Internet Walled Gardens: Artificial Internet Limitations and Digital Inequalities

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Abstract

There is a growing body of literature on digital inequalities with an interest in mending inequalities in a world that increasingly relies on the digital by identifying and isolating the factors that predict digital opportunities. However, there is little which addresses differences in Internet access where infrastructural access in terms of availability and affordability is not an issue. In addition, artificially limiting Internet access is becoming normalised, with limitations used liberally as means for control, neglecting the potential implications of such measures.

The inspiration for this research came from the small body of knowledge available on the effect of artificial Internet limitations on digital inequalities and the consequences of Internet controls on how people make use of the Internet. This research highlights these potential consequences, whether deliberate or not, and link them to outcomes of Internet use, while shedding light on the effectiveness of such limitations. The research was motivated by a belief in the potential the Internet allows as an open platform for a universe with equal access and opportunities for the people. The first part of the research studied artificial Internet limitations in three communities, Bahrain, Estonia, and Singapore, as a factor in determining digital inequalities through two studies aimed at assessing change in opportunities, measured as differences in tangible outcomes of Internet use, as a function of artificial Internet limitations. The findings showed that artificial Internet limitations do indeed affect digital opportunities, producing lower satisfaction, with achievement opportunities attained when the individual is able to circumvent the controls.

The second part of the research is a practical implementation of the model developed in the first part to predict digital opportunities in one of the projects to reach new Internet users, commonly referred to as Next Billion(s). Facebook's Free Basics platform was chosen as an example. The platform provides access to a set of services without incurring data charges in a form of zero-rating. The innate limitations of the platform were proven to limit the potential for individual to access any content not within the walled garden of the platform with near-zero circumvention potential, leaving opportunities provided by the platform to wither in front of the limitations set. People with access only to that platform remain passive consumers and part of disconnected and excluded communities, as the platform limits the potential for meaningful participation in the network society.

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List of Acronyms

3G	Third Generation of GSM mobile technology
ARPANET	Advanced Research Projects Agency NETwork
ASN	Autonomous System Number
DASH	Dynamic Adaptive Streaming over HTTP
FoN	Freedom on the Net
GDP	Gross Domestic Product
HR	Human Rights
HTTP	HyperText Transfer Protocol
HTTPS	Secure HyperText Transfer Protocol
ICT	Information and Communication Technology
ISP	Internet Service Provider
IT	Information Technology
LTE	Long Term Evolution
NDT	Network Diagnostic Tool
NPL	National Physical Laboratory
ONI	OpenNet Initiative
OONI	Open Observatory for Network Interference
SATUM	Spatially Aware Technology Utilisation Model
SBA	Singapore Broadcasting Authority
SSL/TLS	Secure Sockets Layer/Transport Layer Security
TAM	Technology Acceptance Model
TCP/IP	Internet Protocol Suite, Transmission Control Protocol/ Internet Protocol
TRA	Telecommunications Regulatory Authority
URL	Uniform Resource Locator
UTAUT	Unified Technology Acceptance and Usage Theory
VPN	Virtual Private Network
WWW	World Wide Web

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Declaration

I declare that the work contained in this thesis has not been submitted for any other award and that it is all my own work. I also confirm that this work fully acknowledges opinions, ideas, and contributions from the work of others.

Any ethical clearance for the research presented in this thesis has been approved. Approval has been sought and granted by the Faculty Ethics Committee on 16 May 2017 with reference number 674.

I declare that the word count of this thesis is 89,872 words

Name:

Signature:

Date:

Chapter 1

Introduction

1 Introduction

1.1 Study Motivation

Is all Internet access equal? The question that inspired this research towards a quest to look at potentially neglected differences in Internet access and trying to measure the effect they have on how people make use of the Internet. The difference in Internet access as a determinant for digital inequalities is not fully covered in the current body of literature discussing digital inequalities. Allowing the opportunity for this research to offer a much-needed contribution to knowledge in the form of a fresh look on nuances in differentiation in access among the connected resulting from avoidable limitations. The other field this research touches on is Internet censorship studies, which the research contributes to by connecting it with the field of digital inequality studies, to provide a wider perspective of the implications of censorship and other artificial Internet limitations on tangible outcomes of Internet use.

The normalisation of artificial Internet limitations, sometimes as a misconception of how networking works, leads to resorting to measures and controls that produce these limitations as means of control, neglecting the potential negative consequences of such measures. This research tries to highlight these potential consequences, whether deliberate or not, and link them to outcomes of Internet use, while shedding a light on the effectiveness of such limitations, motivated by a belief in the potential the Internet allows as an open platform for a universe with equal access and opportunities for the people.

1.2 Scope

The scope of this research is to identify artificial Internet limitations and tangible outcomes of Internet use in Bahrain, Estonia, and Singapore, and then the research covers Facebook's Free Basics as an Internet platform for the Next Billion(s), by studying the main innate artificial limitations and predicting outcomes of use correlated with these limitations. The artificial Internet limitations in this research are defined as the limitations imposed artificially over the network and can be changed with no significant change in technology. The limitations studied are imposed at network and community levels, and thus affects a whole network or portions of it rather than an individual user. The artificial Internet limitations are grouped as direct and indirect, with direct limitations presented by technical controls,

such as blocking of websites and services, and the indirect limitations comprised of activities that deter unwanted usage or aim at changing behaviour, such as intimidation from unapproved usage.

The notion of tangible outcomes of Internet use is defined as the influence of online activity on offline activities grouped as fields of economic (property, income, education or employment), cultural (identity, belonging), social (with personal, formal, and political or public networks), and personal (health, self-actualisation, and leisure) use, as achievement, and satisfaction with related Internet affordances compared to offline-only use. The tangible outcomes are used in this research as specific indicators for digital inequalities, as they offers an overview of the difference in opportunities among individuals obtained through online activity and applied in the offline world. This indicator is assumed more reliable than indicators such as time spent online, and speed of access, as it reflects developments in personal life opportunities, and their satisfaction with the affordances offered online.

Facebook's Free Basics, the platform that allows access to a predefined set of online services with no charge for data transferred, as used in this research refers to the platform offered through both the mobile application and web access. The innate limitations studied refer to the general limitations imposed by the platform as indicated in the technical specifications and guidelines available for the general platform, and do not cover any special arrangements that may be taking place within a specific community. The testing of the network took place within the Zain mobile network in Jordan, but the findings comply with general technical specifications and guidelines and thus can be generalised to the expected innate limitations in other networks where this platform is offered.

The research scope is, however, limited to the users of the Internet within the countries selected as it focuses on differentiated outcomes of Internet use, and thus targets Internet users. This limits the remit of this research by excluding individuals that are totally excluded from network society through artificial Internet limitations, such as with Internet shutdowns, or deliberate efforts to keep connectivity away from specific regions, or individuals that chose not to connect as a result of coercion.

1.3 Research Questions, Aims, and Objectives

This research aims to identify the role artificial Internet limitations have in determining digital inequalities, in order to transform communities through better opportunities by highlighting the correlation and applying the predicted impact on networks with innate limitations. The research questions as formulated below serve to ascertain the relationship and enable application of the findings, with each research question followed by the set of objectives that contributes to answering it.

1. What are the relationships between Artificial Internet Limitations and Digital Inequalities manifested as tangible outcomes of Internet use as measured among samples from Bahrain, Estonia, and Singapore?

   Objectives set to answer this question:

   a. To evaluate the status of the Internet studied through identifying artificial Internet limitations imposed, whether direct or indirect.
   b. Investigate tangible outcomes of Internet use as reported by individuals in the countries of research, in terms of achievement and satisfaction.
   c. Explore the correlations between predictors related to artificial Internet limitations and the tangible outcomes of Internet use, at community and individual levels.

2. How do the relationships developed predict inequalities in communities with Internet access that is artificially limited, in particular, Facebook's Free Basics as an example of Internet for the Next Billion projects?

   Objectives set to answer this question:

   a. To evaluate the status of Facebook's Free Basics in terms of artificial Internet limitations innate to the platform.
   b. Project findings of the correlation between artificial Internet limitations and tangible outcomes of Internet use on the platform using predictors found on the network level.

The methods used reflected the research questions and objectives set above, influenced by the transformative-emancipatory perspective to mixed-methods research as described by Martens (2003), which serves the main aim of the research, supporting transformation through information on the effects of limitations, and creating a set of policy recommendations.

1.4 Impact and Contribution to Knowledge

The impact of the research stems from multiple dimensions, including the main transformative aim of the research, the data and knowledge captured, the findings reached, and several contributions to the practice. The dissertation situates itself in the contemporary discussion on digital inequalities beyond basic access, skills, and outcomes divides, by offering a different and original look on nuances in differentiation in access among the connected as resultant from avoidable limitations. This research also contributes to the field of censorship studies by providing a view based on a global network connecting people from the West, the Middle East, and Asia, as opposed to the Global North and American-centric view dominating in the field as described in the literature review.

This fresh look opens opportunities to expand the research either horizontally by applying the research methods and design to more communities, or vertically by discussing power relations and differentiation in access as advised by infrastructures, international relation and hegemony aspects, as well as closer to the individual, with limitations set by the technologies used. The data, analysis, and recommendations reached in this research also provide a good account that can be used in Internet censorship studies to compare actual implications of censorship beyond theoretical rhetoric on who controls what, while shedding light on understudied communities.

By the time of submission, the concepts discussed in this research were utilised to advise the following contributions:

- Research project on the weaponisation of access, or the use of artificial Internet limitations to produce and maintain digital inequalities as an instrument to support hegemony. The project included a book chapter, guest lecture, and a conference paper.
- A co-authored peer-reviewed journal article on digital divides, titled “The Three Levels of Digital Divide in East EU Countries”
- A co-authored book chapter on digital inequalities, titled “Digital Inequalities in European Post-Soviet States”
- A book chapters on the relation of Internet affordances and tangible outcomes of Internet use, titled “Defying Borders in the Levant: Contemporary Dance and the Internet”.

- A book chapter on digital inclusion and practices with unexpected events, titled “Digital Inclusion in Jordan: Opportunities and Hurdles”.

Data collected on the communities studied in this research also offer a window for impact, especially given that the communities selected are among the less-studied communities. The data collected allowed for the following contributions so far:

- Presentation of initial findings to a multidisciplinary audience, including non-academic Internet governance actors in the GIG-ARTS2018 conference held in Cardiff. The paper titled "Meaningful access and tangible outcomes of Internet use, Bahrain case study", was presented based on preliminary data collected for this research from Bahrain.
- Discussion on anomalies found in data collected from Estonia, advising the less documented and researched practice of escaping localities using circumvention tools. The discussion was presented at the European Communication Research and Education Association 2018 conference, Lugano, with a poster titled “Bypassing localities: shifting Internet access to join intercultural communication”.

Further contributions come from practical aspects related to the research, from promoting the concept of artificial Internet limitations to development and sharing of research instruments, as well as data contributed to open repositories. Some of the impact already achieved in this category includes:

- Developing the survey used in three additional languages to the one available as part of the framework, making a version in Arabic, Estonian, and Mandarin available for sharing with the academic community. The Arabic version was already shared with the framework developers in LSE to be used in a project on Kuwait.
- Supporting the Open Observatory for Network Interference in advising on the mobile probe that was launched in February 2017 and was instrumental in expanding the data collection of the project, and getting measurements from areas with no measurements previously collected, including Bahrain.
- The concept of artificial limitations developed in this research made its way to the definition of *Meaningful Connectivity* as developed by the

Association for Affordable Internet (A4AI) as a new standard to measure Internet access.

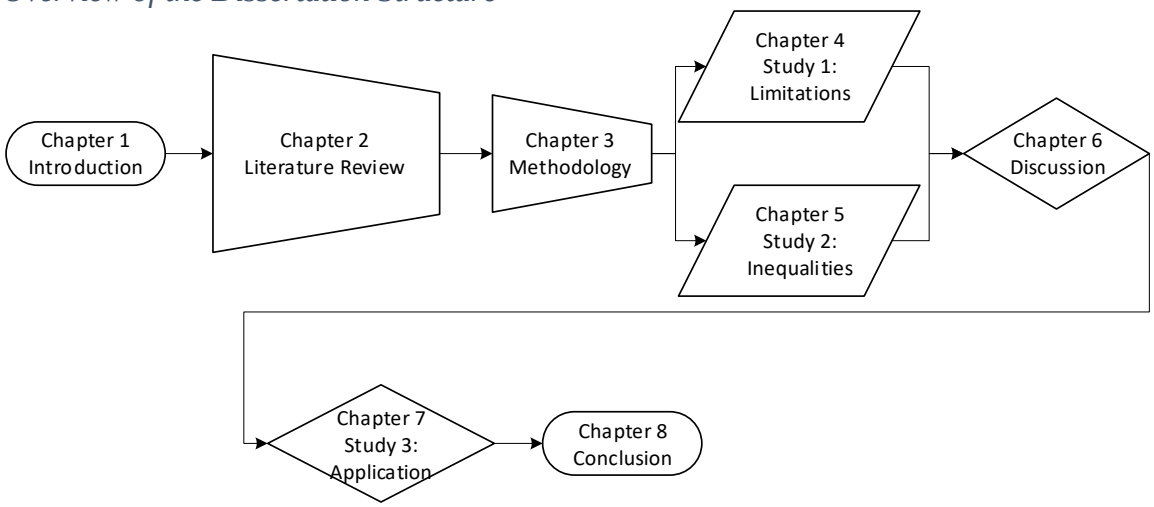
The potential for impact continues to be possible, with more research and dissemination conducted, whether to augment the findings, build on concepts developed, or to use the policy advice the research concludes by suggesting ways to to transform individuals' access to increase the opportunities individuals have, and potentially address digital inequalities.

1.5 Structure of the Thesis

The dissertation takes a simple structured approach to achieve its goals and thesis, the structure is described in figure 1-1, with details on each chapter following. The approach taken allowed for gradual knowledge building from the current body of research and for designing methods to answer the research questions in a rigorous manner, followed by data collection and analysis of the two studies as pillars of the research to apply the knowledge developed on a real-life case with yet another understudied community. Finally, the research concludes with a summary of the process and building for future research and further contributions to knowledge.

Figure 1-1

Overview of the Dissertation Structure



The research begins with paving the grounds for analysis based on theories of technology adoption and inequalities in the digital world, including the concepts of stratification and normalisation as forces behind changes in opportunities. The research then gets into the details of the studies conducted, from Study 1, which provides the foundations for comparison among communities studied in terms of artificial Internet limitations, to Study 2, which builds a body of knowledge on

tangible outcomes of Internet use in those communities and the correlations different predictors at the individual level have with these outcomes. The research then goes to discuss the findings of the effect of artificial Internet limitations on tangible outcomes of Internet use and later on provides an additional study that is considered an application to the final findings, hence the unorthodox structure of having a study following the discussion chapter. The last chapter provides advents for additional impact on supporting knowledge on newly established networks that are inherently limited, and the prospects they offer to the communities they are serving in terms of digital inequalities.

Chapter 2 provides attempts to review the current body of knowledge related to the link between artificially limited Internet access and digital inequalities and development resultant from access to information, thus it necessarily draws upon theories and approaches settled in a variety of disciplines, including media and communication studies, social studies, and technological aspects of Internet access and availability. The review goes briefly through foundations of wide-scale media of communications, from electrical to digital, highlighting the expectations of communication technologies to change the world and necessarily eradicating inequalities in access to knowledge. The review looks in-depth at theories and models aiming at explaining adoption and diffusion of technology, to understand what factors suspected as determinants to access and usage, and then move towards social study's theories on the digital divide, to see what these theories base research on in terms of factors and predictors. The discussion in chapter 2 allows for an understanding on views from different disciplines on what affects access and use, enabling for a conclusion on what variables needed for the measurement of digital opportunities and outcomes of access, and as a result, digital inequalities.

Following the literature review, the Methodology chapter, Chapter 3, looks at the research questions detailing the design of research methods to answer these questions while highlighting the rationale behind each decision taken in relation, including community and sample selection, and listing potential limitations with suggested ways to mitigate their effects on the quality of the research. The chapter builds on the conclusion of the gaps in understanding and explaining the effect of artificial Internet limitations on digital inequalities described in the previous chapter, with a design for the research covering two-tier approach for studying limitations and digital inequalities, followed by a third study as an application for findings. Each of

the two first studies is designed as a mixed-method study, with quantitative and qualitative instruments. The chapter also covers ethical considerations, validity and reliability, and limitations of the research.

The first of the two core studies of the research follows in Chapter 4, covering the first leg of the correlation sought after in studying artificial Internet limitations and digital inequalities, the limitations part. Through studying the three countries covered in this part of the research, Bahrain, Estonia, and Singapore, as three communities of Internet users, fulfilling the requirements of the transformative-emancipatory perspective to mixed methods. The chapter is structured to cover each country in a separate section, starting with a brief context on the country. Then to provide a look at digital inequalities and inclusion efforts that affect digital opportunities, followed by an examination of network measurements collected from networks, then a review of reported Internet limitations to advice change in policies and perceived limitations, to conclude each section with key findings. The chapter ends with a comparison of critical findings as a conclusion, which is incorporated and further studied in the discussion chapter.

The second leg of the correlation, the digital inequalities, is studied in Chapter 5 by researching the inequalities in the tangible outcomes of Internet use as the measurement adopted for inequalities in opportunities for Internet users. The chapter structure differs from the previous chapter in that it categorises findings and discussion by the instrument as the main grouping, rather by country, to allow for studying of the whole sample as one network society, with communities that differ by level of artificial Internet limitations exposed, as well as by the individual level. The chapter begins with reviewing the data collected as part of the survey and its characteristics, then the measured tangible outcomes of Internet use in terms of achievement and satisfaction, followed by analysis on the role of predictors studied on these outcomes. The interview instrument is also reviewed, with main findings by country included and discussed.

Chapter 6 follows the data reviewed in the two previous chapters, to connect the dots and answer the research inquiry on artificial Internet limitations and their connection to tangible outcomes of Internet use. The chapter builds on the grounds of analysis based on the literature reviewed and the theory developed through Chapter 2. The chapter then goes on to review the limitations found through Study 1 dealing

with the countries as communities within the larger network society differentiated by the model and level of limitations applied to its Internet access. Finally, the chapter fulfils its goal, and the overall goal of the research, by connecting the limitations in means of predictors and function for tangible outcomes of Internet use as a manifestation of digital inequalities.

With the findings collected throughout the chapters dedicated to Study 1, Study 2, and the discussion, Chapter 7 plays the role of applying these findings on a real-life example of networks with innate artificial Internet limitations to provide an example for further studies on infrastructure, their artificial Internet limitations, and digital inequalities. The network chosen for the study is Facebook's Free Basics, one of the platforms that aim to connect people with no or limited affordability for Internet access in what is known as Internet for the Next Billion(s). The history and main changes of the platform are discussed, followed by a discussion on the type and level of artificial limitations set on the access level and the prospect for circumvention, with an example of the platform as offered in Jordan. The discussion then naturally moves to estimate digital inequalities through the predictions developed between limitations and tangible outcomes of Internet use.

The conclusion of the research comes in Chapter 8, with the reiteration of the research key findings, expected contribution to knowledge and the potential implications of the research on policy-making and further studies on access differentiations through artificial Internet limitations and its correlation with digital inequalities. Finally, the limitations faced and planned activities to build on the research to support the transformative vision that motivated the research are reviewed as the way ahead towards better opportunities mediated by the Internet to all.

Chapter 2

Literature Review

2 Literature Review

2.1 Introduction

Researching the link between artificially limited Internet access and digital inequalities and development resultant from access to information draws upon theories and approaches settled in a variety of disciplines, including media and communication studies, social studies, and studying technological aspects of Internet access and availability. Thus, this literature review is necessarily broad, and covers multiple aspects of research, moving between subjects to explore theories and models relevant to the research.

The review goes briefly through foundations of wide-scale media of communications, from electrical to digital, highlighting the expectations of technology, particularly communication technology, to create a new world, enabling world knowledge sharing and development of civilisation, and necessarily eradicating inequalities in access to knowledge. Then the review looks in-depth at theories and models aiming at explaining adoption and diffusion of technology, to understand what factors suspected as determinants to access and usage, and then move towards social study's theories on the digital divide, to see what these theories base research on in terms of factors. The field of Internet censorship studies is briefly covered in the literature review as well to widen the prospects and impact potential of the research. This discussion will allow for an understanding on views from different disciplines on what affects access and use, enabling the conclusion on what variables needed to be included in the measurement of digital opportunities and outcomes of access, and as a result, digital inequalities.

As this research also looks at artificial limitations and information controls that define access, the literature on the constructs of the Internet, and what constitutes unrestricted and unfettered Internet access is covered in this chapter. Then it is contrasted with what restrictions can be applied on access, and how to measure them in a way that would enable projection on digital inequalities in terms of opportunities for achievement and satisfaction with tangible outcomes of Internet use, to conclude this research. Studying Internet access also includes a look at different models of networks constituting Internet access, from conventional networks provided as part of the business offering to networks managed and operated by communities, to recent models of access to expand Internet penetration and availability for the next billion

users. This discussion reach to parties involved in access at each model, and the role of each in enabling and potentially fetter with access, and the models in which the Internet is governed on multiple levels.

2.2 Background on expectations of technology

From the first days of electrical communication, people foresaw the potential of communication technology to connect people together, creating "one intellectual neighbourhood" with all inhabitants of Earth, as described in 1846 proposal to connect European and American cities via telegraph (Hynes, 1988). And in 1960s when McLuhan and Fiore (1967) said that "thanks to electric circuitry, we are living in a Global Village, where 'Time' has ceased, and 'space' has vanished, reconstituting dialogue on a global scale". This concept of breaking spaces by creating a universal medium connecting all people is an idea shared among new media invented, including the Internet.

This concept of a connected world motivated researchers to look at technology as an enabler for world knowledge sharing and catalyst for the development of civilisation by enlarging one's immediate environment and providing an opportunity for world development. The great inventor Nikola Tesla remarked in an article published in 1904, that he has "no doubt that it [World Telegraphy] will prove very efficient in enlightening the masses, particularly in still uncivilized countries and less accessible regions, and that it will add material to general safety, comfort and convenience, and maintenance of peaceful relations" (Tesla, 1904).

The introduction of digital communication and later packet switching, first described in a 1964 study by RAND Corporation (Baran, 1964), paved the road for the transfer of different types of information, routed to and from multiple recipients, without having to have a dedicated connection or circuit between every two ends. Digital communications allowed multiple ends to share the same set of connections, thus lowering the cost of connectivity and communication, and requirements for new ends to join the group of ends, or in other words, the network. Also helping by adding resilience to the overall network, where a connection between any two ends can be established through multiple paths so that in the case of a path is damaged, a new path can be established quickly with no need for infrastructure changes.

The mid-20th century saw the advent of several packet-switched networks connecting computer and devices, including the network created by Donald Davies at the United Kingdom's National Physical Laboratory (NPL) following research in 1965. As well as General Electric Information Services (GEIS) network in U.S.A in 1965, Merit network of Chicago public universities demonstrated in 1971, SITA network of airlines (SITA HLN network) in 1969, CYCLADES in France in 1973, and ARPANET, the Advanced Research Projects Agency Network that was the first to implement the TCP/IP protocol suite in 1969.

These networks, and others, operated individually until the ARPANET and NPL networks were connected in 1973, forming the first network comprising of other networks, called internetwork, or internet for short, vanishing the space of the Atlantic Ocean and connecting two continents (Kirstein, 2017). Over time, and with inter-connection protocols like TCP/IP becoming standards (Maathuis and Smit, 2003), more and more networks were connected, creating what is currently known as the Internet, with the capitalised 'I' to distinguish it from the generic concept of internet. The Internet provided a link among scientific elites for two decades, before the invention of World Wide Web in 1989, and later graphical browsers in the early 1990s popularised the technology (Norris, 2001, p. 3).

From then and over two decades, most of communication and expression moved to digital forms, through emerging media platforms that use computer networks for communication, overtaking conventional media. This move posed new opportunities and challenges to communities from different social and economic abilities, in terms of access to information, reach, and ability to express freely, highlighting gaps in technology adoption and skills, and social inequalities.

The digital and connected world has substantially affected all of our activities, including receiving and sharing knowledge and information, adding vast sources of information that are usually not bound to geographical limitations, and at the same time, may not follow governmental restrictions, sources that are not otherwise possible in scale, scope, and ease of access. At the same time, it provided an opportunity to reach out to the world to communicate and express ideas and thoughts in a manner that have the potential to be free, and have a multiplying effect on the spread of any thought or news (Dutton *et al.*, 2010), creating communities of shared interests that could cover the globe in reach. On the other hand, the connected world

posed a new aspect of social inequalities, as being able to have access to connected devices was never accessible to people from different economic stands, and access was not readily available in remote and hard to reach areas. This has changed over time with the introduction of cheaper devices, and broader coverage networks with a lower cost of entry.

Advancements in computer networks accelerated this move to digital forms (Shane, 2004), particularly the Internet, on technical and spread aspects, as seen with networks expanding in size and geographical reach. Computer networks cover every corner of the earth, with an increase of accessibility to 40% of the world population in 2015, from less than 1% in 1995 (World Bank, 2016). The expansion meant more networks are being built around the world, and these networks are being connected.

Internet infrastructure has evolved to accommodate the increase in demand. In the beginning, when the network was still a research project, the design decisions were solely based on technical requirements set by researchers. Later on, when corporates realised the commercial potential of the Internet, design was driven by requirements set by business demand (DiMaggio and Hargittai, 2001), but when reliance on the Internet increased as the primary source of news and information for the majority of the people, States, and community organisations became interested in deciding how the network operates. The effect this left on Internet infrastructure decision-making cannot be neglected, especially with opportunities for technology use being structured by the infrastructure providers and regulators, who in many authoritarian cases are the repressive states themselves.

Internet adoption proved to be a more complex state of affairs, with its dependency on availability of electricity, devices, and connectivity, and the specific set of skills required to be able to access and use the Internet, as well as other set of circumstances that affect inequalities in what outcomes and benefit people get from the Internet. In the next sections, the discussion covers theories developed to understand the diffusion and adoption of the Internet and differentiation in access and use was looked at and researched.

2.3 Technology adoption to digital divide

How people are introduced to and make use of new technologies, including equality in opportunities provided, were well studied in recent years, through multiple

disciplines from science and technology-focused disciplines, to humanities and socially focused disciplines. Differentiation in access and use of Information and Communication Technology (ICT) took the lions to share in research, particularly opportunities provided by the Internet to people and societies. The digital divide was the term mostly used to describe stratification and use of the Internet (Ragnedda and Muschert, 2013), this covers differentiated access, the gap between who has and who does not have access to communication technology and the Internet, and differentiated use, or the gap between different usage behaviours.

The reasons behind the difference in access and use have been extensively studied, mostly through methodological individualism relating differential access to ICT to individuals and their characteristics(van Dijk, 2012). In a book that sat as a stable reference for much-related research to date, Pippa Norris (2001) argued that it might be possible to overcome the global divide if the main drivers behind the diffusion of the Internet were established. In addition, it will be possible to understand and predict the probable patterns of diffusion and consequences of the Internet, if the main drivers proved to be similar to drivers behind diffusion and adoption of older forms of information technology. Several theories tried to explain and predict diffusion and use of information and communication technology and the divide resultant from differentiated access and use, as covered later.

One of the theories that placed foundations for the study of technology and adoption is Diffusion of Innovation theory (Rogers, 1962), looking at diffusion as the process by which an innovation is communicated over time among participants of a social system. Categorising users of technology into five groups based on when they adopt and use new technologies, the groups are innovators, early adopters, early majority, late majority, and laggards. The elements affecting diffusion according to this theory, are the characteristics of the innovation itself, the channels over which information about the innovation is communicated, time, and the social system, which the potential user is part of, and can influence their decision.

This was also the focus of models with rather simplistic variables, like the Technology Acceptance Model (TAM) (Davis, 1985), which includes two factors affecting user acceptance and adoption of technology, perceived usefulness and perceived ease of use, these two factors would define user's behaviour intention, and thus decide whether that user accepts and uses a specific technology or not. This view

focused on factors related to the technology itself, neglecting any spatial or positional variables, and similarly to Diffusion of Innovation theory, neglected factors that limited or allowed user ability to access and use the technology, including societal and economic factors, in explaining differentiated access and use.

Other models tried to build on the aforementioned theories expanding the factors and determinants affecting technology diffusion and adoption. One of the principal efforts in this regard is the Unified Technology Acceptance and Usage Theory (UTAUT), which, in addition to factors related to the technology itself of ease of use and performance expectancy, added positional factors of social influence and facilitating conditions as its core constructs (Venkatesh *et al.*, 2003). The model also used gender, age, experience, and voluntariness of use as moderating variables for the four constructs' influence on behavioural intention and use behaviour. This theory continued the tradition of previous theories in looking at constructs as the user perceives them, even with facilitating conditions, which, according to UTAUT, mobilises behavioural intention to use behaviour, and defined as "The degree to which an individual believes that an organisational and technical infrastructure exists to support use of the system" (Venkatesh *et al.*, 2003).

To further extend these models, Spatially Aware Technology Utilisation Model (SATUM) built on them towards understanding technology diffusion, by associating ICT adoption and diffusion with demographic, economic, societal and infrastructure variables, to recognise geographic pattern in digital divide, thus making the model useful for studying differentiated utilisation of information and communication technologies among different geographical regions. However, unlike previous models, this model skips individual-level behavioural intention and motivation, focusing on groups of people in geographic areas, and their general utilisation of technology.

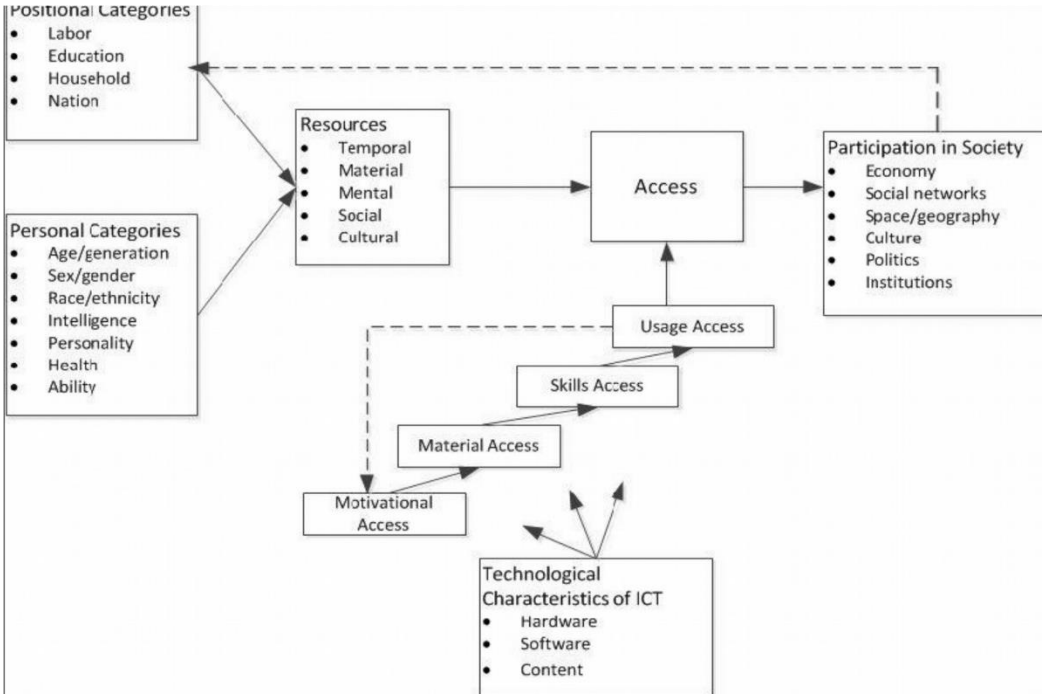
Stocker and Whalley, in a more recent study, looked at the user experience of Internet customers in the United Kingdom to conclude that there multiple complex interactions that shape the experience (Stocker and Whalley, 2018). These interactions concluded that the quality of experience is composed of the user, with their preferences, digital literacy, and context of demographic and socioeconomic factors, and the system, with the network performance, content and media, and

terminal equipment. The research also suggested what factors the Internet Service Provider could influence.

A notable theory that utilised positional, personal, and technology factors, as well as factors affecting the ability to gain access, and resources available, is Jan A.G.M van Dijk theory on the digital divide, portrayed in his 2005 book The Deepening Divide (van Dijk, 2005a). Their resources and appropriation theory of the diffusion, acceptance and adoption of new technologies is based on four core concepts that interact among each other to define the individual's potential of access and use of technology. The first two concepts, personal and positional categorical inequalities and the distribution of resources in relation to digital inequalities, define the resources available to a person and thus define the third core concept, access, which is the number of types of access to ICT available, sequencing from motivational, material, skills, and usage access.

Figure 2-1

The conceptual model for van Dijk theory



Notes: From the Deepening Divide 2005

These types of access are also affected by characteristics of the technology itself, and itself affects the fourth concept, participation in society, whether economic, social, spatial, cultural, political, or institutional. This model is iterative in that the fields of participation in society affect categorical positional inequalities, the first core

concept of the theory. This theory covers a wide variety of determinants of access and uses with many variables, thus the amount of data required to operationalise the model is hard to collect, particularly with large groups, but it seems to be a widely adopted theory concerning factors affecting digital divide and technology adoption.

The relationship between types of access relevant to effective use of ICT was also studied by de Haan and Iedeman, who discussed three types of access, motivation, possession (as access at home, or work/school), and digital skills (De Haan and Iedeman, 2006), these types correspond with van Dijk's types of access of motivation, material, and skills. de Haan and Iedeman analysed two alternative models for the relationship between the types of access, the first is hierarchical, which is sequential in essence, and each type is a precondition for the following type, from motivation to possession to skills. While the second model is a crosscutting circle model, treating each type of access as equally important, and as relatively independent from the others. After studying large scale sample in the Netherlands, they concluded that the hierarchical model is a better than the cross-cutting circle model in terms of representation of reality, a similar conclusion to the definitively-sequential model of van Dijk.

van Dijk listed what they saw as shortcomings in research on the digital divide. These included lack of conceptual elaboration and definition, lack of theory, lack of interdisciplinary research, lack of qualitative research, research being static and not dynamic enough to include fundamental changes in technology, and the insufficient attention to the observation of consequences of the digital divide (van Dijk, 2006). These conclusions were a result of an inventory of leading digital divide research published between 2000 and 2005, showing how some of the issues were tackled as research in digital divide moved from focusing on access and availability to skills, and later to outcomes of Internet use, as will be seen next.

In the same article, van Dijk tried to answer questions on what inequalities does the concept of digital divide refer to and concluded that research on the subject looked at a set of inequalities grouped into four main categories of inequalities. Immaterial inequalities like life chances and freedom, Material inequalities like capital and resources, Social inequalities including position, power, and participation, and Educational inequalities such as capabilities and skills. These inequalities moved along different digital divide research levels, from looking at access (material) as the

primary determinant to looking at what benefits people make out of Internet use, which included very much similar categorisation.

The digital divide research focusing at the level of availability of access and use assumed mainly the notion that by having access, people will utilise technology to better themselves and enhance their opportunities within their society. This technology determinism approach perpetuated the idea that having access to technology that would definitely enable world knowledge sharing and development of civilisation, from the early days of electronic communications. Later in this chapter, how individual relationships in network society may cause the opposite of that is covered, and how reports show that in reality, digital expansion and development may be skewed towards who is in a better position within societies.

At this stage of research, two conflicting concepts related to the progress of the digital divide were defined by Norris (2001), normalisation and stratification. These concepts govern the relationship between the digital divide and digital inequalities, as they provide a long-term overview of the effect new technologies have on societies. The concept of normalisation states that during the initial phase of Internet development and spread, it is expected that differences among social strata increase, however, with time, and as the technology becomes widely spread, these differences gradually disappear and different groups of the society reach saturation level of the technology.

On the other end, the concept of stratification states that the difference in Internet adoption starting point of different social groups dictates difference at endpoints, meaning that social strata lagging in technology adoption, will always be behind, and may never reach the same saturation point as social strata of early adopters. Effectively propagating inequalities among different strata, stating continues intersection between digital divide and social inequalities. In a form similar to the cumulative advantage described under St. Matthew Effect, where those who have more, gain more, something that, according to Ragnedda (2017) applies to terms of socioeconomic position and cultural acquisition, as well as technological skills.

The intersection between society and technical access availability was largely discussed by Warschauer (2002). This view could have confined understanding of digital opportunities to classical social inequalities, where people with higher income

and social position, would with no doubt, have access to the latest technology, and thus digital inequalities will be nothing but propagation for social inequalities.

In terms of geography, the digital divide has been studied on multiple levels, from people living within the same society to country and national levels, and between groups of countries, like the studies looking at digital divide between the global south and the rest of the world, or between developing and developed countries (Norris, 2001; Ogunsola and Okusaga, 2006). These studies used different attributions to describe the variables affecting access to ICT and knowledge, including economy, demographics, and geography. Norris (2001) described differentiation by studying the digital divide through three dimensions, social, global, and democratic. Through the first dimension, they described the social divide as the gap between the information-rich and information-poor nations. The second dimension of the global divide, in turn, looks at the gap between countries categorised as industrialised and developing countries. The third dimension, democratic divide, looks at the use of the Internet for civic participation and the gap between those utilising the Internet to participate in civic discussions and change, and those who use the Internet as passive consumers.

This book, coming in the early days of Internet dominance on our daily lives, outlined questions that were at the core of digital divide studies for years. These questions were related to inequalities between and among societies, resulting in differentiated access and use of the Internet, looking beyond the dichotomy of haves and have-nots, to digital inequalities. Digital divide studies asked whether digital inequalities would gradually fade away over time as access becomes more widespread than before, or will these inequalities cause an enduring pattern and thus maintain a divide between info-haves and have-nots. These questions resonated in most of the research following and helped in framing the digital divide as a social matter, for what connection between digital and social inequalities and patterns it states. Disparities reinforced by the emerging Internet age were also described by Norris to include disparities between post-industrial economies at the core of the network and developing societies at the periphery.

