Towards a Networked Economy in Myanmar

Interim technical report

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1. Synthesis

The telecommunications sector in Myanmar was in a nascent stage at the time of conception of this project. Before liberalization there were only two mobile cellular subscriptions per 100 individuals as recently as 2012[1]. The liberalization of the market in 2013 has been followed by significant growth in the sector to date; this is reflected in the telecommunications affordability, access and use indicators. Myanmar ranked 140th out of 175 in the ITU's ICT development index, four places ahead of Lao PDR and ahead of both Bangladesh and Pakistan. It is within striking distance of India. The objective of this project was to catalyse Myanmar's movement towards becoming an inclusive, networked economy that was making advancements on both social and economic fronts.

LIRNEasia focused on taking an all-fronts approach in this endeavour. It focuses on addressing, the four elements in the Internet ecosystem in a single project: infrastructure enabling affordable connectivity services, skilled users, low cost and user-friendly devices, and attractive content and applications. The expected outcome of this combined, all-fronts approach is that it increases Internet subscriptions and users per 100 to a level above that of its comparator countries.

The project consists of three kinds of activities: research, capacity building, and policy advocacy.

LIRNEasia looks to facilitate evidence based policy making. Much of the core evidence required for policy intervention is to stem from quantitative and qualitative research carried out by the organization. It conducted two nationally representative household and individual ICT use surveys in 2015 and 2016. The survey conducted in 2015 under the previous project/research cycle[2] was the first nationally representative ICT use survey to be carried out in the country. In both years, dissemination events and meetings were held in Yangon and Nay Pyi Taw to share the findings with policy makers – including the relevant Union Deputy Minister, private sector, civil society organizations and the media. The two surveys are key parts of the impact assessment of mobile phones that LIRNEasia is conducting. The results from the baseline survey gave rise to a series of questions related to gender disparities in ICT access. A joint qualitative study with the Connected Women programme of the GSM Association (GSMA, the industry body representing mobile operators world wide) was undertaken (with majority of funds coming from GSMA, while all research was conducted by LIRNEasia). The resulting report was completed in time for the Mobile World Congress in February 2016, and officially launched in Yangon in April 2016. Qualitative research was also conducted on the use of free and subsidized data packages in Myanmar, with co-funding from Mozilla and the Google Fellowship programme. The first round of broadband quality of service experience (BB QoSE) testing took place in May 2016 in collaboration with M-Lab (Measurement Lab, a consortium founded by the New America Foundation's Open Technology Institute). The results were disseminated to the three operators through a series of face-to-face meetings in June 2016.

The second focus of action in this project is capacity building, firstly targeting MIDO (a named partner institution in this project) so that they are able to become a financially independent, evidence-based research and advocacy

[1] http://data.worldbank.org/indicator/IT.CEL.SETS.P2
[2] IDRC project number: *107077-001: Inclusion in the information society in Asia*

organization, and secondly the policy makers, regulators and civil society in Myanmar who can influence ICT policy. LIRNEasia's finance experts spent a week in Yangon to conduct financial training for MIDO's finance department in April 2016. MIDO's communications officer has worked extensively with the LIRNEasia to organize dissemination events and courses, and plans are underway to conduct further training on this front.
Two courses titled 'Social media and ICTs for governance: E-gov for parliamentarians' were conducted in July 2016. 20 members of the Lower and Upper houses of the Union Parliament attended the first course. The second course was carried out over two days within the premises of the Yangon Regional Parliament, recording an attendance of over 80 parliamentarians on each day.

Work on policy advocacy has commenced in selected areas. During this reporting period, LIRNEasia addressed the improvement of ICT infrastructure by submitting responses to policy documents including the draft Telecommunications Masterplan and a consultation paper regarding the allocation of spectrum frequencies in early 2016. In a visit to Myanmar in early 2016, the team from LIRNEasia, MIDO and CIS (the Center for Internet and Society, India, a named partner institution in this project) started work towards catalysing ICT access for the differently abled people of Myanmar, by consulting with multiple experts who are interested in enabling wider access to digital content for the blind. At LIRNEasia's invitation a leading expert in the development of software solutions for the blind flew to Yangon and met with key stakeholders – progress is being made in identifying and resolving errors since his visit. Steps are also being taken to promote the development of content accessible by the blind.

2. Research problem

Myanmar is at a critical juncture in time. A shift in the country's economic policies has taken place since 2012, orienting the country towards a more market led mechanism. The telecommunications sector has undergone significant liberalization, with two international operators being granted licenses to compete with the incumbent. The incumbent too has contracted outside expertise and is investing a significant amount of funds towards improving their services.

While the liberalization of the market is a step towards the right direction, it is essential that regulatory best practices are encouraged to facilitate welfare gains to all. However, one size fits all policies may not be the panacea in finding optimal solutions.

LIRNEasia, which has worked extensively in the ICT policy sector in developing Asia, was well positioned to lay out the dangers of incoherent policy making. Its close ties with MIDO further reinforce this position.

As such, this project was conceived with the ultimate objective of playing a role in increasing the Internet subscriptions and users per 100 to above the average of comparator countries. Toward this end, research, capacity building and policy intervention activities are included in this project.

One of the key research objectives of the project was to gain a good understanding of how individuals in Myanmar, particularly ones at the bottom of the pyramid (BOP) use ICTs, and how that use is evolving as the market develops. LIRNEasia conducted a nationally representative baseline survey of ICT uses and needs in 2015.3 The baseline survey forms the base of much of the demand side research (quantitative and qualitative) that is being conducted through the current grant.

2.1 Demand-side research: Quantitative

2.1.1 2015 baseline and 2016 follow-up survey

While initial top-line analysis of the nationally representative baseline data was conducted in March-April 2015, the current grant has enabled continued analysis of the data, specifically to measure socio-economic impacts of the expansion of mobile coverage in Myanmar.

The impact analysis was conceived during the previous grant, which led to a baseline survey being conducted. The rationale behind this was to take advantage of the unique opportunity to witness mobile connectivity surging from close to zero soon after liberalization of the sector. There is much potential for mobile phones to play a role in socio-economic development, be it through access to specific services such as mobile money or simply through the access to information afforded by the mobile phone.

The original idea was to measure socioeconomic outcomes at baseline (when connectivity was expected to be non-existent in a large enough number of wards and villages) and then in a follow-up survey measure the same outcomes after those wards and villages had received connectivity, a year later. However, it was found that the proportion of wards and villages that were already connected just prior to baseline fieldwork was too high for this approach to work. Therefore data on the quality of the mobile signal was collected along with household and ward and village-level data, in order to enable other design approaches to be explored. Therefore, other approaches are being explored, and based on the data collected at baseline and instrumental variable approach seems most feasible at this point.

[3] Facilitated through IDRC project number 107077-001

Through the current grant, a follow-up survey of ICT needs and uses was conducted in June-August 2016 using similar methods to the baseline. The idea behind this was to capture the growth in mobile access and ownership, see how mobile use has evolved, explore the uptake of data services (including zero-rated content), if and how information needs and sources have changed, among other questions. The survey also introduced a few questions aimed at assessing digital literacy in the population.

While the initial objective was to cover the BOP only, the decision to conduct a nationally (i.e., all socioeconomic groups) representative baseline survey has similarly been applied for the follow-up survey.

2.1.2 Impact evaluation

The continued analysis of the baseline survey data is directed towards a socioeconomic impact assessment of mobile phones in Myanmar. While the impacts have not yet been measured/calculated, the analysis conducted so far, led by Jorge Garcia Hombrados4, has been to determine the most appropriate empirical strategy to assess and understand the socioeconomic effects of improving the strength of the mobile phone signal in Myanmar.

2.2 Demand-side research: **Qualitative**

2.2.1 Gender and ICTs

By March 2015, just over a year from liberalization, 39% of Myanmar's population between the ages of 15-65 owned a mobile phone, according to the baseline survey conducted by LIRNE*asia* in 2015. The survey showed however, that women in Myanmar were 29% less likely to own a mobile phone than men.

The initial analysis of the findings from LIRNEasia's baseline survey on mobile use were presented by LIRNEasia CEO Helani Galpaya at the GSMA Mobile World Congress in March 2015 in Barcelona, Spain. After seeing the gender-disaggregated access numbers of the survey findings, LIRNEasia was approached by the Connected Women programme of GSMA to conduct a joint qualitative study to analyze the reasons for differences in mobile ownership between men and women. GSMA Connected Women provided funds to hire a vendor for the fieldwork and the design and printing of the final report (approximately USD 40,000), while LIRNEasia covered the cost of field travel for its researchers as well as its researcher time (approximately USD5,000) toward the cost. What resulted was a co-branded research report entitled *Mobile phones, Internet and gender in Myanmar* , which is being launched in Barcelona in February 2016 and in Myanmar in April 2016. The following research questions were explored through the joint-study, which was carried out in July 2015:

- Why is there a mobile ownership gender gap in Myanmar?
- Why do many mobile owners in Myanmar not use mobile Internet?
    - Are there different reasons for men versus women?
- What are the opportunities to encourage more women to own and use mobile phones (especially mobile Internet) in Myanmar?

2.2.2 Free and subsidized data use

LIRNEasia's 2016 follow-up survey showed that despite 78% of mobile owners having Internet ready smartphones, only 49% reported using mobile data services. In a country where the mean monthly income is less than MMK 300,000 (USD 250), affordability remains an issue.

[4] University of Sussex

Zero-rated promotions allow subscribers to use data for free, i.e., without counting towards their purchased data plan or top-up balance. Such data is often limited in scope to a few apps or Internet services. Zero-rated promotions introduce people to Internet services, and may thereby stimulate demand for mobile Internet access.

The use of free and subsidized data (zero-rated content) in Myanmar was thus explored. Mobile operators in Myanmar offered a number of these services including Facebook free basics. .

This research was co-funded by Mozilla (approx. USD 10,000), as a part of its research in Asia, Africa and Latin America on Internet use in the presence of subsidized data. Funds were also received from the Google Policy Fellowship Programme. LIRNE*asia* covered the personnel and travel costs of its researchers.

The questions explored through this research are:

- How do people use Facebook free basics and other zero rated content?
- Do users connect to the Internet beyond zero-rated services or stay within these 'walled gardens'?
- How do users change data consumption habits after using zero-rated offerings?
- Do users continue to use zero-rated offerings over time?

2.3 Web literacy development

LIRNEasia aims to investigate scalable models of promoting mobile and web literacy in order to facilitate the use of ICTs. Telecentres were proposed to be set up by the mobile operators was identified as a means of promoting mobile and web literacy. The models that have been used by these Telecentres to promote digital literacy, and the demand for the content is to be analysed to the extent possible.

2.4 Broadband QoSE testing

LIRNEasia has been testing Broadband Quality of Service (QoS) as experienced by the end user since 2008. Previous studies confirm that advertised speeds are a far cry away from what is actually received by the user. We have also observed service degradation when connecting to International servers. A misconception in broadband quality measures is that download speed is the only metric that really matters. It is perhaps, what is most easily understood by consumers, however, there are other aspects that are vital for a user's 'online' experience. This research component aimed to measure multiple metrics that affect the quality of broadband services received by the user across all states in Myanmar. As Internet access via the mobile phone is prevalent in Myanmar, it focuses on mobile broadband of the three main mobile network operators.

3. Research findings

3.1 Demand side research: Quantitative

3.1.1 2015 baseline survey

Apart from being an integral part of the impact evaluation, the data from the baseline survey is interesting in and of itself, and shed significant light on the status of ICT use in the country, when no other nationally representative data for the country on ICT use existed. Its highlights are reported here since the previous grant ended before the results were analyzed, with the analysis being done in this grant. Further detailed descriptive statistics are available in the online report available at http://lirneasia.net/wp-content/uploads/2015/07/LIRNEasia_MyanmarBaselineSurvey_DescriptiveStats_V1.pdf. It can also be referred to in Annex 1

ICT access

By the time of survey, 96% of wards and 87% of villages in Myanmar received a mobile signal.[5] Quality is variable as networks expand coverage and capacity, but just one year after the two private licenses were granted, mobiles had already become the most prevalent ICT in Myanmar households (Figure 1) with 58% of households having an active SIM and 57% having a mobile handset present, compared to 'older' ICTs like TVs and radios. Almost 60% of households had at least one mobile phone present, while almost 30% had more than one. Mobile SIM and handset ownership was approximately 45% higher in urban (vs. rural) and 43% higher in higher income[6] (vs. lower income) households.

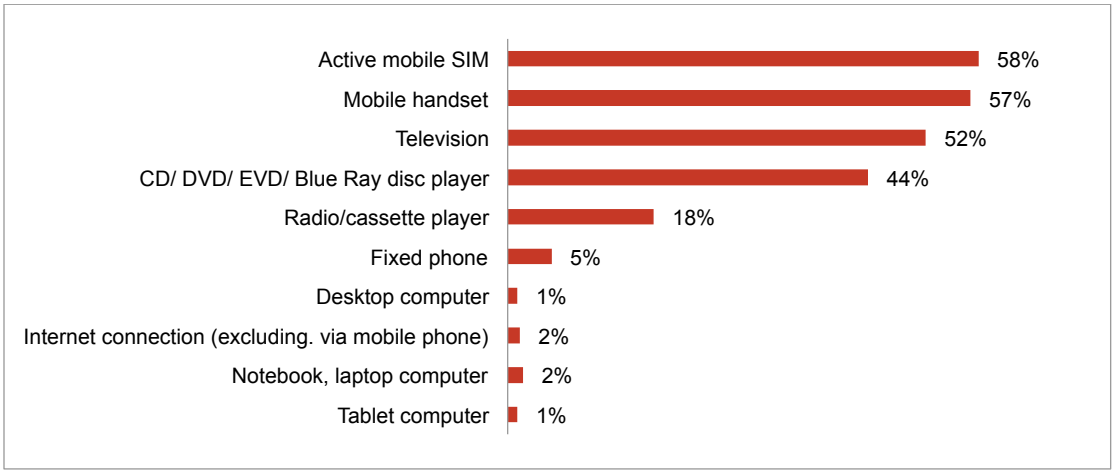


Figure 1: Household access to ICTs and ICT connections 2015 (% of Myanmar households)

[5] Based on survey responses of ward/village administrators surveyed in every ward/village selected for the baseline survey; ward/village administrators were asked whether their ward/village received any mobile signal at the time of survey. Coverage data is based on responses to the following question: "Do you receive any mobile phone coverage in your ward/village?" All ward and village administrators/leaders in the survey were asked this question.

