	(-)	0.000	0.275	(-)	0.368	0.737	(-)	0.002	0.290	(-)	0.036	0.269
No education	(-)	0.089	0.225	(-)	0.107	0.167	(-)	0.999	0.000	(-)	0.085	0.145	(-)	0.999	0.000	(-)	0.999	0.000	(-)	0.999	0.000
SEC (reference category = SEC A)		0.467			0.072			0.115			0.441			0.008			0.046			0.631	
SEC B	+	0.960	1.019	(-)	0.545	0.821	(-)	0.643	0.867	+	0.285	1.374	(-)	0.843	0.942	(-)	0.203	0.698	(-)	0.635	0.878
SEC C	(-)	0.570	0.799	(-)	0.198	0.647	(-)	0.063	0.551	+	0.803	1.081	(-)	0.065	0.560	(-)	0.045	0.548	(-)	0.356	0.756
SEC D	(-)	0.303	0.657	(-)	0.042	0.491	(-)	0.158	0.623	(-)	0.764	0.907	(-)	0.015	0.450	(-)	0.019	0.478	(-)	0.144	0.611
SEC E	(-)	0.310	0.653	(-)	0.037	0.468	(-)	0.058	0.517	+	0.784	1.099	(-)	0.032	0.479	(-)	0.005	0.394	(-)	0.339	0.713
Employed (0= employed; 1= not employed)	(-)	0.002	0.571	(-)	0.007	0.646	(-)	0.000	0.472	(-)	0.000	0.554	(-)	0.000	0.560	(-)	0.001	0.596	(-)	0.005	0.595
Married (0=unmarried; 1=married)	(-)	0.687	0.873	(-)	0.168	0.667	(-)	0.949	0.982	(-)	0.343	0.753	(-)	0.282	0.731	(-)	0.323	0.761	(-)	0.114	0.611
Marital status * gender (interaction)	(-)	0.798	0.912	(-)	0.237	0.691	(-)	0.465	0.800	(-)	0.863	0.947	+	0.234	1.441	(-)	0.914	0.969	+	0.481	1.272
Type of mobile phone owned (reference category = smartphone owned)		0.000			0.000			0.000			0.000			0.000			0.001			0.195	
Basic phone or feature phone	(-)	0.000	0.345	(-)	0.000	0.273	(-)	0.000	0.303	(-)	0.000	0.235	(-)	0.000	0.264	(-)	0.000	0.286	(-)	0.083	0.432
No phone owned	(-)	0.083	0.619	(-)	0.460	0.830	(-)	0.381	0.804	(-)	0.215	0.732	(-)	0.032	0.587	(-)	0.696	0.907	(-)	0.549	0.818
Personal desktop or laptop computer ownership (0= own, 1= don't own)	(-)	0.000	0.184	(-)	0.001	0.411	(-)	0.018	0.545	(-)	0.000	0.378	(-)	0.000	0.328	(-)	0.000	0.392	(-)	0.001	0.475
Household desktop computer ownership (0= own, 1= don't own)	(-)	0.006	0.523	(-)	0.000	0.495	(-)	0.001	0.505	(-)	0.001	0.508	(-)	0.044	0.676	(-)	0.017	0.640	(-)	0.400	0.832
Fixed phone ownership (0= own, 1= don't own)	+	0.875	1.033	+	0.736	1.064	+	0.872	1.030	+	0.335	1.192	(-)	0.687	0.930	+	0.673	1.076	(-)	0.401	0.849
Radio ownership (0= own, 1= don't own)	+	0.239	1.216	(-)	0.554	0.917	(-)	0.723	0.950	(-)	0.927	0.987	+	0.460	1.114	+	0.690	1.059	+	0.859	1.031
TV ownership (0= own, 1= don't own)	(-)	0.036	0.574	(-)	0.418	0.821	(-)	0.153	0.711	(-)	0.234	0.749	(-)	0.027	0.586	(-)	0.042	0.608	+	0.229	1.388
Satellite decoder or cable TV ownership (0= own, 1= don't own)	+	0.270	1.219	+	0.085	1.316	+	0.604	1.085	+	0.541	1.103	+	0.005	1.564	+	0.031	1.394	(-)	0.546	0.899
Presence of school aged kids in the house (0 = absent; 1 = present)	+	0.265	1.227	+	0.862	1.028	+	0.094	1.308	+	0.174	1.248	+	0.164	1.249	(-)	0.893	0.979	+	0.313	1.204