Rok Park et al. (2015) researched the digital divide at country level through studying the level of digitisation convergence in 108 countries, concluding that countries can be classified into three groups. This grouping suggests that although

countries diverge as a whole, convergence is happening within subgroups of countries, classified as clubs with the first showing high level of digitisation and lowest speed of convergence, the third showed the lowest convergence in digitisation level, with the fastest level of convergence, while the second is somewhere in between. This research contribution included identifying factors that drive a country's digitalisation convergence level, which included GDP, the share of service trade in GDP, tertiary education entrance rate, and the ratio of the urban population. With GDP per capita, tertiary education entrance rate. The first three factors have a direct relationship to the convergence level, while the last factor has an inverse relationship.

Later on, as access itself was becoming more available worldwide, new stratifications among Internet users started to be notable, and researchers found that little is known about gaps in societies where internet access is very widely diffused (van Deursen *et al.*, 2016). Researchers like Attewell called attention to the disparities in skills that affect technology and Internet use, which they labelled as the second digital divide (Attewell, 2001). These disparities, Attewell argued while focusing on education of schoolchildren, are missing in policies addressing the digital divide as a mere technological dimension of social exclusion. Moreover, Attewell noted that even if everyone gets access, children with better social and cultural resources will excel in the new arena of technology and the Internet. Attewell also placed the digital divide as one of the keys to get social and political leaders to work on ameliorating inequality and social exclusion in general, calling technology a “Trojan Horse” in this regard.

Similarly, DiMaggio and Hargittai (2001) argued that a shift of emphasis in digital divide is needed, from research on digital divide as a dichotomy of having or not having access, to research on digital inequalities, the differentiation among people with access to the Internet. DiMaggio and Hargittai suggested going beyond documenting inequality, to developing a testable model connecting individual characteristics, dimensions of inequality, and positive outcomes of technology use, which would be of more value to both scholars and policymakers, than basic research on access.

Researchers carried on Attewell, DiMaggio, and Hargittai ideas to discuss determining factors related to opportunity enhancement through the Internet other than access determining factors. This view defined the second level digital divide as

the divide resulting from how people use the Internet and from the online or digital skills they possess, or lack of thereof (van Dijk, 2006; Parent and Cruickshank, 2009; Ragnedda and Muschert, 2013). This view introduced new factors that have the potential to crosscut classical social stratifications reflection on digital inequalities. These factors played a role in the understanding that people may have equal opportunities to the Internet, despite being somewhat deprived economically and socially, if they could obtain skills needed, and could use the Internet to their benefit. Ragnedda and Muschert however, did not suggest total detachment between digital and social worlds in terms of inequalities but instead discussed the entanglement between inequalities existing in the digital sphere, and inequalities present in the social sphere (Ragnedda and Muschert, 2013).

The term democratic divide was used by Seong-Jae Min (2010) to describe one example of the second level digital divide, as the differences between those who actively use the web for politics and those who do not. The relation with second level divide is proven in the results of their study, which showed that access by itself is not enough to encourage meaningful use of technology for politics, skills and motivational factors were equally important for that.

Skills needed to use the Internet were defined by van Dijk and van Deursen (van Deursen and van Dijk, 2010; van Dijk, 2012), and categorised into two main sets, medium related, and content-related skills. The medium related skills are skills needed to be technically able to access and navigate the Internet, including operational Internet skills, that is the skills needed to 'operate' browsers, search engines, and forms. Moreover, formal Internet skills, that is skills needed to navigate between pages, and maintaining a sense of location while navigating the Internet.

Content-related skills were defined as informational, communication, content creation, and strategic skills. These sets of skills are concerned about the ability to search and evaluate results and information offered over the Internet. Skills enabling the creation of online identities and communication through mail and other media to exchange opinions, skills needed to contribute to the Internet, and finally skills that allow the achievement of personal or professional goals via the digital medium.

These sets of skills pushed forward research on digital inequalities to study the tangible outcomes of Internet use, in what is known as the third level digital divide (van Deursen and Helsper, 2015; Ragnedda, 2017), as having access alone was clearly

found insufficient to reap outcomes of the Internet, and better oneself and the society. This view studied the change in one's life taking place as a product of using the Internet, through the aspects of social participation, cultural use, economical and personal opportunities (Helsper, 2012). This also allowed for the introduction of new approaches relating social and digital inequalities, moving from what seemed as simplistic views on digital inequalities, similar to Marx theory on stratification, to Weberian approach, where ideas and values causation are studied as part of determinants to digital inequalities (Ragnedda, 2017). This new dimension of digital sociology looked at social stratification in the digital age, and how they are reproduced by status and group affiliation, in addition to economic aspects of class dynamics.

Another view on the digital divide and digital inequalities theories were suggested by Servaes and Oyedemi (2016), where the approaches to ICT gaps were viewed as structuralist, culturalist, and post-modernist. The structuralist approach uses class structures and has a bipolar lens, between who have and who have not, roughly mapping to studies on the first level of the digital divide. The culturalist, in turn, approach widens the lens to include economy, social, cultural discourse, as well as studying patterns of use and policy, corresponding roughly to studies of second and third levels of the digital divide. The post-modernist approach offers a multidimensional perspective of inequalities, confronting digital divide from a broad principle encapsulating the multidimensionality of inequalities.

However, research into the effects of inequalities of access is, as van Dijk states (2013, p. 45), very scarce, which is something they found strange. Especially that analysis through this lens for national Internet use surveys showed them that access really matters and that people without access are clearly disadvantaged, and people with access to traditional information sources solely lag behind. This dissertation sits in this area of studying effects of inequality of access but focusing on inequalities resulting from artificial Internet limitations.

2.4 Network society powers and digital labour

Physical or material access aspect is intuitively the base for digital divide and digital inequality research, having access defined the studies of the first level of the digital divide, and it is the requirement for studying the second and third levels of the digital divide and digital inequality. However, types and levels of access were not

well covered and studied. This includes changes in technology, networks, devices, and services, affecting access, and the nature of relationships within the networks and network society, which define the visibility of content and services, and access abilities.

Jan van Dijk attributed research lack of ability to adapt to changes in technology as one of the shortcomings in research on digital divide (2006). They saw that digital divide research is not dynamic enough to accommodate changes in how people access and use the Internet; this includes changes in device ownership and use patterns. For instance, personal computer ownership is regarded as the primary device for access, and one of the conditions for access ability, however, the change in technology made mobile devices the base device for access for many people, and personal computer ownership became irrelevant to the ability to access and use of the Internet. A similar argument can be projected on access technology, prior to home Digital Subscriber Lines (DSL), connection technology determined access speed, but with advancements in infrastructure and connectivity technology, access speed became artificially controlled. For large parts of the connected world, this relates to what package the user chose, which in many markets is a combination of access speed limitations and download volume quota.

For the issue of who controls what is visible and accessible, Hargittai touched on the concept of gatekeepers, the bodies controlling what information is visible to Internet users (2000), and their role in the allocation of user attention to online content. Hargittai called the attention to the relationship between Internet users and content providers, at the time when they were distinctively separate, and highlighted the role of search engines and portals as gatekeepers having deciding power in what information reaches users, based on commercial reasons or the value of the content as perceived by the gatekeeper. At the time when users are becoming content providers, this power relationship persists, with Social Network Sites (SNS) playing a significant role as gatekeepers.

Castells and van Dijk looked in-depth at power relationships in networks and network society, Castells (2011), defined power in networks as “the relational capacity that enables a social actor to influence the decisions of other social actor(s) asymmetrically in ways that favour the empowered actor’s will, interest and values”

(2011, p. 10). Castells distinguished among four forms of power in this regard, Networking Power, Network Power, Networked Power, and Network making Power.

Networking power, as described by Castells, is the capacity and control over what medium or message is included in a network, through gatekeeping activities depending on decisions and instructions of whom they called 'Programmers'. Although Castells seems to have borrowed the language of the technological networks, their work does actually apply to digitally enabled networks in the same way as on other types of networks, like financial market networks, and in this regard, the concept of gatekeeping corresponds with the power of Hargittai's gatekeepers described above, with the programmers setting policies and guidelines. The persistence of networking power in the hands of gatekeepers can be seen, as per Castells, in government control over the Internet, and corporate attempts to enclose communication within their walled gardens.

The second power is Network Power, the set of rules and protocols of the network, controlling how it works and how it is managed. Whereas Networked Power is concerned about the relationship between nodes, with specific nodes exercise power over other nodes in a network, through setting policies and guidelines, as in editorial decision-making on content, for example. The last power, network making, is the most determining form in networks and allows decisions to set up and program a network, deciding the content and format of communication of the network. Network-making power includes another power relationship, the Switching power, the power of deciding what networks are connected to other networks, and how they interact with each other. A key concept to take from Castells views on power relationships is that it does not have to be always represented by applied enforcement, as the practices of coercion and intimidation are also an essential mechanism for those in control in the power relationships, and can even be more stable and effective if the concept of intimidation is in people's minds (Castells, 2011, p. 5).

In addition to powers in the hands of corporates as mentioned above, DiMaggio and Hargittai mentioned the aspect of corporate control on altering individual-level incentives and constraints resulting in inequalities in technology and access, from decisions on devices to decisions on network infrastructure (2001). This includes decisions by technology and computer companies on capabilities of devices and standards supported and decision on core speed of networks and coverage. One

example of this is how a decision by the late Steve Jobs to not support Adobe Flash in Apple's mobile devices, partially because he hated it, caused the death of the mobile version of this technology (Hern, 2015).

In their take on the Network Society, van Dijk (2005a) shows how the development of new information and communication technologies may put our societies' most fundamental values, including social equality, at risk. With a possible result of complexity and cost of technology is intensifying alienation and social inequalities (p. 3). Results from the real world can confirm this, the World Bank's *World Development Report 2016: Digital Dividends* (2016) concluded, "the benefits of rapid digital expansion have been skewed towards the wealthy, skilled, and influential who are better positioned to take advantage of the new technologies, while the world's most vulnerable falls behind".

In a similar fashion to our view of the Internet as a network of systems or smaller networks of nodes, van Dijk defines networks as the collection of links between nodes that among themselves constitute units or systems. van Dijk (2005b) sees the infrastructure of network society as the result of relationships between social, technical, and media networks. In western societies at least, the individual linked by networks is the basic unit or node of the network society. Relationships can be organised at four levels, individual relations, group and organisational relations, societal relations, and global relations, these levels offer various level of permanency, strength, and scale.

Relationships within networks define how they work, and who can do what, for example, van Dijk attributes code relations, or how relations between and within ICT networks are programmed and configured, to be an instrument of power, affecting personal opportunities of autonomy and privacy. None of the code relations is technically neutral and thus selective in how the network works, and how it relates to other networks, tending to increase inequalities in society and organisations (2005b, p. 40). Not only is network communication biased by code nature, but also it is vulnerable, depending on technology as well as trust, commitment, and richness of information exchanged. Break down of network communication can be a result of the lack of these dependencies.

As networks expand in scale and scope of integration with our lives, particularly at the organisational level, control and authority remain unchanged

between members of the organisation, but communication distance is reduced, and more information is shared and collected as part of computer networks. This may lead to a severe threat of privacy if not dealt with according to van Dijk, who suggest the need for protective measures governing computer networks, mainly through legislation, self-regulation, and technological solution (2005b, p. 117).

The vow towards legalisation as an effective mean of governmental control may seem in contrast to what van Dijk argues at the same book on the trend of communication sector to set loose of governmental control. When they said, "The final result will be a replacement of government-controlled public monopoly without competition by a small number of private oligopolies with the limited competition but no democratic supervision" (2005b, p. 84). Nonetheless, this is understandable when looking at legislation-control of privacy suggested as a needed measure, in the scope of governance of relations between people within the network, rather than at a multinational corporation scope.

The digital divide within the network society, according to van Dijk, can be amplified by structural inequalities among three groups of the network society, pictured as a tripartite with *Information Elite* at the centre, then the *Participating Majority*, and the *Disconnected and Excluded* at the periphery, defining participation in the network society. Information elites have most of the powers; they make all critical decisions in society. This structure was used by van Dijk to refer to multiple scales of organisation, from people to countries. For countries, poor countries, as they described it, sit on the periphery of the global network society. Where despite employment and labour diffusion enabled by technology was thought to be able to bring social equality to the world, van Dijk (2005b, p. 174) observes that the employment structure created sets high-quality jobs at the centre, while relatively low skilled jobs at the poor countries at the periphery of the system. This difference in the type of employment is seen as more critical to social inequalities than the extent of employment.

Other prominent scholars, Fuchs and Sandoval (2014) focused at types of employment in the digital economy, which they use to describe an economy with high reliance on digital means, defining digital labour and the different forms it can take in the production, circulation, and use of digital media. Fuchs and Sandoval discuss the international division of labour taking a Marxist stand stressing class

contradictions in the analysis of globalisation, putting class relationships s forms of organisation of the relations of production. This includes a dominant class controlling modes of ownership, distribution, and coercion for exploiting another, subordinated class. This can be understood in line with van Dijk's argument on the quality of jobs and global employment diffusion above. It is worth mentioning here that the labour discussed here includes all work needed concerning digital media, from mining material needed for digital devices to knowledge and cultural products.

Fuchs and Sandoval conclude that "the world of digital media is shaped by a complex global articulation of various modes of production that together constitute the capitalist mode of creating and using digital media. The digital tools that people use for writing, reading, communicating, uploading, browsing, collaborating, chatting, befriending, or liking are embedded into a world of exploitation." (2014, p. 515), this describes one relation between corporate and people, extending the concept of digital labour from formal employees and workers, to users and consumers.

Fuchs used the typology and definition of digital labour to expand further on digital valorisation, in their book Digital Labour and Karl Marx (Fuchs, 2014), which is the first of two analysis of digital labour, in an effort towards demonstrating the relevance of Marxism to the world of multidimensional global inequalities we are living in now. The types of digital labour Fuchs focuses on in this book, is the contemporary unpaid work of consumption on the Internet, where consumer provide the commodity of being the audience, giving attention to what is offered to them, conventionally through various modes of advertising. Moreover, the labour of unpaid content and data generation, in what they later called prosumers (producer/consumer), as Fuchs rightfully argues is not that only consumers are providing audience commodity ubiquitously by being connected all the time, effectively placing a 'factory' wherever people are, from living location to work, and all in between spaces (2014, p. 111). However, that there is a monetary value that operators obtain from their clients in the form of personal and usage behaviour data (2014, p. 103), defining internet prosumer commodification, which is the form of digital labour I will be focusing on mostly throughout this research.

The second book in this series, Culture and Economy in the Age of Social Media (Fuchs, 2015), takes on the same approach on digital labour, focusing on social media, and the culture and economics related to them. From what ideologies they

create, to how consumers are almost always prosumers, creating value for corporates from providing attention to generating usage data and profiles merely through being within the network and navigating around, exposing their interests and behaviour.

Another in-depth look of how the digital world perpetuates stratification and the difference between capitalists' super-rich and under-employed people, can be found in Nick Dyer-Witheford book on cyber-proletariat (2015). The book argues that growth of cybernetics, which can be understood as a component of digital media in Fuchs and Sandoval analysis, including networks, computers, and digital technologies, extended the notion of social class. With power imbalances between capital and proletariat, in what seems a reflection of classic Marxist theory on digital media, however, Dyer-Witheford focused on formal labour or work, including immaterial labour, more new forms of labour that are unique to the digital world.

Mark Andrejevic covered the relationship between corporate and users through a series of writings on exploitation and digital labour (2009, 2012, 2013), where they discussed how online services make money from its users. Creating a new form of digital labour, where users' attention is the value companies sell to make money, connecting this attention-economy to early scholars on television and media and the idea of audience labour, by Smythe (1981), Schiller (1971), and Mattelart (1996), who established the way in relation to audience influence and capacity, and audience commodity.

Andrejevic also connects digital labour with exploitation, arguing that components of exploitation of capturing of unpaid surplus labour, coercion, and alienation, exist and operate in the digital world, through forms of commercial surveillance facilitated by technology (Andrejevic, 2012). This commercial surveillance, as Andrejevic argues, would not likely be the choice of individuals, but because of privatization of Internet infrastructure and services online as production resources, provide owners of these resources the power to control over terms of access, including what data to be collected, and how it is dealt with and possibly commoditised.

In addition to the relationship between corporate and users as producers of usage data and attention corporate sell for advertisement, there is another relation, that is not less exploitative, the relationship between corporate and users as producers of content users themselves consume over the corporate-owned networks. This is

particularly noted in Social Media Sites and Web 2.0 services. Web 2.0 is a term defined by Tom O'Reilly in 2005 as "the network as platform, spanning all connected devices; Web 2.0 applications are those that make the most of the intrinsic advantages of that platform: delivering software as a continually-updated service that gets better the more people use it. Consuming and remixing data from multiple sources, including individual users, while providing their own data and services in a form that allows remixing by others, creating network effects through an 'architecture of participation,' and going beyond the page metaphor of Web 1.0 to deliver rich user experiences" (O'Reilly, 2005). This definition compacts multiple features of this kind of networks that will be expanded throughout the research.

Fuchs puts the relation that governs Web 2.0 in clear terms in *Critique of the Political Economy of Web 2.0 Surveillance* (Fuchs, 2012), when they said that "the exploitation of surplus value in cases such as Google, YouTube, MySpace, or Facebook is not merely accomplished by those who are employed by these corporations for programming, updating, and maintaining the soft- and hardware, performing marketing activities, and so on, but by them, the users, and the prosumers that engage in the production of user-generated content" (2012, p. 54). However, they acknowledged that not all of Web 2.0 is based on such exploitive relationship, citing Wikipedia as an example of a non-profit and advertisement-free, preventing Web 2.0 from being commodified completely. This relation, according to Fuchs, is a result of the asymmetrical ownership structure of web 2.0 corporations, which is owned by a few legal persons and not by the users, while user data, including user-generated content, profiles, interactions and usage data, are dispossessed by the corporations to generate profit.

The realisation of the high value and commercial interest users bring to companies, as seen earlier through noting this rise of Internet economies that rely on attention and user-generated content as products, brought the realisation of valorisation potential more connected people do provide. This was one of the reasons behind the push towards reaching to non-users of the Internet, including the unconnected 55% of the world population (World Bank, 2016), and trying to connect them.

The power corporate and governments exert on networks to limit them artificially, and what effects it have, is the central theme of this research where it is

defined as artificial limitations of the Internet. It is the tools Hargittai's *gatekeepers* use, a rendering of Castells networking power, one of the results of van Dijk's code relations, and one of the tools corporate is using to exert powers towards valorisation of users. These can be understood in the context of any network, but for the sake of this research, it will be looked at from the context of the broadest used network at our time, the Internet. Later literature concerning history and types of these artificial limitations is looked at.

2.5 Internet access, censorship, and artificial limitations

Some studies discussed inequalities in access, focusing on the inequality of access speed equity (Longley, 2003; Riddlesden and Singleton, 2014), while other studies focused on the effect of artificial limitation in schools or libraries on access to knowledge, or political participation in countries, as discussed by Wagner & Gainous (2013) and Yang et al. (2013). Nevertheless, the issue of fettered or artificially limited access and its effect on digital inequalities is still largely understudied. One of the possible reasons for that is that artificial limitations have usually been limited in scope and scattered across populations and environments, as at home or school or work censorship, or targeting specific sites under the flag of protecting social norms and culture (Lawrence and Fry, 2016). However, with the increase in number of projects aiming at connecting new people to the Internet (Reed, Haroon and Ryan, 2014), and the rising interest by corporations and state to control Internet users, it becomes necessary to highlight resulting inequalities and suggest what effects it has on outcomes of Internet use, which is the heart of this research.

Neil Selwyn suggested that what is meant by access in the definition of the digital divide should be reconsidered, to include factors of time, cost, quality of the technology, and the environment in which it is used (Selwyn, 2002). As part of their work, the term *effective access* comes up to describe what users can get from their access, as opposed to what is available for them in theory. This distinction in theoretical and actual access is also part of Internet Governance Forum definition of meaningful access in its policy options for connecting and enabling the Next Billion(s), a definition the author helped in shaping through discussions at regional levels, and addresses the issues of "quality and speed of access itself to the availability of relevant content, the ability to use content, the extent to which human rights are promoted and respected online, and whether women and marginalised groups are able to benefit from" (IGF, 2016).

This shows the existence of inequalities in types of access, and a need to distinguish among different types of access from the view of limitations they have, particularly in the light of changes in power relations within the network society discussed earlier.

At the early days of computer networks, limitations on what to access and at what speeds were determined entirely by the capabilities of the connection and network the individual is connected to, however, over time, this changed, and many limitations where introduced. One of the earliest accounts documented on limitations related to content started with a joke, when a service/address blocking of a *usergroup* in University of Waterloo and a temporary ban of that *usergroup* in Stanford University (McCarthy, 1996), because of an inappropriate joke being communicated on that *usergroup*. Faculty at Stanford University issued a statement that would still be appropriate today, although was issued in 1989, even before the days of the World Wide Web, stating that "Computer scientists at Stanford fear the university has entered a never-ending role as a moral regulator of computer bulletin boards by recently blocking access to a list of jokes deemed to serve no 'university educational purpose'" (Philp, 1989).

From there, surveillance and censorship became part of how we view the Internet, the first case of Internet wiretap was in 1995 when governments started seeing the need for them to practice authority in the cyberspace. Then attorney general of the United States Janet Reno stated, "If we are not vigilant, cybercrime will turn the internet into the Wild West of the 21st Century". In 1996, a law to control the content on the Internet was introduced in the United States under the name Communications Decency Act (CDA) (Nesson and Marglin, 1996; Ciolli, 2008), which set the pace for online content censorship.

Researchers documented the move and transition in how the Internet is viewed and controlled. Of the most prominent works in this regard is Goldsmith and Wu's book *Who Controls Internet*? (2006), which provided detailed account and analysis for Internet controls and limitations as well as a documentation of the dynamics of Internet controls among the community, governments, and commercial entities. This work, which became a cornerstone in the field of Internet censorship, argued that the Internet will only move towards more governmental and commercial control assuring territorial governance, as the Internet, like previous technologies of communication,

will not replace the central role of territorial governance (2006, p. 180). These limitations as Goldsmith and Wu argue provide the Internet with stability and robustness, while not denying the opposite side of governmental regulation and control used as a tool to monitor and control population. Other researchers analysed the world of Internet regulations as the United States leading, with the rest of world working in a different field, this view could not be put in terms clearer than Bauml when they justified Google's acceptance of China's condition of assisting in censorship in order to allowed to work in the country by saying that "We cannot expect every country to be the United States". The accompanying footnote further explains the West-centricity that reads "Even countries such as France and Austria have differing policies on what is acceptable speech, yet they are still considered advanced, rather than backward, countries" (Bauml, 2010).

The views presented in this book are compatible with Goldsmith's long standing argument on the importance of territorial governments as controllers of the Internet, as expressed in their work from as far as 1998, when they argued that territorial regulations of the Internet are as feasible and legitimate as non-Internet regulations (Goldsmith, 1998). Twenty years later, Goldsmith further confirmed their believe in the importance of governmental control, and extended it to assert that the United States, of all other governments in the world, rightfully controls and manages Internet and promotes Internet freedom agenda that involves commercial non-regulation and anti-censorship agenda, while other countries efforts revolve around clamping down on unwelcome speech (Goldsmith, 2018).

Responses to Goldsmith views quickly emerged, with Pozen (2018) arguing that aside from government, there is a global movement of Internet freedom defenders that is less deferential to market logic and more concerned with people's capacity to control their own data and privacy away from state interference. The United States here was viewed as a false friend rather than a fellow defender of Internet freedoms. The dominating body of knowledge in the Internet censorship studies revolves around the comparison between the advanced Global North and the backward Global South. While this research invokes the concept of a one global Internet that is subject to artificial limitations setting the conditions for difference in outcomes of use among end-users, thus, it can be hardly said that this research is based on that field, despite having a potential for direct contribution to it by connecting the concept of digital inequalities.

Regardless of academic analysis in the field of censorship studies, states around the world carries on with their individual Internet control agenda. This fact pushed this research away from analysing censorship and its reasons, to analysing the facts on the ground through measuring what the end-user faces of artificial Internet limitations no matter whether they were set by governments or as a result of commercial interests. Countries practiced their direct powers to introduce their own restrictions since the mid-1990s, including what was listed at Human Rights Watch 1996 report (Sorensen, 1996), listing China, for requiring ISPs and users to register with the police. Germany, for blocking access to several newsgroups served over CompuServe pre-WWW service. Saudi Arabia was included for confining Internet access to universities and hospitals, Singapore for requiring political and religious content providers to register with the state, New Zealand for classifying computer disks as "publications" that can be censored and seized.

Limitations have developed over the years to cover new methods and reach larger coverage. Limitations set by governments and commercial entities extending its territorial control to cover access at countrywide scale, as happened when Afghanistan's Taliban banned Internet access countrywide, including from Government offices, in an attempt to control content in 2001. Other limitations included Egypt Internet shutdowns in 2011 (Malas, Hafidh and Millman, 2011), and Syria going offline for two days in 2012, and later for 8 hours a day during general school exams period of 2016 (Al-Saqaf, 2016), as part of an anti-cheating policy. Reports also came on Internet shutdown every night at certain neighbourhoods in Bahrain and specific areas in Cameroon.

These limitations were not only related to government policies but also included corporations, as when two feuding providers (Cogent, Level 3) severed their peering connection in October 2005, resulting in many customers from one provider not being able to access resources on the other's network. Limitations on access speed were introduced not so far along when Digital Subscriber Line (DSL) connections became widespread in the United States in 1996 several Internet Service Providers suffered extended outages, unable to cope up with the growing number of users, and the solution was to introduce bandwidth throttling and bandwidth cap.

From the examples above, we can get an idea of what type of limitations to look for, distinguishing between natural and artificial limitations. With natural

limitations defined as the limits set by current technical advancements or laws of physics, such as when speed is confined to maximum possible by medium or availability of access confined to topography. While artificial limitations are defined as the limitations imposed artificially over a network that can be changed with no significant change in technology. Based on the compilation of restrictions mentioned in historical overview and literature above, we can list artificial limitations on the Internet to include any of the following forms:

- Service Blocking: Limiting the ability to access a particular site or service.
- Bandwidth Throttling: Limiting connection speed to a defined value.
- Bandwidth Cap: Limiting the maximum amount of data transferred to a pre-set volume within a specified period.
- Peripheral Control: Limiting the ability to introduce other devices to the network or connecting another network.
- Content Censorship/Filtering: Limiting the ability to access and viewing of certain content.
- Algorithmic Limitations (Algorithmic Walled Gardens/Filter Bubbles): Controlling and limiting the content shown.
- Access Limitations (Walled Gardens): Limiting the ability to access content and services outside a set of predefined content and services. This differs from service blocking, in that instead of blocking a list of sites and services, this only allows a list of sites and services.

Some of these limitations are already part of how we think Internet access is, particularly Bandwidth Throttling and Bandwidth Cap, which are part of usual Internet service offerings. Other limitations, however, are being contested these days, for example, the Net Neutrality debate, which is concerned with power exerted by corporate to differentiate the quality of access and traffic for content (more on net neutrality).

Research efforts on limitations included Open Net Initiative, a collaboration project aiming to investigate, expose and analyse Internet filtering and surveillance practices, through development of measurement tools and methodologies to study Internet filtering and surveillance, capacity building of a network of local advocates and researchers, and studying the consequences and trends in filtering and

surveillance, and their implications (ONI, 2016). The project ended in 2014, after almost a decade of research.

Three leading organisations collaborated on this project Citizen Lab at the Munk School of Global Affairs, University of Toronto; the Berkman Centre for Internet & Society at Harvard University; and the SecDev Group (Ottawa). In addition to a pool of partners worldwide that assisted in data collection. The project issued a series of reports, books, country reports, and regional overviews in addition to the publishing of data sets of measurements collected.

Freedom House has also been studying a set of artificial Internet limitations, as part of their annual survey and analysis of Internet and digital media freedom around the world. They issued a series of reports and ranking on the Internet and digital media freedom since 2011. Their methodology includes three categories, obstacles to access, limits on content, and violations of user rights.

The limitations discussed here stem from the powers governments and corporations have on deciding the network design and offerings to assure networks are used to their benefits. Later we will look at projects aiming to connect new users to the Internet and studying the artificial limitations innate to them.

2.6 Predictors of digital inequalities

As research in the digital divide moved further, the set of predictors studied and connected to variation in opportunities available to individuals changed slightly, with the simple sociodemographic and socioeconomic variables. For example, the Unified Technology Acceptance and Usage Theory (UTAUT) research used gender, age, experience, and voluntariness of use as moderating variables (Venkatesh *et al.*, 2003). Also, age, and gender as stable set of predictors in Internet diffusion and use including Zillien and Hargittai (2009), Meraz (2008), (Losh, 2004), and van Dijk (2005a, 2013), some of these researches also included education level and employment status, as well as income.

The van Deursen and van Dijk study on the shift of digital divide into the difference in usage (2014) found that the most prominent predictors for differences in Internet usage are education, age and gender, whereas Internet experience, income and residency seem to be less relevant. The work of Helsper, van Deursen, and Eynon (2015)

(2015) on Tangible Outcomes of Internet Use focused on gender, age, education, and employment, as the classical predictors to opportunities for Internet use.

It is worth mentioning here that for the literature covered in this review, the gender predictor was a dichotomous variable of male and female, which limits the sexual identities individuals identifying themselves as and thus fail to capture more broad differences among people. For the sake of compatibility, the same two options are used for this research but will be labelled further on as sex.

However, these predictors lacked the ability to capture the difference in access opportunities, particularly with the variation of Internet limitation, natural or artificial, to predict opportunities for use, and making use, of the Internet. Here comes an essential contribution to knowledge that this research is offering, the look at variables related to Internet limitations as predictors for digital inequalities. The variables as advised cover the perception of limitation, as a measure for how people see their network of being open or not, and the level of limitations, whether direct or indirect applied. The variables also include the self-described efficacy of ability to bypass and overcome these limitations, to the operationalisation of these skills through the actual use of tools to allow circumvention of blocking and surveillance.

Although the Internet limitations usually affect groups of people and thus constitute difference at community level rather than individual level, there is room to study how much each of these limitations affects the individual. This room relies on difference in individual's ability to bypass the limitations either as skills to shape usage or through using technological means to circumvent said limitations and deciding on what predictors are informed by of the types of artificial Internet limitations as discussed in the previous section. Which suggests that it is possible in many cases of limitations for the individual to put an effort and be able to limit the influence of the limitation on how they use the Internet.

2.7 Internet for the Next Billion(s)

Although access sits at the base of any digital divide research as seen earlier in this literature review, the methods to reach unconnected people and related theories were not thoroughly discussed. It was often left to matters of public policies and commercial interest. Forcing reliance on policy documents, statistics, and news, rather than academic literature for this section. Here the research outlines motives and

means behind reaching the unconnected, in an effort to understand whether efforts towards the bridging of first level digital divide enable digital equalities or establish inequality as a result of artificial Internet limitations part of its design.

Some research tapped on why people do not use the Internet, like Reisdorf and Groselj, who studied unconnected people in the highly connected country Great Britain and concluded by categorising users into non-users, low users, regular users, and broad users (Reisdorf and Groselj, 2015). The results they concluded was that low and non-users come from disadvantaged socio-economic backgrounds and that non-users have a negative attitude towards technology, suggesting being unconnected as being a choice for some people, despite having networks they can access if they had the motivation and could manage resources to connect.

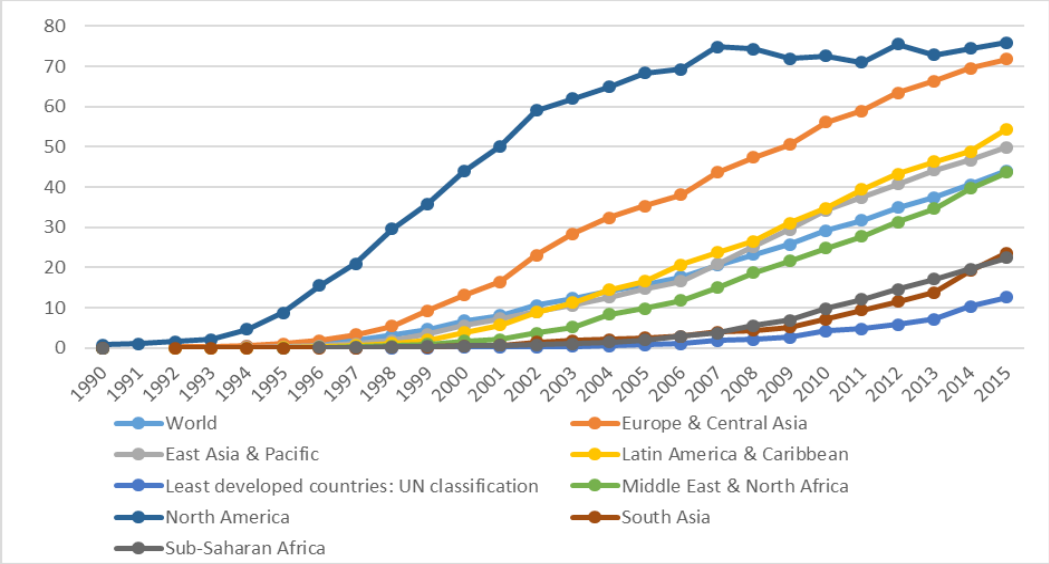
However, and despite the feeling one might get from the sheer amount of research on the digital divide, the fact is that there are more people not connected to the Internet than there are people connected, and little have the choice of being connected or not. World Bank data shows that as of 2015, only 43.9% of the world population is connected to the Internet (World Bank, 2016). In 2017, Internet World Stats put this number at 49.7% (Internet World Stats, 2017).

Most of the unconnected people numbers come from countries with the lowest income resulting in the global digital divide, with the group of countries defined by the World Bank as low income having only 9.5% of its population using the Internet (WorldBank, 2018). Figure 2-2 demonstrates the change in Internet users as a percentage of the population in different areas of the world.

The trend lines strongly demonstrate and effect of economies on Internet penetration on multiple levels, from local to a country level, with the group of least developed countries sitting at the lowest rank of the chart. This essentially demonstrates van Dijk (2005b) tripartite at the global level, with developed world as Information Elite at the centre, and developing countries towards the periphery as the Disconnected and Excluded.

Figure 2-2

Internet users as a percentage of the population



Based on data from the World Bank

Most of the research surveyed in previous sections described the characteristics of people with differentiated opportunities in terms of access and skills, with the hope that policies targeting people fitting these characteristics would help in bridging the gap. Nevertheless, Fuchs and Horak set to describe the reason for such stratification as the multidimensional class structure of modern society that creates structural inequalities (Fuchs and Horak, 2008). So that the global digital divide described above is mainly an aspect of the economic divide between countries, which, in turn, cause countries on the wrong side of the divide to be deprived of political power and cultural skills.

Fuchs and Horak see these as requirements for active participation in the information society, resulting in what they call digital apartheid. Looking at the global digital divide between Africa and developed world as "an expression of the unequal geography of global capitalism That there is a lack of economic and technological resources in Africa is not the fault of corrupt African governments and not an effect of bad governance, market protectionism, a lack of investment conditions for Western capital, etc., but the effect of hundreds of years of colonial and post-colonial exploitation, exclusion, and dependency of the Third World that has caused the very conditions that Africans have to face today." (2008, p. 115).

States' realisation of the importance of the Internet as a tool for development was crystallised in World Summit on the Information Society (WSIS) 2003 Declaration of Principles (2003a) and Plan of Action (2003b), aiming to help

countries overcome the digital divide, and later in WSIS follow up WSIS+10 and its United Nations General Assembly review (UNGA, 2015a). Efforts to connect the unconnected majority of the world is often attributed as Connecting and Enabling the Next Billion(s) (IGF, 2015). The efforts were translated in many parts of the world with the state's efforts to connect more people, particularly in rural and economically deprived areas. That was at a time when Internet Service Providers and Telecommunication Operators were the drivers behind Internet expansion, based on commercial interest, these corporates found it simply non-lucrative to invest in connecting remote users, as they relied mainly on income from selling connection and products online, something that users in deprived and remote areas cannot provide for.

More recently, on the 25th of September 2015, the General Assembly of the United Nations adopted a resolution setting the agenda for Sustainable Development Goals to be achieved by 2030 (UNGA, 2015b, sec. 9). In which countries agreed to "Significantly increase access to information and communications technology and strive to provide universal and affordable access to the Internet in the least developed countries by 2020". This is expected to push states to join the race by either investing directly in access and skill development projects or collaborating with other corporates already in the race to do the job, in a manner that guarantees the interest of both parties. One example of how may this look like is the recently proposed EU Copyright Directive, which 'requires internet companies to install filtering technology to prevent the upload of content that has been “identified by rights holders”' (McNamee, 2016). Later on in the research, projects for the Internet for the next billion will be discussed, including strategies, agendas, and reports issued at the inter-governmental level, to evaluate what was in fact moved into robust actions, and how successful these initiatives are.

In addition to people that are choose to be unconnected or as a result of economic position, whether as individuals, or as a country, there is a group of people that reside in countries where the Internet is available in general, and are not considered economically deprived, but live in remote locations that are not easy to reach. Corporates do not find the revenue from investment in infrastructure to reach these locations good enough. In some of those areas, local initiatives worked towards creating common networks, making technology and knowledge on building these networks available to the public. Providing access to people in remote areas, or as an

open alternative for available networks, some of these initiatives succeeded in connecting a significant number of nodes, like Guifi.net in Spain (Guifi.net, 2017) and AlterMundi in Argentina (AlterMundi.net, 2017).