[6] 'High' income households were considered as those that had a total monthly expenditure of over MMK300,000, equivalent to socio-economic classification (SEC) groups A, B and C; similarly, 'low' income households were considered those that had a monthly household expenditure of MMK300,000 or less, equivalent to SEC groups D-E.

Source: LIRNEasia national baseline survey, 2015

Respondents from higher income groups were more frequent teleusers[7], with just 15% having *never* used a phone before, compared with 38% of those from lower income groups. Eighty percent of this use was from a mobile phone. When the purpose of calling was considered, owners tended to have more livelihood-related calls, although this kind of usage was low compared to social-purpose-related calls.

Mobile ownership and factors influencing mobile adoption

At an individual level, mobile phone ownership (having an active SIM, with or without a handset[8]) among 15–65 year olds in Myanmar was 39%. A relatively large gender gap of 29% was seen, with women's ownership being just 33% compared to 47% among men.

Mobile penetration was greater in higher spending households (i.e., those with higher income or more wealth) - 42% of them had a mobile phone and SIM. But even in poor households the number was 35%. This figure is remarkable, given that in 2006, nearly 9 years after market liberalization, only 9% of the Indian poor had a phone, 23% of Pakistan and 22% in Sri Lanka.[9]

The urban-rural ownership gap was 58%, with urban mobile ownership at 65% (driven largely by the three big cities: Yangon, Mandalay and Nay Pyi Taw) and rural at 27%. However, these levels were still higher than the 2006 levels seen in India, Pakistan and Sri Lanka (who were each several years post-liberalization compared to Myanmar at 1 year from liberalization).

Affordability and a lack of a need for a phone were given as the main reasons for non-ownership.

A logistic modeling of the factors determining the 'odds' of adopting was conducted. The 'Odds' is directly related to (but not the same as) the probability of something happening.[10]

A binary logistic regression is a way of modeling the probability of an event when the event is a binary outcome, so mobile adoption = 1 (yes) or 0 (no). The coefficient of a logistic regression (Column 1 in Table 1) cannot be directly interpreted, therefore the Odds Ratio (Column 2) is calculated from which the, the change in the odds of adoption associated with[11] a 1-unit increase in the explanatory variable (e.g., gender, education, etc) may be calculated (given in Column 3).

This analysis shows that the largest impact on the odds (and therefore probability) of mobile adoption is from the completion of tertiary education in Myanmar, although the actual number of respondents who have completed tertiary education is low. A person who has completed tertiary education in Myanmar has 378% higher odds of mobile adoption than someone who has not completed tertiary education but has all other measured characteristics (e.g., gender, household characteristics, etc) the same. Having completed secondary education is associated with increased odds of 55%. Being a female is associated with a reduced odds of adoption of 42%. Age has no significant association. Household characteristics appear to have a positive association with mobile adoption, with having a TV, electricity and household spending being positively associated with the odds of adoption. Network variables are significant and positive, with each additional 10% of a respondent's family owning a mobile associated with an increased odds of adoption of 36%. Positive perceptions of the benefits of

[7] That is having used any) phone before.

[8] Although responses show that a negligible number (0.7%) own an active SIM but not a handset of their own, we consider these SIM-only owners as mobile 'owners'.

[9] As seen in LIRNEasia's Teleuse@BOP2 data.

[10] The 'odds' of and event happening is equal to the probability of the event happening divided by the probability of the event not happening; in this case, Odds of mobile adoption = probability of adoption / probability of not adopting

[11] This type of modeling and data can not be used to ascertain causality, only association.

phone use are associated with higher odds of mobile adoption, especially with respect to the perceived emotional benefits.

Table 1: Binary logistic model for mobile adoption in Myanmar in 2015

	Coefficient (β)	Odds Ratio	Change in Odds Ratio due to 1 unit increase in variable	p-value
Gender (0=male; 1=female)	**-0.536**	**0.585**	**-42**	**0.00**
Secondary education being the highest obtained (0=no, 1=yes)	0.438	1.55	55	0.00
Tertiary education being the highest obtained (0=no, 1=yes)	1.564	4.777	378	0.00
Having television at home (0=no, 1=yes)	0.61	1.84	84	0.00
Having electricity at home (0=no, 1=yes)	0.342	1.407	41	0.00
Employment status (0=not employed; 1=employed)	0.608	1.836	84	0.00
Perceived economic impact of mobile (scalar variable: 1-5)	0.067	1.07	7	0.25
Perceived knowledge impact of mobile (scalar variable: 1-5)	0.122	1.13	13	0.04
Perceived emotional impact of mobile (scalar variable: 1-5)	0.235	1.265	27	0.00
Proportion of family members having mobile (scalar variable: 1-10)	0.304	1.355	36	0.00
Proportion of friends having mobile (scalar variable: 1-10)	0.047	1.048	5	0.00
Monthly household expenditure (MMK)	0.115	1.122	12	0.01
Age of respondent (no. of years)	-0.005	0.995	-0.5	0.09
Constant	-3.439	0.032	-97	0.00

Source: LIRNEasia

Smartphone and Internet use

The data showed that 66% of mobile subscribers owned a smartphone and 37% owned a feature (or 'keypad') phone (3% owned both). As such, more than two thirds had Internet-ready features such as a browser, applications and Wi-Fi features. This is a penetration rate higher than Thailand, Myanmar's much-richer neighbor,

reported to have under 50% smart phone penetration. Countries like India and Sri Lanka are much lower – under 20 or 25%.[12]

Smartphone penetration was highest in the 15-24 age group, as high as 84%, and highest among those from higher income households (75%). On average mobile owners had paid approximately USD 90 for their handsets.

Among mobile owners, there is considerable use of mobile Internet, using various apps that are installed on the phone. Thirty-four percent of mobile owners used at least one data service (internet via a browser or apps, including social media, calling and chat applications, etc.) on their mobile phone. Usage was limited to a few apps (mostly social media and calling apps); over half of these data service users only used between one and three types of services.

Looking at the data services individually, the highest percentage, or 24% of phone/SIM owners' use is calling/using VOIP application such as Viber and Skype (Figure 2). Next highest, at 20% are the various chat applications such as Whatsapp and Facebook messenger. Third is the Facebook app, with 17% of all phone owners using it. These are reasonably high numbers, just 6 months after liberalization.

Interestingly, however, when asked (in another question of the survey) if they had used the Internet "through a browser on any device such as a computer, tablet or mobile phone in the past 12 months", only 2% say "yes". Even within this 2%, the majority use a mobile phone, not a tablet or a computer. Given that computer use in the 12 months preceding the survey was at a mere 2%, the dominance of mobile phone even for browser-based Internet (the traditional and perhaps more cumbersome way to access the internet) is not surprising.

[12] GSMA Intelligence. 2015. *Mobile internet usage challenges in Asia — awareness, literacy and local content*. Retrieved from https://gsmaintelligence.com/research/?file=06e82e7d9c569e05a6d54974c33f6b04&download

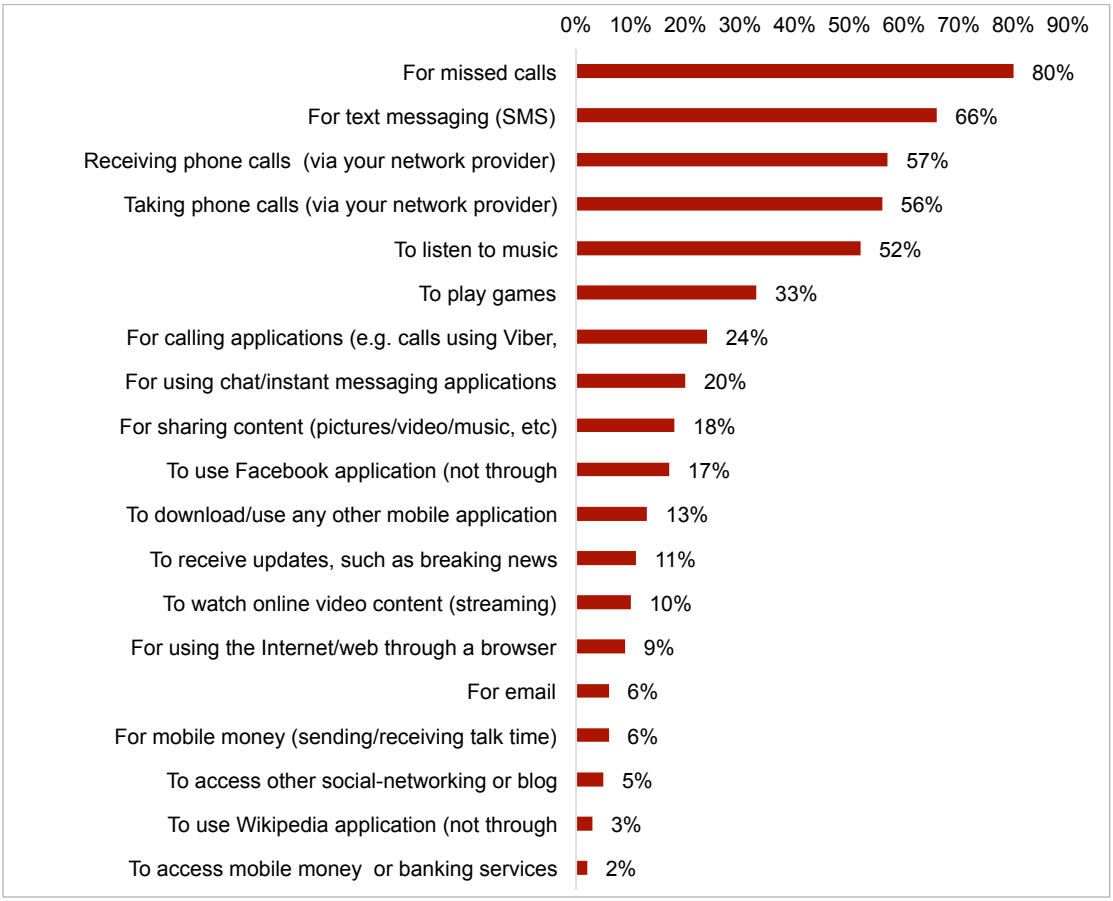


Figure 2: What mobile owners used their handsets for in 2015 (% of mobile owners)

Note: 'app' use excludes use of the browser-based version of the service

Source: LIRNEasia national baseline survey, 2015

Perceived benefits of phone use

The greatest perceived benefit of access to phones was seen in terms of improved social and family relations and relationships. Mobile owners felt more strongly about the benefits than non-owners, especially those from higher income households.

Perceptions of quality

While mobile subscribers were on the whole satisfied with the quality of mobile signal received (63% said they received 'satisfactory' quality), 41% of urban and 56% of rural mobile subscribers stated that calls were not successful upon the first attempt.

Information needs

Responses to the questions on information needs showed that the top rated information types were community and national news, weather information and information on cost and where to obtain daily goods and services Friends and family were by far the main information sources for 73% of respondents.

When asked what the three most important, day-to-day information needs are, community news (about what is happening at ward/village level), national news (important things happening in Myanmar) local news (what's

happening at state/regional level), weather information, information on where to get everyday household goods (at a better price), and information about job opportunities are ranked at the very top (Table 2). Sports, entertainment, horoscope and other "entertainment" related information is ranked much lower. The top 6 categories remain consistent even when urban areas and rural areas are considered separately. But weather information rises to the second most important information need in rural areas, reflecting perhaps the dependence on rainwater for agriculture related livelihoods.

Despite high penetration of TV (in 50% of households) and radio (in 18% of households), very few people (under 10%) rely on these sources to get information. Instead, it is word-of-mouth that works in Myanmar today: nearly 70% of respondents say friends/family are the main source of information. A ubiquitous and personal device such as the mobile phone may be able to play a significant role in filling the gap and fulfilling information needs of people of Myanmar.

More mobile subscribers (54%) than non-subscribers (37%) felt they required more information that they already have access to; a large number were unsure.

Owners are hungrier for more information. When respondents are asked if they require "more information than they currently have" about their key information categories, 54% of owners say "yes" (i.e. they need more information) compared 37% of non-owner users. When asked if they get certain types of information fast enough, 54% of owners say "no" compared to 42% of non-owner users.