Constant	+	0.000	107.332	+	0.000	31.715	+	0.000	24.529	+	0.000	28.162	+	0.000	33.844	+	0.000	20.910	+	0.175	1.633
Nagelkerke R square		0.222			0.254			0.216			0.286			0.296			0.275			0.153	
% of correctly classified cases		78%			70%			70%			71%			71%			70%			81%	

Table A5: Models (2)-(8) (skills models) full binary logistic outputs: India

	SRI LANKA																				
	(2)			(3)			(4)			(5)			(6)			(7)			(8)		
	Performing at least one skill			Search for information or other content on the Internet,online			Post any information on the Internet,online			Install an application			Create login details (user) and a password to use a particular service or a website			Locate and adjust settings on an application or service			Make a payment or complete a transaction online or by mobile		
	Sign	Sig.	Odds ratio (Exp(b))	Sign	Sig.	Odds ratio (Exp(b))	Sign	Sig.	Odds ratio (Exp(b))	Sign	Sig.	Odds ratio (Exp(b))	Sign	Sig.	Odds ratio (Exp(b))	Sign	Sig.	Odds ratio (Exp(b))	Sign	Sig.	Odds ratio (Exp(b))
Gender (0=male; 1=female)	+	0.845	1.061	(-)	0.886	0.964	+	0.737	1.086	(-)	0.147	0.688	(-)	0.061	0.627	(-)	0.286	0.778	(-)	0.741	0.917
Location (0=urban; 1=rural)	(-)	0.326	0.853	(-)	0.682	0.943	(-)	0.596	0.928	(-)	0.369	0.878	(-)	0.053	0.758	(-)	0.101	0.794	+	0.973	1.006
Age (reference category = 15-25 years)		0.000			0.003			0.000			0.000			0.000			0.000			0.595	
26-35 years	(-)	0.129	0.642	+	0.777	1.073	(-)	0.128	0.687	(-)	0.155	0.701	(-)	0.056	0.626	(-)	0.166	0.723	(-)	0.801	0.933
36-45 Years	(-)	0.004	0.416	(-)	0.354	0.782	(-)	0.001	0.402	(-)	0.004	0.459	(-)	0.000	0.310	(-)	0.000	0.360	(-)	0.721	0.897
46-55 Years	(-)	0.000	0.271	(-)	0.092	0.586	(-)	0.000	0.333	(-)	0.000	0.227	(-)	0.000	0.201	(-)	0.000	0.239	(-)	0.920	0.963
56-65 Years	(-)	0.000	0.193	(-)	0.013	0.363	(-)	0.000	0.212	(-)	0.000	0.161	(-)	0.000	0.083	(-)	0.000	0.185	(-)	0.461	0.694
66 + years	(-)	0.001	0.216	(-)	0.004	0.280	(-)	0.002	0.263	(-)	0.000	0.158	(-)	0.000	0.070	(-)	0.000	0.176	(-)	0.071	0.297
Level of education (reference category = tertiray education)		0.204			0.004			0.652			0.000			0.328			0.005			0.056	
Secondary	(-)	0.281	0.818	(-)	0.001	0.590	(-)	0.538	0.906	(-)	0.001	0.567	(-)	0.068	0.745	(-)	0.013	0.675	(-)	0.035	0.665
Primary	(-)	0.143	0.601	(-)	0.032	0.494	(-)	0.207	0.661	(-)	0.000	0.275	(-)	0.368	0.737	(-)	0.002	0.290	(-)	0.036	0.269
No education	(-)	0.089	0.225	(-)	0.107	0.167	(-)	0.999	0.000	(-)	0.085	0.145	(-)	0.999	0.000	(-)	0.999	0.000	(-)	0.999	0.000
SEC (reference category = SEC A)		0.467			0.072			0.115			0.441			0.008			0.046			0.631	