Fuchs and Horak (2008) discussed six possible strategies to reach unconnected people and solve the global digital divide, they are:

1. Wait and see, market and technological development will cheapen access.
2. By entering into markets and competition, third world countries will be able to leapfrog directly into information societies.
3. Attracting foreign capital will increase wealth for all and access in developing countries.
4. Technologies developed for the Third World.
5. The Third World does not need technology.
6. An integrated strategy of combining the global redistribution of wealth, educational and health programs, digital literacy programs; public and free access to computers and technologies, open-source technologies, and computers for the Third World.

According to the authors, all but the last strategy are one-dimensional, trying to reduce the digital divide by targeting one dimension, neglecting the interconnectedness between different dimensions of technology, social aspects, development, human rights, and global capitalism.

Despite that, major corporations starting seeing high value and commercial interest in ubiquitous Internet (Schmida and Lovegrove, 2016), as a result of the shift in Internet economies increased reliance on attention as the commodity of the Internet, as well as user-generated content and data, which brought realisation of valorisation potential more connected people bring. As seen earlier in reviewing the works of Fuchs (2012) (2012) on economies of Web 2.0, Andrejevic (2009, 2012, 2013) on exploitation in the digital world, Fuchs and Sandoval (2014), Fuchs (2014,2015) on digital labour and exploitation in social media, and Dyer-Witheford (2015) on cyber-proletariat.

This drove many corporations that provide services over the Internet and have its users' information and attention as their bread and butter, including Facebook (Yim, Gomez and Carter, 2016) and Google (VentureBeat, 2016) to a "connectivity

race", in a manner similar to the fourth strategy mentioned above. This is a race to connect and reach new users and convert existing ones to free or subsidised access. Corporations like SpaceX (Moon, 2016) and OneWeb project backed by Virgin and Qualcomm (OneWeb, 2016), joined the race in the hope of being able to re-sell the new grounds to Internet corporates. ISPs are trying to join the race as well by providing a platform to collect and sell their customers browsing behaviour and information (Ogunkoya, 2016).

All of the companies mentioned as part of the connectivity race are developing their own Internet delivery methods; Facebook's Internet.org is testing Aquila, a solar-powered model of drones that 'beam' Internet signal to people in remote and underserved regions (Facebook, 2017). Not waiting for this project to realise, Facebook already provides access to its social network and specific services at no cost through partnerships with local mobile operators. Company X, the sister company of Google, has Project Loon, which is a network of balloons providing Internet access through partnerships with last-mile providers from mobile operators and local authorities (Alphabet, 2017), this system was tested in New Zealand. OneWeb is on a mission to create an affordable global gateway, "building a new global knowledge infrastructure accessible to all", aiming to "fully bridge the digital divide by 2027" (OneWeb, 2016), using a constellation of 648 low orbiting satellites, with terminal that connect to the satellite and emit LTE, 3G and Wi-Fi. A similar concept of using low orbiting satellites, but with a much more ambitious numbers, is SpaceX constellation of 4,425 satellites, planned to be operating in five years from 2017 (Moon, 2016), this company looks at this project as a pilot for its system to provide Internet on planet Mars (Dickerson, 2015).

These corporate efforts should be looked at from the view of power relation between them and their users, and from digital exploitation theories, where their interests are vested. This is another aspect this research is focusing on and contributing to the knowledge in. as seen earlier in the works of Castells and van Dijk on network society, corporations designing and providing access have Network Power, while corporations managing the medium or services available over the network have Networking Power. When there is one corporate providing both, this corporate can exert almost complete control on the network users, from what they can access and see in services from other networks and how they communicate, to content censorship and gatekeeping. When this is combined with a business model reliant on

digital exploitation of user data, attention, and generated content, we end up with networks that have limitless ability to control and motivation towards control, the research refers to those as holistic network providers, as this scenario is becoming a reality.

From the details above, we can classify projects to reach the next billion into two main groups, infrastructure providers, and holistic network providers. SpaceX and OneWeb are evidently building a global infrastructure that they will monetise on through selling access to Internet companies, states, and potentially end-users. While Facebook and Company X do not share enough details on the monetising model of Aquila and Project Loon, they have the potential to become holistic network providers. This is particularly possible if we analysed the current service offered by Facebook, Free Basics.

Free Basics' platform goal is to bring internet access and the benefits of connectivity to the portion of the world that does not have them. They do that by providing access to country-specific useful services, as they call it, to people regions where internet access may be less affordable, through mobile operators (Internet.org, 2017). The services offered include a set of websites and services on topics from weather to sexuality and health. These are handpicked by Facebook, effectively creating a walled garden, where Facebook is both the network owner and gatekeeper. The platform is marketed as a stepping-stone for users to get on to the Internet. The platform is currently available in 61 countries and municipalities as of mid-2017 (Internet.org, 2017). Gebhart (2016) studied Free Basics and Wikipedia Zero in Ghana, and how users understood and experienced these services, to find that most users perceived it as telecom operator's promotions, and most of Gebhart's respondents did not use any of these services, because of technical and educational barriers as well as uncertainty about how to access and use them. These services also did not affect users' data-buying strategies, suggesting that most of the users were already Internet users that used the offering to minimise the cost of access to these specific services.

Internet Governance Forum, when discussing policy options for connecting and enabling the Next Billion(s), expressed concern about the nature of these private initiatives. Moreover, they stressed the need to ensure that such initiatives to expand access do not come at the cost of net neutrality and the free flow of information, with

contributions mentioning a warning of acceleration of walled garden Internet (IGF, 2016).

Yim et al. argue that although altogether rejecting attempts like Free Basics to provide social good might mean losing an essential opportunity for benefiting different stakeholders, and it is important not to embrace it uncritically (Yim, Gomez and Carter, 2016). This was said in their discussion on whether Free Basics is for or against the community, concluding that although it restricts users' choices, and the implementer (Facebook) possesses virtual political powers with potential privacy risks. The use of the platform is determined by users themselves, putting the weight on the individual's skills to make use of the platform, while overcoming its risks. However, not much research is available measuring the potential effects of such walled gardens on the benefits of Internet use on people's lives and opportunities. This is an area of knowledge this research is trying to contribute to as well, with the conclusion aiming to sum up the effects such walled gardens, as offered to the next billion users, have on digital inequalities in light of third level digital divide.

Chapter 3

Methodology

3 Methodology

3.1. Introduction

From the literature review, it can be concluded that there is a gap in understanding and explaining the effect of artificial Internet limitations on digital inequalities. This research aims to fill this gap through studying the correlation between artificial Internet limitations and outcomes of Internet use, defined as the Third Level Digital Divide, among three countries. The research was influenced by the transformative-emancipatory perspective to mixed-methods research as described by Martens (2003), a perspective that addresses inequalities through working with groups with different opportunities and powers from communities perspective. For this research, the adoption involved looking at the Internet users worldwide as one community, with the difference in Internet limitations imposed on sub-communities grouped in countries as a source of difference in power, comparing the tangible outcomes of Internet use as the divergence in opportunities and a rendition of inequalities.

Countries were selected in an effort to limit the agency of the first and second levels of the digital divide. This was achieved through selecting countries from top of the list of countries in terms of Internet penetration rate based on World Bank statistics (World Bank, 2016) while having highly contrasted levels of artificial Internet limitations as reported through the Freedom House Freedom on the Net annual reports (Freedom House, 2017). To be able to conduct the correlation, the research utilises two distinct but interrelated studies. The first study looks at artificial Internet limitations in selected countries, while the second aims to measure Internet use outcomes in these countries. A third study is also designed and included to assess artificial limitations part of services offered to expand Internet to new users, the case for this is Free Basics, a service provided by Internet.org/Facebook to allow people in areas that have no connectivity around the world to access a pre-defined set of websites and online services. The variation in variables being measured compels the use of multiple data collection methods.

This chapter looks at research questions detailing the design of research methods to answer these questions while highlighting the rationale behind each decision taken in relation, and listing potential limitations with suggested ways to mitigate their effects on the quality of the research. The following chapters build on the design advised here to fulfil the research goals and provide an insight to support answering the research

questions, with more details on the studies, including specific correlations between variables and analysis described in the following chapters.

3.2. Research questions, hypothesis, and analyses overview

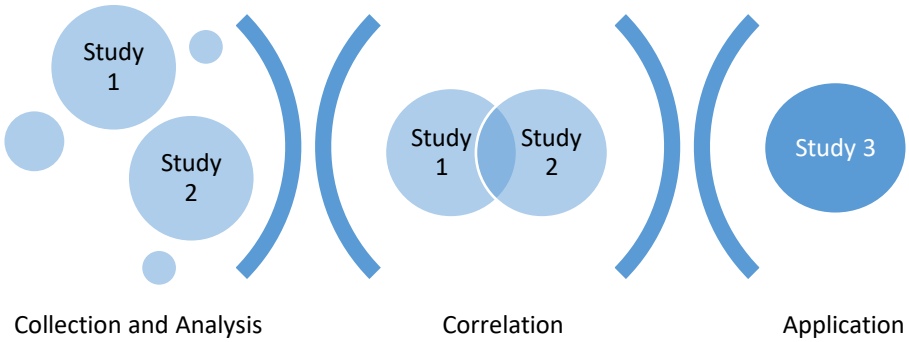
The core of this research can be summarised in the following research questions:

1. What are the relationships between Artificial Internet Limitations and Digital Inequalities manifested as tangible outcomes of Internet use as measured among samples from Bahrain, Estonia, and Singapore?
2. How do the relationships developed predict inequalities in communities with Internet access that is artificially limited, in particular Facebook's Free Basics as an example of Internet for the Next Billion projects?

The path taken to fulfil the first question goes through two central studies: the first looks at artificial Internet limitations in the research countries (Study 1), while the second study aims to measure the second leg of the correlation represented by the measurement of tangible outcomes of Internet use in these countries (Study 2). Crossing results from the studies over the examined population in countries of interest establish what effect do different artificial Internet limitations have on outcomes of Internet use, if any. The approach for taken for research is illustrated in figure 1.

Figure 3-1

Studies and Phases of the Research



The literature review showed lack in the body of knowledge in testing the nuances of connectivity as forms of digital inequality, with Internet access generally assumed to be the same regardless of the artificial Internet limitations imposed on the access, and thus, the null hypothesis (H_0) would be that artificial Internet limitations do not affect digital inequalities. This research, as iterated throughout, aims at dealing with the

differences produced by artificial Internet limitations, with the alternative hypothesis (H_1) proposed to be that these limitations do affect digital inequalities. The hypotheses based on the available literature to fulfil requirements to answer the research questions, and allow for the continuation of the research to understand the effect in relation to the limitations, and the related predictors. Accepting or rejecting the hypothesis above, and the further research into the nuances of the effect measured would allow for an informed response to the second research question, on predicting inequalities in communities with Internet access based on artificial Internet limitations imposed to it.

The risk here is that the application, as proposed, looks at projects of connectivity for people with no, or scarce access to the Internet, while the studies 1 and 2 looked at areas where Internet access in terms of availability and affordability is not an issue. However, this by itself provides an aspect of power for the research, as it looks at access in abstraction, neutralising as much as possible factors other than artificial Internet limitations, to be able to use these limitations as predictors for digital inequalities among Internet users. The power also stems from the fact that Internet for the Next Billion(s) projects minimise access hurdles to the network, and as with the countries covered in studies 1 and 2, individuals do not have to worry about the cost of access, or its affordability, but may need to worry of the openness of the walled garden they are entering.

For the second question, and as the research matures, it looks at an area where the Internet for the next billion projects selected for this study, Free Basics, is available for new Internet users, and get an understanding of what artificial limitations that exist on these connections (Study 3). In the case of rejecting any of the null hypotheses related to the first question, and thus accepting the alternative one, the research would be able to extend to studying the extent of the limitations related to the hypotheses rejected in the networks covered as part of Study 3. With the rejection of any of the null hypotheses, it would be suggested that the existence of these limitations might affect the digital inequalities in these communities, as represented by tangible outcomes of Internet use. The knowledge of the effect of the artificial Internet limitations on Internet use outcomes developed by the studies, we can project what effects the limitations have on new Internet users, and thus effectively answering the second research question.

3.3. Research sample and country selection

Since the research is looking at the inequalities prescribed as part of the third level of digital divide, the population of interest for Study 2 is general people already having access to the Internet. Thus is not limited to populations of specific countries or geographies, but rather to communities affected by group artificial Internet limitations applied at large scale viewed as communities with different access potential. The differences studied through the transformative-emancipatory perspective adopted in this research allow precisely for that, as it is designed to study differences among sub-communities with different opportunities. Large scale artificial Internet limitations tend to be implemented at country level following censorship and blocking laws and regulations, rendering people with access to the Internet within a country treated as a sub-community of the overall network society, with the difference of access potential mediated by controls and limitations set. As a result, it was logical to look at countries as level of comparison.

When comparing media in different countries, the field-setting work of Hallin and Mancini (Hallin and Mancini, 2004) cannot be ignored, as it did define a widely accepted basis for comparison of media systems across countries with different levels of democracy, different types and levels of journalism and media contribution. However, this work, and the plethora of works that followed, even with the follow up by the original authors published as a ten-plus year review of the original work (Hallin and Mancini, 2011, 2017; Brüggemann *et al.*, 2014), focused on localised media systems. The concept of localised media systems, as opposed to access to worldwide information sources, works well with established conventional media, such as newspapers and collective action supported by localised new media such as petitions, but does not seem to be offering much relevance in the Internet-enabled world of a global media system.

Furthermore, the notions of community and country as used in this research shall be clarified. The research looks at the whole global network society is one community, while grouping by country exists solely to facilitate a look at large-scale implementation of artificial Internet limitations. This usage does not fit with the definition of locality as used in the field of media systems comparison. The research field uses the geo-political and territorial affiliation manifested at country level as basis for comparison. Thus, it does not seem appropriate to rely on comparing media systems as base for this research or to select research sample communities, leaving the need to conduct a separate preliminary

research to select regions where it would be easy to isolate artificial Internet limitations' role in determining user potential.

Following preliminary research to select the communities to be covered by this research, the initial selection included Estonia and Bahrain, in addition to the reasons for selection included later. Bahrain offered a distinguished opportunity to compare limitations among more than one sub-community within the same geographical setting that are affected by different forms of artificial Internet limitations, coming from knowledge of nightly shutdowns affecting only the Duraz region in Bahrain. It is worth noting here that the comparison among communities with different limitations within Bahrain was later dropped and replaced by looking at nuances in access availability as expressed by research participants, who included people affected by these shutdowns.

The reason for dropping this potentially important aspect is that it is not possible to measure differences in outcomes of Internet use resulting from temporal access impediments covering only few hours of the day with clarity, especially that access during the rest of day is on par with access available to general population of Bahrain. Nonetheless, the aspect of Duraz region and the added limitations it is enduring is still covered in Study 1 to offer a well-rounded picture of the situation there.

To increase reliability of the research, two more countries were added, Singapore and New Zealand, however for practical reasons related to resources available for the research, New Zealand was dropped, leaving the sample for this research to network communities grouped geographically in the countries of Estonia, Bahrain, and Singapore. The research countries were carefully selected to fulfil the research requirements of having active network society while being exposed to pronounced levels of artificial Internet limitations. The geographies were selected for having high Internet penetration rates and among the top 30 countries in terms of World Economic Forum Network Readiness Index indicating a high level of Internet availability and reliance among businesses and the society (WEF, 2017), thus clearly active in the network society, with access not being a huge impediment to Internet use.

The other face of the coin that was critical in selecting these countries making them distinct from the many countries that have a similar position in terms of access availability, is based on Freedom on the Net annual report (FoN) published by Freedom House (Freedom House, 2017). The chosen countries have varying levels of restrictions on Internet access and use as per the FoN. These countries are all considered small in

terms of population and have comparable Internet adoption patterns over the years. Table 3-1 compares some of the selection criteria among the countries.

Table 3-1

Comparison between countries of research

	Bahrain	**Estonia**	**Singapore**
Population, millions [1]	1.378	1.315	5.607
Internet users as percentage of population in 2012 [1]	88	78.39	72
Internet users as percentage of population in 2015 [1]	93.4	88.4	82.1
Internet Openness [2]	Not Free, 71	Free, 6	Partly Free, 41
Types of Restrictions [2]	Access/Content/HR	None	Content/HR
OONI Measurements [3]	2,963	333,952	55,473
World Economic Forum Network Readiness Index [4]	28	22	1

Notes, 1: World Bank Data, http://data.worldbank.org

2:FreedomHouse Freedom on the Net reports, http://freedomhouse.org

3:OONI Explorer, https://explorer.ooni.torproject.org

4:World Economic Forum Global Technology Report 2016, http://reports.weforum.org/global-information-technology-report-2016

Data in table 3-1 show that the research includes one country with Internet access available to residents to be considered free (Estonia), one considered partly free (Singapore), and one not free (Bahrain), which further strengthens the reliability of research through covering similar countries that differ in aspects related to this research. Another source of information for comparison concerning Internet openness was

OpenNet Initiative reports[1]. The initiative did follow rigorous methodologies in their data collection and reporting. It is worth mentioning that this effort, as well as the efforts of FreedomHouse used in this research, cannot be considered as fully academically valid resources as it did not go through a strict peer-review process as expected from rigorous academic resources. Nonetheless, these sources provide a very good indicator of the situation, and with its multi-year edition, provide a necessary longitudinal perspective to understand changes and connect them with other events. These resources are also some of the scarce resources available that do extensively cover countries of research. Thus, they are used in this research to provide necessary context and guidance with the information they provide are tested against primary-collected data whenever possible.

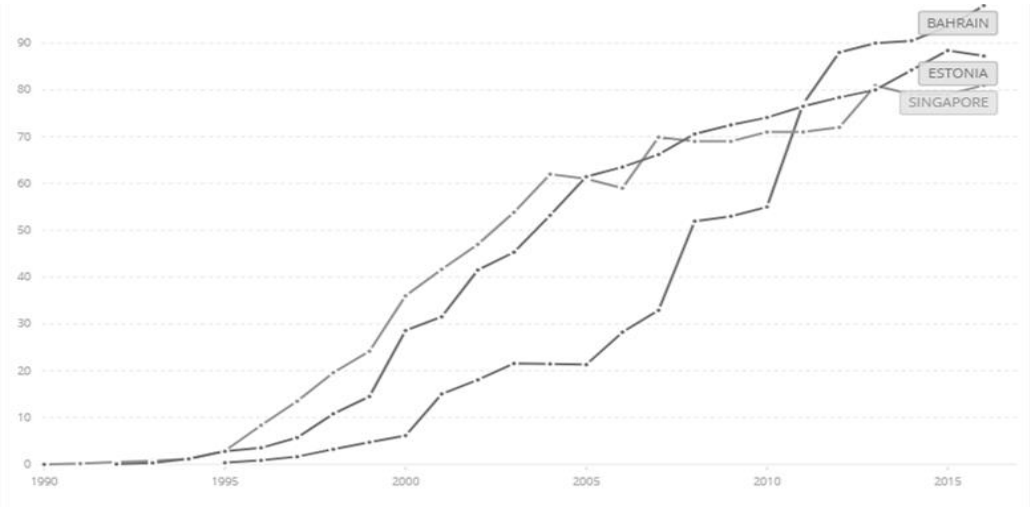
Initial assessment of reports covering Bahrain and Singapore included results on the status of the Internet and details on confirmed that artificial Internet limitations in Bahrain cover political, social, and Internet tools, while limitations in Singapore included selective filtering on the social context. The latest OpenNet Initiative reports available and used for the initial assessment are from 2009 for Bahrain and 2007 for Singapore, rendering them outdated, especially when taking into consideration the pace in which the Internet and Internet controls are evolving. They are referenced as part of the historical context development, and their findings are used in comparison with findings of the research studies to understand changes in Internet limitations.

Internet adoption rate can also play a role in determining the use of the Internet (van Dijk and Hacker, 2003), which is another factor used to select countries of research. Figure 1 shows Internet adoption rate over the years in countries of study as percentage of the population, demonstrating similar trend between Estonia and Singapore, which in turn is comparable to that of Bahrain, showing no significant difference in the overall Internet adoption that may result in a comparable difference in attitude towards the technology and services. This serves to strengthen the rationale of country selection. The data for this table is sourced from World Bank indicators database, which in turn sources the International Telecommunication Union's World Telecommunication/ICT Development Report and database.

[1] OpenNet Initiative website as of November 2019 is http://opennet.net

Figure 3-2

Internet penetration rate, 1995-2015, Bahrain, Estonia, and Singapore. World Bank Data 2017



In each of the countries of the study, the research involved conducting a survey among a random sample of Internet users, the sample for the survey are Internet users aged 18 and above. The survey itself was conducted online targeting sample for surveys per country was aimed at roughly 150 samples per country, which, when calculated using tools based on the formula by Krejcie and Morgan (1970), provides 95% confidence level with up to 8% confidence interval. The sample was selected through a hybrid sampling method of snowball sampling with multiple entry points. The entry point participants were reached through online calls for participation, through paid advertisements on leading social networks, mailing lists, and through access provided by local organisations working in related issues, and later asked to pass the survey to people they know. This combination of methods of access provided needed randomness.

As the research progressed, it was apparent that the recruitment of participants is more challenging than anticipated, especially in Bahrain and Singapore, affecting the number of responses from these two countries. Different measurements were taken to mitigate that, including introducing rewards for survey completion to increase interest in the survey, the rewards were four £100 Amazon vouchers, to be drawn among respondents who opt-in by leaving their email address at the end of the survey. This method helped bring new responses, but not as effective as perceived.

The second instrument for Study 2 is a set of interviews, increasing the validity of the study, as well as confirming and expanding survey results. The interviews are semi-structured, with subjects carefully selected to extend the representation to varied portions

of the population, with people considered experts as users or providers in their respective fields. The interviews focused on aspects similar to that to the survey, as well as discussing initial results of the survey to get a deeper understanding on responses and issues measured, as in the perception of artificial Internet limitations. The interviews also provided interviewee's points of view on Internet usage fields. The aim is to conduct at least five interviews at each of the study countries with at least one interview for each field per country, and this is possible since fields are not mutually exclusive and it is probable to find people that fit in more than one targeted sample.

The sample was discovered and access negotiated through contacts in each country, and cold emails and messages on online fora to key people in each of the fields above, as well as online advertising on social networks targeting these countries. For the interview, a simple token of appreciation was introduced in the form of a £20 Amazon voucher sent at the end of each interview.

Study 1 continues working with the same countries to collect measurements from various networks in these countries. The aim is to have at least 2,000 measurements from networks operating in each country. A measurement can be a site or service tested or any single test covering any of the limitations, one user or testing session can provide multiple measurements. The second source of information for this study aims at collecting reports available on artificial Internet limitations in the said countries.

3.4. Methods

3.4.1. Study 1

The literature review educated on the existence of two main categories of artificial Internet limitations: the first is active Internet limitations, which are limitations set on the network level and are not related to the user, such as blocking of websites. While the second category can be described as soft limitations, indirectly affecting the network but primarily affect Internet use, such as perceived censorship and surveillance. To be able to study both categories effectively, Study 1 adopts a mixed-methods approach with both quantitative and qualitative instruments and analysis.

Quantitative methods are used to collect and analyse data on active and hard artificial Internet limitations, as it is the most appropriate method when it comes to analysing facts that can be measured systematically in forms of numbers and quantifiable results. The results in our case are measurements and tests conducted on networks within

the selected countries. Moreover, to cover aspects indirectly affecting Internet and information access, or soft artificial Internet limitations, a qualitative effort was conducted, with information sourced from reports and new as well as from parts of the interviews and survey conducted for Study 2. Steps for Study 1 can be summarised as follows:

1. Evaluate and adopt methods to measure artificial Internet limitations.
2. Select countries and regions to be studied.
3. Collect measurements and tests on networks if no reliable and timely measurements already available.
4. Research reports and news on indirect or soft artificial Internet limitations.
5. Analyse results.

At the stage of step 5, and when the results from Study 2 are available, we can conduct the correlation between these two studies, and conclude what effects do artificial Internet limitations have on outcomes of Internet use in the countries selected for this study, giving an idea on similar effects existing wherever certain limitations exist. This knowledge allowed for informed look at Study 3, which can be considered an applied case towards understanding how these limitations affect new Internet users.

The mixed-methods approach used in Study 1, as described above, adopts quantitative network measurements and qualitative research on reports and news on artificial Internet limitations and information controls, as well as information collected from interviews in Study 2. The instrument for network measurement looks at hard limitations set as part of networks used to access the Internet among the population, the fact that we can measure difference in limitations among different networks, open the way towards inter-country comparison between users of different networks. From research, Open Observatory of Network Interference (OONI) approach was found to be the most suitable, as it covers a wide range of artificial Internet limitations, and is collecting measurements through probes available all around the globe, including countries of research. OONI also offers a mobile version that can further expand the coverage to reach most areas and population of interest.

The measurements collected which only gives an idea on limitations based on physical and configuration aspects, meaning that user faces these limitations unless a technical effort was exhorted to circumvent it. To augment results of the measurements, and expand coverage to include indirect and soft artificial Internet limitations, the research includes comprehensive investigation of reports and news on measures taken in recent years affecting people's use of the Internet in countries of research. This includes laws limiting or criminalising open expression and dictating how the people should use the Internet, as well as prosecution based on online activities, which may result in a state of self-censorship, and chilling effect on the effective use of the Internet.

3.4.1.1. Network measurements

Measurement of Internet limitations applied on networks was conducted using OONI tools, which constructs a global observation group, of volunteers mainly, to test networks around the world to detect censorship and surveillance. OONI measures network traffic manipulation using a series of tests covering blocking of websites, blocking of some of the most common instant messaging applications, blocking of circumvention tools, and detection of systems that could be responsible for censorship and surveillance (OONI, 2018). Measurements are collected through series of tests that comprise, in essence, of requesting sites and services through a control server and over the user network simultaneously and compare results from both to detect blocking and possible manipulation.

One advantage of OONI is that it covers multiple blocking methods, including Domain Name Services (DNS) tampering and consistency, Transmission Control Protocol (TCP) transmission reset, and Internet Protocol (IP) address blocking through a transparent proxy. In addition, it offers Network Diagnostic Test (NDT), a test developed by Measurement Lab (M-Lab), a consortium of research, industry, and public-interest partners interested in global network performance. These measurements are essential to cover different methods of site censorship extending beyond the official and clear site blocking with a page served to inform the user that the site they are trying to access is blocked, to practices using different technologies to make it look as if the site is not available for technical problems.

Another advantage of using this measurement approach is that it does not only describe accessibility or availability of a site or service but can also be considered experimental in that it compares access through different routes, resulting in the ability to

identify causality of unavailability. The logic used to identify causality is simple, if a site is accessible and identical over both routes, direct, and through Tor network, which provides access through secure connection to set of nodes distributed around the world hiding the traffic from local networks, and using different locations as exit points, then the site is available, and no blocking is detected. If the site is only accessible over the Tor network, then blocking is probable, and the type depends on the response received through direct route. While if a site is not available on both, then it is probable that there is a problem with the site, but blocking is not excluded.

OONI probe uses a list of potentially blocked websites (URLs) in order to run the tests against, there is one global list, and there are country-specific lists with sites contributed by the community and maintainers of the OONI project. The lists include categorisation of the URL to be tested, date of addition and source, number of addresses at each list of interest to the research is listed in table 3-2. To test the blocking at the countries of the research effectively, websites that may be blocked were researched and contributed to the lists of interest accordingly. One shortcoming of the OONI mobile application, when compared to the desktop probe, is that it does not allow natural selection of list to test, leaving most people testing for the default lists. The researcher collaborated on this issue with the development community to try to find a way of overcoming.

Table 3-2

Addresses in relevant OONI test lists

List	Number of addresses
Global	1235
Bahrain	519
Estonia	4
Singapore	180

Notes: lists from https://github.com/citizenlab/test-lists/tree/master/lists

In addition to testing for blocked websites, other tests conducted and data analysed for including common and potential artificial Internet limitations that were decided on based on examining reports and news available on Internet limitations in the countries of interest. The test covered the following common artificial Internet limitations:

- Limiting access and blocking websites, tested through testing web connectivity, availability of the website requested, comparing responses for site request from multiple networks, and testing for Domain Name Server manipulation.

- Limiting access and usage of circumvention tools, including the use of proxies, testing for the usability of common services like Tor, Lantern, and Psiphon.

- Blocking instant messaging applications and protocols, testing for reachability of common services like Facebook Messenger, Telegram, and WhatsApp.

- Censorship, surveillance, testing for middle boxes that are common for tools used in censorship, surveillance, and trying to identify the technology used.

- Testing for performance and speed of the network to identify the potential limitation of quality of service in areas or for services.

Either the data collected through the probe is then transferred to the OONI primary collector, where it is made available to the public through the OONI explorer web interface, or through an Application Programmable Interface (API), which allows queries to run on the dataset online, a third method would be to download the datasets, and conduct offline analysis. For this research, a combination between the available interfaces was used to allow for an in-depth analysis, especially when there is no particular conclusion on a specific test or measurement, as this is possible when OONI does not find enough evidence supporting definite result for a status of a website or service. One scenario is when a measurement shows that a website is inaccessible through the direct route, but it is through the Tor route, but there is no enough measurement to eliminate the possibility of a temporary error, and the result was not a page stating that the site is blocked.

A new tool that promised the opportunity to further validate research findings, the *AccessCheck* tool, announced by Berkman Klein Center for Internet & Society at Harvard University in June 2019 as part of their Internet Monitor project (BKCIS, 2019). The tool follows a similar method for network measurements as used in the research by utilising the OONI methods, but allows for real-time checking of accessibility through a series of servers located in locations around the world. The researcher obtained real-time access to the data and testing services as a verified researcher by the platform. The end nodes available included four ISPs in each of Estonia and Singapore, but none in Bahrain, for

reason matching the limitations faced by this research of inability to access the Bahraini network. The results from this study take the form of quantitative results representing the existence of artificial Internet limitations and the scale of these limitations. In the case of website blocking, the results take the form of percentage of websites and services blocked from the country and global test lists, and the category these limitations fall into. In the case of tampering and performance interruption, the results take a similar form of percentage and possibly the scale of the tampering, and the percentage of population affected where possible, the last is conceivably possible when looking at Internet shutdowns that affect specific regions within the countries of study. The results in this format would allow an objective point of view on what Internet limitations are in existence in each of the study countries and constitute an original contribution to research in digital inequalities by shedding light on the role of limitations in determining opportunities.

3.4.1.2. Laws and reports

In order to expand the study of Internet limitations in terms of coverage and depth of the research, it included a study on laws, regulations, and practices that limit the use of the Internet and affect tangible outcomes of said use. These include collection and analysis of existing reports on the status of the Internet in research countries, as well as a look at laws and regulations related. The research is interested in any available information that may be related to affecting how people use the Internet, from research papers and reports, reports from human rights organisations and civil society interested in freedom of expression and Internet to news items.

Reports and laws were collected through desk research in library and journals, as well as online resources, including the OpenNet Initiative research project, which ran between 2007 and 2014, collecting and reporting on Internet censorship in countries around the world. The project concluded with several reports and three books published (Deibert *et al.*, 2008, 2010, 2011), which are used in this research extensively, but with scrutiny, as a valuable resource, particularly their reporting on Bahrain, as Bahrain did not receive enough attention and coverage in other reports. The OpenNet Initiative reports, although outdated, provide well-developed evidence than can be used to develop research context and general understanding, which we aim to augment and provide updated information through this research. This lack of extensive coverage made it challenging to get details and data, but at the same time, provided an opportunity for this

research to contribute further to knowledge, especially that much of the data collected, and information used has not been previously documented in scientific research.

A valuable input also comes from Study 2 tools, where its survey carried questions on perceived limitations to the benefit of Study 1, and the interviews were used to provide valuable insights in this regard. The questions at the survey allowed participants to express how they feel their school or work, Internet service provider, or government is controlling or monitoring their Internet access. In addition to that, the questions on tools used and know can also provide an idea of how people feel about the openness and freedom of their Internet access and use.

This approach allows an in-depth overview of determinants or predictors of Internet use, which in addition to measurement collected in the other part of Study 1, would fulfil enough confidence in the results to conclude on level of artificial limitations allowing for achieving good correlation with Study 2.

Results from this part of Study 1 would be beneficial and can be related them to the first part as many of them are quantitative in nature, as in the rankings and scores were given to countries in issues related Internet limitations and digital inequalities in reports and studies. The qualitative output also proves paramount value here, as it does provide insight and explanation to many of the findings throughout the research.

3.4.2. Study 2

Study 2 also adopts a mixed-methods approach as in Study 1. However, it has a different approach to sources of data, with surveys among random sample to get as much data as possible, and interviews specific to carefully selected sample to confirm and expand survey results. Steps planned to achieve this study can be highlighted as the following:

1. Select a framework to measure Internet use outcomes.
2. Select countries and regions as groups to be studied.
3. Select samples among study groups.
4. Design and test survey.
5. Conduct survey.
6. Conduct Interviews.
7. Analyse results, compare the primary outcomes from surveys and interviews.

The approach adopted for Study 2 has two instruments: survey and interviews. More specifically, the interviews with expert aimed to target outcomes of Internet use in different countries, known as the Third Level Digital Divide. This choice was made with the nature of research taken into consideration to increase reliability of data collected. The main framework that stood out in the review is what van Deursen and Helsper used in their article "Third-Level Digital Divide: Who Benefits Most from Being Online?" (van Deursen and Helsper, 2015), and later adopted at large scale research titled Digital Skills to Tangible Outcomes (DiSTO) at London School of Economics and University of Twente. The DiSTO study included several projects aiming at measuring people's digital skills, digital engagement, and outcomes of Internet use covering several countries around the world. The framework was also applied in sub-projects in the UK, Netherlands, Chile, Uruguay, and Kuwait, as well as other projects targeting specific user groups, like the DiSTO Youth project.

This framework had a similar aim and focus on this research in terms of measuring tangible outcomes of Internet use as determinant of digital inequalities. Nonetheless, to focus on artificial limitation predictors as possible variables, related dimensions inspired

by the sequential model of access described by van Dijk in their book "The Deepening Divide" (2005a) were added, particularly questions on perception of information controls and artificial limitations, and the use of circumvention tools. The researcher has developed a draft survey based on the above, this survey was translated to main locally used languages to fit users of different countries of the study and was customized based on feedback from piloting the survey with ten participants speaking the four languages of the survey. A printed version of the survey is supplied as an annexe.

The survey relies on the offline activity influenced by Internet use fields as described in framework mentioned above, which are economic (labour and commerce), social, political, institutional (governmental and health), and educational. Questions added to refer to perception of information controls and artificial Internet limitations, and the use of circumvention tools, which are necessary for relation to this research.

A second instrument designed to add validity and reliability to Study 2, and to expand the results of the survey, is a set of semi-structured interviews, with subjects carefully selected for having a particular interest in at least one of the fields of use mentioned above. The data provided by both instruments are expected to provide adequate coverage to the subject of the study, allowing understanding of difference in Internet use outcomes among countries of the study.

3.4.2.1. Survey

The survey instrument used in Study 2 was designed to cover tangible outcomes of Internet use, as well as including standard demographic questions, and questions to assist in determining perceived limitations, which is used as a source for Study 1. Fields, question grouping and scales used in the tangible outcomes of Internet use segment of the survey are designed to be compatible with the framework set by van Deursen and Helsper and used for this research, providing invaluable ability for continues benchmarking of results collected against results reported from previous research that used the same framework in other countries. Another goal served by assuring compatibility is to increase the impact of this research by allowing use of the results as part of further research increasing the representation at the same countries of this research, or projects that cover wider regions.

The highest level, or the second level, of grouping of tangible outcomes of Internet use, is through the four fields of Economy, Culture, Social, and Personal aspects, allowing

coverage of different aspects of a person's life. Questions for the tangible outcomes where logically distributed over four pages mirroring these four fields, with two matrices of questions for each classification, one for achievements in aspects related to this classification, and the second for satisfaction related to these aspects. Each field was also divided into groups of questions with two questions on achievement, and two other questions on satisfaction in each, this level of grouping was not displayed to participants, but used in the analysis. The scale was unified across all aspects to make the questionnaire as easy as possible to answer. All questions focused on online activities in the year prior to taking the survey, with standard five points Likert scales with two added options, one for not applicable, and another for when the participant does not know about what is asked about in the question.

The Economic field questions included four groups of benefits and outcomes. The groups in this field focused on uses and outcomes related to the person's economic and financial position and opportunities, labelled as property, finance, employment, and education. The property group is composed of buying and selling products online in terms of price and quality, the finance group is composed of information and services found and used online to improve financial situation, and insurance bought online. While employment group is composed of things found online influencing person's job and jobs found online, and the last group, education, is concerned with certificates obtained that would not have been obtained without the Internet, and educational material found online and their quality.

The Cultural field followed a similar composition of two questions per group for achievement and two others for satisfaction, but within only two groups, Identity and Belonging. The identity group focused on understanding gender differences and learning about the participant's own ethnic group and satisfaction with information online about religion. The Belonging group questions were more concerned with connecting with peers of similar age and interests, and people with shared religious or spiritual beliefs, comparing online and offline encounters.

The third field, Social, included three groups of questions covering three types of social networks and associations, informal, formal, and political. Questions in these groups looked at friendships, memberships and affiliations, and government-related information and connections, to measure how people made use of the Internet to benefit themselves socially, increasing and maintaining their social capital, and satisfaction

related to affiliations and relationships. Governmental services accessed and used, as well as interaction with local political and governmental entities, were assessed as well.

The last field in the tangible outcomes of Internet use segment was the Personal field, with three groups of questions on health and lifestyle, Self Actualisation, and leisure. The questions covered decisions, and use of information found online in relation to health and medical care and lifestyle, general knowledge and understanding of social issues, and entertainment and leisure achieved as a result of using the Internet, in addition to a question on general feeling about spending time online.