Table 2:Top-three information needs in Myanmar in 2015 (% of 15-65 Population)

	Most important	2nd most important	3rd most important
Community news, about things happening in your ward/village	20%	11%	10%
National news, about important things happening in Myanmar	12%	14%	13%
Weather information	11%	12%	12%
Information on where to get every day household goods and services and how much they cost (not business-related)	19%	3%	3%
Information on job opportunities	7%	7%	10%
Local news, about important things happening in state/region	6%	11%	5%
International news, about important things happening in other countries	3%	7%	5%
Health tips and information	3%	4%	8%
Information on how to do or make things	4%	8%	2%
Price information related to your line of work	3%	5%	4%
New skills and ways of doing things that you can learn to enhance your earning capabilities	2%	3%	5%

Information on where to find healthcare (doctors, hospitals, medications etc	2%	3%	4%
Other entertainment information (e.g., TV, movie updates, etc)	2%	1%	3%
Current news and updates about or related to your sector	1%	2%	3%
Information used in your or your children's education	1%	1%	2%
Information on education opportunities for yourself or your children	1%	1%	3%
Other market information (supplier/customer information, market locations, etc)	1%	2%	2%
Sports information	1%	1%	2%
Beauty tips	1%	1%	1%
Information on sources of finance (formal and informal sources, the cost involved, etc.)	0%	1%	1%
Crime information	0%	1%	1%
Information on government programs, laws and policies.	0%	0%	1%
Information on government services and documents	0%	0%	0%
Astrology information	0%	0%	1%

Source: LIRNEasia national baseline survey, 2015

Future demand

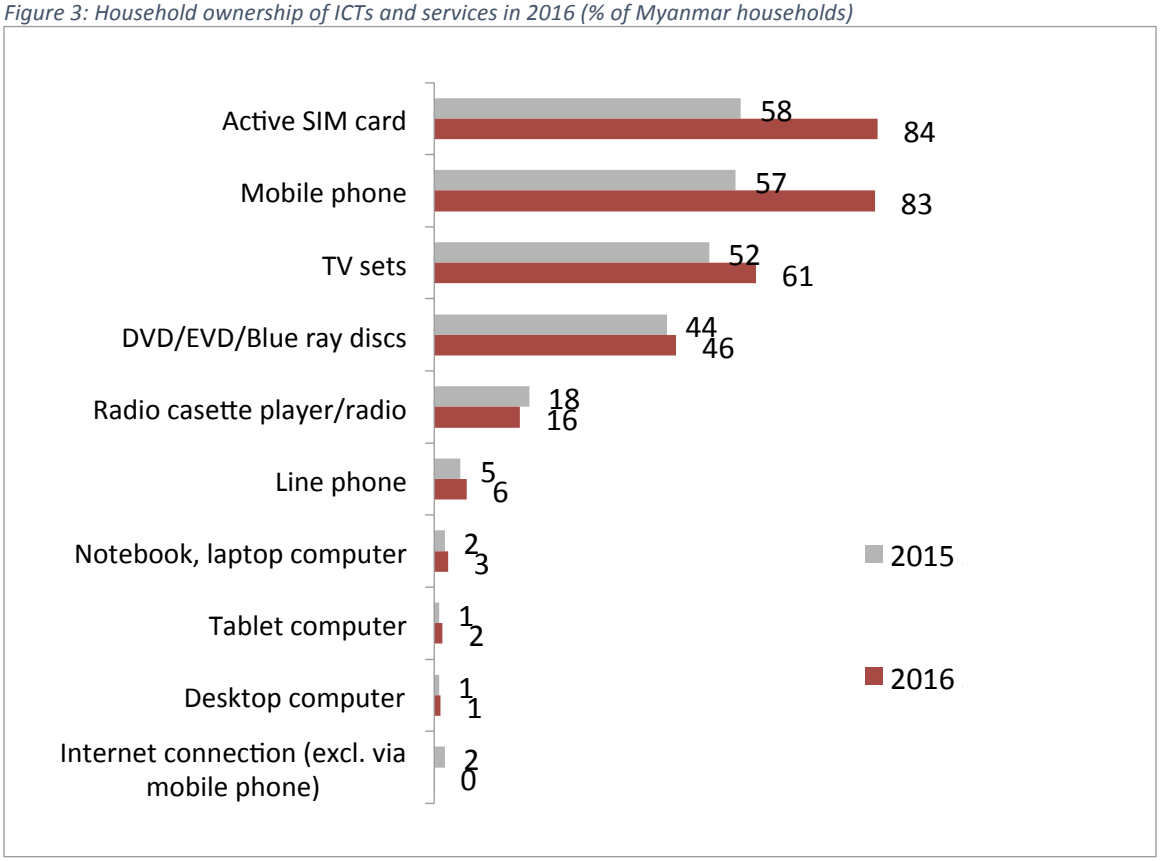
Looking forward, over 70% of non-subscribers were hoping to buy a mobile in the future, with 21% of non-subscribers planning to do so within the following year. Sixty percent of these new buyers will be rural; 57% will be female; 63% will be from lower-spending (poorer) households; 73% will be under the age of 44 years.

3.1.2 2016 follow-up survey

ICT access

Access to ICT devices had increased considerably between 2015 and 2016. Household ownership of mobile phones stood at 83%, up from 57% in 2015 (Refer section 3.1.1). On average, there were 2.3 mobile phones per household; the corresponding figure for SIM cards per household was even higher at 2.9. Geographically, the increase in the proportion of households with mobile phones and SIMs has been largely in the smaller townships. As a result, households with mobile phones are less concentrated in the cities, in comparison to 2015. A similar, though less stark, diffusion has also been observed in the case of televisions.

Figure 3: Household ownership of ICTs and services in 2016 (% of Myanmar households)



Teleuse at an individual level was high, and had improved considerable. The proportion of individuals who said they had never used a phone reduced to 9% from 31%. Nearly half the population (45%) had used a phone on the day of the survey in 2016, up from 29% in 2015. This increase in the frequency of calling was observed in both urban and rural areas, and amongst both men and women. Men however, were more likely to have owned the last phone they used. Women, on the other hand, were twice as likely as men to have used a household or common phone. Ninety-four percent of the calls were made on a mobile device. Those belonging to higher SECs were more frequent teleusers. Nearly seventy percent of those belonging to SEC A had made a call within the day- they were also 3.5 times more likely to use a phone than those belonging to SEC E. Over ten percent of those belonging to SEC E, on the other hand, had never made a phone call.

Mobile ownership and factors influencing mobile adoption

Mobile ownership has increased to 61% in 2016- by 21% in urban areas, but more than doubled in rural areas. The population belonging to higher SECs were more likely to be mobile owners. More individuals in SEC A, B and C1 were more likely to be mobile owners than not, while the opposite was true for the lower SECs D and E. Equal proportions of those belonging to the lower middle income category SEC C2 were mobile owners and non owners.

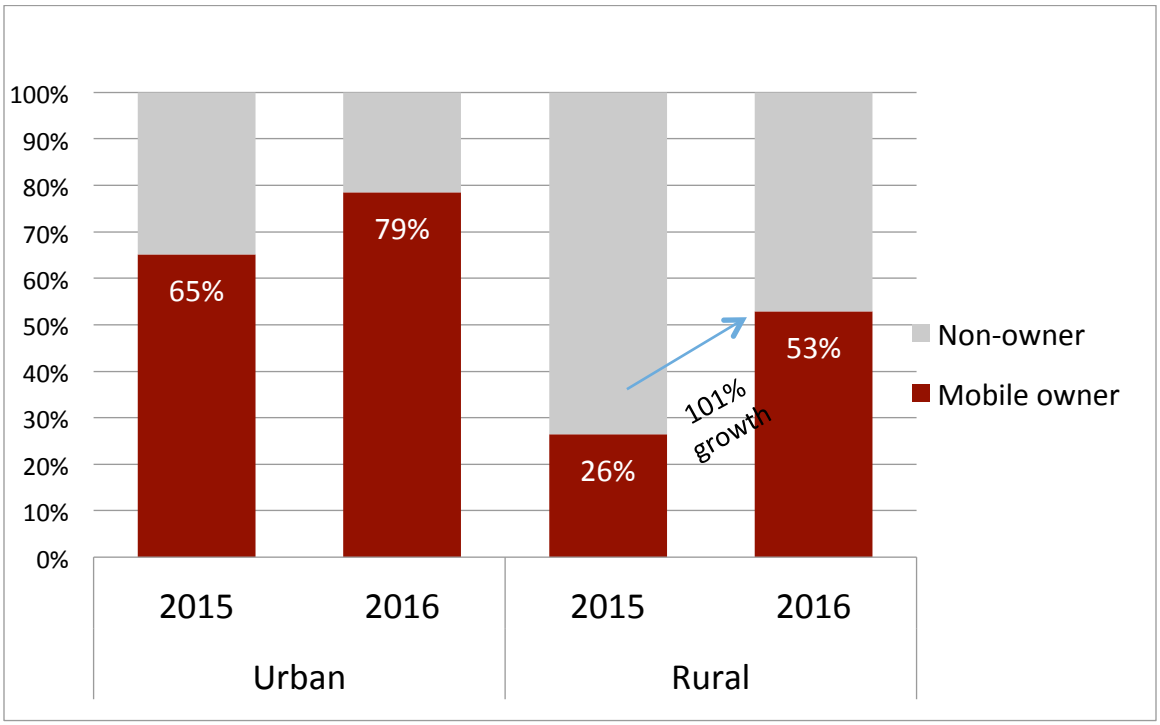


Figure 4: Mobile ownership in Myanmar in 2016- urban vs rural (% of 15-65 population)

Mobile ownership among women had increased with 52% owning mobile phones. However the gender gap remains, with men being 28% more likely to own a mobile phone than women. The average expenditure on purchasing a mobile phone was MMK 105,198 (USD 87) and total average monthly spend on top-ups was MMK 7,494 (USD 6) Expenditure on top-ups was 50% greater in urban areas than rural areas.

Over a quarter of active SIM owners owned more than one SIM card; a third of those between the ages of 15-33 owned more than one SIM card, while the corresponding figure for older cohorts was lower. Fifty six percent of those with more than one SIM said it was to get coverage wherever they went.

Thirty nine percent of the population didn't own a mobile phone in 2016. The main reason stated for the lack of ownership was that they could not afford a handset (43%), followed closely by the perception that they didn't need one (41%). The proportion of respondents who stated that they didn't need a phone has increased since 2015, perhaps in the line with the notion that those who aspired to buy a phone in the past have already got connected.

Smartphone and Internet use

Computer use was low in Myanmar; only 3% of the population 15-65 had ever used a computer in 2016. Among that small group of computer users, only 16% had accessed the Internet within the day.

Thereby, smartphones were the primary mode of accessing the Internet. The data showed that 78% of mobile owners used smartphones in 2016. No gender gap was observed in smartphone ownership among mobile owners, as in the previous year. Smartphone penetration in rural areas has increased, leading to a reduction in the urban-rural gap. Smartphone penetration is still highest among the younger cohorts with 93% of mobile owners between 15-24 owning smartphones, but older cohorts are also catching up. However, only 47% of

mobile owners used mobile data services.

Accessing Facebook was a common use of the mobile phone, with 35% of mobile owners claiming they use it; 21% access it daily. Users, similarly, use their phones to engage in chats/instant messaging and make Internet calls. Significant growth in the use of these services has been observed since 2015.

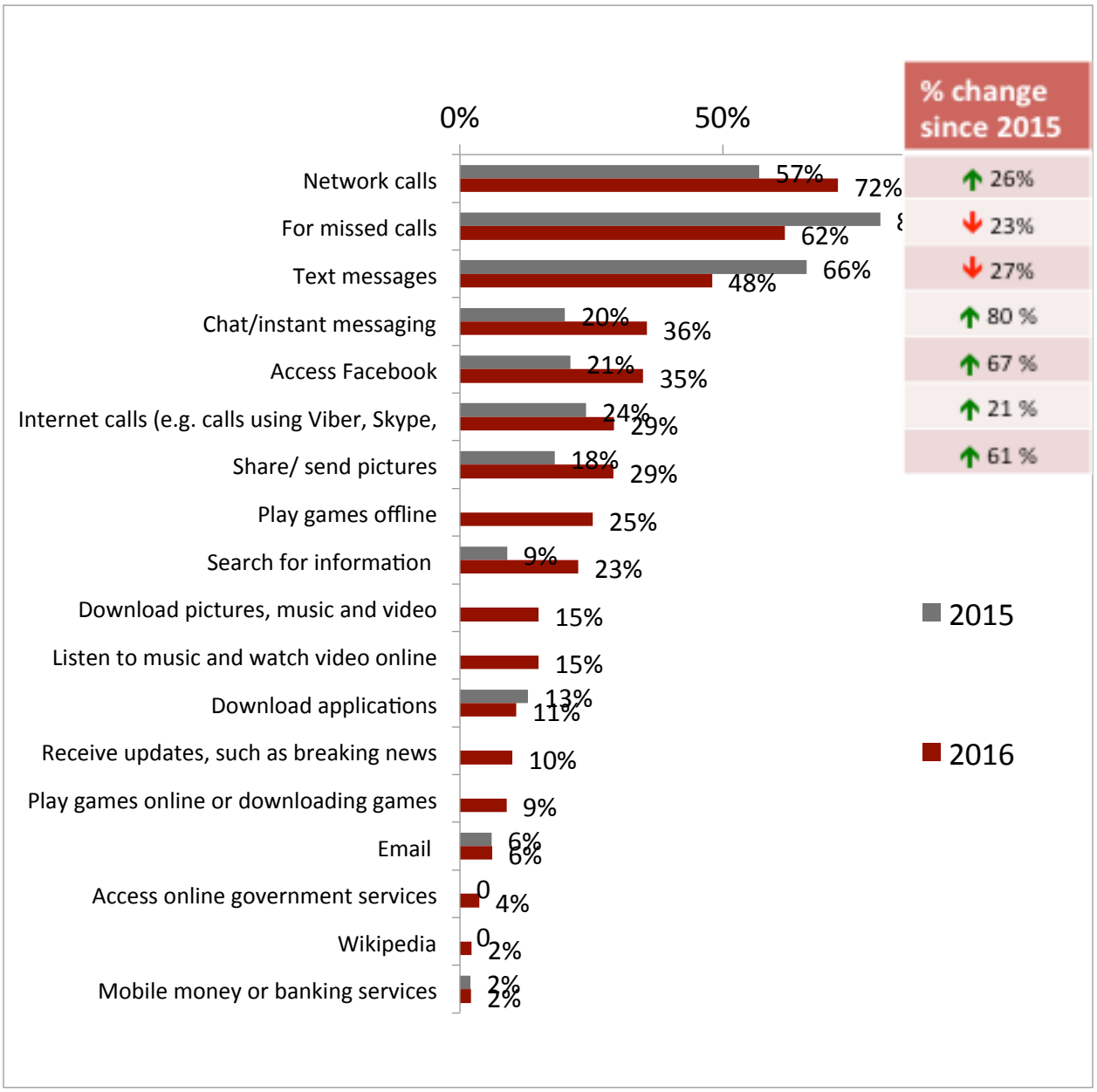


Figure 5: Use of mobile phone in 2015 (% of mobile handset owners)

Information needs

Community news, weather information and national news were the top three information needs in Myanmar, consistent with the results in 2015. Fifty three percent of respondents stated that they would get information from friends and family. Face-to-face conversations were the most common mode of getting information,

followed by calls via mobile phones (15%) and the Internet (9%). A shift from the use of mobile phones to the Internet was observed between 2015 and 2016.