SEC B	+	0.960	1.019	(-)	0.545	0.821	(-)	0.643	0.867	+	0.285	1.374	(-)	0.843	0.942	(-)	0.203	0.698	(-)	0.635	0.878
SEC C	(-)	0.570	0.799	(-)	0.198	0.647	(-)	0.063	0.551	+	0.803	1.081	(-)	0.065	0.560	(-)	0.045	0.548	(-)	0.356	0.756
SEC D	(-)	0.303	0.657	(-)	0.042	0.491	(-)	0.158	0.623	(-)	0.764	0.907	(-)	0.015	0.450	(-)	0.019	0.478	(-)	0.144	0.611
SEC E	(-)	0.310	0.653	(-)	0.037	0.468	(-)	0.058	0.517	+	0.784	1.099	(-)	0.032	0.479	(-)	0.005	0.394	(-)	0.339	0.713
Employed (0= employed; 1= not employed)	(-)	0.002	0.571	(-)	0.007	0.646	(-)	0.000	0.472	(-)	0.000	0.554	(-)	0.000	0.560	(-)	0.001	0.596	(-)	0.005	0.595
Married (0=unmarried; 1=married)	(-)	0.687	0.873	(-)	0.168	0.667	(-)	0.949	0.982	(-)	0.343	0.753	(-)	0.282	0.731	(-)	0.323	0.761	(-)	0.114	0.611
Marital status * gender (interaction)	(-)	0.798	0.912	(-)	0.237	0.691	(-)	0.465	0.800	(-)	0.863	0.947	+	0.234	1.441	(-)	0.914	0.969	+	0.481	1.272
Type of mobile phone owned (reference category = smartphone owned)		0.000			0.000			0.000			0.000			0.000			0.001			0.195	
Basic phone or feature phone	(-)	0.000	0.345	(-)	0.000	0.273	(-)	0.000	0.303	(-)	0.000	0.235	(-)	0.000	0.264	(-)	0.000	0.286	(-)	0.083	0.432
No phone owned	(-)	0.083	0.619	(-)	0.460	0.830	(-)	0.381	0.804	(-)	0.215	0.732	(-)	0.032	0.587	(-)	0.696	0.907	(-)	0.549	0.818
Personal desktop or laptop computer ownership (0= own, 1= don't own)	(-)	0.000	0.184	(-)	0.001	0.411	(-)	0.018	0.545	(-)	0.000	0.378	(-)	0.000	0.328	(-)	0.000	0.392	(-)	0.001	0.475
Household desktop computer ownership (0= own, 1= don't own)	(-)	0.006	0.523	(-)	0.000	0.495	(-)	0.001	0.505	(-)	0.001	0.508	(-)	0.044	0.676	(-)	0.017	0.640	(-)	0.400	0.832
Fixed phone ownership (0= own, 1= don't own)	+	0.875	1.033	+	0.736	1.064	+	0.872	1.030	+	0.335	1.192	(-)	0.687	0.930	+	0.673	1.076	(-)	0.401	0.849
Radio ownership (0= own, 1= don't own)	+	0.239	1.216	(-)	0.554	0.917	(-)	0.723	0.950	(-)	0.927	0.987	+	0.460	1.114	+	0.690	1.059	+	0.859	1.031
TV ownership (0= own, 1= don't own)	(-)	0.036	0.574	(-)	0.418	0.821	(-)	0.153	0.711	(-)	0.234	0.749	(-)	0.027	0.586	(-)	0.042	0.608	+	0.229	1.388
Satellite decoder or cable TV ownership (0= own, 1= don't own)	+	0.270	1.219	+	0.085	1.316	+	0.604	1.085	+	0.541	1.103	+	0.005	1.564	+	0.031	1.394	(-)	0.546	0.899
Presence of school aged kids in the house (0 = absent; 1 = present)	+	0.265	1.227	+	0.862	1.028	+	0.094	1.308	+	0.174	1.248	+	0.164	1.249	(-)	0.893	0.979	+	0.313	1.204
Constant	+	0.000	107.332	+	0.000	31.715	+	0.000	24.529	+	0.000	28.162	+	0.000	33.844	+	0.000	20.910	+	0.175	1.633
Nagelkerke R square	0.222			0.254			0.216			0.286			0.296			0.275			0.153		
% of correctly classified cases	78%			70%			70%			71%			71%			70%			81%		