Each question in the survey was given a sequence within the main field it serves and a code identifying what subfield it is part of, representing the combined scale that is calculated from responses. One example is in questions EconomicA (SQ001) and EconomicA (SQ002), the questions read, “I save money by buying products online” and “I sell goods that I would not have sold otherwise”, together they constitute the scale of Economic Achievement in terms of Property at the first level of aggregation. On the second level, when this scale is combined with other subfields of Economic Achievement in terms of Income, and Education or Employment, constitute the scale of Economic Achievement. Figure 3-2 includes the questions and the different levels of aggregation used to develop the scales.

Figure 3-3

Fields of Tangible Internet Outcomes Studied

Field			Code	Question
Economic	**Achievement**	Property	EconomicA(SQ001)	I save money by buying products online
			EconomicA(SQ002)	I sell goods that I would not have sold otherwise
		Income	EconomicA(SQ003)	The information and services I found online improved my financial situation
			EconomicA(SQ004)	I bought insurance online that I would not have bought offline

		Education / Employment	EconomicA(SQ005)	The things I found online influenced how I do my job
			EconomicA(SQ006)	I found a job online that I could not have found offline
			EconomicA(SQ007)	I got a certificate that I could not have got without the Internet
			EconomicA(SQ008)	I found educational material online that I could not have found offline
	Satisfaction	Property	EconomicS(SQ001)	The quality of the last product that you bought online
			EconomicS(SQ002)	The price you get for the products you sell online
		Income	EconomicS(SQ003)	The last financial service you used (e.g. banking)
			EconomicS(SQ004)	The insurance or other financial product you bought online
		Edu/employment	EconomicS(SQ005)	The job you got online
			EconomicS(SQ006)	The way the Internet has influenced how you do your job
			EconomicS(SQ007)	The quality of the course that you found online
			EconomicS(SQ008)	The quality of the educational material that you found online
ultur	**chiev**	Cultural Identity	CulturalA(SQ001)	The things I came across on the

				Internet made me think about the differences between men and women
			CulturalA(SQ002)	Through the Internet, I learned new things about my ethnic group
		Cultural Belonging	CulturalA(SQ003)	Through the Internet, I found people of a similar age that share my interests
			CulturalA(SQ004)	Due to the information I found and people I have met online I feel more connected with religion or spiritual beliefs
	Satisfaction	Cultural Identity	CulturalS(SQ001)	The information you come across about religion and religious people
			CulturalS(SQ002)	The information you come across about your ethnic group
		Cultural Belonging	CulturalS(SQ003)	Your interactions with people of your age online (as compared to offline interactions with people your age)
			CulturalS(SQ004)	Your online interactions with people and organisations that share your religious beliefs (i.e. in comparison with the offline people you might encounter)
Social	**Achievement**	Personal	SocialA(SQ001)	I am in touch with my close friends more because I use the Internet

			SocialA(SQ002)	People I meet online are more interesting than the people I meet offline
		Formal	SocialA(SQ003)	I became a member of a hobby or leisure club or organisation that I otherwise would not have found
			SocialA(SQ004)	I became a member, donor of a civic organisation (e.g. those involved in environmental or human rights campaigning) I would not have become a member of otherwise
		Political/Public	SocialA(SQ005)	I have discovered online that I am entitled to a particular benefit, subsidy or tax advantage which I would not have found offline
			SocialA(SQ006)	Online, I have better contact with my Member of the Parliament, local councillor, or political party
	Satisfaction	Personal	SocialS(SQ001)	Your online communication with friends and family? (i.e. in comparison with the offline communication you might have)
			SocialS(SQ002)	Your online communication with people online who are not close friends or family? (i.e. in comparison with the offline communication you might have)

		Formal	SocialS(SQ003)	The last club or organisation you became a member of online
			SocialS(SQ004)	Your online involvement with the last organisation you joined/donated to
		Political/Public	SocialS(SQ005)	The last online government service you accessed
			SocialS(SQ006)	Your last interaction with a Member of the Parliament, local councillor or political party online
Personal	**Achievement**	Health	PersonalA(SQ001)	I have made better decisions about my health or medical care as a result of the information / advice I found online
			PersonalA(SQ002)	Information I found online gave me more confidence in my lifestyle choices
		Self actualisation	PersonalA(SQ003)	My knowledge increased because of the Internet (i.e. looking up information, talking to others)
			PersonalA(SQ004)	Using the Internet helps me to form opinions about complex social issues I would not fully understand otherwise
		Leisure	PersonalA(SQ005)	Online entertainment (games, listening to music, reading jokes) made me feel happier

			PersonalA(SQ006)	I go to events and concerts I would never have otherwise considered
	Satisfaction	Health	PersonalS(SQ001)	The way in which the last bit of advice, program or app you used has influenced your level of fitness
			PersonalS(SQ002)	The way you changed your lifestyle as a result of information you found online
		Self actualisation	PersonalS(SQ003)	In general, the information you find online about topics that interest you
			PersonalS(SQ004)	The way in which the Internet helps you think about social issues
		Leisure	PersonalS(SQ005)	The last concert or event you went to after finding information or buying the ticket for the event online
			PersonalS(SQ006)	In general, how do you feel about spending time online

In addition to the tangible outcomes segment, the survey included questions to measure other possible Internet use predictors as educated by the review of literature, in an effort to capture as many predictors as possible to allow for more accurate analysis and conclusion. These questions included aspects related to the respondent of age, age at first Internet use, gender, education level, employment type, and devices available for use. Questions also included locations where the person is using the Internet, whether at home, work or school, while travelling using mobile devices, or at public or other places. A copy of the survey as used in English is included as Appendix I.

Recruitment of the respondents proved to be challenging, as the classical methods of random sampling as described in the literature, as in Creswell and Clark (2010), required resources not available to this study, a best effort approach to random sampling was adopted. The approach adopted was to access the population through multiple communication media and access point, and spread the survey as much as possible through social media platforms and trusted local people, to generate as much exposure to the survey as possible to gain some randomness. The survey was promoted on social media platforms of Facebook and Twitter for people from the countries of research fitting the age criterion, and announced over mailing lists for a various local interest group, as well as sending emails for address lists obtained through list providers, and announcing the survey on local online fora. Contact with key local people used for the interviews also proved to be very beneficial to the recruitment of subjects for the survey, as they have announced and shared the survey to their social networks, and have asked people with high number of local followers to do the same. This method, although unorthodox, resulted in a diverse sample with best effort for randomness and showed some stratification characteristics to fit that of the population, as described in Chapter 5.

3.4.2.2. Interviews

The second instrument of Study 2 is a set of semi-structured interviews with people from different groups in countries of research. This instrument was designed to shed more light at the status of the Internet and Internet use, as well as expanding the scope of research to capture any factors and variables that may not have been captured well through the survey. The initial design placed the interviews as the stage after collecting the survey data and conducting the analysis to be able to build on the survey results in expansion and validating through the interviews fulfilling the sequential explanatory design (Creswell and Clark, 2010). However, as the data collection started, it was clear that the survey would require much more time than planned to reach the target number of responses. A change in design occurred here to commence with the interview process as the first set of preliminary survey results became available in order to maintain the overall timeline of the research. This decision proved to be useful for two reasons. The first is that the interview participants were also helpful in reaching to more survey participants, and the preliminary survey results available then provided enough insight and understanding to inform the survey questions.

The semi-structured approach deemed to be the fittest where a list of guide questions is used for all interviews, and there is enough room for individual and specific expansion questions, as well as open-ended discussions. The pre-set structured questions provided higher rigour with reliable and comparable results that can be reflected on survey results as well. At the same time, the flexibility of open-ended questions, and room for any further comments allowed an opportunity to touch on issues specific to a specific country or field of outcomes studied with full freedom of expression for the participant.

Interview participants were selected to represent different groups of people with a particular interest in at least one of the offline activity fields influenced by Internet use as described by the reference framework used previously detailed, fields and sample target type are described in table 3-3.

Table 3-3

Categories of Interview Sample

Field Code	Field	Sample Targeted
EL	Economic, Labour	Jobseeker
EC	Economic, Commerce	Online entrepreneur, e-commerce user
S	Social	General user
P	Political	General user, local activist
IG	Institutional, governmental	General user/citizen
IH	Institutional, Health	General user
E	Educational	Student, Educator

It was challenging reaching the sample target working remotely without actually being in the country of research. The sample target was reached through local contacts, and access through social media sites, particularly professional networks like LinkedIn, as well as cold emails to key people in each field, a special effort was put to assure that people selected thoroughly represent the user group.

Structured questions were designed to be simple and straight forward, beginning with what the participant thinks of the role of the Internet in affecting people's lives in

their country. Then followed by questions specific to the way the Internet is used in the sector or field the participant is involved in, what services are available and how it is related to people's opportunities, and if these services are making people use the Internet more. The questions then target Internet limitations, and how the participant sees them affecting Internet use, to what extent, and in which aspects. Then, open-ended questions are asked based on the previous responses to expand the results, and the respondent is offered the chance to discuss and provide the commentary they believe related to the research.

Data collected through the interviews are analysed manually and summarised in a way to allow comparison. The manual analysis seemed to be the best fit for the scale of interview. Later on, responses are compared to related field of Internet use outcomes of the survey, and insights are used in discussing the analysis results. This method allows for deeper understanding of the outcomes of the analysis, and better reflects the status of digital inequalities, and the tangible outcomes of Internet use sought after in this research, allowing for better correlation with artificial Internet limitations.

3.4.3. Study 3

As we have the results from Study 1 and Study 2, we can project the results of having artificially limited access to the Internet on opportunities in terms of outcomes of Internet use. To fulfil the transformative goals of this research, we look at one of the projects that are providing access to new Internet users, with a critical eye on what digital opportunities they provide or hurdle. The project of focus of this research is Free Basics by Facebook, because it is one of the few projects that moved beyond planning and testing to actual implementation, and because of the clear constraints it has on its users, and the fact that is one of the leading projects in this regard. Steps for this study are as follows:

1. Select a project to focus on.
2. Study artificial limitations of that project.
3. Analyse results, compare outcomes with results of Study 1 and Study 2 correlations.

The final part of the research, Study 3, takes an approach similar to that of Study 1, but focusing on a network, rather than a region, to conclude on what are the possible effects of artificial limitations set on that network have on outcomes of the use of it.

3.4.4. Cross-study analysis and correlation

The core of the research is the main research question on the effect of artificial Internet limitation on digital inequalities in terms of outcomes of Internet use and the third digital divide, comparing the countries of research through the hypotheses described earlier. The approach taken to answer this question is through accepting or rejecting hypothesis by comparing the studied artificial Internet limitations as measured in Study 1, correlating them with outcomes of Internet use as measured in Study 2, and then comparing the correlation among the countries as communities, and among the whole sample as individuals. The approach allow for correctly placing the correlation step at the forefront in terms of importance and originality of this research. The correlation is performed at multiple levels, from the sub-field level at Internet tangible outcomes to aggregate scales and overall outcomes.

As educated in the literature review, there are several determinants that may affect digital opportunities, particular to the person's traits and their status. These determinants or predictors were included in the research data collection as classical predictors to account for and eliminate their agency to gauge with success for the effect of the main predictors related to this research, artificial Internet limitations. The classic predictors include socio-demographic variables such as age, gender, education, employment, and years of Internet experience, as advised by the literature review, while the research predictors are variables related to perception of limitations, use of circumvention tools, and skills to bypass limitations, which will be further detailed in chapter 5.

These two groups of predictors are tested against the outcomes of Internet use as per the data collected through the survey, to measure what predictors have the highest effects on usage outcomes, and where there is an effect, the null hypothesis can be rejected, and the alternative hypothesis accepted. The predictors above are used as the independent variables that we analyse the outcomes of Internet use variables against, which should provide a clear idea on what affects the uses people make of through the Internet, and to what level.

3.5. Validity and reliability

The validity of the research stems from the validity of each of the studies comprising the correlation. Study 2 validity is based generally on the fact that the framework previously adopted for the tangible Internet outcomes study was tested and

proofed as part of the DiSTO[2] project in several countries as previously detailed. The results and literature produced shows that the framework is capable of measuring Internet use outcomes as required by this research.

Key component of the reliability of this study comes from the extent of survey responses and coverage of interviews. Although the level achieved provides good and generally reliable results, the responses collected does not catch the full reliability and representation desired. This is tackled through additional interviews to support the reliability of the study, and understandable given the time and resource restraints of this research.

The depth of tests conducted to cover a vast number of possible artificial Internet limitations can assure validity of study 1. The measurement framework selected serves this purpose by providing reliable results in accordance with scientific rigour, as described by M-Lab. In addition to that, the study of indirect, or soft artificial Internet limitations, adds further validity of the research by connecting both types of limitations to Internet use outcomes, giving equal footing for both types of limitations. Reliability of this part is assured by the breadth of tests conducted, with testing planned to cover all main networks providing access to Internet users in each of the research countries.

Tests are conducting through OONI probes software that can be run on computers or through a customized Linux image that runs on Raspberry PI and similar single-board computer, called Lepidopter. This image includes ready to run OONI probe software with all the needed dependencies and makes it easy to run tests from different locations and networks efficiently. However, this ease of use cannot be compared with the mobile application, first launched in February 2017 (OONI, 2017), and provide an easy to use interface to run network tests and contribute measurements to primary OONI data collector, making it possible to test mobile networks through mobile data, and residential or public networks through WiFi-connected mobile devices. With the high availability of smartphones in the countries of research, this proposes an opportunity rather than a limitation, as majority of the population are able, in theory, to run tests and collect measurements.

[2] DiSTO research and related projects available at the DiSTO webpage: http://www.lse.ac.uk/media-and-communications/research/research-projects/disto

3.6. Limitations

A vital part to any research is acknowledging the assumption made and limitations expected and faced, here is a list of main limitations expected, and the measures the research is taking to mitigate their effect on validity and reliability of the research.

- The low response rate to the survey: it is expected that many of the people receiving calls for participation not take action or begin with the survey and that many other people may drop before finishing the survey. This is mitigated by shortening the survey as much as possible. Interviews are helpful here in providing added reliability to the results.
- The tendency towards positive responses in survey: It is possible that responses to survey are skewed towards the 'right answer', for example, participants may deny that they use proxies for Internet connection, which may be illegal in some countries, interviews help here, by providing closer look at network habits in the country.
- Dynamic nature of limitations and networks: Limitations on the Internet are not static, they are dynamic and respond to various changes in the countries of research, we are handling this by documenting results from previous studies on Internet limitations and connecting changes to main events in these countries. As a result of the dynamic nature of the limitations, change in use habits may not be directly simultaneous to changes in limitations, and interviews provide valuable insight here.
- Unavailability of network measurements from some networks: It is possible that network measurements do not include all of the networks available in regions of interest; this may be due to restricted nature of some networks, or simply because of lack of people interested in running tests from these networks. Reports on limitations, especially collected from fieldwork, are useful here to fill this gap and provide information on overall Internet limitations.
- Limitations discovered might be local to specific networks: It is possible that limitations discovered are local to specific network regulations, and are not affecting overall Internet users, to address this, and where possible, limitations discovered on specific Autonomous Systems are labelled to be local to these networks unless proof was available to generalise over other networks.

3.7. Ethical considerations

The research, in general, does not pose primary ethical considerations, however, due to the nature of the research and geographies studied, some areas in relation to interviews and network measurements proved to require attention, which dictated the utmost measures and care taken to protect the identities and safety of participants, as detailed below. After finishing the data collection, all research data as collected from all of the studies were stored on an encrypted USB stick as well as an encrypted backup available on the University's OneDrive following University data retention schedule and guidance. At the end of the project, data is sanitised from any possibly identifying information and made available as a data set for other projects where possible, it was clear to participants through the studies that this is possible, and consent was collected accordingly.

Study 2 survey is an online survey aimed at a random sample of adult Internet users. The survey itself is general, and asks questions related to Internet usage habits, with questions to assist in categorisation, but no identifying information was collected. Participants are presented with introductory text on the aims and objectives of the survey and how the data used, stating with clarity that participation is voluntary. Nonetheless, data collected was dealt with utmost security on many levels. The survey tool first selected was University of Bristol Online Survey tool (onlinesurveys.ac.uk), which was migrated to Jisc, the UK not-for-profit company working to support educational institutes in October 2017 (Jisc, 2018). However, and due to lack of support to languages of the survey, the need for another trusted platform rose after some research, it was apparent that the best solution was to run a self-hosted instance of the open-source survey platform Lime Survey

The domain name *InternetStudy.xyz* was dedicated to this research, with the main page allowing participants to select the language they would like to use for the research survey. This domain name will be later dedicated to displaying the main outputs of the study. Security measurements have been taken at the server and survey design levels to assure security of results, and protection of participants' identities. Trusted and valid Secure Hypertext Transfer Protocol (HTTPS) certificate is provided to assure secure communication.

Raw results are available through restricted access to the survey system, and the data was pulled from the service and stored online with the procedure detailed above for

the whole data related to this research. The only pieces of data that can be used to locate the person at the survey are their Internet Protocol (IP) address, and the email they are asked to provide optionally if they wanted to enter the draw for a reward offered as an encouragement to them. The IP addresses are sanitised at the end of the research, and emails are extracted and removed from the dataset regularly, used for the draw then purged.

Interviews part of Study 2 requires attention to assure that no identifying information is stored beyond analyses phase, contact details of participants, conversation logs and any recordings of the interviews are stored according to University guidelines, with safety and security of participants as the top priority. Interviews themselves were be conducted over secure and encrypted connections that support anonymity, preferably with no login or sign up required and require no special skills to operate, meet.jit.si, ricochet.im, and chatb.org are good choices here, as the interviewee needs only to click on a link to access a chat area, and all use encrypted channels for communication.

Measurement collected through OONI for Study 1 is made available online through OONI explorer, which is already sanitised from personal information. Thus no special effort needs to be done on the collected data in this regard, most effort required here is analysing what is openly available, conveying in no need for any special ethical consideration. However, we needed to be careful when asking people to conduct the tests, as, at some locations, the mere act of running network testing may put the person running them at risk. In response, and to protect the survey participants, the call to run tests at the end of the survey was carefully written to reflect this potential, with a clear statement asking the person to make sure that they are not breaking any laws when using the tools and are not putting themselves in any danger. In addition to that, the concern was communicated to developers of OONI with a suggestion to implement a less aggressive testing mode that runs tests at a slower pace to attract less possible attention from surveying bodies.

Chapter 4

Study 1:

Internet Limitations, Context and Analysis

4 Study 1: Internet Limitations, Context and Analysis

4.1 Introduction

Studying effects of artificial Internet limitations require a clear understanding of the potential controls that may pose limitations to accessing the open network, and different predictors determining digital opportunities for utilising the technology of the Internet for individuals to enhance their life opportunities. The potential limitations are measured through a mixed-methods approach in compliance with the methodology and methods used in this research, covering measurements of actual limitations on the networks through probing access and discovery of control of access, protocols, and services. The second part of the mixed methods looks at qualitative coverage of main reports and news items covering Internet controls in the countries of the research. As well as incorporating brief findings from Study 2 including the interviews that deem relevant at this stage, further incorporation and crossing of Study 1 and Study 2, including the survey results of Study 2, is studied in depth in Chapter 6.

The structure of this chapter follows the logical categorisation of the three countries studies as three communities of Internet users, fulfilling the requirements of the transformative-emancipatory perspective to mixed methods, which this research is influenced by to maintain rigour. Each country is looked at in separate but comparable sections, starting with a brief context on the country, including history of Internet and related market structure, then a look at digital inequalities and inclusion efforts that affect digital opportunities. An examination of network measurements collected from networks in that country as descriptive and brief critical analysis follows, then a review of reported Internet limitations to advice change in policies and perceived limitations, to conclude each section with key findings. The chapter ends with a comparison of critical findings as conclusion, which is incorporated and further studied in the discussion chapter.

Although balance was sought after in writing the sections, the difference in limitations found and available reports, which is expected given the difference in limitations known in each country, resulting in noticeable variance in size among sections. Nonetheless, each country did receive the coverage needed to arrive at a conclusion and appropriate understanding to advise the research questions at a suitable level of elaboration. The difference in section size plays yet another indication to the extent of limitations, whether technical or perceived. The size limitations have affected the level of analysis included in this section, forcing move of higher-level analysis to later chapters, limiting this chapter to providing needed overview of the situation.

The chapter ends with a summary of findings to advise for further discussion and analysis in the discussion chapter later on, where the research questions will be looked at in the lens of all the findings and the literature reviewed to achieve the conclusion of the research.

4.2 Bahrain

Bahrain underwent reforms after the Sheikh Hamad bin Isa Al-Khalifa took the throne in 1999 following the death of his father to become the Emir, the head of state position of the then State of Bahrain. Reforms included the ending of political repression and promising a period of human rights (Amnesty, 2001), this included a new constitution promulgated in 2002, which redefined the political regime of the country. The changes followed a referendum on a National Action Charter proposed by the new Emir to return the country to constitutional rule and moved the country to become the Kingdom of Bahrain, with Hamad bin Isa Al-Khalifa as the first king of the small island.

Bahrain is home to 1.37 million, of which 647,835 are Bahraini nationals[3]. The official language is Arabic, with English, Farsi, and Urdu common, and Islam is the main religion, with Shia majority, and Sunni royal family, and Christian and Jewish minorities[4]. Bahrain is part of the Gulf Cooperation Council, and lies in a location within close proximity to Iran and, a bridge connecting it to Saudi Arabia. The composition of the country and its location proved to make Bahrain a location for tensions between different groups of the population.

This section establishes the context and situation of the Internet in Bahrain by going through a brief history of Internet and Internet market structure in Bahrain, from the first days of the Internet in Bahrain, principal players in the field of regulations and activity of civil society organisations, to current Internet penetration rates. Then the section looks at digital inequalities in Bahrain in terms of skills and participation of citizens in online services, to develop an idea on the general level of digital skills and initiatives of e-participation. The section later reaches the core of this study, with details of the network measurements Collected in Bahrain through Open Observatory of

[3] Data retrieved from http://www.data.gov.bh/en/DataAnalysis

[4] Data from https://www.cia.gov/library/publications/the-world-factbook/geos/ba.html

Network Interference (OONI) probes, as described in the methodology chapter. An elaborative part on reports on Internet situation in Bahrain is included with necessary level of details to develop an adequate understanding of the timeline and evolution of Internet controls and technologies used for control and surveillance. By the end of this section, findings of each part are compiled to produce an analysis of the situation of Internet limitations in Bahrain.

4.2.1 History of Internet and market structure in Bahrain

Since 1995, Internet has been promoted by the Bahraini government as a tool towards development, with a bid of the government to position Bahrain as a leader in telecommunications in the Arab Gulf, serving as the main regional hub (HRW, 1999). Bahrain was the third country in the Arab Gulf region to have public Internet access, just months after Kuwait and United Arab Emirates (Palmer, 2000), this demonstrates the leadership the country had in the field at that time, and its interest in the Internet and what it offers for the businesses and society alike. As part of this leadership, the government of the small island kingdom realised early the need for skill development to reach the potential benefits of technology in general and the Internet in particular.

With an eye on investment promotion, the Bahraini government worked in line with the private sector to establish a healthy telecommunication market environment, beginning of the establishment of Bahrain Telecommunication Regulatory Authority (TRA) as a governmental institution in 2002 (BahrainTRA, 2016) as part of telecommunication sector reforms through legislative decree no. 48 of 2002 promulgating the telecommunications law (BahrainTRA, 2009). Establishment of the TRA and the new telecommunication law allowed for the liberation of the telecommunication market to allow companies to enter and compete with the incumbent telecom provider, Bahrain Telecommunications Company (Batelco). The first step in opening the market was to grant the second telecommunication license in 2003 to MTC Vodafone after two decades of Batelco monopoly (BahrainTRA, 2016). Over the years, the market evolved, and Batelco's dominance was challenged with 26 companies providing Internet and communication services, of which 13 licensed as ISPs as of the end of 2017. The third mobile telecommunication operator, VIVA Bahrain, a Saudi Telecommunication Company (STC) subsidiary, launched its services in 2010. Nonetheless, a better indicator of market dominance would be market share, which is not clear, making the number of licensed ISP as the best estimate.

A look at the development of proportion of broadband Internet by the method of access as published in Bahraini TRA Telecommunications Markets Indicators Report of 2017, shows that mobile broadband became the primary method of access, with 52% of traffic delivered through mobile technology, from 31% in 2013 (BahrainTRA, 2017). This reflects higher dependence on mobile technology, which is hugely overtaking other access methods, especially fixed wireless broadband, which dropped from 41% in 2013 to 18% in 2017, while fixed wired broadband maintained its share at 28 to 29% over the years. These numbers are helpful in determining what companies control most of the Internet access. In this case, we can deduce that at least half of all Internet traffic goes through the three mobile operators in Bahrain, giving them network access control powers.

Civil society has also been involved in the areas of access availability and Internet use, with a clear focus on better Internet service offering and availability to residents of Bahrain. One of the notable efforts is Bahrain chapter of the Internet Society, Bahrain Internet Society (BIS). BIS objectives include training for citizens on computer fundamental and specialised seminars, workshops, and fora, encouraging the innovative and effective use of technology, and providing advisory to entities on technology-related matters[5].

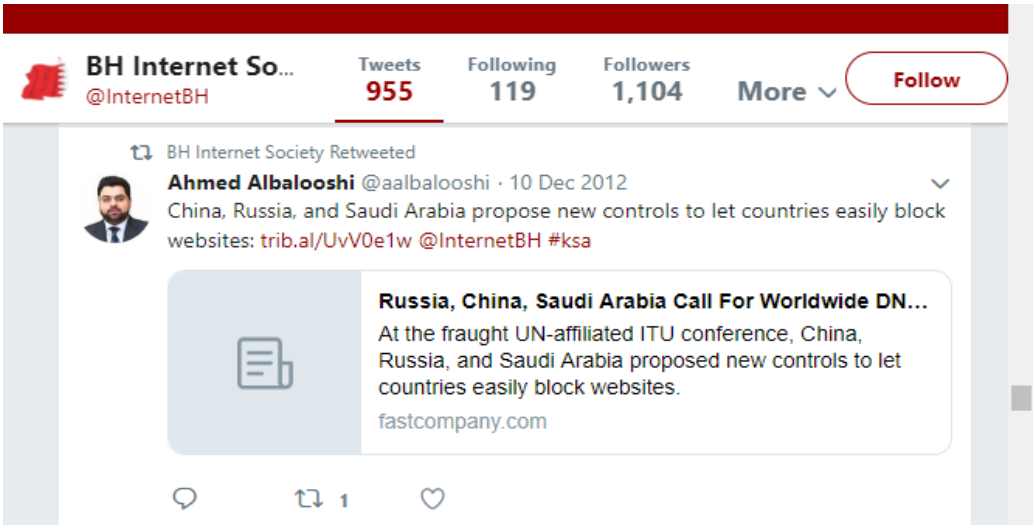
Nonetheless, the Bahrain Internet Society turned a blind eye to political blocking and artificial Internet limitations, as none of its publications mentioned any of limitations set by the government, despite being documented by other parties, as we will see later. On the contrary, their activities on social media suggested they were promoting higher control of states on the Internet, as in the retweeting of a news item on a proposition of new controls to allow countries to block websites easily, as in figure 4-1, taken from the Bahrain Internet Society official Twitter page[6].

Figure 4-1

[5] Based on the data published at the official website of Bahrain Internet Society: http://bis.org.bh

[6] Available at https://twitter.com/InternetBH

Screenshot from Internet Society Bahrain Twitter account retweeting of a proposition for easier Internet controls

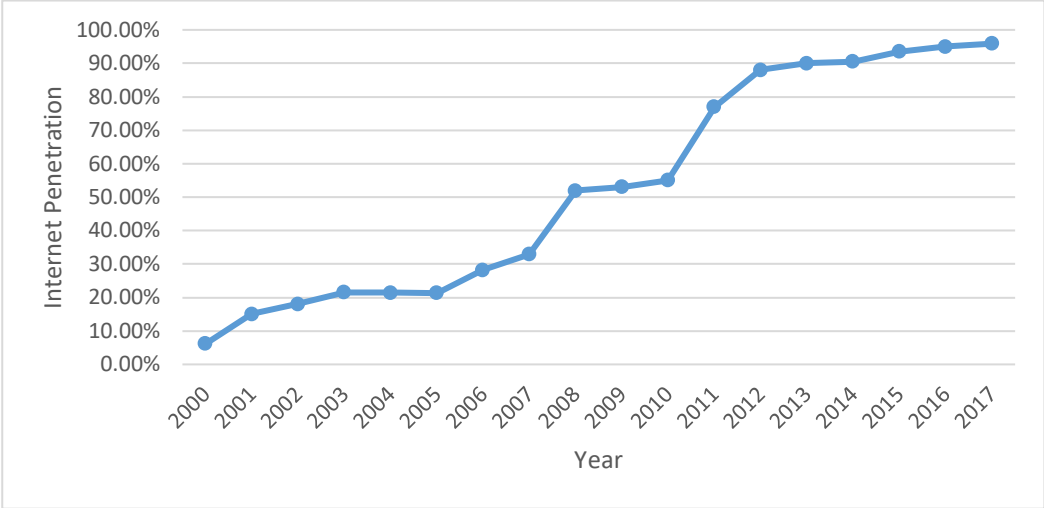


The increased offering of the Internet and digital inclusion efforts, as well as public demand, resulted in fast and wide adoption of the Internet in Bahrain, with percentage of users rising steadily over the years from a mere 6% in 2000 where it equalled the same statistic for the world in the same year, to 98% in 2016. This percentage is one of the highest in the world, and represents double the percentage of Internet users as part of the world population statistic for the same year, putting Bahrain as the country with highest Internet penetration rate among the Arab World and the Middle East (World Bank, 2016).

Figure 4-2 demonstrates the increase in the number of Internet users in Bahrain. The table shows impressive leaps between statistics of 2007 and 2008, and 2010 and 2011, in each of the two leaps we can see about one-fifth of the population join the Internet users group. Two jumps of one fifth seem huge in terms of percentage of the population, but when taking into consideration the small size population of Bahrain, the numbers sound possible when compared to actual numbers of people joining when. It is worth mentioning that 400,000 SIM cards were deactivated in Bahrain in August of 2010 following a revision by the TRA to address inflated subscriber numbers (Curwen and Whalley, 2018), however, does not seem to have affected the trend of change in the number of Internet users reported.

Figure 4-2

Individuals using the Internet in Bahrain as a percentage of the population between 2000 and 2017



The business of providing access whether in the form of access lines, as in Internet lines, or time of connected device use, as in Internet café's, has benefited from the quick jump in adoption of the Internet. This is notable especially in the early 2000s, which came with a considerable spread of Internet Café's in different areas of the country as well as a noteworthy increase in commercial offering for residential fixed lines and an increased demand for data and mobile Internet. This increased demand was cited as the driver for the growth of the mobile telecommunication market (OBG, 2015). The increase demonstrates the potential of the Internet in developing new business models to provide access and allow for a window of competition that would make Internet access more affordable.

Parallel to the developments in access, the Bahraini government realised early the opportunities open Internet access have on freedom of expression, mainly political. The government sustained its 1990s history of telephone and correspondence monitoring and surveillance by applying the same concepts in the form of monitoring of Internet activity and imposing controls on access. The controls imposed included the blocking of several websites that deemed critical to the regime in Bahrain, especially when it comes to criticism of the ruling family. Over the years, this control took several forms and was assigned and implemented through different governmental bodies. In 2002, the government issued a decree-law to control the press, law number 47/2002, the law restricted coverage of sensitive subjects and resulted in the prosecution of journalists and activists for allegedly defaming government officials, insulting the king, or inciting hatred against the government.

Based on the law 47/2002, and the telecommunication law number 48/2002, the Ministry of Culture and Information issued the ministerial creed number 1/2009 to ISPs to adhere to block websites as per the ministerial blocking orders, in addition to blocking of websites of pornographic nature and those that violate public morals, blocking the use of circumvention tools. The creed also directs ISPs to implement an official and unified filtering system (MoCC, 2009).

Another related legal instrument was issued in 2009, this time by the Bahraini Telecommunication Regulation Authority, requiring telecommunication licensees to implement lawful access to their networks and data (BahrainTRA, 2009). Lawful access meant that "The Licensee providing all technical resources, including Telecommunications Equipment, systems, programs and communication links" (2009, p. 2) to every entity concerned with national or international security, giving them access to information sent via the telecommunications networks, as well as user identifying information and location of access. This tool confirms the increased need of the Bahraini government, with its different arms, to expand its control on information and networks.

Few years later in 2010, King Hamad separated the Ministry of Culture and Information to establish the Information Affairs Authority, which mandate included controlling Bahrain official media outlets, the Bahrain News Agency and Bahrain Radio and Television Corporation, as well as regulating press and publication in the country, and acting as spokesperson of the government of Bahrain. The authority expanded its powers in censoring information to controlling Internet limitations, by blocking websites and controlling access to services (ONI, 2009; Bahrain Royal Court, 2010; Yasin, 2012).

Despite all the regulatory instruments, the executive branch of the government of Bahrain practices what seem to be efforts to ordain the environment of fear among the citizens of Bahrain when it comes to online activity. An example of such efforts comes in the use of official social media outlets to publish simple yet effective messages on interpretations of related laws, figure 4-3 shows a message published by Ministry of Interior official twitter account with 439,600 followers, warning that following what they called inciting accounts may put the individual at risk of being held accountable. The Arabic version includes the same message as the English one, but adds a message at the end that read "closing it immediately is a national duty". Such a message is clearly meant to encourage self-censorship and pushing people to limit their sources of news and information.

Figure 4-3

Screenshot from the official Bahraini Ministry of Interior Twitter account, the message is published in Arabic and English languages.

The practices of direct and indirect limitations and coercion in relation to Internet use in Bahrain is covered the coming sections, from looking at digital inclusion initiatives and status in Bahrain, to understand the position of the individual in relation to digital skills, as well as the availability and affordability of the Internet . The chapter then takes the path through network measurements and empirically attempt to enumerate limitations and understandings the scope and scale of these limitations, as well as technologies and practices behind them. The natural next step followed in the chapter is looking at reports and other studies one the Internet and networks of Bahrain, particularly in the lens of limitations and access potential, to devise the history and timeline of limitations, the related laws and regulations, as well as potential developments planned to take place in the future.

4.2.2 Digital inclusion in Bahrain

The swift spread of Internet access in Bahrain Initiative by the government and private sector to provide access to the public imposed challenges related to adoption and use of the Internet, and the digital skills. The skills and adoption motivation are required for people to be included in the network society, and be active members that are able to exploit the full potential of Internet affordances in their lives. This section looks first at the skills and initiatives related to it, and then cover eParticipation as a gateway for citizen participation in public affairs, or its illusion.

Skills

To address the issue of digital skills, the government launched and supported several initiatives towards spreading access and developing digital skills of the citizens. One of the first initiatives was part of a partnership between Microsoft's Unlimited Potential initiative and the Bahraini Ministry of Labour and Social Affairs (MoLSA) in 2004 to address digital inclusion by providing training courses in subjects related to technology, Internet, and electronic commerce (Microsoft, 2004). The partnership allowed Bahrain to make use of Microsoft's training curriculum and funding to bridge the digital skills gap by developing a cadre of qualified IT professionals, rather than developing the digital skills of the society overall. This is understandable given the challenges faced by Bahrain then of unemployment and a shortage of trained IT professionals. The impact of this project is not clear, as there is no available report that measured outcomes.

Further iterations of the governmental training programmes were launched in 2009 and 2011 under the brand *eCitizen* at the beginning, to be later rebranded to *Qudurat*, Arabic for capabilities, as an overarching project with a broader aim to train 7,500 beneficiary of the country's population of 1.3 million on general digital skills. In 2014, it was announced that 16,951 of the population were trained through Qudurat in the six years since its launch (Bahrain Government, 2018). The programme was a result of a collaboration between the Ministry of Social Development and General Organisation for Youths & Sports and various non-governmental organisations focusing on different aspects of the society. Programme advertising material mentioned affiliation with Microsoft through its IT Academy Program (Bahrain Government, 2004), but there is no clear indication on the type of affiliation from any of the parties.

Courses offered through Qudurat consisted of two programs based on Microsoft IT Academy Program offered in two streams, Basic and Advanced. The Basic stream covered 20 hours of topics of computer use basics, the Internet and the World Wide Web, digital lifestyle, Microsoft Word and Microsoft PowerPoint, eServices offered through the Bahrain eGovernment Portal, and Social Media. The Advanced stream of the programs added computer security and privacy, eCommunications, and Microsoft Excel (Bahrain Government, 2018). These programs would provide the necessary skills needed to be able to navigate the online world but would require personal initiative to advance more and better make use of the Internet.

A fourth iteration of the programme seem to have been launched in 2015 as a result of a partnership between the Bahraini government and the principal telecommunication company at the kingdom, Batelco, as a programme targeting the whole country to enable participants to make use of technology, Internet and electronic commerce, mainly through the governmental electronic services portal. As part of this partnership, Batelco committed to providing special telecommunication access packages for trainees, as well as hosting training at their training centre (Batelco, 2015). There are no details available on the status of the programme after the announcement. This programme has been portrayed as the primary digital skills development programme in the country, and incorporated several other programmes, making the statistics mentioned earlier on Qudurat representative of overall digital skills development initiatives related to the government in Bahrain.

Citizen participation through technology (eParticipation)

As the Internet penetration and use developed in Bahrain, e-participation efforts have also increased, defined as initiatives to use of technological means for citizen participation in the democratic process. This comes despite Bahrain being defined as a non-democracy, as detailed by Åström et al. (2012), who discussed that e-participation in non-democracies, including Bahrain, is increasing in rates similar to, if not more than, democratic states. The main driver behind the increase for non-democracies comes from pressures of economic globalisation pushing the countries to maintain the appearance of democratic participation and modernisation as a form of symbolism to attract players in the international environment (DiMaggio and Powell, 1991).