Perceived benefits and costs of phone use

The ability to act or contact others in the case of an emergency was the biggest perceived improvement since the use of the mobile phone. Users also saw a comparatively large improvement in social and familial relations with the use of mobile phones. Concerns on mobile access and use remained, particularly regarding the costs associated with mobile phones and the risk of children being exposed to inappropriate content.

Digital skills

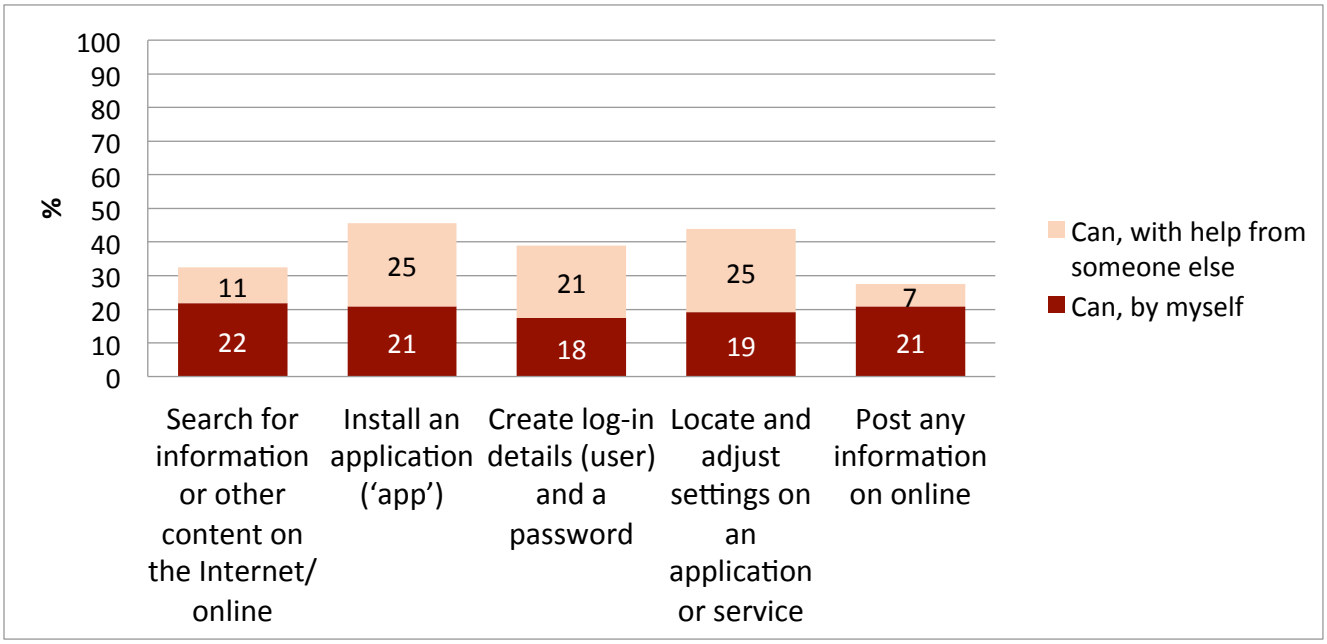


Figure 6: Digital skills in 2016 (% of mobile phone owners)

Digital skills among mobile handset owners were low. Approximately a fifth of mobile owners were able to search for information, install applications, create log-in details, locate and adjust settings on an application or post information online by themselves. Although the ability to carry out these tasks improved with the help of another.

The full slideset can be accessed in Annex 12

3.2 Demand side research: Qualitative

3.2.1 Gender and ICTs

LIRNEasia's 2015 survey on ICT use and information needs showed how men in Myanmar were 29% more likely to own a phone than women. Qualitative research was carried out to understand the reasons for this gender gap.

The research (jointly conducted by LIRNEasia and GSMA Connected Women) showed that women in Myanmar play a prominent role in the management of household finances, even if they do not earn anything themselves. Their key role is to ensure household income is spent prudently, and they often prioritize the needs of other

household members over their own. They are clearly involved in the financial decision to purchase a mobile phone for the family. Yet once a mobile phone is purchased, the woman may not necessarily have access to that phone all the time. This is because the phone will 'travel' with the person who needs it the most – for example a daughter who works outside the home and returns late at night (so a phone providing security), or a son working in a different city. Since activities outside the home are more often undertaken by men, this mobile access and usage gap is exacerbated. As such, getting a *second* mobile phone into the household (which has a higher likelihood of staying inside the household) seems key to increasing women's access and usage.

The top two reasons among women for not owning a mobile phone (lack of affordability or need) are connected. 'Not needing' a mobile is relative to the cost-benefit trade-off of purchasing an additional phone for the household. Many women without a mobile phone said that they don't 'need' one because they do not leave the house for work or studies. Though many would like to have their own mobile, they felt that even if they did buy one, the top-ups would be unaffordable because they are not earning (or earning a lot less than the male household members). The clear preference for particular high-end brands of smartphones was also a factor, since many women were willing to delay the purchase until they could afford a particular brand.

The low perceived benefits also play a role. Many women do not see spending on mobiles as a priority compared to other more pressing needs of the household, partly as a result of having limited experience of mobile phones. Even among women who already use or own a mobile, many did not possess the skills or knowledge to expand their current use to potentially valuable data services and usually relied on others (primarily men, either relatives or in phone shops) for instruction. On the rare occasions where women *were* using the mobile Internet, for example Facebook, we saw relatively 'unsophisticated' use. Often it was the local retail shop owner who created the account (including assigning the password and user name), and pre-subscribed the account to follow Myanmar celebrities or certain information sources. The user then simply followed what was on the news feed.

In Myanmar, closing the mobile gender gap and realizing the associated social and commercial benefits will require stakeholders to focus on the two main barriers: improving affordability and technical literacy, particularly for mobile Internet.

With regards to mobile data services, many female and male qualitative respondents seemed to be stuck in the basic mobile literacy stage, needing help even to make a call, especially rural respondents. While it was apparent that many mobile owners and non-owners were interested to learn about and use the Internet, most did not know how to do it (even smartphone owners). One issue was that many female owners were not present at the time of purchase and did not get an 'introduction' to the mobile at the shop (as men tend to do), so they relied on relatives and friends who are already owners. Many (including female non-owners) feared they could damage the phone when experimenting with it. This concern has limited their exploration of phone functionalities and internet possibilities. Language was another barrier that restricted trial and investigation. Respondents who knew English were better educated and had no usage barriers. Those who used Internet/data services often require help to do so, and were not aware of privacy settings, how to evaluate the authenticity of posts, etc. This being said, Smartphone owners in Yangon have a broader/richer understanding and internet usage patterns. For them, the internet is not just a place to make friends and chat, but also to search for information. Many rural respondents had not heard of mobile apps or admitted they did not understand what they were.

The results are given in greater detail in the resulting publication, Zainudeen, A. & Galpaya, H. (2015) Mobile phones, internet & gender in Myanmar. GSMA available at http://www.gsma.com/mobilefordevelopment/programme/connected-women/mobile-phones-internet-and-gender-in-myanmar/. The report can also be found in Annex 2

3.2.2 Free and subsidized data use

Research on free and subsidized data use was conducted in over two weeks in Yangon, Myanmar in July 2016. The team conducted focus group discussions with a total of 63 mobile phone users as well as informal interviews with corporate stakeholders and street-side vendors. Males and females from SEC A to E from urban and rural Yangon were selected. All 63 respondents were Internet users, i.e., users of mobile data.

At the time of research, Myanmar had a range of zero-rated data offerings—the most prominent being Facebook Free Basics (offered via MPT, the incumbent operator), and Free Facebook and Viber text messages (offered by new entrant Telenor). All operators offered a number of other subsidized or promotional data packages.

The research found that respondents did not use or know of Free Basics content other than Facebook. While some 40 respondents had used Free Basics, only four knew of free content available on the platform beyond Facebook and Messenger.

Respondents described different behavior on the two main zero-rated promotions in this study. Many respondents stopped using Free Basics because of user-experience frustrations: the absence of photos and video on the free version of Facebook, slow data speeds and the process of switching back and forth between paid and free content. Those who continued to use Free Basics used it—alongside paid data—for limited purposes. Many respondents used Free Basics primarily when their top-up balance had run out, as a means to keeping in contact with others before topping up.

Respondents who used Telenor Free Facebook and Viber increased data consumption on the promotional packages available. Several rural respondents began watching video content on Facebook for the first time because of the promotion. Most used their entire 150MB free quota each day, and many paid for additional data. Thus, the promotion served as an 'on-ramp' to paid data consumption, although not to the 'open Internet': users paid to continue using Facebook. Telenor Free users were content to remain within the 'walled garden'. Respondents also used zero-rated promotions as a strategy to manage data-costs. These respondents used one of several strategies on Free Basics: using free Messenger exclusively, choosing to read posts on free Facebook, or limiting certain Facebook activity to free mode, in particular checking Facebook groups. Some users of Telenor Free stopped once they reach the daily cap, while others continued using Facebook by switching to MPT Free Basics.

User perception mattered: if users understood that they were using free content, i.e., they see the 'garden walls', then they understand they are not using the 'open Internet'. The limitations of Facebook on MPT Free Basics served to highlight these garden walls: respondents knew when they are using zero-rated content and when they were not. The same cannot be said for Telenor Free. Several users—from both urban and rural focus groups—described the free 150MB Facebook allotment on Telenor as general-use data.

Perception and visibility aside, users did not remain within the 'walled garden'. Most active zero-rated-content users also used other Internet services, including Google, news websites, and apps. Respondents describe following links from within Facebook to external websites. Exiting the walled garden was more common among urban respondents, but most rural respondents who used zero-rated content also use other applications online, commonly BeeTalk or Clash of Clans.

Given the choice between zero-rating, limited data to access unrestricted content, or unlimited access to open content but at slow speeds—three widely proposed models for spreading access—respondents preferred unrestricted content. Respondents expressed frustration at slow Wi-Fi and data speeds. Frustrations with

limitations on Free Basics and the launch of an alternative with free full-content Facebook led seven of the FGD respondents interviewed to switch from MPT to Telenor. Users themselves were not happy with a perceived second-class Internet.

The results are given in greater detail in the resulting publication, Cihon, P. & Galpaya, H. (2017) Navigating the walled garden: Free and subsidized data use in Myanmar available at http://lirneasia.net/wp-content/uploads/2017/03/NavigatingTheWalledGarden_CihonGalpaya_2017.pdf and in Annex 3

3.3 Broadband QoSE testing

Servers used for the diagnostics were within core transit locations in Bangkok and Los Angeles. The Network Diagnostic Tool (NDT) servers are outside of ISP networks, within data centers that have direct upstream transit connectivity to the Internet (Tier 1 networks). This placement is intended to compare to actual user experience, where more than one network is potentially involved in the delivery of content. This is different from isolating only one component of the ecosystem as other testing infrastructures sometimes do, such as to the access provider's edge.

Detailed results are available in the report (Annex 4). However, a case in point is the often-misunderstood metrics; for instance download speed and latency. Latency, or Round-Trip-Time (RTT), is the time taken for a packet to reach a destination server and return to the client. It often affects the quality of certain services like online gaming and streaming media, among others, and also contributes to the time taken for a webpage to load. The lower the latency the better the overall performance. However, various factors can affect the download speed even if latency is low and vice-versa. This was evident in our diagnostics (Figure X & Figure Y) where areas with high download speeds did not necessarily measure up well in terms of latency.

The figures below illustrate the better performing states (colour coded in shades of green) where the higher download speeds (Figure X) and lower latencies (Figure Y) were observed. The states colour coded in Red had lower download speeds (Figure X) and higher latencies (Figure Y)

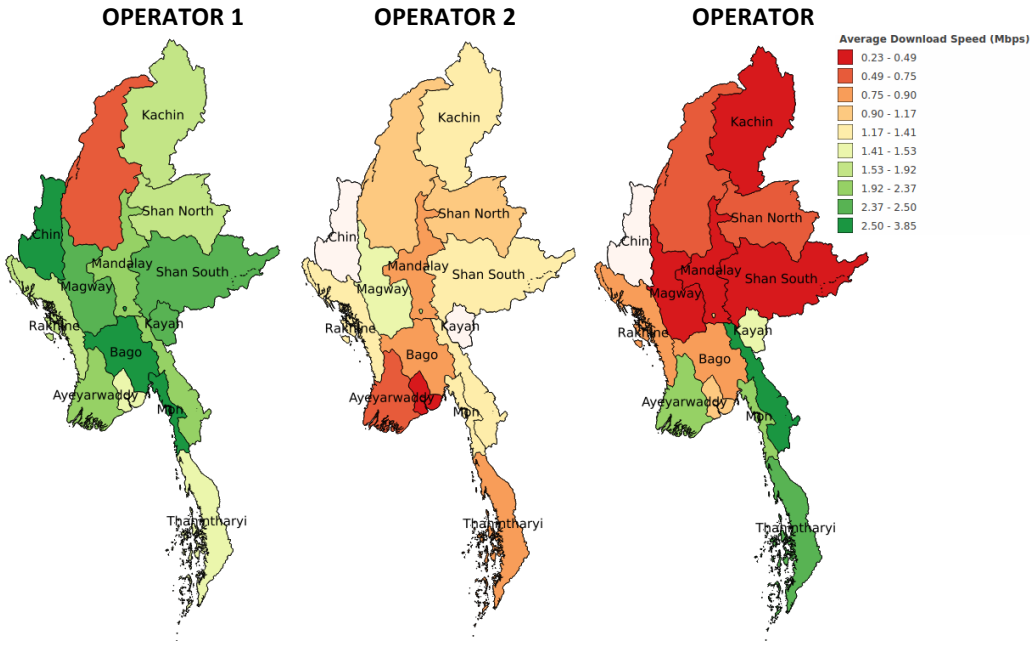


Figure 7: Average download speed (in Mbps from a server in Los Angeles) for the three operators

Source: LIRNEasia, 2016

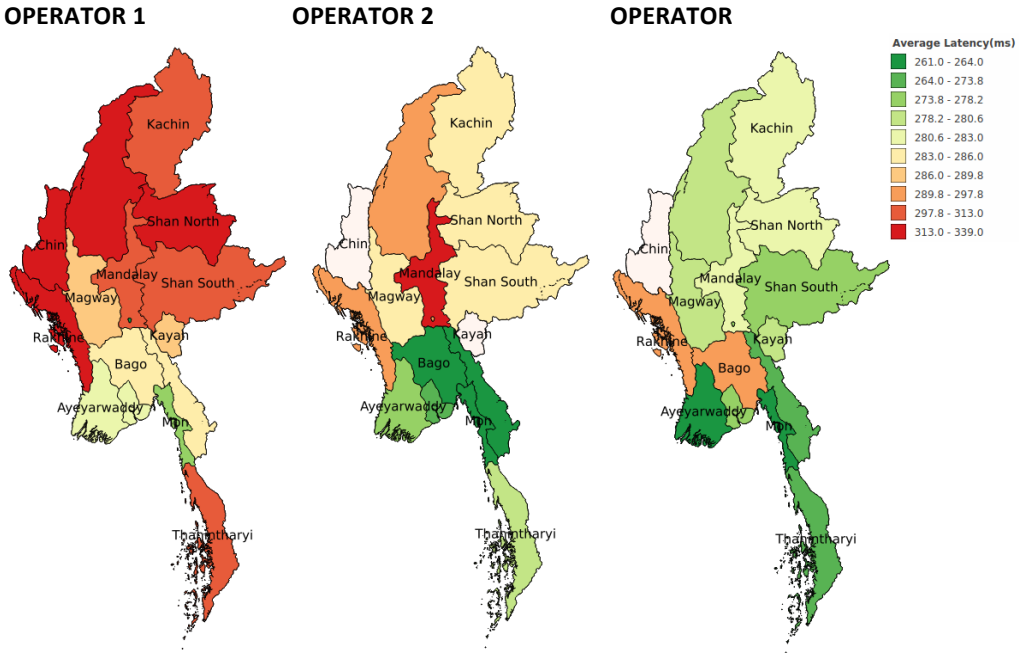


Figure 8: Average latency (in ms to a server in Los Angeles) for the three operators

Source: LIRNEasia 2016

We often use the advertised speed as a base to assess how much of it (as a percentage) is actually received at the consumer's end (Figure Z). Unlike fixed networks, mobile networks have a higher degree of volatility with the load on base stations constantly increasing and decreasing. However, other issues of the lack of network

optimization by the operator for instance that results in consistently poor quality in some locations can be addressed if these diagnostics are carried out periodically.

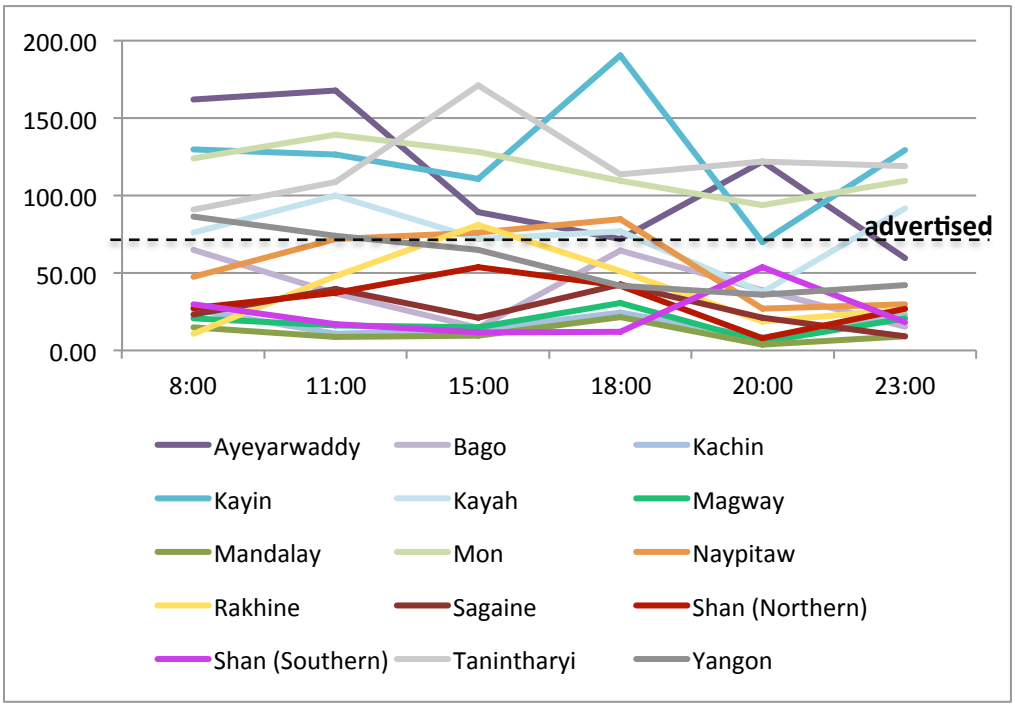


Figure 9: Actual download speed as a percentage of the advertised "upto 2 Mbps"

4. Project implementation and management

The project has research, capacity building and policy intervention components.

The degree of progress towards each objective is listed in the table below; detailed descriptions if necessary, are given in the sub-sections which follow.

Changes to planned activities and changes in understanding

Table 3: Degree of progress towards objectives

Objective	Activities Completed	Anticipated/ongoing activities
Research		
Achieve a good understanding of how Myanmar ICT users, especially men and women at the bottom of the pyramid, use ICTs and communicate this knowledge effectively to relevant stakeholders and to those who develop apps and content	1.Analysis of data & dissemination of results from the baseline survey on mobile phones, internet, information and knowledge in Myanmar 2. Questionnaire design,	1. Report on endline survey on mobile phones, internet, information and knowledge in Myanmar (ongoing) 2. Second round of

	fieldwork, data analysis and dissemination of results form the endline survey on mobile phones, internet, information and knowledge in Myanmar 3. Design of discussion guides, fieldwork, data analysis, preparation of report and dissemination of results of GSMA-LIRNEasia qualitative gender study 4. Testing, preparation of report and dissemination of results of the first round of Broadband Quality of Service Experience (QoSE) testing 5. Design of discussion guides, fieldwork, data analysis, report writing on qualitative research on free and subsidized data use in Myanmar 6. Co-authorship of paper based on 2014 Myanmar microenterprise research (submitted for academic publication) with NTU (Singapore) researchers, including Rich Ling.	broadband QoSE testing using a crowdsourced method 3. Qualitative research on online harassment, security and privacy
Identify scalable models of web literacy development and implement in at least 100 tele-centers or equivalent locations	1. Pilot research on digital literacy in Myanmar.	1. Evaluation of demand for courses in Telenor/MIDO's lighthouse project (waiting for confirmation)
Capacity building		

Establish MIDO as a credible, independent entity making evidence-based interventions in Myanmar ICT policy and regulation processes and playing a catalytic role in building an inclusive information society by mobilizing civil society and the private sector	1. Strategic planning meeting 2. Preliminary financial training for MIDO's finance department and senior staff	1. Follow up financial training for MIDO's finance department 2. Training on event organization and communications (ongoing)
Build capacity of policy makers, regulators and private-sector and civil-society stakeholders in consultative policy making and regulation and also in broadband quality of service experience monitoring	Social media and ICTs for improved governance: E gov for parliamentarians. Conducted for 1. 20 members of Union parliament 2. 87 members of Yangon regional parliament	1. Data for policy course for members of Yangon regional parliament 2.Workshop on ICT indicators for officials at Ministry of Transport and Communications (tent)
Policy intervention		
Provide timely and comprehensive responses and advice on ICT reforms and, to a limited extent, on electricity reforms	1. Response to telecommunications masterplan 2. Response to a consultation paper on allocation of spectrum 3. Response to Guidelines on Provision of International Gateway Facility Services 4. Recommendations on the design of a regulatory agency and a policy unit within the ministry	No planned activities since policy windows open up without prior notice and resources are mobilized when the opportunity arises.
Catalyze the rate at which members of the disabled community gain access to ICTs	1. Meetings with telecom operators, leaders of the disabled community digital content providers and discuss the actions that can be taken to enable more ICT access and content access (using ICTs) to	1. Resolving problems in the text to speech engine in Myanmar language (ongoing) 2. Conducting an audit of Government/Ministry

	visually impaired persons in Myanmar. 2. Meetings with multiple stakeholders (blind schools, national association, developers) to identify problems pertained to Myanmar text to speech engine.	websites to check for WCAG 2.0 compliance
General		
Facilitate the creation of a multi disciplinary advisory committee	1. Project Advisory Committee formed. The first meeting held in June 2016, and subsequent correspondence/interaction taken place.	

4.1 Research

4.1.1 Demand side research: Quantitative

4.1.1.1 2015 baseline and 2016 follow-up surveys

LIRNEasia, when writing the project proposal, envisaged that it would be able to get additional funding from external sources to fund the 2016 follow-up survey. However, fundraising activities were unsuccessful 13, LIRNEasia was then forced to consider the reallocation of funds from the qualitative research allocated budget to allow for a quantitative survey to be conducted. Since a significant amount of qualitative research was undertaken at minimal cost to LIRNEasia through the joint gender study with GSMA Connected Women, this seemed like a feasible option. Funds for a second round of qualitative research (USD 40,000) were preserved, and USD 60,000 was be reallocated to the quantitative follow-up survey, bringing the total funds for this activity to USD100,000. Even still, this was less than the cost of the baseline survey conducted in 2015, for which LIRNEasia collaborated with Third Eye Co in a cost-and-data-sharing agreement. The high market costs once again prevented LIRNEasia from being able to independently commission a nationally representative follow-up survey to meet the research objectives. Therefore once again, LIRNEasia has been offered a low-cost opportunity which allowed us to insert a number of questions in Third Eye's maiden national quarterly panel survey.

Table 4: Key differences between the two surveys

	2015 baseline survey	2016 follow-up survey

[13] The following organizations were approached by LIRNEasia for funds for this purpose: Telenor Myanmar, Ooreedo, ISOC Asia Pacific

Sample age group	15-65	15-69 (15-65)
Sample size	8400	7500 (7,204 for analysis)
Margin of error	+/-2.5%	+/-3%

Despite the differences in sample size and margins and margins of errors, the results from the two nationally representative surveys are largely comparable. The 2016 follow up survey was covered the population aged 15-69, but only the data from the population aged 15-65 was analyzed for the sake of comparability with the 2015 baseline survey. .

The results can be disaggregated by 15 states and regions including Nay Pyi Taw territory, 6 geographic regions, and urban vs rural location as well as by gender and age groups as appropriate. The townships are set to be Primary Sampling Units (PSU). 32 of the 330 townships (from Kachin State, Kayah State, Kayin State, Chin State, Sagaing Region, Rakhine State and Yangon Region) are excluded from the PSU sampling frame due to inaccessibility and security concerns.

The data is stratified as follows:
-Main strata: 19 strata of 15 states and regions including Nay Pyi Taw Union territory which can aggregated to form 6 geographic areas – Northern hills, Eastern hills, Middle Dry Zone, Lower Valley, Ayeyarwady Delta and Long Coast.
-First level Sub strata: This level of stratification depended on the population size in the cities or townships.

Table 5: First level of sub-strata for quantative research

Type of sub strata	**Population size in the cities or townships**
Big cities	Greater or equal to 1 million (> =1 million)
Other major cities	Between 0.25 million and 1 million (0.25 – 1 million)
Smaller townships	Less than 0.25 million (< 0.25 million)

-Second level Sub strata: Urban & Rural within selected sample cities/ townships for disaggregating the estimates between urban and rural. Samples are allocated two fifths and three fifths between urban and rural as appropriate respectively.

Four stage sampling was carried out. The stages, briefly, are;
Stage 1: Selection of township
Stage 2: Selection of wards in urban areas and village tracts in rural areas in selected townships
Stage 3: Selection of clusters in specified wards/village tracts
Stage 4: Selection of households in selected cluster (segment)

Once a household was selected, a Kish grid was used to select one respondent for the individual specific component of the questionnaire.

For more details on the methodology, see Annex 14.

Additionally, LIRNEasia has also entered into a collaboration with the Nanyang Technological University (NTU, Singapore, under Prof. Rich Ling's charge), to conduct further analyses of the Myanmar data collected on information and communication needs among low income urban micro-enterprises by LIRNEasia in 2014[14], toward academic papers. One such paper has been co-authored with Prof. Rich Ling and others from NTU, and submitted to Information, Communication & Society for consideration.

Discussions are also currently underway with the /mobile vulnerability analysis and mapping (m-Vam) team of the United Nations World Food Programme to share the data from the baseline survey. The data is to be used to understand relationships between food security and mobile phone usage, and to produce weights for their mobile phone based surveys

4.1.1.2 Impact analysis

The conceptualization and initial socioeconomic impact analysis of the data collected at baseline was led by Jorge Garcia Hombrados, who has substantive expertise in impact analysis as a former researcher at J-PAL and 3ie. Due to his time constraints however, the latter stage of the analysis will be carried by LIRNEasia researchers under his supervision.

The analysis so far has been aimed at establishing an empirical strategy as to how to measure and calculate the impacts given the data at hand. The insufficient proportion of wards and villages with no mobile network at baseline necessitated the collection of mobile signal strength data, such that the impacts of improving signal strength between baseline and follow-up could be assessed (as opposed to the provision of mobile networks, where none previously existed). The empirical design being proposed will exploit the large variation in signal strength across wards and villages at baseline, such that an instrumental variable approach can be used to measure socioeconomic impacts. The approach is still being tested, and once the researchers are satisfied with the approach, the actual calculations of impacts can commence.