When combined with state surveillance and control of Internet traffic, the concept of e-participation losses a lot of its significance and potential, as citizens would have fewer opportunities in knowing about, discussing, and sharing information that would affect their participation in politics (Åström *et al.*, 2012). This conjecture further demonstrates the importance of open and unfettered access to the Internet in increasing the opportunities of people in effective political participation. Although the categorisation of democracies and non-democracies is sensitive and can be even set as problematic, the concept of access to opportunities for meaningful participation in decisions relating to one's life is much clearer. Making the results of Åström et al. work apply to further contexts and societies in relation on how surveillance and control of communication technology, including the Internet, is there, regardless of the context being categorised as

democratic or not, to project opportunities in access to information and ability to initiate and contribute to decisions.

In the case of Bahrain, the findings of increased initiatives of e-participation, with the existing level of surveillance and control of the Internet suggests the motivation of these initiatives comes from a determination to position the country as a modern place suitable for investment. Another potential driver is using the e-participation facilities as a vent for pressure building up among people by allowing them the illusion of participation, even if in a symbolic way. Nonetheless, we cannot totally deny the candidness of some of the efforts, particularly in the early 2000s, when the instability was not as materialised, and the Internet was not looked at as a tool of political opposition.

4.2.3 Measured Internet limitations

At the beginning of this research, there were zero measurements collected in the OONI data repository, which means that either no measurements were conducted, or no measurements could be transmitted from the local probes to the OONI data repository, it is more probable that the former is the reason, as after studying limitation patterns, they were reactive in nature. Which means that there would be at least one measurement collected before filtering systems would study the traffic and deem it should be blocked. Another reason that contributed to the lack of tests from Bahrain was that until early 2017, to be able to run OONI probe, a person with access to the network to be tested need to connect a probe device, or run the probe on a desktop computer, which posed a hurdle for running OONI tests. As the research developed, OONI launched its mobile probe making it possible to run tests from a mobile device, as a result, measurements started to flow, but not as much as expected or as much as was collected from Singapore or Estonia.

After communications with Bahrain Watch to coordinate research efforts, it was clear that the action of running OONI probe by itself could put the person in danger. Thus the research did not actively promote running the probe, except with a message at the end of the survey, making it clear that it is optional, and up to personal judgement, as well as coordination with Bahrain Watch for possible methods to conduct tests. This was one of the reasons for the limited number of tests to 1100, of which 1045 were included in the analysis producing 4688 measurements between 9 February 2017 and 25 April 2019.

Nonetheless, the tests conducted covered major ISPs of Bahrain, as detailed in Table 4-1, which shows each Autonomous System Number (ASNumber) and count of

tests conducted on that network. The tested networks include six of the 13 ISP license holder in Bahrain (BahrainTRA, 2017), Nuetel, Kalaam, Infonas, and the three leading mobile and telecommunication providers, Zain, VIVA, and Batelco who had most of the tests with over 90% of tests. The incumbent communication provider, Batelco, was represented with almost one-third of tests. It is worth mentioning that some smaller ISP be using the network of another major one, and is included in the results of it under one of the major networks. The entry AS0 indicates that the test could not determine the actual network from the ASNumber, however, detailed examination of results showed that the IP addresses connected were part of the Batelco and VIVA networks. Nonetheless, and to keep in line with the methodological practices used with the rest of the countries, the 53 tests coming through it were excluded.

The other excluded tests came from AS22363, a number reserved for a network called *PHMGMT-AS1 - Powerhouse Management Inc*, belonging to a company registered in Texas, the USA as per *IPInfo.io* database. The involvement of this number in Bahrain networks is probably through a small ISP or a specialised service provider with not enough information to identify. The two tests that came from that network were Network Diagnostic Tool (NDT) tests, testing for networking speed and trying to diagnose any network problems. The type of test and insignificance of the number of tests, in addition to the ambiguity of the network itself, prompted exclusion from the analysis.

Table 4-1

Number of tests conducted in Bahrain per network

ASNumber	Network / ISP	Tests	%
AS51375, AS39015	VIVA Bahrain BSC	396	37.71%
AS5416	Bahrain Telecommunications Company (BATELCO) BSC	350	33.33%
AS31452	Zain Bahrain BSC	265	25.24%
AS39273	Kalaam Telecom Bahrain BSC	26	2.48%
AS35568	Nuetel Communications SPC	5	1.24%
AS198727	Infonas BSC	3	0.28%
Total		**1045**	**100.00%**

Testing in Bahrain faced a significant problem as access to TOR network, the network used for control requests, was itself blocked, thus testing was not able to be

conducted in the manner designed, following the rigorous method of OONI no results were labelled as confirmed in the OONI data explorer and dataset. However, the measurements collected are precious, as all results that showed blocking characteristics are categorised as anomaly results. The results with anomalies are then categorised into four-colour system, depending on anomaly type, with green indicates no probable restriction, yellow as a failure in connection with no high probability of blocking, orange for measures that have a high probability of blocking, and red for confirmed blocking.

This categorisation made it possible to take sites with anomalies with Orange and Red categories as positive results of blocking. To reinforce this assumption, testing of direct access through a browser for results through contacts in Bahrain confirmed that these websites are indeed blocked, promoting confidence in taking website access results with anomaly as positive cases of limitations. A more in-depth analysis of the raw data from the tests showed that for these tests, the typical result was a successfully served page that is either empty, confirming the existence of content manipulation and non-transparent blocking. Pages could also redirects to the website *block.bb.zain.com* on Zain network, or *anonymous.com.bh* on Batelco network, both showing that the website intended to access is blocked. The anonymous.com.bh website request included information that can help to identify the person trying to access the website intended, including IP address and network trying to access through.

Tests conducted varied in nature, and covered aspects such as blocking of common instant messaging platforms, Facebook, WhatsApp, and Telegram, diagnostics of network interference affecting speed (NDT), Dynamic Adaptive Streaming over HTTP test (DASH) which tests for manipulation of streaming quality, existence of middleware and manipulation of requests, and blocking of websites in terms of web connectivity. The test frequency, detailed in table 4-2, shows the interest of people for testing network interference and speed, with 644 tests, followed by manipulation of requests and website blocking, with 52 and 141 tests respectively. This result showed that one of the main motivations behind running OONI testing was to test for speed of the Internet as the main reason, followed by testing for Internet limitations.

Table 4-2

Number of tests analysed in Bahrain per type

Test Type	Tests	Measurements
Dynamic Adaptive Streaming over HTTP - DASH	46	46
Facebook Messenger	16	16
HTTP Header Manipulation	52	52
HTTP invalid request line	120	120
NDT, Network issues affecting the speed	644	644
Telegram	9	9
Web Connectivity, Website access	141	3784
WhatsApp	17	17
Total	**1045**	**4688**

For most of the test type, each type would collect one measurement as it measures specific aspects with no need for multiple measurements, while website access tests for several websites in each test from the local and international test lists, as described in the methodology chapter. The OONI probe and application run the tests as far as the user allows it to cover as many websites as possible. A total of 1499 websites were tested from the URLs included in the Global and Bahrain test lists used by OONI, now these lists have a combined size of 1754 URLs, this number would have been higher or lower during different testing times, as these lists are maintained regularly to keep it up to date, and remove any inactive websites. Another reason to edit the lists is also to reach a level of balance in size of categories to assure no one category gets more testing resources than other categories, based on discussions with the OONI community. This is particular with the Pornography category, which is reviewed regularly to include a sample rather an extensive list.

The URLs tested included websites from 31 categories, covering aspects related to common types of websites and content that are susceptible to blocking and information controls, from pornography to circumvention tools, and Human Rights issues. Table 4-3 lists categories of websites tested in Bahrain, with the number of URLs in each of them, as well as the number of websites with anomalies found in each category.

Table 4-3

Categories in lists tested in Bahrain and the number of anomalies found in each

Category	URLs in current Lists	Tested in Bahrain	With Anomalies
Alcohol & Drugs	43	40	1
Anonymization and circumvention tools	71	51	29
Communication Tools	105	73	4
Control content	13	0	0
Culture	57	32	1
E-commerce	18	12	1
Economics	24	21	3
Environment	30	26	0
File-sharing	49	37	0
Gambling	44	38	32
Gaming	27	24	1
Government	51	31	3
Hacking Tools	46	41	4
Hate Speech	14	12	2
Hosting and Blogging Platforms	68	52	1
Human Rights Issues	269	145	5
Intergovernmental Organisations	4	4	0
LGBT	91	33	3
Media sharing	49	45	2
Miscellaneous content	1	1	0
News Media	235	96	4
Online Dating	36	21	2
Political Criticism	96	26	1
Pornography	22	24	22
Provocative Attire	21	20	3
Public Health	29	28	2
Religion	106	59	3
Search Engines	40	27	0
Sex Education	31	30	0
Social Networking	40	38	3

Category	URLs in current Lists	Tested in Bahrain	With Anomalies
Terrorism and Militants	24	15	1
Not in List	0	330	54
Total	1754	1432	187

The categories show that the tested URLs covered most of those in Bahrain and Global test lists, with at least 85% coverage. Some categories, as in Pornography, have more URLs tested than what is currently in the lists because, at the time of testing, more websites were included in this category, and they were later trimmed to maintain balance among categories, as described earlier.

The websites with anomalies shows that blocking covered most of the categories, except for Environment and Sex Education, and is particularly extensive in the Gambling and Pornography, and to a slightly less extent in Anonymization and circumvention tools, while is apparently selective with categories like Religion, News Media, Human Rights Issues, LGBT, and Communication Tools. This reflects the motivation of blocking to be more of blanket blocking with Gambling and Pornography, without neglecting media control as the main issue, especially ability to bypass blocking and monitoring, features provided by anonymization and circumvention tools.

Of the URLs tested in Bahrain, 226 URL showed anomalies of potential blocking in access, including 187 with consistent anomaly across all measurements collected for them through the study period, and can be considered blocked with high confidence. While the other 39 URLs had results varying between the existence of anomaly and not from different tests, this change in results, which happened in two dimensions, time, and network, reflect changes in blocking practice over time, and inconsistency among networks.

One website that showed inconsistency among networks was ArabTimes.com, a website categorised under news, and serves more of satire news and conspiracy theories, was consistently blocked over Zain and VIVA networks with three identical measurements on each, but two measurements on Batelco network showed that it did not show any anomaly reflecting blocking. This case had five of the measurements taken during February 2017, including two on the same day from different networks, showing that the time dimension was not a factor in explaining the discrepancy across measurements.

On the other side, the website hacktivismo.com, categorised as providing hacking tools, was tested four times on three networks, including two tests on Zain that provided different results, the first test was on 11 April 2017 returning an anomaly, while the second, conducted 16 days later on 27 April 2017, showed no anomalies. This suggests a change in blocking policy for that website between those dates. It is also possible, since access to the testing control network was blocked, that an aspect of temporal network interference caused this result, however, a look at few other websites, with similar results of change during the same period on the same network provides confidence in the policy change postulation.

The delicates.co.uk, a website that sells lingerie, and categorised as provocative in the OONI global test list, showed no anomalies consistently on three tests before 26 June 2017, and anomalies afterwards, showing another proof for policy change over time between the last two tests conducted on 13 May 2017 and 26 June 2017. During that same period, results for centcom.mil, the website of the US Central Command, categorised as official website in the OONI global list, changed from no anomalies in tests conducted until 13 February 2017 to anomalies in tests conducted on 19 May 2017 on Zain network. The third website from a third category showed also similar result change during May 2017, carnivalcasino.com, a gambling site, had test results changing from no anomaly to anomaly between 11 April and 8 May 2017. Similar symptoms were also measured on other networks, as in Batelco's change of results for cartercenter.org, a Human Rights website according to OONI global list, from an anomaly in February 2017, to no anomaly in three tests conducted afterwards. These examples serve as a proof for policy change over time, suggesting active monitoring, and updating of blocking lists, a feature consistent with large scale filtering systems.

An investigation conducted by Citizen Lab at the University of Toronto to discover hosts and fingerprints using Internet filtering systems manufactured by Netsweeper, Inc., the Canadian company, determined the existence of Netsweeper products within networks in Bahrain. The method used by these systems include injecting a frame in the response page when requesting a blocked website, confirming blocking of 88 URLs in four categories, Pornography, Gambling, Circumvention Tools, and News websites, all of the URLs confirmed were tested in the networked measurements discussed earlier in this section and resulting in anomalies with high confidence of blocking. This investigation also confirmed the method of blocking by injecting frames using Netsweeper technology to confirm blocking.

Network measurements conducted in Bahrain clearly show the existence of network fettering in Bahrain, with the most apparent method as URL blocking, as evident from the tests with website access anomalies. Access to the control network necessary to verify the measurements was blocked in itself, resulting in blocking confirmed solely through the OONI method, however, combining the OONI results with direct testing through contacts in Bahrain, confirmed blocking of websites tested, allowing for usage of anomaly results of OONI as blocking. The websites blocked spanned across the majority of categories tested, but the intensity of locking varied hugely among categories, with most of Gambling and Pornography websites tested blocked, and websites related to circumvention of access and free access to news and information strong as well. The results also advised the dynamicity of blocking across time and variation between networks, which imply that there is no one central filtering system covering all networks, but somewhat different setups in different networks.

4.2.4 Reported Internet limitations

Bahrain's history in communication controls from telephone and correspondence monitoring to protecting the regime and ruling family, and the fitting of these practices to cover modern communication technologies to serve the same goals, placing the small kingdom in the Middle East as an example country when it comes to communication and Internet monitoring and control. Several organisations covered these practices in their reporting on Internet freedoms in the world, and other organisations dedication most of their efforts on Bahrain to study human rights, including Internet limitations. These reports provided an important resource to support this research as a complementary source of information that covers a timeline extending from early 2005 until recent days, with details allowing a conclusion on the evolution of technologies used and practices.

Website blocking in Bahrain has existed since the early 2000s. The issuing of legislative decree no. 48 of 2002 promulgating the telecommunications law restricted coverage of sensitive subjects and placed the legal basis for the prosecution of journalists and activists for allegedly defaming government officials, insulting the king, or inciting hatred against the government with minimum jail time of six months(BahrainTRA, 2002). In the same year, there were several websites blocked by the then sole telecommunication provider, Bahrain Telecommunication Company, sparking public action and a small demonstration in May 2002 outside of the telecommunication company, to protest governmental censorship on the Internet (BBC, 2002). As we will see later in the interview instrument discussion, Interviewee B3 participated in that demonstration and

reflected on it in their interviewee for this research. The reflection included how the mere act of participation in such demonstration placed them on a watch list that they could never get out of that affected the course of their life, giving additional context to the effect such demonstrations have in that country.

The blocking and activism against it came shortly following the height of political reforms that promised citizens with high respect for human rights and ending the notorious history of the 1990s political oppression. The blocking also came a few months before the first parliamentary elections in 27 years, which ran in October of 2002 (BBC, 2005). The promises for reform placed Bahrain as the new hope for democracy in the region. Nonetheless, website blocking served as an example for limiting freedom of expression and access to information. The timing of the blocking contributed to it receiving international media coverage and prompted researchers and organisations to consider studying the case of Bahrain when it comes to measurement of Internet limitations.

One of the earliest efforts to scientifically measure and document Internet limitations in Bahrain was OpenNet Initiative testing for blocked websites in 2004 and 2005, with the results published in March 2005. The tests covered 6,000 sites susceptible to blocking found a small number of eight websites that are actively blocked (Palfrey *et al.*, 2005). Five of the reportedly blocked websites covered politics and religious subjects, while the other three were pornographic websites in nature. These finding does not necessarily mean that these websites were the only ones blocked because of the composition of the test pool. The large pool of websites susceptible to blocking included a world-wide list of websites that may not be relevant to the case of Bahrain and 4566 sites collected through searching online for terms that may be relevant, increasing the size of the pool, but not necessarily making it extensive.

Nonetheless, the findings confirm that despite the cover of protecting virtue and blocking pornographic content as the drive behind website blocking, blocked websites proved to be not only related to pornography, but serve political goals as well, a finding that was mentioned in interviews conducted on Bahrain, particularly B1, B3, and B4. The report also concluded that the blocking efforts have eased from previous years, with websites that faced blocking in 2002, are now accessible. Since blocking measurement concluded that a small number of websites were blocked and that other websites offering content similar in type to the few that were blocked were still accessible, the report

concluded that blocking was more of symbolic in nature than it is actually prohibitive. However, no matter what the number of blocked websites, the practice of blocking itself based on political position is a pretext for further practices against freedom of expression and produces a chilling effect on online political participation by aggrandising self-censorship.

The report detailed technologies behind the blocking as a simple form of blocking based on address, or URL, and in limited cases covers the IP address of the server as well. The telecommunications provider would return a page detailing that the website the person is trying to access is blocked. The fact that although there were eight ISP active in Bahrain at the time, they all had to go through a single primary ISP, made the blocking easier to control technically. An exciting aspect of this report was that, similar to what most other tests do, relied on a response of a site-blocked page or an HTTP error code 403/Forbidden to determine the status of availability of the website while comparing with access from external networks.

This method, although technically sound, opens the door for possible false negatives, where a website is blocked but the blocking system is not acting transparently, returning an error similar to "Page not Found" rather than the standard site-blocked page. It is worth mentioning here that although error 403 mentioned here should return in theory form the website itself saying that the user does not have right to access that content, many blocking systems use it to give the impression that blocking is coming from the website operators rather than the blocking body.

OpenNet Initiative continued testing for Internet limitations in Bahrain as part of their efforts, and issued a report covering 2006-2007, as a follow up for the first report. This report also concluded that Internet filtering and blocking is limited in coverage, especially when compared to other countries in the region, but increased in topics subject to filtering to include in addition to pornography, political, and religious content, topics of LGBTQ discussions and websites that offer proxies and anonymizing servers. The report also mentions that some websites and services can be blocked temporarily or for extended periods.

One of the services that were blocked temporarily was Google Earth, which was blocked for three days in August 2006 (ONI, 2007a) following what seems to be spread of a document that includes images taken from Google Earth showing the variance in land ownership between the ruling family and the public. Another example of the

inconsistency and temporality of blocking is the discrepancy pointed by this ONI report with a similar report covering the same period by *Reporters Without Borders* (RSF), which listed two websites as blocked, while ONI testing could not find evidence on that. The websites, *Bahrain Center for Human Rights*, www.bahrainrights.org and the popular blog instrumental in a local political scandal known as *BandarGate*, www.mahmood.tv, were both highly critical of the regime. Either this can point to flaws in the testing methodologies of either organisation or that the blocking itself was dynamic in either coverage or time, the second is more likely given the nature of the websites in question.

In terms of intensity, the ONI report of 2006-2007 does not reflect any differences in methods of Internet filtering, but points out that some websites received higher attention from the regime resulting in the blocking of not only their server IP addresses in addition to the standard blocking of the URL, as in the case of bahraintimes.org and bahrainonline.org. Another essential notice this report mention is that blocking is not always transparent in Bahrain, in that some of the blocked websites would return a "Page not Found" error message rather than a standard site-blocked page. This confirms that the analysis that the 2005 report may not have been extensive because it relied on the assumption that blocking was transparent, expecting a site-blocked response to confirm blocking.

In its last report on Bahrain, ONI's *Internet Filtering in Bahrain* of 2009 confirmed the lack of transparency in the blocking method, especially with filtering and blocking of political content and websites (ONI, 2009). In terms of surveillance, the 2009 report reflected the interest of Bahraini government to tighten its control on online activity, including establishing a special unit at the Ministry of Culture and Information to monitor websites for possible blocking. The report also cited Bahraini official sources on monitoring of circumvention techniques in addition to websites, as well as reports indicating government interest monitoring the press and Internet content through a special commission (2009, p. 4).

In its 2006-2007 and 2009 reports, ONI used a scale to present their findings at a glance that looked at four categories of filtering, Political, Social, Conflict/Security, and Internet Tools, with ranking of level of filtering from no evidence of filtering, to suspected, selective, substantial, and pervasive levels of filtering (ONI, 2007a, 2009). The level of Political filtering has increased from substantial to pervasive, while social moved two levels from selective to pervasive as well, Conflict/Security related filtering moved

from no evidence to selective level of filtering, and filtering of Internet tools have gone up from selective to substantial (ONI, 2009, p. 1). These results show a general increase in levels of filtering and limitations applied to the Internet in all categories, indicating increased efforts and possibly investments, as we will see later, in Internet control technologies.

The report and the network testing conducted by ONI confirmed the continuity of blocking practices in Bahrain, but on a limited scale that targeted a small number of websites up until the end of 2008. 2009 began with the ministerial decree number 1/2009, demanding ISPs to implement unified blocking systems and to adhere to blocking orders by the Ministry of Culture and Information (Ministry of Information and Culture, 2009), coming into action. This yet again iterated the level interest of the government to control Internet access and use not only through the leading and incumbent telecommunication provider, Batelco but also over all the networks of the country. It is providing a sign for transformation from sporadic blocking and Internet controls, to a more pervasive and consistent approach, covering not only Internet access but also circumvention tools as well.

ONI stopped issuing special country reports for Bahrain after extensive testing and studying between 2002 and 2009. This was part of the phasing out of the ONI project, which officially ended in 2014 (ONI, 2014). The events at the evident beginnings of Internet controls in Bahrain of 2002 attracted another organisation towards covering the blocking and arrests in the small island but from the perspective of freedom of information and freedoms of the press. Reporters without Borders, RSF, issued several reports and press releases on the status of freedom of information and access in Bahrain, including Internet blocking and monitoring, as well as statements directed at the Bahraini government to protest Internet controls and resulting offences against journalists and websites.

In 2002, when Bahrain was looked at as one of the quickly rising countries in terms of telecommunication availability in the Middle East, RSF protested about blocking of several websites to the Bahraini government and “urged it to cancel the measure to restore the country's good image” (RSF, 2002). The websites in question included websites related to a human rights organisation, opposition political party, and an online newspaper, showing again how selective the blocking was at that time, and exposing the

motivation behind as an apparent effort to control information to maintain power asymmetry to the benefit of the state.

Between 2002 and 2005, RSF reporting on Bahrain was focused mainly on press freedoms, to get back to covering online information controls from 2005, with the intensification of arrests of bloggers and online activists. One of the cases reported was the arrest of three moderators of the online form Bahrainonline.org in February 2005, to be released two weeks after being interrogated for charges that included "Defaming the King" (RSF, 2005c). In a statement following Ukrainian government rescindment of the decree requiring online publications to register with it, RSF cited Bahrain as one of the few countries in the world that had similar laws of online publications registration (RSF, 2005a). this practice, according to another RSF statement, started in April 2004 but was suspended for online publications, including fora and blogs, but not for books, following "loud protests" (RSF, 2005b). It is nonetheless worth mentioning that this law was referred to in RSF and ONI publications, but it is not listed in the database of Bahrain laws and regulations available at legalaffairs.gov.bh. These activities, among others, reflect a move from direct blocking of websites, to the threat of action and intimidation of online activists to develop a culture of self-censorship.

The move towards threat of action and intimidation did not mean stopping of actual blocking, as the Bahraini authorities blocked access to websites that published information on the political scandal tagged as *Bandargate* and involved high-level politicians and people close to the regime, as RSF reported on October 2006 (RSF, 2006), one month before the legislative elections. The websites related to this scandal and other websites that were blocked in the same period were mentioned in an open letter from RSF to the king of Bahrain in January 2007 (RSF, 2007). The letter condemned the increase in censorship of online content and publications, and the requirement of websites dealing with Bahrain to register with Ministry of Culture and Information, which they described as hard to apply, and indicating "a desire to place inappropriate controls on the Internet" (RSF, 2007).

Over a year later, Bahraini government studied amendments to its press law to allow for more freedom of expression, however, despite the improvements, RSF pinpointed to some failings in the amendments that would keep the threat of jail for journalists and officials the power to block websites (RSF, 2008). The press law, which was relied on at in most cases of blocking, had improvements suggested that would

abolish most of the prison sentences, but kept some, meaning that it can still be used to imprison people based on actions related to information sharing, including over the Internet. By the time RSF issued the statement that hailed the suggestions with reservations, at least 24 websites were blocked, including websites that were deemed of "sectarian nature" (RSF, 2008).

The move towards easing the laws, while maintaining effective control and blocking practices, shows that the Bahraini government wanted to maintain appearances of openness in the face of international community, including RSF, which listed Bahrain as a country to be watched for its violations in its first Online Free Expression Day earlier in 2008 (RSF, 2016). Later reports on blocking of human rights websites following the Ministry of Culture and Information orders explicitly mentioned press law 47/2002 as the base and justification for blocking (RSF, 2009). This statement of January 2009 did not only cover website blocking but also stated that proxy websites that can be used to gain access to blocked content had been blocked since 14th of the same month (RSF, 2009).

By 2010, RSF concluded that information control and arrests based on opinion and activism in Bahrain is systematic, issuing statements shedding light on some of the cases, and outlining latest practices. One of the new practices that RSF outlined was banning the use of Blackberry chat application, which was Bahrainis used to share local news through groups, including information on traffic, cultural exhibits, and religious content, one of the groups including 11,000 subscribers. A government official justified the ban as a needed measure to manage chaos and confusion caused by news sent through these applications (RSF, 2010b).

Another statement from September 2010 identified the blocking of dozens of websites categorised as political, religious, and free speech websites, and the arrest of 23 people with the pretext of combating terrorism, and accusations of conspiring and inciting sabotage against the monarchy (RSF, 2010a). A specific case they mentioned in this report was BahrainOnline.org, which is an online forum that has been blocked in Bahrain for years as previously mentioned but still received 100,000 visitors per day, the chief editor of the forum was arrested with accusations of disseminating false information (RSF, 2010a). In an interview for this research, one of the key people behind this forum stated that they used to distribute scripts that when people click on, would direct them to the website through proxy servers, this shows that some people would use circumvention tools with no need for prior digital skills specific to using proxies.

After issuing public statements, and letter to government of Bahrain about the state of blocking access to information and freedom of press, RSF used the occasion of a visit from the then U.S. Secretary of State, Hillary Clinton, to send a statement voicing their grave concerns on the situation in Bahrain from violations to freedom of expression and human rights and hoping that Mrs Clinton would defend these principles with the Bahraini authorities. The letter included valuable details on the status of website blocking, including a campaign launched in 2009 against online pornography and a radical content filtering policy that affected "all content of a political or religious nature regarded as obscene or damaging to the royal family's dignity" (RSF, 2010c) and a new practice of blocking access to specific Facebook pages.

The practice of blocking access to specific pages on social networking services, which is not technically easy to implement mainly when people use Secure Hypertext Transfer Protocol (HTTPS), was apparently replaced by taking down pages on social networking services. The change in practice was referred to in a statement by RSF published in June 2011, citing the taking over of Facebook and Twitter pages of a primary news source on human rights violation in Bahrain, Rasad News (RSF, 2011b). This came along with blocking access to whole platforms, as in the group chat service *PalTalk*, and several websites that provided anti-government news in a widespread crackdown (RSF, 2011b).

This crackdown came within the height of demonstrations that began early 2011, and continued in different capacities to date, following the wave of revolutions in the Arab world, the Arab Spring, that started in Tunisia and moved to Egypt and other countries. One of the first large scale demonstration in Bahrain was in solidarity with Egyptian revolutionists, and took place in front of the Egyptian Embassy on the 4th of February 2011 (Malas, Hafidh and Millman, 2011), followed by a series of demonstrations against the Bahraini government starting with a "Day of Revenge" on 14th of the same month (Reuters, 2011). The demonstrations in Bahrain were the largest of the Arab world relative to the size of the population (Zunes, 2013). The demonstrations were faced with a ruthless and uncompromising stance from the Bahraini government since, with measures that have affected Internet access as well, the crackdown virtually eliminated all opposition over time, according to Human Rights Watch World Report of

2019 (HRW, 2019). RSF responded to the events of 2011 by issuing 74 statements[7] related to Bahrain that year, showing a hike in arrests of journalists, bloggers, and netizens, and in blocking of websites and Internet controls. The reports also exposed international companies that help oppressive regimes in Internet controls, including Bahrain (RSF, 2011a). RSF ended the year 2011 with placing Bahrain in its list of the ten most dangerous places for journalists, citing systematic repression, the jailing of bloggers, and censorship as some of the reasons for the designation, which did cost a newspaper executive and a netizen their lives(RSF, 2011c).

The demonstrations and the way the Bahraini government dealt with it brought attention of several organisations to the situation of Internet freedoms limitations in the country, in addition to ONI and RSF, including Freedom House, Harvard's Berkman Klein Center for Internet & Society, and IFEX network, as well as establishment of dedicated organisations to cover the situation in Bahrain. One of the acclaimed efforts is *Bahrain Watch*, a collective of academics and activists focusing on researching issues in Bahrain related to digital security, media and information control, economic corruption, and arms control[8]. Bahrain Watch issued reports on the status of telecommunication in Bahrain, technologies and measures used, and on governments and companies that are complicit in providing monitoring and control technologies, documenting the changes they observed in terms of practices and technology used, as we will see next.

A substantive reporting source on the status of Internet freedoms in Bahrain came from FreedomHouse, who was part of the annual Freedom on the Net reports since 2011. The initial Internet freedom status of Bahrain according to the 2011 report was Not Free, scoring 62 on a scale from 0 to 100, with 0 meaning no obstacles at all, and 100 for totally closed access (Freedom House, 2009), the score is based on scoring in three categories, Obstacles to Access, Limits on Content, and Violations of User Rights. Bahrain scoring was consistent with the limitations found on the Internet networks in Bahrain so far, with violations of content as the main problem of Internet access, followed by limitations on content, and finally, obstacles to access.

[7] Reports collected from RSF website through searching for the keyword Bahrain in 2011: https://rsf.org/en/rsf_search?key=bahrain&y=2011

[8] Details on BahrainWatch from their website: https://bahrainwatch.org/about.php

Scoring for Internet freedoms in Bahrain jumped to 71 in the year after, with a significant increase in the measures that constitute violations of user rights (Freedom House, 2012b). Bahrain maintained a score fluctuating between 71 and 74 over the years until 2018, With the worst year being 2014 with a score of 74 (Freedom House, 2009, 2012b, 2013, 2014, 2015, 2016, 2017, 2018). The reports included details that supported earlier conclusions of the Internet being widely available and affordable, but at the same time, facing high limitations in the form of direct limitations on content through blocking of websites and services, and high indirect limitations in the form of violations of user rights.

The consistency in the reports from various sources suggests that the bleak picture it draws of Internet freedoms in Bahrain is a good representation of the reality, with consistent efforts since the early 2000s to curb Internet usage in relation to freedoms of access and expression, especially with dissidents. Bahrain has been working relentlessly by introducing new technologies for limitations, limiting access to anonymization and circumvention tools, and through measures of surveillance, and targeting dissidents with spear attacks.

Methods Used for Testing and Reporting

The reports above mention used different methodologies to collect and analyse the data they based their conclusions on, including actual network testing, to reported observations. OpenNet Initiative (ONI) has studied Internet controls in Bahrain through collecting network measurements by testing access ability to websites and services on the networks in Bahrain comparing it with access testing results from control environment with no access limitations. This method is similar to the network testing methodology adopted in this research. The difference between ONI testing and the network measurement done through this research is that ONI relied on proxy servers in Bahrain provided through contacts, rather than through standalone probes or mobile applications, as with OONI testing utilised here. The researchers of ONI would connect to the machines in Bahrain using remote desktop applications, and attempt to access a prepared list of websites that may be blocked, and compare the results with access attempts from locations with no known filtering. Later on, the results were validated through volunteers, as well as through a specific method used for Bahrain, which relied on direct testing of five Batelco servers to test for consistency (Palfrey *et al.*, 2005). This method was detailed in their 2004-2005 report and was consistent with the methods in their later reports (ONI, 2007a, 2009).

RSF on the other hand, do not detail how they collect their data, but the reports and statements give the impression that information on websites blocked is collected through news from owners or operators of these websites and journalists on the ground. This method provides the ability for a deeper understanding of individual blocking cases as they happen, including measures that accompany the blocking of a website or a blog, as in summoning or arresting of website administrators or editors, and a more accurate timeline for websites that were blocked temporarily. Nonetheless, this method is prone to underreporting of the number of websites blocked, and may not cover international websites blocked, but the critical weakness this method has lies in the verifiability of blocking reporting, affecting the trust in results. However, when crossing the reports of RSF with the more scientific, and thus reliable, method of ONI, we can find that they have many similarities, except for the few discrepancies mentioned before of the cases of www.bahrainrights.org and www.mahmood.tv, which leads to increased trust in RSF reporting, and at the same time, in ONI testing.

The reliance on local sources is also the base for FreedomHouse Freedom on the Net annual reports, which rely on at having at least one researcher in the country of study, who are usually Internet freedom experts. The local researchers' job is to document Internet freedom developments and assess it based on common Freedom on the Net methodology to suggest a change in results of the country score. The change suggestions are then assessed and verified by FreedomHouse staff before being included in their annual report. The results are reported based on scoring weights for categories of obstacles to access, limits on content, and violations of user rights, effectively covering a different aspect of artificial Internet limitations.

The results of RSF and FreedomHouse cannot be considered academically valid, as they do not have academic rigour in terms of validation, which is available in the methods of ONI testing and reporting. Nonetheless, these sources provide a good indicator of the status from direct sources. Most importantly, these sources provide reports of all countries included in this research, enabling direct comparison on coverage and results among different reports and sources over the years, allowing for the dimension of time to be considered when looking at and comparing artificial Internet limitations.

Technologies Reported

Reports published over the years on Internet limitations in Bahrain showed a definite increase in the interest in higher control by the government on information

exchange online. The increase in interest is evident in the increase in investment in blocking and monitoring technologies to increase its effectiveness and coverage. First reports on website blocking from ONI in 2004-2005 conclude that although Internet filtering was not a focus of the Bahraini government nor a significant obstruction to Bahrainis to use the Internet (ONI, 2005a). Nonetheless, the report also states that the Internet infrastructure of a single primary ISP, Batelco, and a state-mandated Internet Exchange Point (IXP) (2005a, p. 3), provided centralisation of access that allows for easy and fast implementation of Internet controls.

Nonetheless, the same report mentions indications of simple domain name or Uniform Resource Locator (URL) based filtering, which is done through listing a predefined set of domain names and route all requests of these domains at the Domain Name Server to serve an access-blocked page, or respond that the domain name requested is not available in an error message. The error message is a response indicating a non-transparent blocking, which does not explicitly tell the user that the website they are trying to access is blocked, but rather imply that there is an error with the address or the server. This method is the simplest of blocking methods, and as apparent from ONI's testing, is easily circumvented, as in one case the domain name www.playboy.com is blocked, but if the user tried to access playboy.com, they would be able to bypass the blocking (2005a, p. 11). Another possible circumvention method would be to change the Domain Name Server that the user is using, from the one provided by the network they are connected to one that is not controlled by Bahraini government or companies, or simply, they can try accessing using the IP address instead of the domain name.

ONI's report of 2006-2007 does not indicate any change in the infrastructure or blocking technology used, conducting its tests on Batelco network to conclude that testing has increased in coverage, with more websites blocked from different categories, and blocking of some website IP addresses in addition to their domain names. Nonetheless, despite these advancements, the technology behind filtering did not seem to have changed, and it kept returning error messages when people tried to access services that are blocked.

Following the ministerial creed number 1/2009, which reinstated ministerial powers to require ISPs to block websites, in addition to default blocking of websites that violate public morals through implementing an official and unified filtering system, ONI reports a change in the blocking behaviour, indicating that ISPs have started using a

commercial filtering system. ONI testing did not specify the commercial system used, but its effect was apparent in the spike of the number of websites blocked, and the consistency of the blocking across different ISPs. The creed also required ISPs to blocking circumvention tools, making it harder for people to access blocked content, and more effectively limit their access to information. However, ONI states that the blocking was still not fully transparent.

On the surveillance front, the year 2009 also witnessed the institutionalisation of access to telecommunication infrastructure usage information (BahrainTRA, 2009), allowing authorities to monitor how is accessing what, and who is communicating with who, however, verification of actual technology used or whether this was implemented is not available.

One of the first reported technologies used for automated filtration in Bahrain was mentioned in a report on the use of western technology by Middle East censors published by ONI in 2011 (Noman and York, 2011). The report included Bahrain as one of the countries that use the American-made *SmartFilter*, developed by Secure Computing Company, acquired by Intel and then McAfee. This solution relied on centralised lists of websites in a multitude of categories, ISPs would select what categories to block, for example pornography, nudity, extreme, tobacco, information security, to block websites that are classified by the company under any of these categories, blocking changes whenever a website is added or removed from a blocked category. ISPs could also add their own lists of blocked websites, which allows blocking of websites that the censor requires to be blocked.

In addition to the blocking technology, Bahraini government resorted to other methods in an effort to identify account holders of social media and website users that try to conceal their identity and protect themselves from possible prosecution based on their online activity, especially people that are highly critical of the government. A method that BahrainWatch reported that Bahrain's government used since at least 2011 to identify specific users, was to send malicious links to those users. When the user clicks on that link information on the machine the user is accessing from, such as IP address and type of browser and operating system, is logged and may be used to identify the real identity of the user, BahrainWatch dubbed this method as *IPSpy* (BahrainWatch, 2013b). The report also named Ministry of Interior's Cyber Crime Unit as the body managing and conducting these phishing and social engineering attacks.

During the interviews, interviewees B1 and B3 mentioned the IPSpy method, elaborating that it is common knowledge in Bahrain that people should be very cautious with links they receive and do not open any website they do not know and trust. They had also stated that this is possibly one of the reasons many people did not trust the research survey, link except when they received it through people they know. This method created an environment of mistrust, especially that the government would send the malicious phishing links through various media, from emails to social media platforms, and chatting applications. The technology used behind this is *freely available IP Spy services* as described by BahrainWatch (BahrainWatch, 2013b).