4.1.2 Demand side research: Qualitative

4.1.2.1 Gender and ICTs

91 respondents aged 18-65 were interviewed for this qualitative study to analyze the reasons for differences in mobile ownership between men and women. Gender and their locality (urban vs rural) were key factors used when selecting respondents.

The sample table for the research is given below.

	Female		Male		Total	
	Urban (Yangon)	Rural (Pantanaw)	Urban (Yangon)	Rural (Pantanaw)	Protocols	Participants
Focus group discussions	4	4	1	2	11	66
Home visits	10	10	3	2	25	25
						91

Mobile owners and non owners of of varying ages and socioeconomic categories were interviewed.

LIRNEasia took part in the selection of the research vendor (Myanmar Survey Research, MSR) with GSMA, designed the sample and research instruments. Nilusha Kapugama (Former Senior Research Manager, LIRNEasia) and Chiranthi Rajapakse (Senior Researcher, LIRNEasia) participated in some of the early protocols, conducting

[14] Facilitated through IDRC project number 107077-001

quality checks on the work that was taking place. LIRNEasia then played a significant part in the analysis of data, using nVivo software to analyse the transcripts. The report was authored by Ayesha Zainudeen (Senior Research Manager, LIRNEasia) and Helani Galpaya (CEO, LIRNEasia), with contributions from GSMA (mainly in terms of feedback), leading to a detailed set of policy recommendations for a wide group of stakeholders. The report was copy-edited and published by GSMA, who has also funded the printing cost of 100 copies.

4.1.2.2 Free and subsidized data use

Qualitative research in the form of FGDs was carried out in over two weeks in July 2016 in Yangon. MIDO carried out the recruitment for this set of focus groups. Phyu Phyu Thi (Research Director, MIDO) moderated the focus group discussions. **67**63 respondents from SECs A to E in urban and rural areas in Yangon were interviewed. All the respondents were mobile data users. While some users had used zero rated content, others had not. Helani Galpaya (CEO, LIRNEasia) and Peter Cihon (Google Policy Fellow, LIRNEasia) supervised the FGDs.

4.1.3 Web literacy development

MIDO has been working with a mobile operator to develop a curriculum to be taught at the telecentres to promote mobile and computer literacy. Pilot research with the telecentre operators and customers on the curriculum and the demand for the training took place in Yangon and Nay Pyi Taw in April 2016. Contingent to he lack of objections from the implementing parties and availability of data, the web literacy curriculum will be documented and the data on the demand for each of these services will be analysed.

4.1.4 Broadband QoSE testing

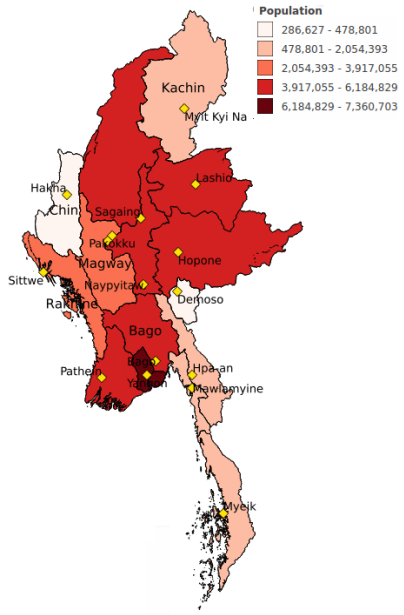


Figure 10: Testing locations for QoSE testing

Mobile broadband in Myanmar is predominantly accessed via mobile phones. Given the negligible availability of fixed broadband in Myanmar, the focus was on three similar mobile data plans offered by MPT, Ooredoo Myanmar and Telenor Myanmar.

However, the devices that were accessible to MIDO and LIRNEasia did not meet the necessary specifications in that some had older versions of Android and others did not support 3G on the GSM network. Due to compatibility issues the testing scheduled for early March 2016 was postponed to May 2016 (April had to be avoided as most people were on holiday for approximately 2 weeks in April due to the Water Festival). LIRNEasia secured funding from M-Lab to purchase suitable devices. The Samsung J1 was used as the testing device in all instances.

	MPT[1]	Ooredoo Myanmar[1]	Telenor Myanmar[1]
Data Plan	1.35 GB	Internet Monthly 1.35 GB	Smart Internet Month Pack 1.25 GB
Price	MMK 6500	MMK 6850	MMK 6600
Advertised Speed	Not advertised	Not advertised	Up to 2 Mbps
Validity	30 days	30 days	30 days

Table 6: Plans selected from the different operators for QoSE testing

There are many tools and methods that can be used to measure broadband Quality of Service. Often, the underlying methodology adopted is one of the reasons as to why readings vastly differ based on the tool used for testing.[15] LIRNEasia considered Ookla's SpeedTest and the Open Technology Institute's Network Diagnostic Tool (NDT). The methodology of the former is partially opaque whereas NDT is well documented (The methodology and technical details of the NDT can be found at https://github.com/ndt-project/ndt/wiki/NDTTestMethodology).

The researchers conducted diagnostics on two week days and a weekend (four days in total) during the second week in May 2016, at multiple times of the day (8:00, 11:00 15:00, 18:00 20:00 and 23:00) to iron out potential peak / off-peak traffic variations.

Researchers covered locations in all the states and regions. The testing locations can be seen in figure x. Ideally, multiple locations would have been covered to geographically represent a state/region. However, as this was a resource-intensive exercise, one township was selected per state / region. Diagnostics were carried out in one location per township.

The intended use of the server in Bangkok was to replicate it as a locally hosted server. This was the initial hypothesis. However, on completion of the diagnostics it was evident that the NDT server in neighboring Bangkok cannot be a proxy for a server within the national domain. Trace routes from Yangon to www.google.com and to the NDT servers in LA and Bangkok illustrate the routes taken between the client and server. Several private IP addresses were encountered which are most likely to be within the service provider's network and packets reached / was routed through Bangkok after a significant number of hops. Ideally, a locally hosted server would be used to measure broadband QoSE within the local domain.

LIRNEasia is in the process of evaluating three other mobile apps and will employ a crowd-sourced approach to increase the geographical coverage of measuring as broadband quality, which is highly location sensitive.

4.2 Capacity building

4.2.1 Capacity building for policymakers

At the initial states of project planning, it was envisaged that one course on e-government and one-course for legislators on telecommunications for regulators would be carried out. No courses took place in the first year of

15 Zuhyle, S. & Mirandilla-Santos, G. 2015. Measuring Broadband Performance: Lessons Learnt, Challenges Faced. Available at: http://www.cprsouth.org/wp-content/uploads/2015/08/CPR-south-2015_Measuring-Broadband-Performance-Lessons-Learnt-Challenges-Faced_PP21_Final.pdf and Bauer, S. et al. 2010. Understanding Broadband Speed Measurements. Massachusetts Institute of Technology. Available at: http://groups.csail.mit.edu/ana/Publications/Understanding_broadband_speed_measurements_bauer_clark_lehr_TPRC_2010.pdf

the project as due to changes in the political landscape. Training the legislators may have been redundant due to the impending change in Cabinet portfolios; getting the attention of other government officials during this period was a challenge given the rapid changes in the political landscape.
In the second year of the project, once the new Cabinet was appointed, a course on social media and e-government for 20 members of Union Parliament was being organized. During this, a request came from members of the Yangon Regional Parliament to conduct a similar training for their entire parliament, and offered their parliamentary premises as a venue. Funds still remain due to cost savings from organizing the courses (due to savings on the venue primarily). The interest of the members of the Yangon Regional Parliament was high and requested follow up courses, particularly for other government officials. Hence, another course is being conceptualized/organized on the use of data for policy for government officials.

4.3 Policy intervention

4.3.1 Catalyzing ICT access for the disabled community

Myanmar's 2014 national census revealed that 4.6 percent of the population of Myanmar lived with disabilities; 2.5 percent of the population was visually impaired.[16] Access to ICTs for this segment of the population is problematic. LIRNEasia's objective is to step in order to catalyze the rate at which they gain access to ICTs, particularly the Internet.
Following meetings with multiple stakeholders in February 2016, a number of problems in accessibility of ICTs for the disabled were identified. LIRNEasia wrote to two operators suggesting that an action plan was drawn up promote accessibility by the disabled such as providing billing and other information in accessible formats and ensuring that the website is WCAG 2.0 compliant. Further progress on this was not made due the lack of engagement from the operators.
During this visit it was also learnt that technical problems exist in converting devices such as electronic book readers (eg: DAISY readers) into the Myanmar language, though the root cause was unclear. A leading figure in resolving technical issues, Mr. Dipendra Manocha was invited to Myanmar to scope out the existing situation and identify the bottlenecks preventing the text to speech engine (TTS) from working optimally. Further details on his meetings, findings and work can be seen in section 5.4.2 and Annex 16.
Plans were alos underway to organize a hackathon to develop applications for the disabled. However, subsequently, it was learnt that other parties in Myanmar were planning to run similar programmes. Instead, the focus was shifted towards working with content providers such as 7day news in developing applications in the Unicode font, which could be read by screen reading software needed for the text-to-speech engine to work.

4.4 Myanmar advisory board

The contract imposed that LIRNEasia should form a project advisory board for this project to evaluate its work and provide suggestions for further work. Dr Robert Anderson, professor of communication (at Simon Fraser University, Canada) and trained, director of the program on Development and Sustainability, and who has worked in Myanmar for decades and is currently building a network of young environmentalists in Myanmar agreed to chair this board.
The board members are,
1. Dr. Robert Anderson- Simon Fraser University, Canada
2. Dr. Thant Thaw Kuang- Myanmar Book Aid and Preservation Foundation

[16] http://data.unhcr.org/thailand/download.php?id=421

3. Vicky Bowman- Myanmar Centre for Responsible Business
4. Nay Lin Soe- Myanmar Independent Living Initiative
5. Wai Phio Myint- Myanmar Centre for Responsible Business

The first board meeting was held in June 2016 at the Sule Shangrila Hotel in Yangon. All but one board member, Vicky Bowman (who then recommended another board member Wai Phio Myint), the IDRC project officer Phet Sayo, Pranesh Prakash of CIS, the founding members of MIDO (Htaike Htaike Aung, Phyu Phyu Thi, Wai Myo Htut and Yatanar Htun) and representatives from LIRNEasia (Helani Galpaya, Rohan Samarajiva and Gayani Hurulle) were present at the board meeting. LIRNEasia's work in Myanmar was presented to the board, and discussion ensued.

5. Project outputs and dissemination

5.1 Research outputs

Table 7: Research outputs

Research reports			
Galpaya, H., Zainudeen, A. & Suthaharan, P. (2015) A baseline survey of ICT and knowledge access in Myanmar	Research report based on baseline quantitative study	Complete	Annex 1
Zainudeen, A. & Galpaya, H. (2015) Mobile phones, internet and gender in Myanmar	Research report based on qualitative study	Complete	Annex 2
Cihon, P. & Galpaya, H. (2017) Navigating the walled garden: Free and subsidized data use in Myanmar	Research report based on qualitative research	Complete	Annex 3
Zuhyle, S. (2016) Quality of Service Experienced by Mobile Broadband users in Myanmar	Research report based on first round of QoSE testing	Complete	Annex 4
Publications			
Parekh, P., Ling, R., Zainudeen, A. & Galpaya, H. (2017) Rationalization of mobile telephony by small-scale entrepreneurs in Myanmar.	Ready for peer review Note the paper was written in the current cycle though the research was done under the previous grant/cycle	Draft	Annex 5

Conference papers			
Galpaya, H., Zainudeen, A., Rajapakse, C., Kapugama, N. (2015). Information/communication habits and needs of the low income micro entrepreneurs in Myanmar and the role for mobile phones.	Conference paper presented at CPRsouth 2016, Taipei, Taiwan. Note the paper was written in the current cycle though the research was done under the previous grant/cycle	Complete	Annex 6
Samarajiva, R. & Hurulle, G. (2016) Regulation under constrained capacity: Lessons for Myanmar	Conference paper presented at ITS, Taiwan	Complete	Annex 7
Galpaya, H., Zainudeen, A. and Hurulle, G. (2016) Factors affecting women's ability to purchase mobile phones in Myanmar.	Conference paper presented at CPRsouth 2016	Complete	Annex 8
Suthaharan,P., Zainudeen, A., and Galpaya, H. (2016) Understanding Gender Variance in Mobile Ownership in Myanmar	Conference paper presented at CPRsouth 2016	Complete	Annex 9
Rajapakse, C. N., Zainudeen, A., Galpaya, H., and Suthaharan, P. (2016) Factors influencing use of mobile data services among women in Myanmar	Conference paper presented at CPRsouth 2016	Complete	Annex 10
Samarajiva, R. (2016) Policy challenges in embracing mobile technology to promote socioeconomic development: The case of Myanmar	Conference paper presented at QualComm-LKY School Research Conference	Complete	Annex 11
Other			
Galpaya, H., Zainudeen, A., Suthaharan, P., Hurulle, G., Aung, H. H. & Thi, P. P. (2016) Mobile phones, Internet, information and knowledge: Myanmar 2016	Slideset presented to the Deputy Minister of Transport and Communications, and media and civil society organizations	Complete	Annex 12

Samarajiva, R. & Hurulle, G. (2016) Performance of Universal Service Funds: India, Malaysia and Pakistan	Slideset presented at International Council of Communications Conference	Complete	Annex 13
A Research Design for the Assessment of the Socioeconomic Effects of Improving the Strength of Mobile Phone Signal in Myanmar	Quantitative study	Draft	Annex 14

5.2 Dissemination

5.2.1 LIRNEasia organized events

5.2.1.1 Demand side research: Quantitative

Events were organized in Yangon and Nay Pyi Taw to disseminate the results of the baseline survey to key stakeholders.