Use of western technology to support oppression was one of the reasons for practices in Bahrain gained attention, including the use of technology platforms to monitor electronic communications and using it against dissidents. In this regard, Bloomberg published an article in 2011 on spy gear that Bahrain bought from by Siemens AG and maintained by the German company Trovicor GmBH, a Nokia Siemens Networks divested unit (Silver & Elgin, 2011). The gear provided the ability to record transcripts of calls and SMS sent by targeted individuals and groups, which was crucial in assisting the Bahraini authorities to pre-empt demonstrations and collect evidence used against activists.

The article also mentioned *Monitoring Centres*, set of gear used to facilitate electronic surveillance, to be sold by other companies to regimes in the Gulf by companies like the Israeli Nice Systems Ltd, and the American Verint Systems Inc., without clearly indicating if these were also used in Bahrain. As we have learned earlier, the Lawful Access directive issued by Bahrain TRA in 2009 facilitated the use of this equipment, by requiring telecommunication providers to allow access to law enforcement forces to communication and user data.

Another advanced technology that was found to be in use by Bahraini authorities was the FinFisher suite, a set of tools marketed as a governmental intrusion and remote monitoring solution by the German company FinFisher GmbH, and distributed by Gamma International UK Ltd (Marquis-Boire and Marczak, 2012; Cox, 2014a, 2014b). The FinFisher Suite allows targeting of individuals and groups through providing an environment that allows exploitation of vulnerabilities in technology and deployment of malicious code, and later assists in what they call tactical intelligence gathering from specific targets and devices, and strategic intelligence gathering from wide-scale

interception and monitoring[9]. The use of this spyware by Bahraini authorities was unfolded in 2012 after research by Citizen Lab, that analysed leaked promotional material on the tool and several pieces of malicious code sent to Bahraini activists. Citizen Lab concluded that the code indicates that the control servers of this code point to IP addresses owned by Batelco, the Bahraini telecommunication company (Marquis-Boire and Marczak, 2012).

Later on, and following another leak of information related to FinFisher's company in 2014, Privacy International and Bahrain Watch analysed the information and reported that among the countries that have been actively using FinFisher spyware to attack activists was Bahrain. Privacy International focused on the fact that some of the targeted people were living in the UK after fleeing Bahrain, making this a case of possible international espionage, and lodging a criminal complaint with the National Cyber Crime Unit at Scotland Yard (PrivacyInternational, 2014). Bahrain Watch analysis of the leaked information found that at least 77 computers where hacked using FinFisher tools between 2010 and 2012. Most of these computers were for known human rights lawyers, journalists, exiled activists, and Bahrain's largest opposition party, Al-Wefaq, Bahrain Watch suggested that since FinFisher is sold solely to governments, the Bahraini government is probably the one that is operating these instances (BahrainWatch, 2013a).

The year 2016 came with a plethora of reports on Internet control and surveillance technology being used in Bahrain, especially after awarding a USD$1.2 million contract for a national website filtering solution February that year (IFEX, 2016). The Canadian company Netsweeper provides the solution in question, and it was not long until network testing in Bahrain conducted by Citizen Lab, the interdisciplinary laboratory based at the Munk School of Global Affairs at the University of Toronto, verified the use of Netsweeper technology was present on several ISP networks in May and July 2016 (CitizenLab, 2016). Citizen Lab concluded that although the Netsweeper technology in itself is simple, it is effective, and can be used in building what they called Great Firewall in Bahrain. Netsweeper devices detect requests to blocked content and websites, and send a response to the user that the page requested is blocked, thus providing a more

[9] As described in solutions section of FinFisher official website https://finfisher.com/FinFisher/index.html

transparent blocking method, but it can also be used to serve malware by injecting malicious code in web page response.

Besides the implementation of advanced filtering and blocking solutions, the Bahraini government was found in 2016 to be using Pegasus, a suite that allows for remote monitoring and control of mobile devices, developed by the Israeli NSO (BahrainWatch, 2016). This finding instigated a two-year investigation by Citizen Lab to scan the Internet for servers that match the fingerprints of Pegasus, and found that it was used in at least 45 countries. Bahrain was as one of the six countries with *significant* use of the tool, with political theme arising from the names of the machines and targets discovered, defying the claim that these tools are designed only to protect against terrorism group (Marczak *et al.*, 2018).

For access to user devices, reports found that the Bahraini government is using specialised equipment, including the Israeli forensics product Cellebrite, to breach mobile devices, in some cases bypassing PIN codes or passwords, to retrieve data including chat logs, texts, and other information stored on the device (Biddle and Desmukh, 2016). This practice is evidence that the Bahraini government did not only rely on remote monitoring and surveillance technology but also relied on technologies that are capable of accessing devices even when secured communication and circumvention tools are used.

Surveillance and monitoring of people's activity have also extended to the streets, with investigations by Bahrain Watch revealing that two companies have provided Bahrain's Ministry of Interior with systems to facilitate facial recognition that can be used to identify protestors (BahrainWatch, 2014). The systems, supplied by Pelco and iOmniscient, included installation of no less than 2000 new cameras, and computer equipment to conduct the facial recognition.

Nonetheless, all the technologies listed above does not seem to have provided Bahraini authorities with the satisfaction of feeling in control and resorted to the radical measurement of shutting down Internet access for whole regions. Between 23 June 2016 and 30 July 2017, people in the Duraz village had their access through both fixed lines and mobile data on all mobile operators cut off daily between 7 pm and 1 am (BahrainWatch, 2017b). The pattern and breadth of disruption made Bahrain Watch conclude that it is probably the result of a Service Restriction Order (SRO) from the Bahrain Government (BahrainWatch, 2017a). This shutdown demonstrates how far is the Bahraini government willing to go to control communication and access to information,

making Bahrain on of the six countries in the world that shut down the Internet in all or parts of the country in 2016 (Zittrain *et al.*, 2017).

4.2.5 Key findings

After promises for reforms since the end of the 1990s and an eye on investment promotion, the Bahraini government worked along with the private sector to establish a healthy telecommunication market environment, resulting in high availability and adoption of Internet access and services. However, a parallel realisation of the effect the open Internet access has on freedom of expression, particularly political motivated the government to extend its 1990s practices of monitoring and surveillance to Internet activity and imposing controls on access, with a series of bodies established to control online activity, and laws, regulation, and creeds issued. This disconnection between the motivation to increase Internet adoption and at the same time maintaining control of its uses was apparent in the efforts for digital inclusion and e-participation and left the e-participation a tool to spread the illusion of participation, especially after the short political instabilities of the early 2000s.

Network measurements for Internet limitations showed the existence of active measures set on the networks operating in Bahrain to limit access to specific websites and services. The limitations of access tested through probing networks faced a significant setback, as the control network for the measurements was blocked itself, forcing the reliance on anomaly analysis, which required further effort to analyse specific cases and previewing of response in the cases of transparent blocking. The tests showed that at least 187 website tested showed anomalies consistent with blocking over almost all of the categories tested, with almost blanket blocking on gambling and pornography categories, and high focus on anonymization and circumvention tools, and a more selective blocking on websites falling under the religion, news media, human rights issues, LGBT, and communication tools categories. The tests also reflected inconsistency among networks in what is blocked and for how long it is blocked, suggesting that the centralised blocking is not implemented yet, and it is conducted following orders of the government to ISPs.

Reports on Bahrain confirmed the findings of the network measurements of access limitations, providing information on the technicalities behind them that is also compliant with the findings of the network measurements in that blocking is highly reliant on classical DNS blocking of URLs. The reports also pointed out monitoring through the lawful access requirements of telecommunication providers, and targeted surveillance

through digital espionage tools, as with the cases of FinFisher and iSPY. The timeline of blocking as advised by analysing reports and studies on Bahrain reflect changes over time in accordance to political instability, for instance, there was an increase in levels of filtering and limitations applied to the Internet in all categories between 2007 and 2009, following demonstrations. The limitations moved over time to a more pervasive and consistent approach, covering not only Internet access but also circumvention tools as well, and in some cases, full Internet shutdowns.

This section provided evidence supporting the conclusion that in Bahrain, The stronghold on Internet access is achieved through technical limitations, as well as an environment of fear of repercussions of online expression and digital activisms, leading in several cases to prosecution and criminal charges, developing high levels of self-censorship. The limitations did also include targeted attacks on dissidents in attempts to identify them and put them under surveillance, even when they are outside of Bahrain.

4.3 Estonia

Estonia regained its independence in 1991 with the dissolution of the Soviet Union (USSR) and went through a transition process affecting most aspects of life, and not stopping at media and telecommunication. The attitude towards communication technologies in general under the USSR was driven by surveillance and maintenance of control, which affected how telephony and media policies are formulated, gearing them towards keeping the sector underdeveloped and under control (Vartanova, 2004). The results of telephony and media policies under the USSR could be seen in the concentration of access to media with what was known as the *Nomenklatura or Nomenclature*, or the ruling elite, necessarily creating an informational divide between the ruling class and citizens of the union. On the other hand, technologies related to digitisation were seen as scientific developments, and unlike communication technologies, not a political threat, allowing some development in the sector, and allowing connectivity with other countries, although still limited then (Vartanova, 2004).

The attitude towards communication technology diverged after Estonia's independence, with the efforts to re-establish the country looked at technology as a tool to guide the transition, resulting in the launching of initiatives to connect with citizens, and developing the democratic system. A key strategy set then in Estonia was the 1998 "Principles of Estonian Information Policy", outlining regulations related to the information society. The principles lead to Information Policy Action Plan that included actions items for modernisation of legislation, supporting the development of the private

sector, shaping the interaction between the state and Estonian citizens, and raising awareness of problems concerning the information society (*Principles of Estonian Information Policy*, 2015).

Estonia maintained open and free Internet access locally, with no monitoring or surveillance to be mentioned (Freedom House, 2018). Nonetheless, on the international arena, Estonia was among nine EU countries to issue a working paper to support looser controls on spy software exports, a step backwards for the fight to control surveillance technology, the working paper lessens controls on surveillance software exporters to maintain the competitiveness of EU-based industry (RSF, 2018).

4.3.1 History of Internet and Market Structure in Estonia

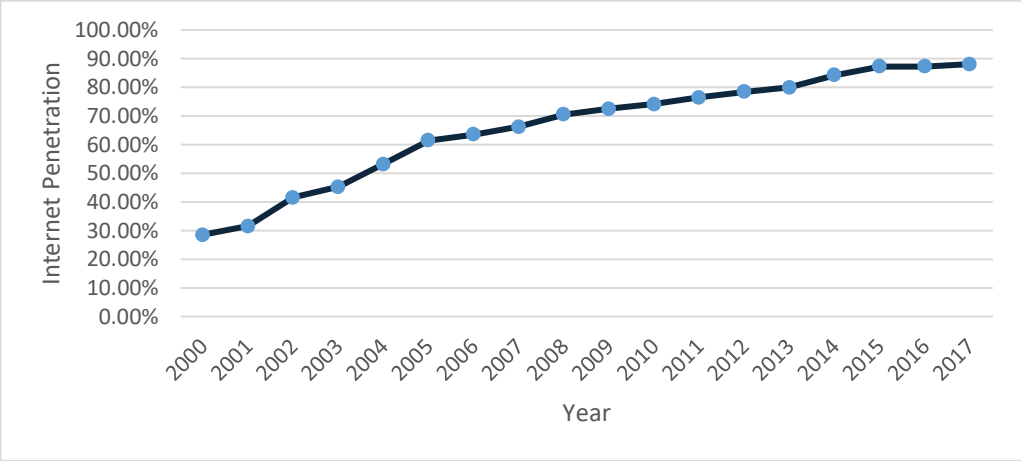
With the dissolution of USSR in 1991, only 21% of Estonians had phone lines, but with strong believe in communication technology as an enabler for state-building, the government set to reach and connect people all over the country, starting with the *Tiger's Leap* plan in 1996 and introduction of Public Internet Access Points (PIAP) from 1998. Tiger's Leap was a programme aimed at providing ICT infrastructure to schools, support content creation, and support ICT-related skill development in Estonia (Runnel, Pruulmann-Vengerfeldt and Reinsalu, 2009). PIAP at the same time aimed at providing public locations with free access to computers connected to the Internet, introduced with the support of United Nations Development Program (UNDP, 2015), and later Open Estonia Foundation, the PIAPs started to spread around Estonia, from main cities, expanding to reach small towns and rural areas. The success of Tiger's Leap encouraged the launch of a follow up program, Tiger Leap II between 1999 and 2000, as a massive technological reformation of the Estonian government, to move towards a paperless cabinet with reliance in teleconference and other technologies in the cabinet's work.

Another initiative aimed at providing access to the public was the grassroots initiative Wifi.ee, a group of technology activists with social agenda to increase Internet access and availability through setting up wireless access points all around Estonia. The initiative collaborated with businesses like cafés, hotels, and the like to provide free WiFi access to the Internet, growing from around 80 access points in January 2003, to over 1100 in 2008 (Saarenmaa and Suominen, 2004; Kallio, 2008). The project, nonetheless, seems to have ceased, with the last appearance of its website Wifi.ee dating to December 2018.

In terms of commercial Internet Service Providers, the small state is home for six mobile operators, and over 200 operators offering communication services, including numerous Internet Service Providers, all of whom are required to register with the independent telecom regulator, and the Estonian Technical Surveillance Authority (Freedom House, 2012b, 2018). The plethora of communication providers and governmental initiatives in spreading access and focus on providing services online contributed to the rapid increase of number of Internet users in Estonia from around 29% of total population in the year 2000, doubling in five years to 61.5% in 2005, and reaching near 90% in 2017, as demonstrated in figure 4-4.

Figure 4-4

Individuals using the Internet in Estonia as a percentage of the population between 2000 and 2017



Estonia government was a pioneer in adopting the Internet as a platform for eGovernment, where the individual can do most of the interactions with public service over the web, relying on the first national-wide Public Key Infrastructure that allows securing transaction by identifying individuals using encryptions keys part of the national ID card system. Interviewee E3 from Estonia said, "… that you can do everything online, except divorce, but they are working on that." The government have also extended its plans to achieve national coverage of broadband access with at least 30Mbps connection for every Estonian citizen by 2020 through the EstWin program (EAS, 2018). This approach of combining access availability and service created an environment where individuals are pushed towards developing their technical skills. Nonetheless, not all Estonian are able to use the Internet in the same way.

4.3.2 Digital inclusion in Estonia

Initiatives to spread the Internet and digital inclusion in the country and its success placed Estonia as an Internet nation with high reliance on digital and e-government services, leading the way and setting records for e-government initiatives. Including being the first nation to conduct nationwide voting over the Internet in 2005, and later the first presidential elections with electronic voting in 2007, and being the first nation to acknowledge digital signature is equal to conventional signatures in 2000 (EAS, 2018). Policies and initiatives to bridge the digital divide and enhance ICT adoption by organisations and the government are considered effective in propelling Estonia away from the neighbouring countries in terms of access and use (Hsieh *et al.*, 2012).

However, digital inequalities still exist in Estonia, with the level of education stands out as the most influential factor affecting digital opportunities, with a clear gap between Estonians with high and medium levels of education have much better opportunities of use compared to those with a low level of education (Cruz-Jesus *et al.*, 2016). Earlier studies referenced lack of motivation as the main factors, particularly among people over the age of 50 and blue-collar workers, as well as preferring to do things the old-fashioned way (Kalkun and Kalvet, 2002).

Classical factors of economic, class and social structures have also been studied to provide difference in opportunities online in Estonia with social status as the primary determinant, this can be understood when considering that class structure in these countries is largely unsettled as the society is rapidly changing (Klamus, Talvis and Pruulmann-Vengerfeldt, 2013, p. 204). The social status here combines factors of economic and cultural capital, digital literacy, and sufficient leisure time.

The Digital Economy and Society Index (DESI) by the European Union provided information on Connectivity, Human Capital, Use of Internet Services, Integration of Digital Technology, and Digital Public Services, with conclusions similar to the research referenced previously, and further establishing Estonia's position as a leading country in terms of trajectory of development across the spectrum (European Commission, 2018). The next part of this section looks at possible Internet limitations to help to establish a wider picture on the status of the Internet in Estonia, from digital opportunities to accessibility of Internet services and possible limitations.

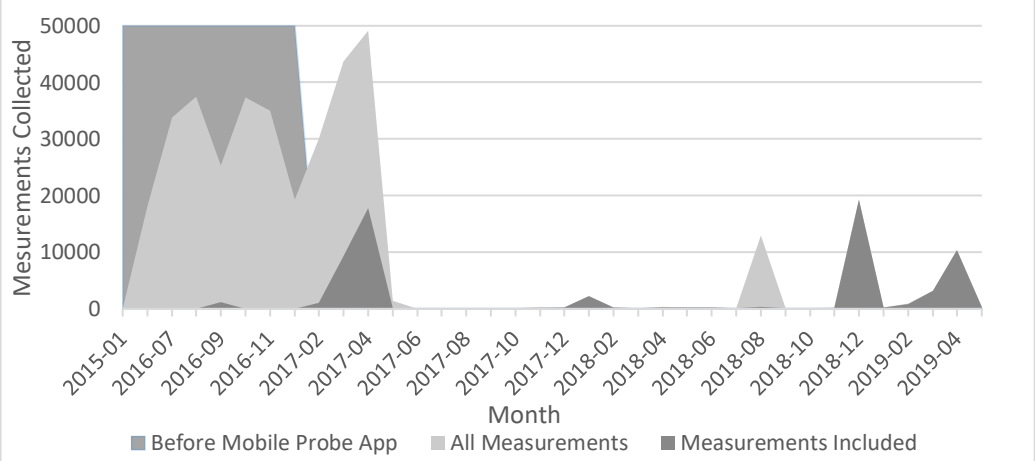
4.3.3 Measured Internet limitations

Network measurement in Estonia collected through the ONI problem, including the mobile probe, covered 22 autonomous system numbers or networks, from Internet Service Providers (ISPs), Institutions, and technology service providers, including hosting and cloud service providers. For the sake of this research, only measurements that represent networks individuals can connect through to the Internet were included, meaning that the five networks of hosting and cloud service providers had to be excluded in compliance with the practice done for the rest of the countries, leaving 17 networks, from 15 providers and institutions, included in the analysis.

The first measurements for networks in Estonia began with a small number of measurements, four, conducted in January 2015, followed by intensive tests between April and December 2016 resulting in a massive 206,424 measurements of the overall 382,951 collected from the ONI API until May 2019. However, most of the measurements in that period came from excluded networks, leaving mere 1,219 measurements collected up until the introduction of the ONI mobile probe application. Since the introduction of the mobile application, the measurements included in the analysis soared to 67,408 measurements. The figure 4-5 represents the measurements included and collected from Estonia over time.

Figure 4-5

Timeline of Estonia Measurements



The networks included in measurements collected from Estonia represented major Telecommunication and Internet Service Providers, Tele2, Elisa Eesti, and Telia Eesti representing a total of 88% of all measurements included, in addition to smaller ISPs and institutions such as the Tallinn Airport, as detailed in table 4-4. The number of

measurements collected and networks covered represent good coverage of main networks of Estonia, providing adequate measurements to advise understanding of the status of the Internet in Estonia as measured.

Table 4-4

Networks in Estonia included in the analysis, grouped by ISP or Institute

ASNumber	ISP/Institute	Tests	%
AS1257, AS39301	TELE2	662	29.28%
AS13272, AS2586	Elisa Eesti / Teleteenused AS	450	19.90%
AS196743	OU Interframe	1	0.04%
AS198966	Fill Ltd.	31	1.37%
AS201321	Levikom Eesti OU	5	0.22%
AS202652	Skylive Telecom AS	1	0.04%
AS3221	Hariduse Infotehnoloogia Sihtasutus	30	1.33%
AS3249	Telia Eesti AS	869	38.43%
AS3327	CITIC Telecom CPC Netherlands B.V.	23	1.02%
AS39823	Compic OU	1	0.04%
AS42016	AS Tallinna Lennujaam	1	0.04%
AS42300	Top Connect Ou	4	0.18%
AS51504	Telset ltd	44	1.95%
AS61307	AS STV	31	1.37%
AS8728	AS INFONET	108	4.78%
Total		2261	100.00%

ONI tests conducted in Estonia covered most of the tests ONI is capable of, except the DNS consistency test, with 2,261 tests covering limitations set on common communication applications, as with Facebook Messenger and Telegram, to more general limitations on access to anonymization tools. Other tests looked at the possibility of middleware boxes that may be manipulating content as with the HTTP Header Manipulation test, but the most common test run is the simple web connectivity test, which collected 56,566 measurements from 216 tests run on the networks included in the analysis of Estonia. There were no confirmed limitations on any of the tests and

measurements, while the Web Connectivity tests showed 1,485 anomalies as detailed in Table 4-5. These anomalies obligated further investigation to understand the potential of limitations set on web access in Estonia.

Table 4-5

Tests and measurements from networks included in the analysis in Estonia by Type

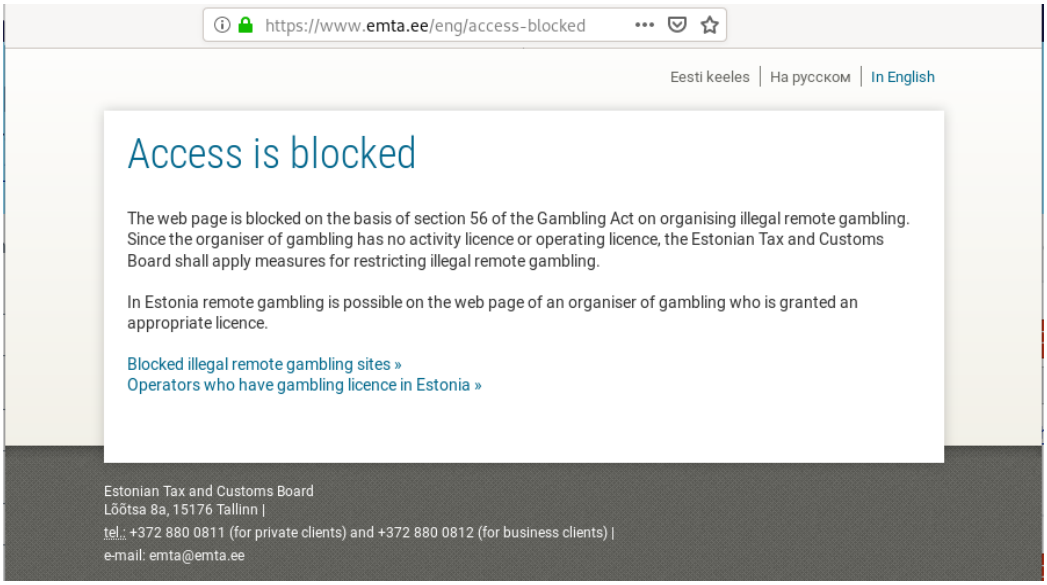
Test Name	Test Count	Measurements Count	Anomalies
Dynamic Adaptive Streaming over HTTP - DASH	53	53	0
DNS Consistency	0	0	0
Facebook Messenger	263	263	0
HTTP Header Manipulation	111	111	0
HTTP invalid request line	139	139	0
MEEK fronted test / TOR Bridged	43	86	0
Multi-Protocol Traceroute	2	2	0
NDT, Network issues affecting the speed	902	902	0
TCP Connect	46	8800	0
Telegram	190	190	0
TOR Direct Accessibility	43	43	0
Web Connectivity, Website access	216	56566	1485
WhatsApp	253	253	0
Total	**2261**	**67408**	

The anomalies found through the Web Connectivity tests indicate the possibility of filtering and blocking of websites by responding unexpectedly to the request sent from the ONI probe. The unexpected response is defined as having a discrepancy between the web page as requested by direct request method, and to requesting access to the same page tested through TOR network, which allows comparison between the website in question availability in Estonia compared to that from other locations. Anomalies indicate possible restrictions. However, with more profound and direct analysis of the websites that are marked as producing anomalies, there were some that returned a page indicating

that the website is blocked, particularly with gambling websites. Figure 4-6, shows the blocking page as served by the Estonian Tax and Custom Board, indicating that there is a centralised system with the purpose of redirecting requests to illegal remote gambling sites to this board, or that ISPs have implemented this as a policy across the industry.

Figure 4-6

Transparent Blocking Response Page in Estonia



Gambling websites are not the only sites that have a high potential of blocking, as anomalies were found in 25 of the 30 categories tested. Although most of the anomalies found cannot be directly linked to blocking, some clearly showed response with a page served to users at time of testing that indicate that the web page is blocked. An example of such blocking pages is Figure 4-7, which shows a blocking page served through an organisation that is connecting to the Internet through Telia Eesti ISP for http://www.schwarzreport.org/, a web page categorised under the Culture category in the Global testing list. The blocking page indicates that the blocking is conducted through networking equipment supplied by Dell SonicWall, a content control solution, which may be used by a private network in this case.

Figure 4-7

Organisational Blocking Response Page in Estonia

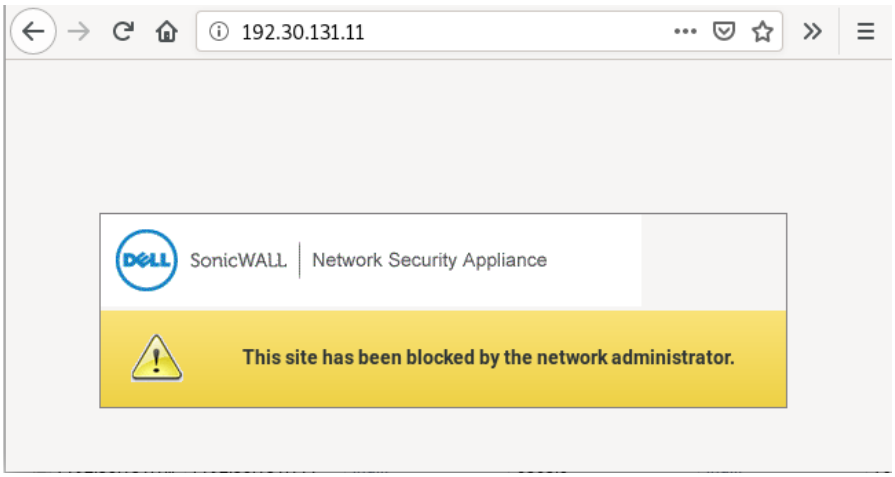


Table 4-6 lists the finding of all the categories tested in Estonia. It is clear strong anomalies were recorded in the in the Gambling category, with less prominence in the other categories tested. This result reflects the confirmed existence of blocking for gambling websites that are not considered legal in Estonia, with lesser blocking on other types of websites, in what seem to be confined to local and corporate content control.

Table 4-6

Categories of websites tested in Estonia and the number of anomalies found in each

Category	URLs in Global + Estonia Lists	Tested in Estonia	With Anomaly
Alcohol & Drugs	43	42	2
Anonymization and circumvention tools	67	62	5
Communication Tools	99	94	6
Culture	53	44	4
E-commerce	18	17	0
Economics	24	27	1
Environment	30	31	1
File-sharing	35	36	0

Category	URLs in Global + Estonia Lists	Tested in Estonia	With Anomaly
Gambling	38	38	21
Gaming	25	26	4
Government	28	30	9
Hacking Tools	44	48	3
Hate Speech	14	13	0
Hosting and Blogging Platforms	64	61	5
Human Rights Issues	155	156	7
Intergovernmental Organizations	4	4	0
LGBT	63	53	2
Media sharing	49	50	4
Miscellaneous content	1	3	1
News Media	94	104	9
Online Dating	20	24	3
Political Criticism	22	24	4
Pornography	19	27	3
Provocative Attire	21	22	2
Public Health	29	28	1
Religion	60	61	6
Search Engines	32	30	0
Sex Education	31	33	1
Social Networking	40	46	3
Terrorism and Militants	16	17	2
Not in List		753	24
Grand Total	1238	2004	133

Anomalies were found to be distributed over the various networks tested, with slightly over 1% of all tests conducted, resulting in an anomaly with potential blocking of web access. Networks with a small test sample, CITIC, Fill, and Skylive, showed no anomalies, while other small networks showed some anomalies. Nonetheless, this may not reflect the actual case at the network because of the small sample size. While the tests for the three larger networks, Telia Eesti, Elisa Eesti, and Tele2, have enough sample size to provide reasonable confidence in the results. The status of anomalies in comparison to regular results from Estonia networks is summarised in table 4-7.

Table 4-7

Results of Web Connectivity tests in Estonia

Network	Regular	Anomaly	Anomaly %
Telia Eesti AS	45121	533	1.17%
Elisa Eesti / Teleteenused AS	6179	77	1.23%
TELE2	3107	35	1.11%
Hariduse Infotehnoloogia Sihtasutus	301	8	2.59%
AS INFONET	158	3	1.86%
CITIC Telecom CPC Netherlands B.V.	51	0	0.00%
Levikom Eesti OU	45	2	4.26%
AS STV	44	1	2.22%
Fill Ltd.	32	0	0.00%
Skylive Telecom AS	32	0	0.00%
AS Tallinna Lennujaam	11	1	8.33%
Total Web Connectivity Measurements	55081	660	1.18%

Network measurements from Estonia determine the existence of controls on web access particularly with gambling websites that are not licensed in Estonia, with people trying to access these websites receiving a page from the Estonian Tax and Customs Board stating the reason for blocking of the service. While there are non-conclusive results for websites falling within categories ranging from official websites, news and media, human rights, and dating websites among others, but in an inconsistent manner, suggesting that the blocking is either part of local institutional policies or an error in measurement. To empower these findings further, the following part looks at reports and

news items related to Internet limitations in Estonia to help to build a clear picture of the status of the Internet in Estonia.

4.3.4 Reported Internet limitations

The status of Internet in Estonia was extensively covered in several reports and news items, from the perspective of highlighting successes of the small state in the digitisation efforts and spread of the Internet, as being one of the most digitally advances countries in the world (Freedom House, 2016). However, reports and studies covering Internet limitations in Estonia are not as extensive. OpenNet Initiative (ONI) mentioned Estonia in some of its reports, while FreedomHouse included it in its annual Freedom on the Net reports from 2011, after an early evaluation and inclusion in Internet freedom index in 2009.

ONI mention of Estonia was limited, with one of the few mentions published coming in their weekly roundup *Threats to the Open Net* of 29th of July 2011. In the roundup, ONI included a news item on a plan by several European nations, including Estonia, to increase Internet surveillance in response to terrorist attacks happening in Norway a week before the weekly roundup (Abell, 2011).

Estonia had a secure entry to the FreedomHouse Freedom on the Net (FoN) reports, by being ranked as the highest for digital media and online freedoms in their index of 2009 (Freedom House, 2009), the ranking established Estonia for the Freedom on the Net reports as a positive example for a country of interest. The perception carried on with the first Freedom on the Net country report of Estonia in 2011, where the report portrayed a success story of a country moving from Soviet rule to one of the "most wired and technologically advanced countries in the world", ranking it the first in the world in Internet freedoms (Freedom House, 2012a).

The FoN report included the existence of Internet content controls in Estonia under two main categories. The first category is for content removal requests following civil court orders based on inappropriate content or comments from news websites while the other category is gambling websites following a law passed in 2010 requiring providers of remote gambling to register with Estonian Tax and Customs Board. The board ask ISPs to block all non-licensed gambling websites through a list updated regularly, starting with 298 websites as of July 2010, to over 15,000 in 2019 (Freedom House, 2012a; EMTA, 2019).

Another main item mentioned in the FoN report of 2011, was the 2007 cyber-attacks on Estonian Internet infrastructure and institutions, these attacks were considered as the most severe threat to internet freedom in Estonia, leading to increased interest in digital security and safety in the country(Freedom House, 2012a). The interest in cybersecurity prompted the establishment of the National Cyber Defence League, and later hosting the North Atlantic Treaty Organisation (NATO) cyber defence centre (Freedom House, 2014).

The following FoN reports of Estonia were pretty much similar as the 2011 report, including the development in Internet access and services in Estonia and status of Internet market, while mentioning highlights of new regulations and practices of the periods reported. The 2012 FoN report included aspects related to possible regulations to protect copyright on the Internet, and discussions on the legal liability of online fora for comments, following rulings by the European Court of Human Rights on freedom of expression (Freedom House, 2012b). This issue was highlighted as critical developments mentioned in the FoN 2013 report as well as amending Estonia's penal code to comply with EU directive on the criminalisation of hate speech, including online (Freedom House, 2013). On a similar topic, FoN report of 2014 highlighted the direction of Estonian Ministry of Economic Affairs and Communication on a development to ensure people would have the agency to know and decide when, by whom, and for what their personal data is used in the public sector, as a pioneer in the issue in Europe (Freedom House, 2014). The same theme was maintained in the 2016 and 2017 reports, while the 2018 report included a major development regarding a vulnerability in ID cards used by Estonians for identification and digital signing of documents, exposing more than 760,000 ID cards, the case was nonetheless quickly fixed, and keys for the affected individuals were re-issued (Freedom House, 2018).

A look at the FoN reports on Estonia over the years show a common theme of an interplay between the regulations of Estonia and the EU, where Estonia pioneered regulations for eGovernment and online freedoms while maintaining compliance with European Union proposals and regulations. The reports analysed portrays a country where Internet access as a given fact and where discussions have moved from access and limitations to "security, anonymity, protection of private information, and citizens' rights on the Internet" (Freedom House, 2012b).

Nonetheless, the reports also imply the existence of procedure for limiting access and controlling content, as evident by the blocking of gambling websites, which places

an instrument in the hand of the government to control the Internet, although no firm evidence has been found on such use beyond gambling and following court orders on limited scale.

The limited reports available on Estonia seem to be a result of lack of practices of limitations and user rights violations that would intrigue international organisations to cover the country, which reflects yet another time the status of openness of the Internet in Estonia. This position helps Estonia to play the role of the control country in this research, taking into consideration the findings of the network measurements of finding a limited implementation of website filtering as well.

4.3.5 Key findings

Measurements of networks on Estonian networks covered main ISP and some smaller networks, however, due to the nature of the Internet, it is possible that some small ISPs run under the networks of other ISPs, and access the Internet as if they were coming from the same Autonomous System, with the same ASNumber. This means that the measurements analysed could have been from more than the 15 listed. This was evident with some of the blocking pages collected that relied on enterprise access-control systems and firewalls. The measurements showed with no doubt transparent blocking of several gambling websites, a finding supported by the reports and research on regulations on the 2010 law on remote (online) gambling. Other websites had transparent blocking in what seemed as institutional or corporate access, while some measurements showed anomalies that may indicate further non-transparent locking, although minimal.

The reports available and analysed on Estonia were limited but shared the eagerness of Estonian regulators to lead in regulations supporting freedom of access and expression, while maintaining compliance with European Union regulations, with high focus on cyber-security. Estonia maintains relatively open Internet access, fettered only to limit gambling websites that are considered illegal and limited blocking on multiple levels, with no repercussions for online expression, resulting in no or little self-censorship.

4.4 Singapore

The Republic of Singapore, the island city-state in Southeast Asia, gained its independence in 1965. During the period of independence, the newly established country was not different from any third world country at the time, with no natural resources to count on. But in a few decades, it turned into one of the first countries in the world in terms of income per head (Mauzy, Milne and Milne, 2002). The People's Action Party (PAP) was in control of the government since the independence of Singapore, and is considered to be the main political party to date. Some media reports attribute the success of Singapore to the party, particularly economic policies pushed by Lee Kuan Yew to attract investments of multi-national companies (Mauzy, Milne and Milne, 2002), leading it to become "Switzerland of the East" with international banking and manufacturing welcomed (NYTimes, 1973).

The conscious process of nation building prevailed the national identity in Singapore, with people feeling that they are part of the process and hold responsibility towards being active positively in the society through collective values rather than autonomous individuals (Hill, Lian and Lian, 2013). The creation of national identity resulted in multilingual, multicultural, and multiracial education to reach shared and common values among the citizens, even at the cost of individual and media freedoms.

The country, despite its economic success and openness, is regularly ranked as lacking freedoms, with the Economist calling it a "Flawed Democracy" (2019), Reporters Without Borders raking it 151 out of 171 countries (2019), Privacy International and Electronic Privacy Information Center giving it "endemic surveillance society" (PrivacyInternational, 2014) , and Transparency International raking it third in perceived level of corruption (2018).

Part of the reason for this view on the freedoms in Singapore comes from the fact that the government have direct and indirect control over media in the country, through owning an equity stake in media conglomerates in Singapore. The control of the print press is depicted in the fact that Singapore Press Holdings (SPH), with its very close ties to the PAP, controls all of Singapore's daily newspapers through ownership, while broadcast media is controlled by MediaCorp a company owned by the state investment agency (ONI, 2005b). It is creating an environment where the ruling party and the government assimilate into an entity controlling most information and media of the

country, transferring it to a link between the state and the public, with little or no room for independent reporting or opinion.

This section goes through a brief history of Internet and Internet market structure in Singapore, to a short introduction on digital inequalities establishes the context and situation of the Internet in Singapore by going through digital inequalities and inclusion in the country, to later detail findings of the study on Singaporean Internet in its two parts. The first part of the study lists main findings of network measurements collected from Singapore, while the second part goes through reports on the status of Internet in Singapore from main sources that did study the country of multiple years, in the needed level of detailing to understand the development of Internet controls and monitoring over the years. The subsections build up towards the understanding of the Internet situation in Singapore, to inform further analysis and discussion to relate it to tangible outcomes of Internet use, the core of this research.

4.4.1 History of Internet and market structure in Singapore

Internet was first available in Singapore to the academic community through universities since the late 1980s, and to secondary schools since 1993, after setting up the National Computer Board (Teo and Tan, 1998). A year later, the Internet was then available to the public, with two services available to the public through SingNet and Teleview-SingNet, both are parts of SingTel (Palvia *et al.*, 1995). Since then, several companies entered the market to provide communication services in the country, licensed through the Infocommunications Media Development Authority, a public agency part of the Ministry of Communication (Freedom House, 2018).