The findings of the baseline survey were presented to members of union parliament, mobile operators, NGOS, the media and other stakeholders at the Sule Shangri La, Yangon on 29th July 2015. Helani Galpaya carried out a 50 minute presentation of the key findings of the nation-wide survey. The book titled "Mobile Communication" by Rich Ling and Jonathan Donner which was translated in to Barma was formally presented to U Kyaw Min and U Myint Oo (Members of Parliament, Myanmar) by Naser Faruqui (IDRC) and Rohan Samarajiva (LIRNEasia) at this event. Copies of the book were made available to all participants at the event. A comprehensive Q & A session followed the presentation, with Helani Galpaya, Phyu Phyu Thi (MIDO) and Htun Htun Oo (ThirdEye Co. Ltd) taking questions from the audience.

The findings were also presented to U Thaung Tin, Union Deputy Minister of Communication and Information Technology and other Government officers at the Aureum Palace Hotel, Nay Pyi Taw on 30th July 2015. A comprehensive Q & A was carried out after the 50 minute presentation by Helani Galpaya. Several copies of the translated version of "Mobile Communication" were presented to the Deputy Minister.
The event report can be found in Annex 17

The research findings were also shared with members of Union and Yangon Regional Parliament as a part of a course on social media and ICTs for improved governance in June 2016. See section 5.4 for further details.

An event was organized on 17 December 2016 at the Novotel, Yangon to disseminate the results of the follow-up survey to the media and other stakeholders. Helani Galpaya carried out a presentation the key-findings of the survey. A number of media interviews followed. Mr. Nay Lin Soe, a member of the Myanmar advisory board also gave interviews to the media on accessibility of ICTs to the disabled.
An event report can be found on Annex 18

5.2.1.2 Demand side research: Qualitative

Helani Galpaya presented the findings of the joint research by GSMA Connected Women & LIRNE*asia* on "Mobile phones, internet & gender in Myanmar" at the Chatrium Hotel, Yangon on 8 April 2016. The event organized by LIRNE*asia* and MIDO was used as a forum to discuss issues pertaining to gender and ICTs in Myanmar at large.

Khin Sandar Win & Htla San Htwe presented the rationale behind and the workings of the UNDP iWomen application while Htaike Htaike Aung of MIDO spoke of the role of women as app developers, hackers and coders. The event was well attended despite it being held on the last working day prior to the New Year Water Festival holidays. Noteworthy was the large media presence, with the event being covered by multiple print, television and online media outlets. Diverse stakeholders such mobile operators, app developers and NGOs also participated at the event, engaging deeply with the presenter.

The results of the gender qualitative were also presented to Marla Bu, Regulatory Affairs at the Ooredoo Myanmar head office on 7 April 2016.

The event report can be accessed here

5.2.2 Meetings

5.2.2.1 Demand side research: Quantitative

5.2.2.1.1 2015 baseline research

Helani Galpaya presented the findings of the Myanmar baseline survey to two smaller groups on the 28th of July in Yangon;
1. The ICT4D Working Group at the Phandeeyar auditorium: the ICTD Working Group is a gathering of all organizations (donors, civil society mostly, but a few private sector organizations) implementing and/or funding ICTD projects in Myanmar. Phandeeyar is the main innovation hub in Yangon, and a gathering place for all techies and venue for hackathons.
2. Gunnar Bertelsen, Chief Corporate Affairs Officer of Telenor Myanmar at the Telenor Office,Yangon

Rohan Samarajiva met with the President and General Secretary of the Myanmar Computer Federation (MCF), pursuant to such suggestion made to him by U Thaung Tin. This meeting was held on the 28th of July at the MCF office in Yangon.

5.2.2.1.2 2016 follow-up survey

LIRNEasia CEO Helani Galpaya and the MIDO co-founders (Phyu Phyu Thi, Htaike Htaike Aung and Wai Myo Htut) met with the Deputy Minister of Transport and Communications, U Kyaw Myo to present the results of the 2016 follow-up survey of ICT use in Myanmar. U Sai Saw Lin Tun, Deputy Director General of the IT and Cyber Security Department in the Ministry and other officials were also present.

5.2.2.2 Broadband QoSE testing

The results of the first round of Broadband QoSE testing was disseminated to the three operators

Table 8: Meetings- dissemination of BB QoSE testing

Operator	Date and location of meeting	Attendees
MPT	22 June, MPT- Bo Aung Kyaw office	Cherry Myo Tint, Deputy Chief Technology Officer
Telenor Myanmar	21 June- Telenor Myanmar Head Office	Gunnar Bertelsen, Chief Corporate Affairs Officer Jai Prakash, Chief Technology Officer
Ooredoo Myanmar	21 June- Ooredoo Myanmar Head Office	Christopher Pierce, Chief Legal and Regulatory Officer Bob McDonald, Legal and Regulatory Advisor

5.2.3 Participation at conferences, panel discussions and workshops

WSIS Forum, Geneva, June 2015
The 2015 WSIS Forum held in Geneva, Switzerland in June 2015 was attended by Helani Galpaya.

UN-DESA ITU expert group meeting, New York, June 2015
Helani Galpaya participated in the UN-DESA and ITU organized expert group meeting in New York, USA in June 2015.

ICTD2015 Conference, Singapore, July 2015
LIRNEasia participated in an open session on Myanmar at the ICTD Conference in Singapore in May 2015. A presentation titled "Knowledge, information and communication habits and needs in Myanmar: Stories from the field" was made to those in attendance.

Asia Pacific Regional Internet Governance Forum (IGF), Macau, July 2015
A presentation titled "What do users want? Data from the last "greenfield" market, Myanmar" was presented by Rohan Samarajiva at the Asia Pacific Regional IGF in Macau in July 2015.

CommunicAsia, Singapore, July 2015
LIRNEasia organized and moderated a panel discussion on Myanmar at CommunicAsia in Singapore in July 2015.

Stockholm Internet Forum, Sweden, Oct 2015
A panel discussion at the Stockholm Internet Forum in October 2015 was organized and moderated by LIRNEasia. The organization's 'all fronts' approach was used as a framework for the discussion and a subset of the findings of the baseline survey were presented at the forum. Rohan Samarajiva was the moderator of the session while panelists included Htaike Htaike Aung and Yatanar Htun of MIDO and Ei Myat Noe Khin of Phandeeyar.

Internet Governance Forum, Joao Passoa, Brazil, Nov 2015
Helani Galpaya participated in 8 sessions (3 main sessions, 4 workshops, one pre-IGF event). In all but 2 of these events, the results of the Myanmar household survey were referenced to provide context for the discussions.

Joint QualComm-LKY School Research Conference, Singapore, April 2016
Rohan Samarajiva presented the paper Policy challenges in embracing mobile technology to promote socioeconomic development: The case of Myanmar in Singapore. The full paper can be accessed in annex 11

UN Commission on Science Technology and Development (UNCSTD) panel, Geneva, Switzerland, May 2016
The research from this project provided the basis of evidence at LIRNEasia's presentation made by Helani Galpaya at the 19th session of the UN CSTD (Commission on Science Technology and Development) in Geneva, Switzerland in May 2016.

International Telecommunication Society Biennial Conference, Taipei, Taiwan, Jun 2016
Rohan Samarajiva presented the findings of the paper Regulation under constrained capacity: Lessons for Myanmar at the 21st biennial conference of the International Telecommunications Society in Taiwan. Refer Annex 7 to access the paper.

CPRsouth, Zanzibar, Tanzania, Sep 2016
Gayani Hurulle, Suthaharan Perampalam and Chiranthi Rajapakse presented three papers pertaining gender and ICTs in Myanmar based on the baseline survey findings. Refer Annex 8, 9 and 10 to access the papers.

International Institute of Communications Annual Conference, Bangkok, Thailand, Oct 2016
Rohan Samarajiva presented research conducted on the efficacy of Universal Service Funds, which was to be used a base for policy intervention on USFs in Myanmar. Refer Annex 13 to access the slideset

A4AI Gender coalition meeting, Yangon, Myanmar, Nov 2016
Helani Galpaya presented the preliminary results of the 2016 survey, pertaining to the use and access of ICTs by women.

Internet Governance Forum, Gualadajara, Mexico, Dec 2016
Data from the two surveys as well as general data on Myanmar were used in multiple panels at the IGF.

Myanmar Digital Rights Forum, Yangon, Dec 2016
Helani Galpaya participated in the Myanmar Digital Rights Forum in Yangon, Myanmar in December 2016 and presented data from the 2016 survey.

ICT4D Working Group, Yangon, Myanmar, Feb 2016
Htaike Htaike Aung presented the data of the follow-up survey at the ICT4D working group discussions on 22 February 2017 at Phandeeyar.

5.2.4 News/media coverage

Table 9: Media coverage

Date	Publisher	Name of article (link if any)	Author
Print			
08/03/16	Myanmar Times	Ooredoo launches K30,000 smartphone	Catherine Trautwein
09/04/16	Eleven News	□□□□□□□□□□□□□□□□□□□□□□□□ □□□□□□□□□□□□□□□ □□□□□□□□□□□□□□□ □□□□□□□□□□□□□□□ □□□□□□□□□□□ □□□□□□□□□□□□□□□□□□ □□ □□□□□□□□□□□□□ □□□□□□□□□□□□□□□□□□□□□□□ □□□□□□□□□□□□□□□ □□□□□□□□□	
23/06/16	Myanmar Times	The economy needs more women working	Thin Yee Mon Su
12/12/16	Eleven News	Women's IT skills lagging: study	

17/12/16	Daily Eleven	Despite telecommunications advances, digital literacy weak, particularly amongst women (translated)	Nay Myo Tun
17/12/17	7 Day Daily	Facebook users in Myanmar is about 12 million (translated)	Myint Kyaw Hlaing
18/12/16	7Day Daily	ICT improvements in Myanmar (translated)	Myint Kyaw Hlaing
20/12/16	Myawaddy	Digital literacy rate needs to be improved in the country	
21/12/16	Newsday New	78% smartphone usage in Myanmar similar to that in the USA	Zaw Min
25/12/16	Union Daily	Facing difficulties in getting full potential of opportunities and other services due to lack of digital literacy	May Lwin
27/12/16	7 Day Daily	A survey shows that there is some trouble amongst local mobile phone users in finding information	Myint Kyaw Hlaing
TV			
09/04/16	Skynet	Mobile phone, internet & gender launch event	
09/04/16	MRTV	Mobile phone, internet & gender launch event	
09/04/16	MNTV	Mobile phone, internet & gender launch event	
23/12/16	MBC	ICT habits and needs	
Radio			
09/04/16	FM Bagan	Mobile phone, internet & gender launch event	
17/12/16	Padmayar FM	ICT use and information needs	
Web			
06/04/16	Internet Journal	GSMA Connected Women □□□□□□□□□□□□□□□ □□□□□□□□□□□□□ □□□□□□□□□□□	
09/04/16	Kamayut Media	Mobile phone, internet & gender launch event	
16/12/16	News Watch	Myanmar's smart phone usage is now almost that of US: LIRNEasia (translated)	

19/12/16	Internet Journal	LIRNEasia showed that among mobile owners aged 15-65 in Myanmar, 21 percent use Facebook daily (translated)	Tun Tun

Table 10: Blog posts

Date	Name of blogpost (link if any)	Author
13/03/16	LIRNEasia research cited in report on USD 25 smartphone in Myanmar	Rohan Samarajiva
03/04/16	Ooredoo Myanmar's data success story	Rohan Samarajiva
09/04/16	GSMA Connected Women- LIRNEasia findings on "Mobile phones, internet & gender in Myanmar" launched in Yangon	Gayani Hurulle
22/04/16	What can one say about policy barriers to mobile communication in ASEAN?	Rohan Samarajiva
16/05/16	MIDO continues raising awareness on how ICTs can serve persons with disabilities	Rohan Samarajiva
31/05/16	Assessment of Media Development in Myanmar : LIRNEasia's Baseline Survey Results Quoted	Suthaharan Perampalam
21/06/16	Training program for Myanmar Union Legislators	Rohan Samarajiva
24/06/16	E-gov course for parliamentarians of the Yangon Regional Hluttaw	Gayani Hurulle
29/06/16	What can Myanmar learn from its peers as it sets up its ICT regulatory agency?	Rohan Samarajiva
20/07/16	LIRNEasia-GSMA research on gender dimensions of Myanmar teleuse reported	Rohan Samarajiva
26/08/16	Linking the Asia Pacific Information Superhighway to the user experience and Internet takeup in the Asia Pacific	Rohan Samarajiva
29/08/16	Myanmar appears to have more Internet (or at least Facebook) users than any S Asian country	Rohan Samarajiva
22/11/16	LIRNEasia source of Myanmar smartphone data in Measuring Information Society 2016 Report	Rohan Samarajiva
17/12/16	First coverage for 2016 Myanmar teleuse study	Rohan Samarajiva
18/12/16	Myanmar 2016 ICT survey released in Yangon	
18/12/16	Step 1 in ICTs for the visual disabled in Myanmar: bringing stakeholders together to find the technical solution	Helani Galpaya
18/12/16	LIRNEasia at Myanmar Digital Rights Forum	Helani Galpaya

5.3 Capacity building

5.3.1 Capacity building for LIRNEasia

In the past, LIRNEasia worked with qualitative research partners such as CKS India, who would in turn sub-contract with a local (Myanmarese) firm to do the local language moderation, translation/interpretation and respondent recruitment. But for the study on ICTs and gender, , LIRNEasia liased directly with Myanmar Survey Research (MSR), the field research agency, when carrying out the qualitative study, instead of having a third party such as CKS in the middle. The lack of a third party led to knowledge creation for LIRNEasia in terms of sample design and instrument design in a much more direct and thorough form than previously. Furthermore, capacity was built on an organizational level due to learning to use the Nvivo, a qualitative data analysis computer software.

LIRNEasia staff are also taking a larger role in the conduct of an impact evaluation using the survey data. A large portion of the work in the latter stages of the analysis will be conducted by the LIRNEasia researchers under the guidance of Jorge Garcia Hombardos.