Singapore has been a leader in the utilisation of technology at the state level, with the formation of the National Computer Board in 1981, and the Civil Service Computerisation Programme (CSCP) between 1980-1985, to guide computerisation of government and state business and development. By 1986, the CSCP showed considerable progress, and was followed by the National IT Plan (NITP) 1986-1991, and the IT2000 master plan of 1991, with the objective to develop Singapore into an intelligent island, with every home, office, and government ministry connected by 2005 through the National Information Infrastructure (NII) (Palvia and Tung, 1996).

Singapore has also been a leader in controlling and limiting access to Internet and online content, with regulations related to censorship and standards reviewed to include

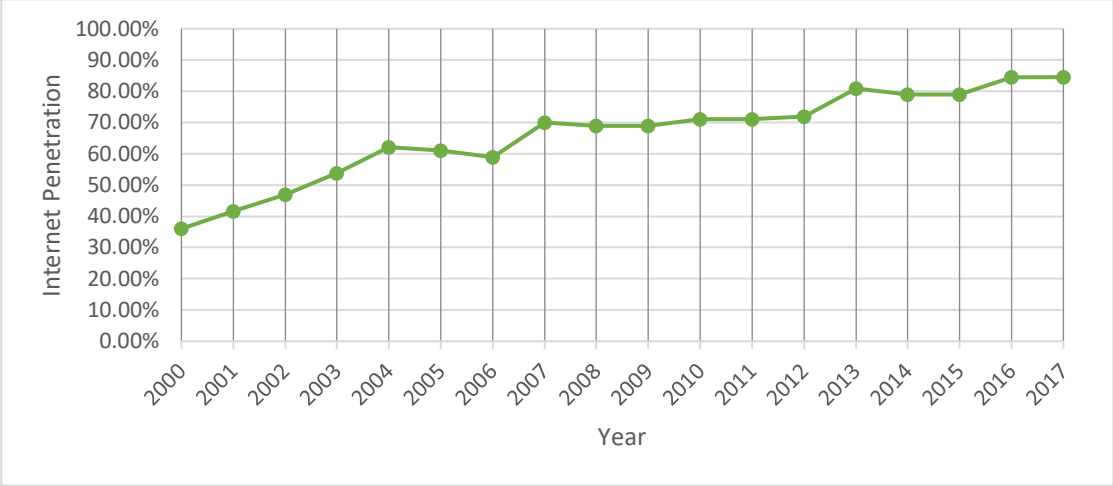
all media in 1991, at the same year Singapore's National Computer Board (NCB) began studying effect of information technology on quality of life in Singapore, and as a competitive advantage (Ang and Nadarajan, 1996). In fact, it can be argued that censorship of online communication began even before the world wide web, with attempts to control anonymous messages and using algorithms to look for censored words used on USENET groups, and using (Ang and Nadarajan, 1996).

In the early days of the World Wide Web, censors in Singapore extended censorship to emerging forms of media, in one case, they scanned 80,000 image files stored in.GIF file format from public Internet accounts of a business service users to find five images of pornographic nature, the users that had these pictures where issued warnings (Ang and Nadarajan, 1996). Other methods included algorithms to scan for censored words in public websites of Singapore. The practice of scanning user accounts continued with at least two scans in 1994, the year Internet access was available to the public, these scans looked at email accounts for pornographic content on user accounts of the leading network at the time, SingNet, with other scans reported as late as 1998 (Lee, 2000). However, as the Internet grew larger in terms of content availability and number of users, the authorities realised that direct censorship in the same methods would no longer be effective. Nonetheless, Singapore's authorities concern to maintain a habitus of control proved to be a more significant motive than technology exploitation when setting communication regulations and standards (Lee and Birch, 2000).

The authorities have portrayed themselves as the protectors of the people from the evils of open online content, vowing to keep them in "well-lit areas and not allowing them to stray to the wrong side of tracks" as Knoll described statements from Singaporean officials in relation to Internet controls (Knoll, 1995). Internet growth in Singapore is in itself remarkable, entering the third millennium with 36% of its citizens having access to the Internet, rapidly increasing to 60% in 2004, then steadily to around 85% in 2017, as shown in figure 4-8.

Figure 4-8

Individuals using the Internet in Singapore as a percentage of the population between 2000 and 2017



In 1995/1996, as the traditional legal measures where assumed to fall short of controlling 'undesirable' online content, Singaporean authorities introduced new regulations that "addressed the multifarious nature and insidious impact of the Internet", the Singapore Broadcasting Authority (SBA) issued a set of acts to regulate Internet content (Endeshaw, 1996). The new regulations, the *Internet Policy*, the *Internet Code of Practice*, as well as the *Class Licensing Scheme* covered licensing of Internet Service Providers (ISP) and Internet Content Providers (ICP) (Lee, 2000). The regulations set expectations for the desirable and undesirable content and practices online with broad definitions of content that should be censored, including content that can be considered to jeopardise public safety or national defence, content that is deemed dangerous to racial and religious harmony, and content that is thought to promote immorality (Hogan, 1998). The broad categories allowed for a flexible interpretation of websites to be blocked, and content to be censored. Nonetheless, the Class Licensing scheme put the ISPs and ICPs in charge of implementing the censorship, maintaining the authority's promise of "light-touch" regulations (Josephine, 2013).

Following the SBA regulations of 1995/1996, Singapore's authorities maintained a symbolic list of 100 websites blocked via proxy servers of ISPs (Lee, 2000), the list served as a constant reminder the blocking exists, and it is possible to expand, especially that the sites included in the list were of pornographic nature. The SBA also required ISPs

to use their best efforts to blocking access to content and websites that harm public morals, racial and religious harmony, and security or national defence, encouraging, do not mandate, ISP to offer the use of parental control software tools. This allowed for blocking of websites at the discretion of ISPs beyond the 100 websites list, and given the close relationship with the ruling party, PAP, leading to the expectation that blocking is used as an instrument to benefit the party and the regime in Singapore.

With its early efforts in Internet limitations, other Asian countries learned from Singapore how to control the Internet. One of the most notable examples here is the case of China, which sent its senior information official Singapore to learn about Internet policing strategies mid-1996, few months before the first Internet controls implemented in China (Rodan, 1998). Singapore did also share the experience with Association of Southeast Asian Nations (ASEAN), through a meeting on September 1996 for the ASEAN Committee on Culture and Information to collaborate on finding ways to control the Internet and activities on it (Rodan, 1998).

Nonetheless, the SBA found that the nature of the Internet, with a myriad of sources of information and the decentralized environment, makes it virtually impossible to implement comprehensive Internet censorship, leading to an adoption of a new model. The new model relies on symbolic blocking and censorship of a small blacklist through technological means and industry-led self-regulation (Malakoff, 1999), mixed with higher reliance on monitoring of activity, and an environment with strong regulations punishing immoral use, defamation, and sedition, effectively relying on self-censorship (Rodan, 1998).

Within the regulations and licensing, a number of Internet Service Providers provided high-quality Internet services, even offering what was the fastest home broadband plan in the world in 2015 at 2Gbps fibre-optic connection available through a new player in the market, ViewQuest (Freedom House, 2015). However, majority of the market of still in hold of the big three ISPs, SingTel, the incumbent telecom provider with the government own the majority of, StarHub, which SingTel owns a controlling stake in, and M1 (Freedom House, 2018), showing yet another level of control by the government by directly controlling two of the big three ISPs through ownership.

The progress of Internet development and adoption in Singapore over the years show the interest of the authorities to spread the use of the Internet from state business to the individuals as a tool for development and to attract foreign investment while

maintaining a controlled environment of media and information through series of regulations and control through ownership and investment. The following part provides a brief look at the use of the Internet in Singapore from the perspective of digital inclusion and digital inequalities.

4.4.2 Digital inclusion in Singapore

The plans for connectivity and computerisation reaped its benefits through the increased use and spread of Internet technologies as we have seen earlier, as well with as the early of Internet services for education, commerce, and other services, putting Singapore as a leader in the use of communication technologies since the mid-1990s. This part looks at the status of the digital divide and inclusion in Singapore among different groups of the population.

One of the earliest studies on the use of Internet services in Singapore looked at awareness and use of the Internet among academic staff and undergraduate students in two universities in Singapore in 1995. The two universities, National University of Singapore, and Nanyang Technological University showed an interestingly high level of Internet use among both, academic staff at 80%, and undergraduate students at 39%, students that know about the Internet but are non-users were 78% of all students (Palvia *et al.*, 1995). That study also showed that communication affordances and information access were the main reasons for using the Internet, with email and USENET Newsgroups taking most of the time of use for academic staff. Almost 90% of the staff were using the Internet for teaching and research purposes, while students used it mainly as a pastime and hobby, both groups had the activity of keeping in touch with overseas friends as the second main reason for use (Palvia *et al.*, 1995).

For companies, the Internet was also a significant item of interest in the mid-1990s, with research by Teo and Tan in 1995 showing that two-thirds of 188 companies operating in Singapore can be considered as Internet adopters, while half of the non-adopters intended to adopt Internet use within six months (Tan and Teo, 1998). The same research also listed the main reasons for adoption as providing information about the company to customers, and advertising their products and services, with 29% of companies adopting Internet use sell directly online(Tan and Teo, 1998).

For eCommerce, another study showed that people between the ages of 15 to 29, 16% bought an item online in 1998, while 74% of the 1,800 respondents viewed online

commerce positively(Meng Poon and Phau, 2000). The results demonstrate how considerable Internet was spread among companies only one year after the Internet was available to the public, showing yet again high interest among the public and corporate in utilising the Internet as part of their life and business.

The spread of the Internet in Singapore was facilitated through the countrywide infrastructure projects, particularly the national information infrastructure (NII), as well as the teaching of Internet use skills at schools and universities since the mid-1990s (Palvia and Tung, 1996). The government initiatives to advance infrastructure in Singapore carried on, with the latest plan to launch the NextGen National Infocomm Infrastructure (Next Gen NII) announced in 2018 (IMDA, 2018b) in relation to the Digital Economy Framework for Action which involved plans centred around collaborations with partners and platform enablers to put Singapore as a leading digital economy (IMDA, 2018a). The plan looks at infrastructure as a critical enabler in boosting the overall competitiveness in Singapore, particularly in the ICT sector and new industries by covering aspects of connectivity as well as the development of a Data Centre Park to attract multinational companies.

The policies and plans, although aiming primarily at economic growth and increasing competitiveness, covered two aspects of the traditional digital inequalities, access and skills. However, the limited number of research available about digital inequalities showed that gender, age, marital status, income, education, and perceived Internet efficacy significantly affected Internet use, with young single males with high education and income are at the fortunate end (Cheong, 2007). In addition, interviews conducted for this research showed that interviewees generally agreed that there is a gap in use of the Internet among generations, with the older generations at the losing end, while other socio-demographic factors were not as dominant in the views of interviewees.

Despite the efforts to make the Internet ubiquitous in availability to every home and office in Singapore, and the early adoption of skills education and infrastructure projects, the alarming view of the authorities for the open communication and access to information affordances of the Internet resulted in tightening attempts to monitor and control access. The next parts look at empirical evidence to assess the level of monitoring and control from network measurements and review of related reports.

4.4.3 Measured Internet limitations

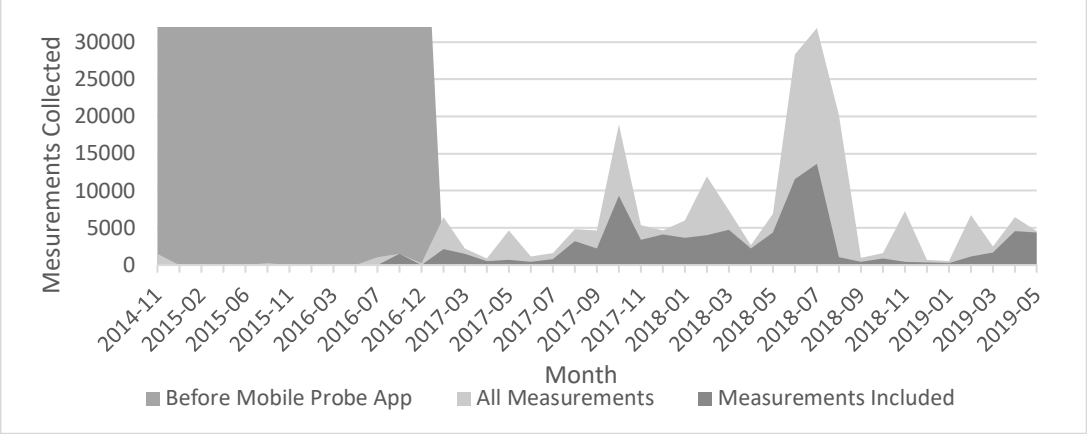
Collecting network measurements from Singapore through OONI probes began in November 2014, with data available up to May 2019. Measurements were clearly affected by the release of the OONI mobile probe app, with the considerable increase in the number of tests conducted from 4,544 tests included up until February 2017, 27 months from the date of release of the OONI mobile probe, to 202,076 measurements afterwards to May 2019, 27 months after the release. The increase is a notable increase of almost 45 times over a similar period of time. Figure 4-9 demonstrates the increase in measurements collected over time, with the shaded region representing the time before the mobile probe. This further reinstates the finding from Bahrain analysis that the availability of mobile application as a probe, instead of the standalone or computer run probe, thus mainly increases public participation in testing networks and contributing measurements to the OONI data repository. The existence of measurements collected before the mobile app also serves as evidence that the connection between the probes and the centralised OONI data repository was not blocked.

A closer look at the tests and measurements collected, shows that they were conducted on 73 Autonomous System Numbers (ASN), the number assigned for a network, indicating the count of networks tested. However, not all the 73 networks were included in the analysis, as some of the networks tested were part of cloud computing locations and data centres operating in Singapore, which does not represent that status of the Internet as used by individuals in Singapore.

Network list was scrutinised to include only networks that individuals may use to access the Internet through directly, resulting in limiting the results to 33 networks, with 9,401 tests, resulting in 89,375 measurement points. Although this process decreased the overall number of measurements to 43% of the 206,620 total measurements, the resulting analysis is more representative for what an average person would experience of limitations when they connect to the Internet in Singapore, rather than through a hosting server or server leasing access. Figure 4-9 illustrates the number of measurements collected before and after the release of the OONI mobile probe app, and the measurements included in the analysis as part of all measurements collected and stored at the OONI centralised repository.

Figure 4-9

OONI Network measurements collected from Singapore over time



The networks tested represent those of the three large Internet Service Providers active in Singapore, SingTel and its subsidiary SingNet, StarHub, and M1 with 75% of included tests, as well as institutes and organisations having their own ASNumbers, as in Nanyang Polytechnic, National University of Singapore, and Temasek Polytechnic Singapore. It is interesting to see how many organisations and institutes have their own ASNumber, for the cost and management effort required to maintain one compared to the more conventional way of connecting through getting access through a larger supplier that manage their own ASNumber. However, this contributes to further potential for a higher level of details when it comes to finding and measurements. Table 4-8 lists networks included in the analysis for the purpose of this research, with the ASNumbers of each network, and the total contribution of each as a percentage of the total tests analysed. The big three ISPs contributed the majority of the tests, with 83% of total test sessions, this provides a better understanding for access most people are offered in Singapore, thus empowering confidence in results.

Table 4-8

Networks in Singapore included in the analysis, grouped by ISP or Institute

ASNumber	ISP/Institute	Tests	%
AS10091,AS4657, AS55430,AS9874	StartHub	1339	14.24%
AS132356	Singapore Changi Airport	130	1.38%
AS135600	Whiz Communication	11	0.12%

ASNumber	ISP/Institute	Tests	%
AS17547, AS4773	M1	4330	46.06%
AS17617	Nanyang Polytechnic	5	0.05%
AS17733	Singapore Management University	2	0.02%
AS17927	WebSatMedia	6	0.06%
AS18106	ViewQuest	153	1.63%
AS24312	AXGN	7	0.07%
AS24482	SG.GS	555	5.90%
AS4628	Pacific Internet	2	0.02%
AS4817	TPG	2	0.02%
AS4844	SuperInternet	8	0.09%
AS55415	Marina Bay Sands Buildings	3	0.03%
AS55919	Singapore University of Technology and Design	4	0.04%
AS56300	MyRepublic	280	2.98%
AS63916	IPTELECOM Global	4	0.04%
AS703	Verizon Business	74	0.79%
AS7472	National University of Singapore	247	2.63%
AS7473, AS3758, AS45143,AS7700, AS9506, AS7474	SingTel and its subsidiaries	2102	22.36%
AS9009	M247	123	1.31%
AS9292	Temasek Polytechnic Singapore	5	0.05%
AS9419	Nanyang Technological University	9	0.10%
Total		**9401**	

Tests from Singapore included in the analysis covered the majority of tests offered by OONI, from testing for service disruptions, as with DASH, to test for limitations affecting live video streaming, Telegram and WhatsApp for limitations affecting the mainstream instant messaging application. Tests also covered limitations on access to circumvention networks with TOR access testing, both direct access and access through bridges to bypass direct access limitations, and network interference affecting speed (NDT). Most of the measurements, as detailed in table 4-9, came from HTTP request testing and website accessibility, testing for blocking of websites and online content, with a combined sum of 80,198 measurements conducted, this is understandable since these tests test for an extensive list of URLs in each.

Testing for limitations on the OONI access to control network could not be established using the tests conducted, as only 33 tests were conducted over five networks, Singapore Changi Airport, National University of Singapore, and the three major ISPs, SingTel, M1, and StarHub. All of the tests failed, but the low number of tests does not establish a positive conclusion. However, the fact that web access testing could not be completed because of the inability of accessing the test control network for most tests suggests possible blocking. According to sources in Singapore, default TOR setting are indeed blocked, but users follow online advice and change the settings to bypass blocking[10].

Table 4-9

Number of tests and measurements from networks included in the analysis in Singapore

Test Name	Test Count	Measurements Count	Anomalies
Dynamic Adaptive Streaming over HTTP - DASH	873	873	0
Facebook Messenger	130	130	0
HTTP Header Manipulation	1167	1167	0
HTTP invalid request line	1386	1389	0

[10] A sample online advice on how to bypass TOR blocking in Singapore suggests changing default port number from 80 to 8080, as port 80 is "blocked by default in Singapore" https://www.quora.com/Is-Tor-blocked-in-Singapore

Test Name	Test Count	Measurements Count	Anomalies
HTTP Request	114	26475	0
MEEK fronted test / TOR Bridged	8	16	0
NDT, Network issues affecting the speed	3666	3666	0
TCP Connect	7	1662	0
Telegram	120	120	0
TOR Direct Accessibility	17	17	0
Web Connectivity, Website access	1776	53723	1219
WhatsApp	137	137	0
Total	9401	89375	

Testing for blocking of websites and access relied on trying to access websites from a set of URLs predefined in a list, in compliance with the description in the methodology chapter. The URL lists used included the Global list for OONI probe and application, as well as the list explicitly predefined for Singapore, including websites that are either know to be blocked, or are known to be under risk of blocking, either for what they offer, or because they fall within a category that is known to be targeted in Singapore. The Global and Singapore lists included 1,754 URLs; almost all of them were tested with at least one measurement, at an average of 30 measurements per URL. The number of sites tested presented 95% of those included in the lists, a number that is higher than that of Bahrain, which was at 85%. As indicated in table 4-9, measurements were also collected for six hundred URLs that are not included in the current test lists. The rationale behind is that these URLs represent either websites that were added by the user directly, or websites that used to be in the testing list, but were removed in the periodic list reviews, which aims at keeping the lists up to date and balanced among different categories.

Categories and websites tested, as detailed in table 4-10, covered most types of websites that are prone to blocking and content control, from religious, political, human rights websites, cultural, to lifestyle websites, websites offering tools to bypass censored and blocking, and websites related to information access and sharing, providing a broad spectrum of coverage for different models of censorship and control based on access limitation. Nonetheless, what these tests do not cover, is limitations that do not rely on technical measurements, as with self-censorship induced by an environment of fear,

which can be sensed in other research instruments, including review of reports and regulations, and interviews, which this research uses in the subsequent sections for this purpose.

Table 4-10

Categories of websites tested in Singapore and the number of anomalies found in each

Category	URLs in Global + Singapore Lists	URLs Tested in Singapore	URLs with Anomalies
Alcohol & Drugs	48	46	1
Anonymization and circumvention tools	73	66	14
Communication Tools	127	111	0
Culture	53	46	0
E-commerce	20	20	0
Economics	28	28	0
Environment	34	33	0
File-sharing	38	36	2
Gambling	38	38	27
Gaming	28	27	0
Government	45	44	1
Hacking Tools	50	49	2
Hate Speech	15	14	0
Hosting and Blogging Platforms	75	66	3
Human Rights Issues	163	161	0
Intergovernmental Organizations	4	4	0
LGBT	67	59	6
Media sharing	53	51	1
Miscellaneous content	7	7	0
News Media	113	112	3
Online Dating	27	26	0
Political Criticism	25	25	0
Pornography	28	28	17
Provocative Attire	25	25	0
Public Health	31	29	1
Religion	62	62	1
Search Engines	33	30	2

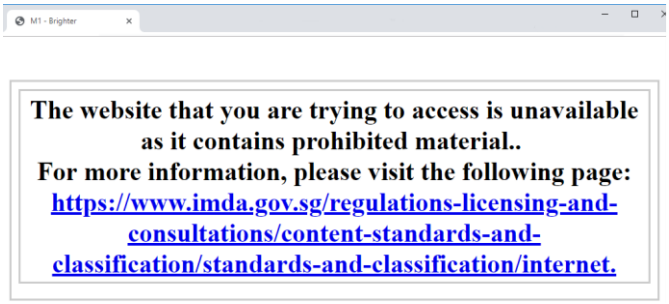
Category	URLs in Global + Singapore Lists	URLs Tested in Singapore	URLs with Anomalies
Sex Education	35	35	4
Social Networking	49	47	0
Terrorism and Militants	20	20	1
Not in List		600	47
Total	1414	1945	133

Testing showed that around half of the tested URLs presented symptoms for possible blocking, with 996 websites falling in this group, spanning across all of the categories tested. All of the sites falling under the Gambling, Pornography, and Human Rights Issues categories showed such symptoms. The categories that had less than half of the websites tested showing anomalies are Culture, eCommerce, LGBT, and Social Networks. The Miscellaneous Content category, which includes websites that do not fall under any of the other categories, but are suspected to be blocked, showed that only one website of the seven tested had symptoms of access fiddling, the "Body Modification Ezine", http://www.bmezine.com. The results show that content in Singapore is highly monitored with active blocking across all categories of websites tested.

Blocking in Singapore is considered transparent, with blocking page displayed to people trying to access blocked pages. For this research, the following block pages were found, five of which from the *StarHub* network, and one from the *M1* network. The blocking page recorded from M1 network, shown in figure 4-10, refers to the website as contravening IMDA Broadcasting and Class License act as the base for blocking.

Figure 4-10

Transparent Blocking Response Page in Singapore Network M1

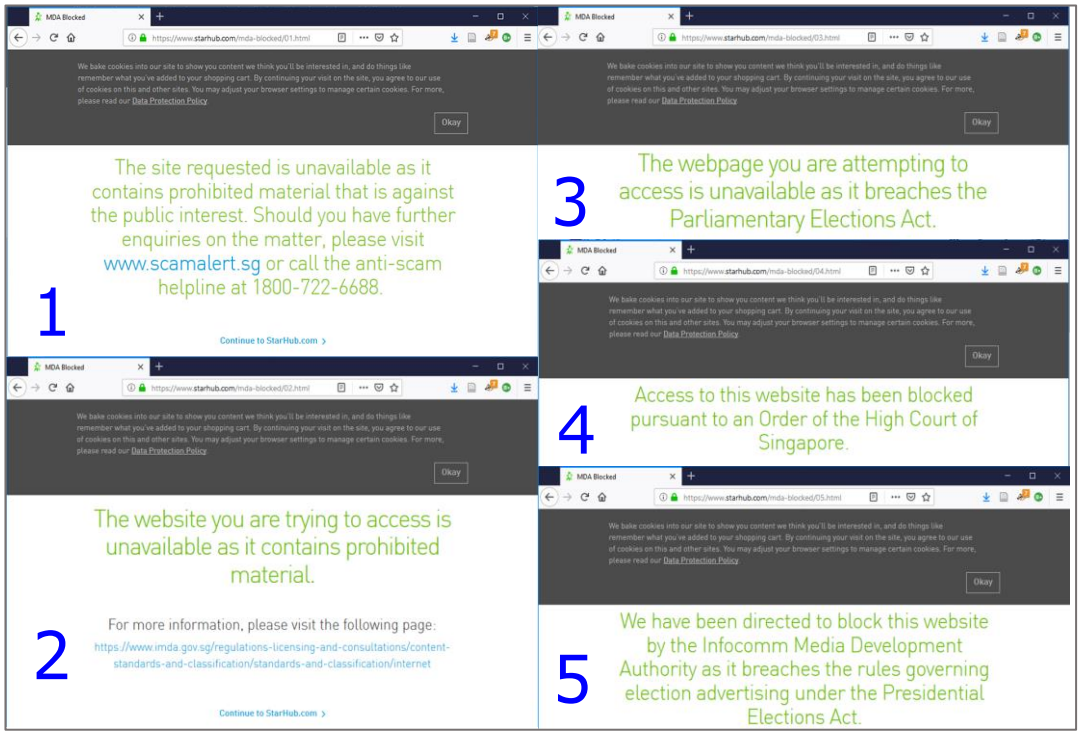


The StarHub network blocking pages uses cookies, which may be used to identify the user and record some of the user web surfing activities. They also communicate to the user the reason or rationale for blocking and the body responsible in the blocking page returned, as in figure 4-11. The bases for blocking as collected from the StarHub blocking pages were as following:

1. Website preaching the Parliamentary Election Act.
2. Prohibited material against the public interest, with a call to visit scamalert.sg or to call the anti-scam helpline.
3. Website is blocked pursuant to order from High Court of Singapore.
4. Prohibited material, with reference to IMDA classification details.
5. Website blocked by IMDA for breaching elections advertising under Presidential Elections Act.

Figure 4-11

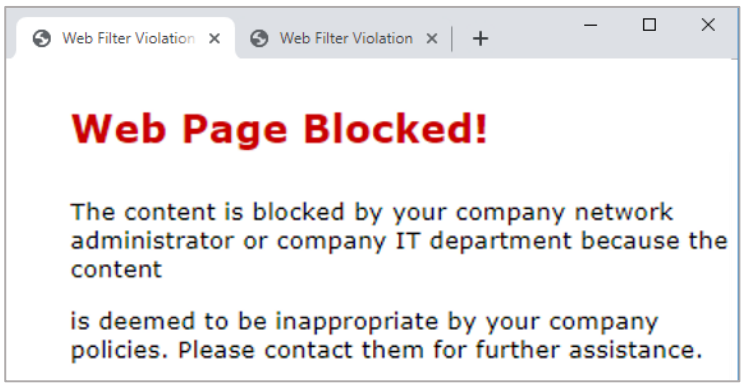
Transparent Blocking Response Page in Singapore Network StarHub



Blocking pages on SingTel networks showed a different approach, the block page as shown in figure 4-12 points the blocking to be as part of a local policy set by the network administrator or IT department, even though the request came through SingTel network. The page code indicated that this is part of "Cloud Web Filtering" as "Powered by SingTel".

Figure 4-12

Transparent Blocking Response Page in Singapore Network SingTel



A very similar blocking page is used by local institutes, as with the page displayed in figure 4-13 from SIM University through M1 network. This page code indicates that the blocking is provided by using solutions from Fortinet networking products. The interesting in this blocking page is that it does not only store or pass user information to the network operators, but also display it to the user, feeding into the increased sense of monitoring by making the user conscious about what information is known about them, including their university username. The username is redacted from the figure to protect the identity of the individual.

Figure 4-13

Transparent Blocking Response Page in Singapore Network SIM University through M1

One may think that network type, whether an ISP or an institutional network, would give different results in terms of websites blocked. However, a look at the results

by type of Network, shows that of the 996 sites in all networks showed symptoms of blocking, 921 did so on the leading ISPs, showing conformity in blocking across various types of networks in Singapore, whether public ISP or institutional access.

A look at the results from another perspective shows that from the 50,723 web connectivity measurements only 3,000 showed anomaly of blocking, detailed in table 4-11, indicating that the blocking is not constant, but somewhat sporadic, creating a sense that at any moment of time, blocking is minimal and more of nominal than hindering limitation. This form of blocking is achievable through dynamic blocking lists that rotate blocking across URLs over time, with no need for much human intervention or effort. There is no clear indication on whether this is implemented in Singapore, but the pattern is consistent with this method, which makes it plausible, especially when taking in consideration that censors in Singapore claim that they maintain a list of only 100 blocked websites, the list is not published (ONI, 2005b), which makes it possible that the list is rotated.

Table 4-11

Results of Web Connectivity tests in Singapore

Network	Regular	Anomaly	Anomaly %
AXGN	16	0	0.00%
M1	22918	757	3.20%
M247	374	3	0.80%
MyRepublic	1124	7	0.62%
Nanyang Polytechnic	25	3	10.71%
Nanyang Technological University	57	0	0.00%
NUS Information Technology	250	3	1.19%
SG.GS	1760	5	0.28%
Singapore Changi Airport	3467	28	0.80%
Singapore University of Technology and Design	1286	131	9.24%
SingTel	12327	234	1.86%
StarHub	6616	47	0.71%
SuperInternet	33	0	0.00%
Temasek Polytechnic Singapore	22	0	0.00%
ViewQuest	407	1	0.25%

Network	Regular	Anomaly	Anomaly %
Whiz Communications	41	0	0.00%
Total Web Connectivity Measurements	50723	1219	2.35%

Table 4-11 shows one difference between public ISP networks and institutional ones, the persistence of blocking. It is clearly less intermittent on some institutional networks, over 10% of measurements in all of Singapore University of Technology and Design, Nanyang Polytechnic, and Temasek Polytechnic Singapore, while drifting between 3.7 and 6.7% in the major ISPs, M1, SingTel, and StarHub. In all cases, a simple look at the number of websites blocked at any moment of time would give the illusion that a nominal number of websites is blocked, while in reality, the overall number of websites limited is vast, covering a broad spectrum of websites and categories.

A selected set of websites were tested through AccessCheck tool, to show that the inconsistency remained the main attribute for limitations in Singapore. For example, testing for the website proxify.com, which enables bypassing limitations, and was found to be blocked by OONI measurements, returned inconsistent result through AccessCheck, where it showed anomalies of blocking on two of the four ISPs tested. A similar manner was found with websites from other categories.

The data analysed shows clear indication for a high level of Internet control on website access in Singapore that covers a large number of websites and content types and is not limited to morally questionable content as implied in Singaporean official statements. Nonetheless, the blocking is sporadic in nature, and blocking lists seem to rotate over time, possibly to maintain an illusion of a small number of blocked websites at any given time. The following section looks at reports on the Internet in Singapore to provide a deeper understanding of the historical context of Internet controls in the country, to provide further explanations for findings of the data.

4.4.4 Reported Internet limitations

The research relies on multiple resources to outline as much as possible of the status of the Internet in terms of limitations. Although the network measurement provided a good view on limitations over the data collection period, a review of related reports published over the years has the potential to provide a more comprehensive view, from timeline to various forms of control. OpenNet Initiative (ONI) and FreedomHouse,

among others, more recently covered the model of artificial Internet limitations in Singapore in a series of reports. The coverage was more extensive than the papers mentioned earlier by including a component of testing for limitations implemented, rather than limitations announced, nonetheless, the finding mostly match. The match demonstrates the good level of transparency when it comes to censorship between the Singaporean government and the citizens, a component that although promotes confidence, serve a role in the Singaporean model that is reliant on fear and self-censorship.

The first report from ONI on Internet limitations in Singapore, *titled Internet Filtering in Singapore in 2004-2005*, stated that Singapore maintained its robust control over the information its citizens have access to, whether formally or informally, through different media, including the Internet, mainly targeting the content of pornographic nature and fanatical religious content. Singaporean Media Development Authority (MDA), a new body formed by the merger of SBA and other media-related authorities, maintained the blacklist approach of the SBA and kept a claim of blocking a symbolic list of 100 websites, to promote social values and maintain national unity (ONI, 2005b). ONI testing confirmed the blocking of just a small set of websites, eight of the 1,632 sites tested, marking Singapore's technical filtering system one of the most limited. Nonetheless, the report indicated that Internet limitations in Singapore are substantial through access controls in the form of licensing, and legal pressures, in the form of defamation lawsuits and the threat of imprisonment (ONI, 2005b). This finding confirms again, the model of censorship described earlier and concluding that this low-tech model is potentially effective (ONI, 2005b, p. 15).

Licensing was discussed in detail in the report, including the Class License Scheme, which requires any Internet Content Providers and Internet Services providers, as well as political parties, religious groups, and even individuals, to register with the MDA. Registration included that they should comply with the Internet Code of Practice, and conform to MDA requests regarding the content and discussions on their websites (ONI, 2005b, p. 9). Although the Internet Code of Practice did not provide restrictions or punishments, it still placed Internet users under the risk of criminal penalties if proven of possession of banned material, as with pornography. The requirement of registration effectively placed site operators at risk of prosecution for published content and online discussion, further extending self-censorship to group-censorship, and encouraging

operators of different networks, as in a university or work networks, to implement higher levels of blocking to safeguard themselves against liability.

ONI report of 2005 went into details of the Singaporean model by including description on the great level of control Singaporean government have on media in general. Through strict licensing schemes, frequent formal actions to control content, and informal investment ties between companies with strong relations to the ruling party (People's Action Party - PAP) and all of Singapore's daily newspapers, and similar ties with broadcast media, resulting in "lack of a free and independent press" (ONI, 2005b, p. 9). The report includes examples of the use of legal pressures to control the content, with defamation suits and the threat of cutting studentships for bloggers who publish content that deems critical to politicians or governmental agencies.

The report also indicated that Internet content regulations in Singapore started in 1996 (ONI, 2005b), this is true for the use of proxies to limit access to content and websites through the World Wide Web. However, as we have seen earlier, Singapore had previous attempts to control content over the Internet on technologies that predated the World Wide Web, as in the image scans on USENET accounts.

The second report from ONI on Singapore was issued in 2007, with similar findings to the previous report, of an environment with selective Internet filtering, massive control on local media and publication, and strict rules and regulations that maintained a climate of pervasive self-censorship, including political discussion and commentary, particularly to opposition to PAP, the ruling party (ONI, 2007b). The report referred to a set of acts that contributed to the climate of control, including Internal Security Act, Criminal Law Act, Undesirable Publications Act, Class License Scheme, and Sedition Act, which threatens dissidents with sanctions, fines, and even jail time and criminal prosecution, which "inhibit more open discourse in an otherwise vibrant Internet community" (ONI, 2007b, p. 9).

ONI left Singapore out of their reporting after 2007, except for few mentions in the book *Access Contested: Security, Identity, and Resistance in Asian Cyberspace*, where Singaporean model was compared against methods and practices of other countries, particularly in Asia, to outline differences. One of those mentions compared Malaysian registration requirements introduced in 2007 to those in effect in Singapore, referencing the success in the later in chilling online political speech (Thien *et al.*, 2011, p. 46). Later, the authors added to the comparison of the difference in online activism,

iterating that Singaporean activism is less visible and vocal despite the significantly higher Internet penetration rate in Singapore (Thien *et al.*, 2011, p. 51).

Another substantive reporting on the status of Internet freedoms in Singapore came from *FreedomHouse*, who started to include Singapore in their annual *Freedom on the Net* reports from 2014. The initial Internet freedom status of Singapore according to the 2014 report was *Partly Free*, with a score of 40 on a scale from 0 to 100 (Freedom House, 2014), the score is based on three categories, Obstacles to Access, Limits on Content, and Violations of User Rights. Singapore scoring was consistent with the Singaporean Internet control model described earlier, with limited obstacles to access, and higher limitations to content and violations of user rights.

The 2014 report concluded that the Singaporean government, under the leadership of the long-ruling People Action Party (PAP), does not use Internet filtering and blocking as primary means for Internet control, but instead use sedition, defamation, and contempt of court laws to manage dissent, including online dissent, creating an environment of self-censorship. Up until 2011, the Singaporean Internet saw an increasing flow of online activity critical of the government, but the general elections of 2011, which saw the first set back for the PAP, triggered higher sensitivity towards online content and dissent, resulting in an increase in cases of content takedowns and use of laws against online activists (Freedom House, 2014).

The 2011 elections were referenced as a turning point in the move towards open Internet and online activism as per the interview with S5, where the decrease in popularity of PAP as reflected in the general elections that year, saw a definite increase in Internet controls. S5 Even mentioned a sudden decrease in Internet quality of service that was sensed by the general public, probably because of the implementation of monitoring facilities, but not much objection came from the public because of the environment of fear that dominated the Singaporean public sphere. Freedom on the Net 2014 report confirmed that saying that "any restraint of online discourse is mainly due to fear of post-publication punitive action – especially through strict laws..." (Freedom House, 2014, p. 4).

The same report mentioned cases of law proceedings against people for their online activity, including the first case of an individual blogger being sued by a government leader, where the prime minister of Singapore initiated defamation proceedings against an activist blogger. There were also several cases of content

takedown notices issued to online content providers, and increase in coverage of the class-licensing scheme and restrictions applied in a highly selective and intermittent manner, to include more websites and limitations, including limitations on foreign funding. The changes drove multiple web outlets to close, citing the onerous requirements, as with *Breakfast News*, closed in 2013, and *Sintercom*. Other websites, such as *Mothership* and *Yahoo News*, opted to assent to the regulations, and joined nine other websites that belong to mainstream media, already connected to the government, to register under the newly introduced individual licensing framework of 2013. This act large affected online news sites, requiring them to comply with takedown notices within 24 hours, and perform in compliance of the Internet Code of Practice

An important aspect that helps in understanding the situation of Internet limitations and controls in Singapore is the understanding that surveillance in the island state is an accepted fact of life, where citizens know that they are under constant monitoring, and a belief that the government can access any private data it wants (Freedom House, 2014, p. 11). This understanding puts in perspective the power of suggestion in Singapore that is leading to a high level of self-censorship, with very little open dissidence.