5.3.2 Capacity building for MIDO

Phyu Phyu Thi, Research Director for MIDO joined LIRNEasia in the field during the quantitative research in both 2015 and 2016. Her capacity in all aspects of qualitative research was developed – including quality control, because she was tasked specifically with calling back randomly selected respondents to validate their answers. She also moderated the focus group discussions in the qualitative research on free and subsidized data. Other MIDO employees have also become more involved in the research conducted in Myanmar. Htaike Htaike Aung and Hnin Nu Nu Niang joined in the observation of fieldwork for the 2016 survey, and other staff also conducted the back checks on the survey (calling a randomly selected number of survey participants to verify their answers to survey questions, in order ensure quality of the field work teams). With LIRNEasia's guidance MIDO staff also recruited participants for the free and subsidized data research (co-funded by Mozilla and Google) and also conducted the focus groups and provided translation services. MIDO staff also assisted in recruitment and testing for the BB QoSE testing under the guidance of LIRNEasia staff.

MIDO's communication officer, Myo Min Aung, is the contact point for LIRNEasia's work in Myanmar and has worked with LIRNEasia staff to organize multiple dissemination events and courses. He has also worked on disseminating the 2016 survey research and has given interviews to media outlets at dissemination events.

Prashanthi Weragoda (Senior Finance Manger, LIRNEasia) and Priyadarshini Liyanage (Account, LIRNEasia) spent a week in Yangon in April 2016 to conduct financial training for MIDO's financial officer and senior staff. The finance experts assessed the status quo of financials on subjects such as petty cash, bank transactions, salaries, fixed assets. The importance of petty cash procedures were explained and forms handed over. The existing purchasing procedure was reviewed and changes were suggested. Cash management procedures were discussed with the finance officer.
It was recommended that a professionally qualified accountant was hired and that a MIDO officer was trained on an accounting software. MIDO has subsequently reported that their financial officer had attended training on Quickbooks- an accounting software, and spoken of their intention to hire an accountant, at least one part time basis.

Helani Galpaya along with Prashanthi Weragoda and Priyadarshini Liyanage, also spent a half day session on 9 April 2016 with the MIDO senior staff to provide training on budgeting and project reporting.
Noteworthy is that MIDO has been able to obtain a business registration certificate, and is now operating as a registered entity in Myanmar.

5.3.3 Capacity building for policymakers

Two courses titled 'Social media and ICTs for improved governance: E gov for parliamentarians' took place in Yangon in July 2016. It is noteworthy that the courses were designed in response to requests made by the Parliamentarians.

1. Union Parliament

LIRNEasia and MIDO organized a daylong course for 20 legislators from the Upper and Lower houses of the Myanmar Union Parliament at the Chatrium Hotel, Yangon on 21 June 2016. A single participant was female. Rohan Samarajiva spoke of the significance of ICTs to legislators, legislation and the need for independent regulation. Helani Galpaya shared the results of the 2015 survey on ICT use and information needs, and spoke on the topic of zero rating and net-neutrality. Phyu Phyu Thi and Hnin Nu Nu Naing made a presentation on Mynamar's experience with online hate speech.

An event report can be found on Annex 19

2. Yangon Regional Parliament

A two day course organized by LIRNEasia and MIDO took place on 22 and 23 June within the parliamentary premises. It saw the participation of representatives from National League for Democracy (NLD), the Military and Union Solidarity and Development Party (USDP). 87 Parliamentarians participated in total, with over 80 attendees each day. 15 of the 87 parliamentarians (17%) were female.
While Prof Samarajiva spoke of the significance of ICTs to legislators, improving government service delivery and mobile phones and health concerns, Helani Galpaya shared the findings of the 2016 survey and conducted a session on how to measure progress. Htiake Htaike Aung and Yatanar Htun spoke on the use of applications while Pranesh Prakash discussed open source and security issues. Many MPs also visited the digital security clinic for one to one consultations on how they could secure their social media accounts.
The presentations were well-received, with the content and speakers getting a rating of 4 out of 5 on average. Participants commented on the useful nature of the course and spoke of how such training would also be useful for other government officials.

An event report can be found on Annex 20

5.4 Policy intervention

5.4.1 Telecommunications

5.4.1.1 Telecommunications Masterplan

(Annex 21)

The Ministry of Communications and Information Technology (MCIT) published a draft Telecommunications Masterplan for the Republic of the Union of Myanmar in July 2015. LIRNEasia and MIDO jointly submitted recommendations for the Myanmar Telecommunications Masterplan on 7th August 2015. Recommendations were made on a range of topics including the language to be used for the drafting of the policy, the lack of clarity on the design of universal service funds and the lack of adequate consideration made to the execution of policy mechanisms. Furthermore, Htaike Htaike Aung of MIDO traveled to Nay Pyi Taw and provided comments on the Masterplan.

5.4.1.2 International Gateway Facility Services

(Annex 22)

A draft version of the Guidelines on Provision of International Gateway Facility Services was published by the MCIT in October 2015. LIRNEasia and MIDO, submitted a written response with suggestions for improvements to the guidelines while commending the efforts of the MCIT to liberalize the telecommunications services market. Recommendations included allowing the creation of multiple gateways based on multiple media, removal of differential domestic and international termination pricing and giving necessary consideration to data communication.

5.4.1.3 Allocation of Spectrum Frequency

(Annex 23)

The Ministry of Communications and Information Technology (MCIT) published a consultation paper titled 'Spectrum Roadmap: Meet the need over the next 5 years' on 1st February 2016. Rohan Samarajiva and Moinul Zaber responded to the consultation paper submitting a response that placed emphasis on principles important to ensure the efficient use of the spectrum asset. They addressed the questions of 1. Neutrality of Band and Technology 2. Opportunity to refarm and repurpose already acquired bands 3. Embedding all auctions and assignments within a pre-announced and credibly implemented road map for making spectrum resources available to operators 4. Use of carefully designed and well timed auctions as allocation method 5. Formulating a licensing regime that clearly set out conditions for entry to and exit from the market 6. Use of new methods such as harnessing Big Data to formulate plans against harmful interference.

5.4.1.4 Design of regulatory agency and a policy unit within the Ministry

(Annex 24)

Htaike Htaike Aung of MIDO, under the guidance of Rohan Samarajiva, provided recommendations on the design of the regulatory agency, the Myanmar Telecommunications Commission as provided for by the Telecom Law. Further recommendations included the establishment of a policy unit within the Ministry.

5.4.2 Disabled friendly devices

LIRNEasia, along with MIDO and Centre for Internet & Society (CIS) are working towards ensuring the participation of differently abled individuals in the mobile and Internet revolutions in Myanmar. Rohan Samarajiva (Chair, LIRNEasia) and Nirmita Narasimhan (Policy Director, CIS) met with a multitude of stakeholders to discuss issues related to e-accessibility for persons with disabilities. Nirmita Narasimham was instrumental in engaging with key stakeholders in the field by making recommendations on policy level decisions that could be made to support disability access.
Face to face meetings took place on 3rd and 4th February 2016 with the following individuals.

1. Christopher Peirce- Ooredoo Myanmar
2. Patricia Curran- Telenor Myanmar
3. Aung Lwin Oo- Kyee Myin Dian School for the Blind
4. Nay Lin Soe- Myanmar Independent Living Initiative
5. Sarah Oh- Phandeeyar
6. Kyaw Kyaw- Myanmar Deaf Community Development Association
7. Thant Thaw Kuang- Myanmar Book Aid and Preservation Foundation
8. Vicky Bowman- Myanmar Centre for Responsible Business

The roles that each party could play in making information resources available and accessible to individuals with disabilities was discussed at length and follow up conversations to discuss these action points were initiated. Annexures 11 to 15 contain the follow up notes sent to various stakeholders.

Annex 25- Christopher Peirce- Ooredoo Myanmar
Annex 26- Patricia Curran- Telenor Myanmar
Annex 27- Nay Lin Soe- Myanmar Independent Living Initiative
Annex 28- Thant Thaw Kuang- Myanmar Book Aid and Preservation Foundation
Annex 29- Vicky Bowman- Myanmar Centre for Responsible Business

During these visits, LIRNEasia learnt of a number of issues that surround the use of ICTs for the disabled. The need to resolve issues in screen reading software to produce a workable text-to-speech engine for the blind in Myanmar was one of the key issues identified during the course of this project.
Mr. Dipendra Manocha, who had worked extensively in such situations in other countries such as India, was invited to Myanmar for this purpose.
Mr. Manocha and Piyush Chanana, a researcher at IIT Delhi were in Myanmar from 13-18 December 2016. Mr. Manocha made a presentation at the Myanmar Digital Rights Forum during his stay.
To resolve issues with the TTS engine, they had meetings with

1. Rev. Thein Lwin: General Secretary, Yangon Christian Fellowship for the Blind, Mya Thida Lwin, Vice Principal Yangon Education Center for the Blind and Mr. Bananan (who demonstrated the use of the existing TTS engine)
2. Benedict La Hkun, Programme Manager of ICT, Myanmar National Association of the Blind Aung NaingTun, Myanmar National Association of the Blind (MNAB)
3. Min Maung (Bo Bo), Aung Lwin Oo

Following these meetings, it was identified that resolving issues in e-Speak, an lightweight open source TTS, would be the low hanging fruit in providing accessibility to the blind despite its robotic voice. The MNAB was working on getting the Myanmar language onto e-Speak since 2013, but had hit multiple roadblocks.

Table 11: Progress towards a workable TTS engine

Problem type	Problem	Intervention	Progress
Communications gap	Myanmar language not included in eSpeak NG repository	Connecting with eSpeak	Files in Myanmar language uploaded. Assessments being made by eSpeak
Technology gap	Punctuation marks not being recognised by eSpeak	Connecting with coders who had worked on such issues in other languages	Feedback received Errors being rectified

Potential unavailability of accessible content was another key area identified: this was due to the need for websites/applications to be WCAG 2.0 compliant to be read by screen reading software. Preliminary steps are being taken with MIDO to conduct an audit of all Government websites to check if they are WCAG 2.0 compliant. The findings would then be synthesized to communicate results of audit to policymakers

Meetings were also held with the publisher of the 7Day newspaper. It was revealed that their website is not WCAG 2.0 compliant. It also uses the Zawgyi font, which is not Unicode compatible. Following meetings with Mr. Manocha, the MD of the newspaper offered to shift their application to Unicode font.

6. Impact

The results of LIRNEasia's baseline survey on ICT use has been communicated to policy makers, including the Union Deputy Minister. LIRNEasia data was used to track Myanmar's progress in ICTs in the ITU's flagship report Measuring Information Society 2016, UNESCO's Assessment of Media Development in Media report and A4AI's 2015 Affordability report. Officials from the Ministry of Transport and Communications in Myanmar are quoting the findings from the 2016. It was quoted by U Myo Swe, Deputy Director General of the Post and Telecommunications Department at a consultative workshop on universal service strategy, design and implementation held in February 2017 in Yangon.

The joint study on women's access to mobile phones and data services was a direct result of dissemination of the baseline survey findings. A large list of policy recommendations has resulted from this study, targeted at improving women's access and digital skills.

Meetings have taken place with the telecommunications operators on the results of the baseline survey and on the various steps that could be taken to enable ICT use by the disabled. Progress is being made bridging communications and technology gaps in the Myanmar language in e-Speak in an effort to build a usable TTS engine.

LIRNEasia interacted directly with policymakers when conducting the courses on Social media and ICTs for improved governance. We had the opportunity to train 20 members of Union Parliament and nearly 90 members of Yangon Regional Parliament on the issue. Legislation pertaining to the course material will be tracked.

LIRNEasia has also provided input into the drafting of new policies and guidelines by participating in public consultation processes. (Annexures 21 to 24) The Telecommunications Masterplan is yet to be published, and it will have to be analyzed to know the real impact of LIRNEasia and MIDO's input. The adoption of spectrum policy in Myanmar has been postponed following the submission of responses to the consultation paper.

Training MIDO on research and research methods yielded results by Phyu Phyu Thi being receiving a grant from the Understanding Myanmar research programme from Chiangmai University, Thailand.

MIDO has also been extremely active in the policy intervention process. They actively partook in providing responses to draft policy documents and frameworks in the country following its engagement with LIRNEasia, MIDO has started partaking actively in international conferences. In July 2015, Phyu Phyu Thi submitted a written document that was discussed at the Regional Internet Governance Forum in Macau. Yatanar Htun and Htaike Htaike Aung participated in a panel discussion on Myanmar at the Stockholm Internet Forum in Sweden in October 2015. In a wide-ranging interview with the Austrian Academic Journal ASEAS, Htaike Htaike Aung and Phyu Phyu Thi talk about MIDO and how they approach policy problems in the ICT space.

On a broad scale, one of LIRNEasia's key objective was to play a role in increasing the Internet subscriptions and users per 100 to above the average of comparator countries. ITU data indicates that Internet user per 100 numbers were at were at 0.18 ten years ago in 2006 and but stood at 2.1 in 2014. This corresponds to the response to our question in the quantative study carried out in 2015 on the use of the Internet through a browser on any device in the past 12 months. However, the study also showed that users accessed the internet

via mobile devices without knowledge of access, particularly through applications such as Facebook. It was reported that the number of mobile broadband subscriptions coming into 2015 was 8 million[17]

[17] http://www.budde.com.au/Research/Myanmar-Burma-Telecoms-Mobile-and-Internet.html

7. Recommendations

Working in Myanmar continues to be a challenge In 2015-16, all project activities were postponed by over nine months due to uncertainties created due to the general elections.

The prevalence of online hate speech has been widely discussed in Myanmar. Concerns on privacy and security have also been echoed in the public arena. However, the lack of demand size research on the topic has been observed- LIRNEasia is exploring the possibility of bridging this gap.

The two-day course on social media and ICTs for e-government at the Yangon regional parliament resulted in requests for a second course. We are hence in contact with the regional parliamentary authorities on a follow-up course. Meanwhile, the lack of indicators depicting growth in Myanmar's growth from government was observed. LIRNEasia is making attempts to organize a course in Nay Pyi Taw on developing indicators for Myanmar, contingent on demand from the Ministry of Transport and Communications.