The 2015 report of Freedom on the Net showed that the status of Internet freedoms remained almost the same, with one point difference in the Violations of User Rights, moving Singapore score from 40 to 41, a slightly less open score (Freedom House, 2015). The report maintained the conclusion that blocking of social media and applications, as well as online content, is non-existent to minimal. However, it clearly reiterated the findings of the previous report of the high level of controls set indirectly resulting in an effectively limited ability to use the Internet within the rigid boundaries of laws and regulations, while enumerating cases of user rights violations.

Freedom House review of press in Singapore concluded that the news websites that are connected to mainstream media do not deviate significantly from the official line of news in political issues. These outlets revert to editing articles post publishing when they feel the content is potentially contentious, in a practice of self-censorship that heightened towards the 2015 elections (Freedom House, 2015, p. 7). The concern of elections followed the lesson PAP, and government officials learned from the 2011 elections, including putting tremendous efforts in having their say in the online world with representation on a different social media platform and news sites.

The years between the two elections saw an increase in online and digital activism in Singapore, including successful campaigns to change policies, as with the campaign related to the government pension scheme, which resulted in changing of the policy to fit more the requirements of the public mid-2014, however, it was clear that the success of online mobilisation is constrained by offline restriction more than by online ones (Freedom House, 2015, p. 9). A new law came around the same time to protect citizens from online harassment, the Protection from Harassment Act, which included a section with remedies for false statements of facts published about a person, which was quickly used as an instrument by the government against critics (Freedom House, 2014).

The new law added yet another instrument for the regime quiver towards the protection of civil and political order and stability, even when at the cost of civil and individual liberties and political opposition and freedoms. Nonetheless, cases showed that Singaporean public are reactionary in general with a tendency to break the silence, sign petitions and go on rallies when they feel injustice. One case was when a 16 years old child was prosecuted for content they published online, including a video of themself speaking against the prime minister and later a manipulated image depicting two politicians having sex (Freedom House, 2015).

Twenty Fifteen also included an important aspect related to the revelations of Edward Snowden, which showed the involvement of SingTel, the Singaporean incumbent telecommunication company, in facilitating intelligence agencies' access to traffic passing through one the major undersea telecom cables. The revelations stirred discussion on total information awareness, a concept where the state has access to all digital activity and electronic records related to their citizens, an analyst was quoted in the Freedom on the Net 2015 report saying "Singapore has become a laboratory not only for testing how mass surveillance and big-data analysis might prevent terrorism but for determining whether technology can be used to engineer a more harmonious society" (Freedom House, 2015, p. 14).

In the years leading to 2018, Singapore maintained the same score at Freedom on the Net reports, with the same status as partly free. The three reports of 2016, 2017, and 2018, described what seems as stability and consistency in the model of Internet limitations and controls, with low dependency on technical filtering and blocking, and high dependency on maintaining an environment of monitoring and control towards self-censorship among the citizens through legal instruments and ominous surveillance

(Freedom House, 2016, 2017, 2018). The year 2016 saw such use of legal instruments when two editors of a website that operate from outside of Singapore, and deemed to publish controversial material, editors of *The Real Singapore* were sentenced for ten months under the sedition laws when they visited Singapore (Freedom House, 2016).

Restructuring in the authorities in charge of media and Internet regulations was conducted in 2016, with the *Infocomm Development Authority of Singapore* (IDA) was succeeded the *Infocommunications Media Development Authority of Singapore* (IMDA), as the authority responsible of infrastructure, and the infamous MDA restructured into Government Technology Organisation (GTO). The changes followed government promises towards a competitive industry structure with an all-fibre Next Generation Network for the whole city-state (Freedom House, 2016). These moves reconfirm the interest of the government in developing Internet usage and reliance on technology for economic advancement. Nonetheless, since the Internet limitations did not see any meaningful change, the need for constant control of the government does not seem to have changed, and limits the advancement interests to the economy, but not for freedom of expression. This can be further confirmed with what FoN2016 report described as a gradual normalisation of online space to match the offline media environment of PAP ideological dominance of content (Freedom House, 2016, p. 7).

Key developments in the years 2016 to 2018 were in more legal instruments to increase control and expression, including online use and expression, as in the 2016 statute to codify the offence of contempt of court and the *Administration of Justice Protection Bill*, which specified publishing material that interferes with ongoing proceedings as an offence. The contempt of court law proved as one of the most applied laws against bloggers writing on the treatment of opposition politicians and LGBT activists (Freedom House, 2017). Another key law that was passed in 2018, but pre-empted in 2017, was the *Public Order and Safety Act*, and the works towards laws that target "fake news", which were received as drastically restricting online media and freedom of expression (Freedom House, 2018).

Overall, reports covering the state of the Internet in Singapore were mostly in agreement when describing the existence of a light-touch control in terms of filtering and blocking, and an impressively capable heavy hand of laws, regulations, and surveillance resulting in a highly controlled environment reliant on self-censorship on the individual and website levels. The prospects of Internet freedoms in Singapore is limited, with no

indication of the change in the attitude of the government, on the contrary, it is exporting the model of control to other countries for its effectiveness, with limited objection from citizens of the country.

4.4.5 Key findings

As this section mapped the status of the Internet in Singapore, the first look reflected a service with very high availability and early adoption provided over a sophisticated infrastructure with an environment supportive for digital skills development. However, a more in-depth analysis reveals what carries the potential for hindering outcomes of the use of the Internet in the form of governmental aptitude towards maintaining control over all media and information access, from conventional media to the Internet, in the form of stringent laws and regulatory processes governing Internet use and content production and communication.

The regulatory environment and the business connections with the regime played a role in the companies and service providers introducing technical limitations on accessing online material and websites that may be deemed controversial, especially material that fall under moral, racial, and religious sensitivities of the country. While for individuals, the environment of legal prosecution based on content shared and in possession, and opinions expressed online created an atmosphere of high self-censorship that, according to the reports studied, was even more effective as a method for control of online use than technical limitations, in a model that Singapore was attributed as a pioneer of. Singapore did provide the expertise of Internet controls to other countries and regimes that shared similar yearn to control, including China, since the mid-1990s.

Nonetheless, and despite relying on a model that relies more on fear than technical limitations, network measurements showed prevalent anomalies and signs of blocking for most websites checked and in every category tested, from pornography to websites of Intergovernmental organisations and even translation services. The network measurements result reflected the sporadic nature of blocking, with what seems as if the lists rotate over time, providing an image that only a small number of websites is blocked at any given time.

The findings of this sections show that the network measurements collected and reports reviewed to support the conclusion that Internet use in Singapore is highly controlled through a setting that encourages self-censorship empowered through light-

handed rotating website blocking with the stern regulatory environment. These findings carry the potential for effectively controlling Internet use and outcomes in the country, a matter that is covered in detail in Study 2.

4.5 Summary

This chapter fulfilled its role of providing knowledge on the status of the Internet, particularly from the perspective of availability and limitations set on the network and the environment, by looking at measured Internet limitations and reported limitations and practices that affect Internet and digital rights in the three countries of research, Estonia, Bahrain, and Singapore. The chapter findings push theory of three different approaches and concepts in how each of the countries views and deals with affordances of the Internet in relation to freedom of expression, activism, and further uses of the medium.

Estonia maintained a positive outlook to affordances of the Internet, encouraging use by offering initiatives to spread access and digital skills, and offering a wide suite of public services online, while maintaining an open environment for expression, and use. The few limitations and filtering found occurred mainly as a result of regulations for licensing of gambling providers, and blocking non-licensed or illegal providers, indicating the existence of technological means for blocking at ISP level, but with no findings to support appropriation of those means to limit access to information and freedom of expression.

Singapore and Bahrain shared a similarly positive outlook towards technology and its benefits for development as Estonia, and running initiatives for spreading access and development of digital skills, but with reluctance of the potential of communication technologies to assist in producing imbalance in the delicate equilibrium of races and religions in each country as conserved by its governments. This reluctance resulted in developing strategies to maintain control over the Internet as a medium, and the message communicated through it. Despite the difference in approach, the resulting limitations as found by the study can confidently support grouping of Bahrain and Singapore in one group as the countries with high level of artificial limitations set on Internet.

In Bahrain, the controls observed are embodied in limiting access to several websites serving content that is deemed dangerous to the public morals as with pornography, as well as circumvention tools, websites of political nature, and news and media outlets, with the blocking fluctuating between transparent and non-transparent. The

filtering is combined with a high level of surveillance and monitoring that is acted upon with force in many cases, endangering people's freedoms and resulting in incarceration at some times. These practices created an environment of high self-censorship in dealing with media in general, and the Internet in specific.

Singapore on the other hand with a slightly different strategy, maintaining a light-hand of technical blocking in what seems to be a rotating list of pages that are blocked, resulting in a more dynamic blocking that would reflect covering a small list of websites limited at any point of time covering several categories of transparent blocking. Singapore tends to be relying more on developing and maintaining an environment of fear and self-censorship supported by laws and regulations, including stringent defamation laws, rather than mere technical blocking.

The data collected through this study and the information deduced help in building the picture of powers in the network society, with each of the countries comprising a community that have different opportunities as reflected by the difference in power relations' influence on access and availability of services and content provided over the Internet. This picture is critical in the studying of tangible outcomes of Internet use, as in the chapter on Study 2 and the later discussion chapter, where it is playing as a lens to appreciate the digital inequalities among individuals in these communities and across communities as predicted by the artificial Internet limitations described in this chapter.

Chapter 5

Study 2:

Tangible Outcomes of Internet Use

5 Study 2: Tangible Outcomes of Internet Use

5.1 Introduction

This chapter carries on with the quest to answering the research questions by delving into tangible outcomes of Internet use as a measurement for inequalities in opportunities for Internet users building on the knowledge developed in the previous chapter on the Internet Artificial limitations in the countries of research. The Methodology chapter elaborated on the studies part of this research, with the second study dedicated to measuring tangible outcomes of Internet use through mixed-methods approach combining a survey instrument and a set of interviews to augment the survey results and provide an explanation where needed.

This chapter looks at these two instruments, beginning with the survey, detailing the population and sample researched, and how that sample was reached as well as its main characteristics. The following sections then study the responses of the sample on questions aimed at building an understanding of the societies being studied in terms of the perception of limitation and use of technology, as well as demographic indicators. Then the chapter flows to study responses on questions specific to the four fields of tangible outcomes of Internet use, Economic, Cultural, Social, and Personal, dissecting the differences among different societies, which are then correlated with predictors.

The correlations with predictors explore the effect of the predictors with significant correlation with the tangible outcomes fields and sub-fields where necessary. This exploratory effort helps to understand what attributes of the individual in communities with different levels of limitations that affect Internet access and use, whether direct as with content and service blocking, or indirect as with promoting self-censorship through building an environment of fear surrounding usage and expression. The predictors combined to produce a profile of people who have higher potential for opportunities to better achieve, and be more satisfied, with Internet affordances.

As the findings of the survey become apparent, the chapter moves to cover the interviews conducted as part of this study to verify and expand the findings and increase the validity of the research. In addition to connecting the interviews with the findings, additional findings came up from the interviews that the scope of research would not have found otherwise. The interviews are organised by country, with each country's interviews written to reflect the main themes discussed.

The build-up for the discussion chapter, where most of the critical input is produced, runs throughout this chapter, with the critical outtakes of Study 2 summarised in the last section of this chapter, combining the main findings of both instruments used in this study.

5.2 Survey

As discussed in the Study 2 design in the methodology chapter, the first of the two instruments used for Study 2 was a survey conducted with respondents in countries of research to measure tangible outcomes of Internet use and collect information on skills and use of circumvention tools, as well as perceived limitations and monitoring on Internet use. The survey was available online since November 2017, with most responses collected between the end of 2017 and the middle of 2018. The survey contributed quantitative measures that are later augmented with interviews as a sequential explanatory instrument to provide an adequate understanding of the relationship between artificial Internet limitations and tangible outcomes of Internet use, the core of this research.

This section is arranged to first look at the survey in terms of structure and aims with an effort to limit any overlapping with the survey design as detailed in the methodology chapter. Then the section includes a series of descriptive statistics for the research sample and responses, including characteristics of responders, and responses to questions related to skills and usage of technologies associated with this research, particularly circumvention tools. The section then discusses the main correlations between the variables to establish findings to be used in the analysis of Chapter 6.

5.2.1 Sample and characteristics of responders

The survey, being open over the Internet to respondents from all over the world, received 756 responses in total, of which 536 responses from the countries of interest, Bahrain, Estonia, and Singapore. Progress through the survey differed among countries, with 55 respondents from Bahrain dropping the questionnaire at the questions on perception of control and limitations in the second of the six-page questionnaire. The number of respondents dropping at this stage from Bahrain is significant when compared to the 17 from Estonia and the six from Singapore who dropped at the same stage. Responses that included answers beyond the second page are considered useful to the research as they provide insight into demographics and knowledge and use of circumvention tools, as well as the perception of artificial Internet limitations in the forms

of monitoring and control. Thus, the responses included in the analysis were the responses that went beyond the second page, with a total of 459 responses, 176 from Bahrain, 157 from Estonia, and 126 from Singapore. Complete responses that answered all the questions up to the end of the survey were 361 in total, 120 from Bahrain, 137 from Estonia, and 104 from Singapore.

According to interviews from Bahrain, an explanation for the high number of people dropping the survey at questions related to perception to limitations lies in that at that stage people get the feeling that the questionnaire is related to politics, particularly that questions asked whether people feel that the government does control or monitor access and use of the Internet. Politics is a highly dreaded subject in Bahrain, and it is conceivable that the fear of being framed as a dissident, even by participating in such survey, caused many people to leave the survey at that stage.

Although the survey was available in the four main languages used in the countries of study, Arabic, English, Estonian, and Chinese, only two responders started the survey in Chinese, one from Singapore and the other one was surprisingly from Bahrain, possibly an expat living in Bahrain. Nonetheless, as expected, the English version was the version most used in Singapore, the Estonian in Estonia, and the Arabic in Bahrain. It is worth mentioning that, since the users had the possibility of switching language at any stage of the survey without disturbing their progress, it is imaginable that some users switched between language versions at any stage of the survey, but that change would not be recorded as only the start language is.

For other indicators on the characteristics of the survey sample, the survey followed conventional demographic indicators, maintaining compliance with the DiSTO framework on which the survey consulted to measure tangible outcomes of Internet use as described in length in the Methodology chapter. The indicators comprised of the sex, age, level of education, and employment status. The sex indicator question responds to the sex variable in the reference framework but is named *sex* as it included only two options following the reference framework, with samples of Bahrain and Singapore consisting of around half male and half female, while, as shown in table 5-1, the Estonian sample had 75% of the respondents self-identifying as females.

Table 5-1

Sex distribution for the sample from each of the research countries

Sex	Bahrain	Estonia	Singapore	Total
Female	82	118	67	267
Male	94	39	59	192
Total	176	157	126	459

Age distribution of the sample showed that half of the respondents from each of the countries is between 18 and 30 years old, while, as detailed in table 5-2, the sample from the age group of people over 61 years old ranged between almost 2% to 4% of the sample. Comparing these numbers with age distribution of the population over 18 years of age for all countries shows that in the age groups of 31-45 and 46-60 combined, the sample can be considered similar in representation of that of the population, with 54% to 48% in Bahrain, 55% to 42% in Estonia, and 55% to 46% in Singapore[11]. The main variance of the sample comes from the age group over 61%, which can be related to recruitment of the sample and the fact that the population of the research is users of the Internet rather than the overall natural population of the country, which the population age distribution number available refer to. The age and sex distribution show a slight deficiency in the representation of this research, which should be mended in future work at a larger scale with better resources.

Table 5-2

Age distribution for natural population and sample from each of the research countries

	Bahrain		Estonia		Singapore	
Age Group	Population	Sample	Population	Sample	Population	Sample
18-30	26.08%	50.00%	22.86%	55.41%	21.98%	50.40%
31-45	30.64%	33.75%	30.27%	33.76%	29.27%	21.60%
46-60	23.78%	14.38%	24.90%	8.28%	25.25%	24.00%
Over 61	19.50%	1.88%	21.97%	2.55%	23.51%	4.00%

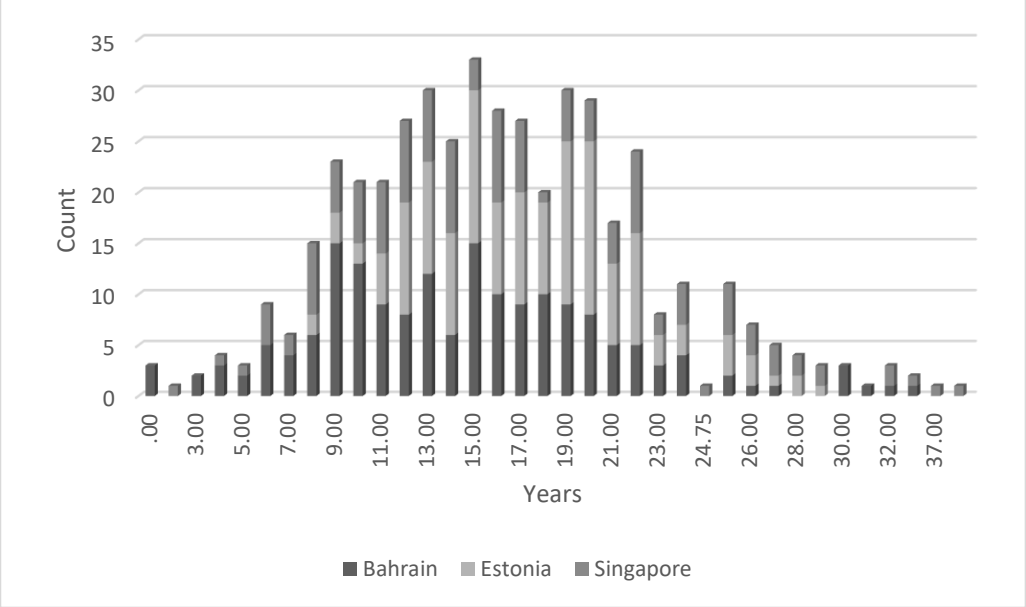
[11] Natural population distribution data from United Nations Statistics Division for the years 2018 and 2017: http://data.un.org/Data.aspx?d=POP&f=tableCode%3a22

The questions for education and employment included several options to reflect most cases possible, as detailed in the survey design section of the methodology chapter. The options were grouped into three primary levels of education, and employment had six categories, in compliance with the analysis of the DiSTO survey used as a reference framework (Helsper, van Deursen and Eynon, 2015). In terms of education, the majority of respondents, 63%, fell in the *High Education group,* indicating that they have achieved education further than high school or equivalent, including college and university degrees. The following group in numbers was the *Secondary Education* group, with people who achieved high school or equivalent degree, with 33%. The third group, *Low Education*, which garnered less than 4% of responses, included people with any level of education that is less than high school or equivalent. For employment, 48% of the respondents across the countries are employed in full-time jobs, and 35% are students, while the distribution of the rest was unemployed 9%, retired 5%, and homemakers 2%. The results here show that the sample distribution was slightly biased towards people with higher education who either are employed or are students enrolled in full or part-time education.

Another aspect that was explored for having the potential to affect outcomes of Internet use is the number of years the person has been using the Internet for, as it reflects the possibility for increased skills in usage. Over the whole sample, less than 3% have been using the Internet for up to five years by the date they responded to the survey, while the majority, almost two-thirds of respondents, have between 10 and 20 years of Internet use experience as apparent in figure 5-1. The results show that since most of the respondents had more than 5 years of Internet use experience, it is expected that the level of use skills is adequate for people to be able to use the Internet at least at basic skills level. Previous research that counted for years of Internet experience as a predictor for use was not conclusive (Boulianne, 2009). However, its effect was measured for the sample and the results, as is shown later, has a positive effect with significant correlation on some of the tangible outcomes of Internet use. This substantiates including this aspect in this survey as being useful and helped in identifying an indicator that was not fully covered in previous literature but did hold potential for determining Internet use outcomes

Figure 5-1

Years of Internet Use by Country



In addition to Internet use experience, the survey did also include questions for a set of digital skills and use of tools and technologies, namely skills that would enable users to surf the Internet bypassing circumvention based on types of limitations that can be circumvented as mentioned in the literature review, particularly blocking and monitoring of access.

These skills included the ability to access websites that are blocked, as well as ability to access websites and using the Internet without being caught through surveillance, the latter question was labelled as accessing a restricted website. Other skills included were skills related to communication, as with the ability to communicate securely and ability to encrypt communications, in addition to knowledge of file encrypting techniques to indicate a higher level of digital skills related to circumvention. The operationalisation of skills was counted for by asking about the use of circumvention tools, including the Tor browser and network, Proxies, and Virtual Private Networks (VPN), and communication tools that provide a level of encryption and has the potential to limit surveillance, such as Signal instant messenger and WhatsApp. Each question consisted of a question to check if the individual knows that tool, and the second is to check if the individual has used the tool in the past year, to measure the knowledge and use of these tools.

Table 5-3 show the skills measured and percentage of respondents stating that they have them. Half of the sample from Bahrain expressed that they can access a blocked

website bypassing blockage and filtering, a similar percentage stated that they are able to communicate securely bypassing surveillance, showing that the sample from Bahrain has confidence in bypassing Internet limitations set in the form of blocking and surveillance. However, the majority, 88.4% of respondents, stated that they are not able to access websites bypassing surveillance.

While in Estonia and Singapore, less than a third of respondents indicated the ability to access blocked websites, while the ability to communicate securely was at 75% of Estonian respondents, and 48% of Singaporean, indicating high levels across all countries of study to bypass limitation and thus limiting the effect of said limitations on the daily use of the Internet. The increased agency of Internet users surveyed to bypass limitations will receive further scrutiny from discussing its potential in sustaining opportunities for tangible outcomes of use across the countries studied.

Table 5-3

Skills reported by country of study

Skill	Bahrain	Estonia	Singapore	Total
Know how to access a blocked website	50.0%	33.1%	28.6%	38.3%
Know how to access a restricted website	24.4%	21.0%	18.3%	21.6%
Know how to communicate securely	56.8%	75.2%	48.4%	60.8%
Know how to encrypt files	28.4%	49.7%	27.8%	35.5%
Know how to encrypt communication	15.3%	33.1%	17.5%	22.0%
Skill to bypass limitations [(a)]	**52.3%**	**37.6%**	**31.7%**	**41.6%**

Notes: (a) calculated based on knowledge of how to access a blocked website and knowledge of how to access a restricted website.

User's agency and ability to bypass limitations is also reflected in the technologies known and used, with more than half of the respondents across the whole sample confirming that they know about proxies and VPNs. The later proved to be the most popular method used for bypassing Internet limitations, with 45% in Bahrain, 59% in Estonia, and 42% in Singapore, as evident in table 5-4. The percentage of people who have used at least one of the three circumvention tools covered in the past year was astonishing as well, with around half of the sample from Bahrain and Singapore, and 70% from Estonia. It is necessary to point out here that during the Interviews, B4 confirmed a tendency that requires attention, that many people in Bahrain do use circumvention tools

without realising what technology it is, as they know that they need to run a specific program, which in most cases sets up a VPN connection, before using the Internet. This would result in a potential increase in the number of people who are able to bypass limitations by using circumvention tools, even if it was transparent to them.

Table 5-4

Tools Known and Used by Country of Study

Tool	Aspect	Bahrain	Estonia	Singapore	Total
Tor	Know	9.7%	35.7%	17.5%	20.7%
	Use	4.0%	12.1%	5.6%	7.2%
Proxy	Know	49.4%	67.5%	53.2%	56.6%
	Use	23.3%	37.6%	20.6%	27.5%
VPN	Know	52.3%	76.4%	76.2%	67.1%
	Use	44.9%	58.6%	42.1%	48.8%
Use of Circumvention Tools (Any)	Use	49.4%	70.7%	50%	56.9%
Signal	Know	25.0%	9.6%	16.7%	17.4%
	Use	10.2%	1.3%	5.6%	5.9%
WhatsApp	Know	96.6%	84.7%	98.4%	93.0%
	Use	96.0%	43.3%	98.4%	78.6%

The argument for using circumvention tools in the countries studied do not only include bypassing Internet limitations, as technologies such as VPN is a standard for some companies for staff to connect from outside of the premises to access business services. However, the interviews revealed an exciting reason for using services and tools that bypass the local Internet, geo-blocking. Interviewees from Estonia and Bahrain, for instance, expressed that the use of circumvention tools, particularly VPN, is widespread because people wanted their Internet access to appear as if coming from countries other than where they are physically located, to gain access to online content that is not available there through geo-blocking.

Geo-blocking is territorially based access control, a practice of restricting access to online content based on the user's geographical location (Yu, 2019), Implemented by the content provider to either comply with sanctions or licensing and distribution agreements. Compliance with sanctions includes, for example, geo-blocking of finance and banking sites as a result of US economic sanctions with Iran, Syria, Sudan, and Cuba (McDonald *et al.*, 2018). Compliance with licensing and distribution agreements, traditionally copyright and licensing, is prominent in the entertainment industry and has been based on availability in geographical markets, or require delays on content availability (Earle, 2016; Riis and Schovsbo, 2016). Interviewees from Estonia, especially E1, cited Netflix as one of the key content providers which people in Estonia use VPN to access, this is understandable when looking at the limited content available in Estonia on the platform, which includes only 13.2% of movies and 15.4 of TV shows available to the USA market[12].

Interviewees B3 and B5 from Bahrain mentioned geo-blocking as a drive for using VPNs. However, interviews have also shown that this use is secondary to bypassing blocking and filtering of websites and limiting surveillance and monitoring. In Singapore, the interviewees cited limiting the ability of local authorities to monitor Internet use and activity as the main reason for using VPNs. The noticeable use of circumvention tools in each of the communities studied reflect the main local limitations affecting individual use of the Internet and the need for people to bypass it to access what they need with less fear of consequences.

In terms of communication tools, the questionnaire asked about knowledge and use of two common communication tools that promise the possibility for secure communication bypassing surveillance and monitoring through end-to-end encryption. The tools are WhatsApp and Signal, which are based on mobile applications but can also be accessed from the desktop environment. These tools are prevalent in Bahrain and Singapore, with WhatsApp having almost ubiquitous use. In Estonia, just a little over 1% of the sample use Signal while 43% use WhatsApp.

An important aspect that was measured as part of the questionnaire is the perception of limitation and control based on the party that implements or enforces it. The questions asked respondents if they feel that their school or work, ISP, or government controls what sites and services could they open, or monitors what they say or do online.

[12] Data based on lists available at https://finder.com

Responses varied considerably across the countries, as detailed in table 5-5. The difference in response derived from how many people feel their Internet use is either controlled or monitored, and what party is more likely to do that.

Table 5-5

Source of Control and Monitoring and Its Forms as Perceived in Countries of Study

Source and Control Type	Bahrain	Estonia	Singapore	All
School/Work Control	48.3%	17.2%	61.1%*	41.2%
ISP Control	51.1%	29.9%*	49.2%	43.4%
Government Control	76.1%*	16.6%	59.5%	51.2%*
School/Work Monitoring	40.3%	20.4%	44.4%	34.6%
ISP Monitoring	42.6%	37.6%*	31.7%	37.9%
Government Monitoring	60.2%*	15.9%	49.2%*	42.0%*
Any Control	84.7%	39.5%	80.2%	68.0%
Any Monitoring	65.9%	47.1%	64.3%	59.0%
Any Monitoring and Control	88.6%	56.7%	85.7%	76.9%
All Monitoring and Control	18.8%	3.8%	11.9%	11.8%

Note. '' denotes the main source of monitoring or control in each of the countries and overall.*

In Bahrain, half of the sample said that they feel that their school or workplace limit what websites they can open, a similar percentage felt that their ISP does that, while a stunning 76% feel that the government is the party that limits and controls their Internet use. A similar pattern was apparent in the monitoring results, but with around 40% feel that their school or workplace does monitor their Internet use, 42% for the ISP, and 60% for the government. This shows that people in Bahrain feel that the Internet is more controlled than monitored, with 85% of the sample feel that at least one party is controlling their Internet access and 66% feel that some party is monitoring their Internet use. The pattern does not reflect a high level of suspicion, as only 19% said that all parties are controlling and monitoring their Internet use. The latest number is humble towards 89%, saying that at least one party is either monitoring or controlling their Internet use.

The sample from Singapore found that their school or workplace lifted the burden of conducting the most of limitations of Internet access with 61% feeling so, followed narrowly by the government with 60% and then the ISP with 49%. However, the balance is shifted with monitoring, with the government blamed for most monitoring at 49% of the sample seeing so, with 44% seeing that the school or workplace does the monitoring, and 32% blame the ISP. Overall, 80% feel that Internet is being controlled by at least one party, 64% feeling the same for monitoring, and 86% felt that some party does either monitor or control their Internet use, thus feeling that their Internet use is not free, with 12% of the sample stating that they feel all the parties do monitor and control their use.

Estonia, on the other hand, displayed a different pattern and level of how many people feel their Internet being controlled or monitored with over 43% seeing that no party is either monitoring or controlling their Internet use, or that they have free and open Internet, compared to only 11% in Bahrain and 14% in Singapore. However, among the sample, the ISP was pointed out as the party that does most of the control or monitoring of Internet access, with 30% pointing at the ISP for control and 38% for monitoring.

The government, on the other hand, had less blame at 17% and 16% respectively, reflecting higher trust in the government not to fetter with their Internet access. The number of people in the sample from Estonia that displayed a high level of suspicion was less than 4%, and those are who said that they feel that all parties are monitoring and controlling their access.

This difference between the countries is in line with the findings of Study 1 on the levels and methods of artificial Internet limitations, where Estonia enjoyed an open and free Internet with very limited limitations set on access, with an environment that supports free speech and expression online and offline. While Bahrain, on the other hand, applies a high level of limitations combined with an environment that suppresses and penalise what deems inappropriate of online expression. Singapore was a similar situation but with lower technical or direct limitations and higher control on people's attitude and practice online.

For the research sample from all of the countries, the government was seen as the primary party that controls access to the Internet through limitations with 51% feels so, as well as being the primary party that monitors or conduct surveillance on Internet use with 42% expressing that. Three-quarters of the whole sample expressed that they feel that some party limits access to the Internet or monitors usage while only the last quarter feels that their access to the Internet is free from any control or monitoring.

A factor analysis was conducted on the variables of perceived monitoring and control of each party, namely School/Work Control, ISP Control, Government Control, School/Work Monitoring, ISP Monitoring, and Government Monitoring, to check if it is possible to deal with them as a one scale reflecting the overall perceived artificial Internet limitations of monitoring and control. The goal is to simplify the statistical analysis of relations with tangible outcomes of Internet use with no significant loss of correlation and change to the results and to explore the possibility of an indicator reflecting the overall perception of Internet limitation.

The factor analysis using Principal Component Analysis resulted in a positive confirmation that these factors can be indeed dealt with as a single component, with one factor extracted, where they all had high significance with each other at 0.000 level, and the Principal Component Analysis extraction method resulted in one component, details of analysis included in Appendix III. As this component represents the overall perception of artificial Internet limitations in terms of monitoring and control, it is labelled *Perception of Limitation* in the analysis forward on and is the summation of the six scales of perception of monitoring and control.

Another factor analysis was conducted on the variables of *skills to bypass blocking* and *skills to bypass monitoring*, to check if it is possible to deal with them as a one scale reflecting overall skills of bypassing artificial Internet limitations of monitoring and control, labelled *Skill to Bypass Limitations*. The goal is to simplify the statistical analysis of relations with tangible outcomes of Internet use when needed. The factor analysis resulted in a positive confirmation that these factors can be indeed dealt with as one component, where they all had high significance with each other at 0.000 level, and the Principal Component Analysis extraction method resulted with one component extracted, details of analysis included in Appendix III. As this component represents the overall skills for bypassing of artificial Internet limitations in terms of monitoring and control, it is labelled *Skill to Bypass Limitations* in the analysis later on and is the summation of the two scales of skills of bypassing monitoring and blocking.

The questions on artificial Internet limitations in the form of monitoring and control provide a great outlook on how people perceive access to the Internet in terms of monitoring and control. In Bahrain and Singapore, the feeling that no one is controlling or monitoring their Internet access was not common, which is in line with the results from Study 1 described in the previous chapter. Which measured limitations and reviewed reports on practices connected to monitoring and control of Internet use to conclude the

existence of an environment that supports controlling Internet access and conduct surveillance and monitoring of access as part of more extensive policies to control individuals and perpetuate a chilling effect on Internet use and promoting self-censorship. In Estonia, the results are also aligned with previous findings to advise that even though access controls are present as part of the regulatory framework, particularly for remote gambling websites, the environment around Internet use is not affected with such self-censorship.

Around 43% of respondents from Estonia stated that they feel no party is fettering with their Internet access, and thus having free and open access, demonstrating the possibility for content regulation to exist without necessarily producing a chilling effect on Internet use in general. This supports the hypothesis that perception of monitoring and control is used as a tactic to control and limit online expression and thus affecting Internet use through promoting self-censorship.

The results also support the conclusion that much of the circumvention use, especially in Bahrain and Singapore, is to bypass Internet limitations and to limit exposing Internet use to surveillance giving Internet users the feeling that their access to the Internet is free from these measures, allowing for a higher potential of use and, in turn, tangible outcomes of Internet use. Nonetheless, this assumption requires further investigation that can be provided by correlating perceived monitoring and control with skills related to circumvention, knowledge of circumvention tools, and use of said tools. Table 5-6 shows the results of bivariate correlation for this purpose, represented by the vector of correlation, or value and direction, with significant correlations marked.

Table 5-6

Correlation Effect Size between Skills and Tools Known and Used and Perception of Limitations

	Control Perception			Monitoring Perception		
	School/Work	ISP	Gov.	School/Work	ISP	Gov.
Know - access blocked websites	.105*	.196**	.196**	.104*	.178**	.236**
Know - access websites bypassing monitoring	.132**	.183**	.162**	0.064	.114*	.154**

	Control Perception			Monitoring Perception		
Know - communicate securely	-0.026	-0.045	-0.025	-0.015	0.048	-0.012
Know - encrypt files	-0.047	-0.006	-0.031	0.043	0.058	0.032
Know - encrypt communication	-0.006	0.013	-0.018	0.066	0.073	0.027
Know Tor	0.010	0.041	-0.039	0.058	0.089	0.001
Know Signal	.117*	0.085	.092*	0.052	0.067	.179**
Know Proxy	0.035	.118*	0.034	0.036	.131**	0.042
Know VPN	0.068	0.070	0.012	0.042	0.088	0.033
Know WhatsApp	0.073	0.015	.126**	-0.016	-0.051	0.077
Use Tor	0.024	.097*	0.002	0.028	.113*	0.019
Use Signal	0.017	0.043	0.077	.110*	.110*	.125**
Use Proxy	0.051	0.053	-0.025	0.034	0.083	0.020
Use VPN	0.016	0.061	-0.006	-0.005	.145**	0.025
Use WhatsApp	.295**	.166**	.332**	.133**	-0.009	.218**

*Note. '**' denotes correlation is significant at the 0.01 level (2-tailed), * denotes correlation is significant at the 0.05 level (2-tailed).*

The results in Table 5-6 show a clear correlation between knowing *how to access blocked websites* and *perception of monitoring and control* from any of the parties involved, with a highly significant relation, except for *School or workplace monitoring*, which is still significant but not as much as the others. A similar relation exists between *knowing how to access websites bypassing monitoring*, or without being caught by surveillance, except that the relation with *perceiving monitoring at school or workplace* is not significant. No significant relations were present between skills of *knowing how to communicate securely*, *how to encrypt files*, or *how to encrypt communication* and *perceived monitoring and control*.

This result supports the argument that the people who feel that their Internet access is being limited or controlled, would have an incentive to learn how to bypass any blocking or monitoring in order to access the Internet more freely, no matter of what community they are in. The result also reinforces the assumption that the use of

circumvention tools is motivated by a want to access the Internet with no limitations, whether politically motivated or as part of geo-blocking. This assumption was tested in the interviews with several interviewees confirming this motivation, as in the interviews with B1, B2, B3, B4 from Bahrain, E1 and E3 from Estonia, and S1 and S2 from Singapore.

It is critical to mention here that the circumvention tools are not a silver bullet aimed at all types and forms of artificial Internet limitations and many are in fact themselves blocked and cannot be used in some locations. Circumvention tools studied have the potential to bypass the types of limitations that are added on top of rather open Internet access, as with content and website blocking and filtering, thus deemed artificial, and utilises the ability to access other websites or other routes to bypass these limitations. They also have the potential to control the exposure of usage on the immediate networks, including work or school, ISP, or at a governmental level, but do not help with tracking that is based on platform, as with Facebook's tracking of users' activities through cookies. A practical example on the second problem of blocking access to circumvention tools is included in Study 1 where the blocking of the TOR network in Bahrain and the blocking of the default settings of the same network in Singapore have affected the research and OONI measurements by forcing the reliance on anomaly analysis rather than confirmed status of blocking.

In terms of knowledge and use of tools that offer the potential for more secure communication, here, the security-oriented application Signal and the more common WhatsApp. The results show that perception of government control is related to knowledge of Signal and WhatsApp but not to the use of any, while the perception of government monitoring is related to knowledge and use of Signal. As well, the perception of ISP control or monitoring is connected to knowledge of Proxy tools and Tor, while VPN use was only related to the perception of ISP monitoring. Users of Signal had a higher tendency to feel monitored by any of the parties.

These results indicate that different people have different approaches and use different tools for circumvention, and no one tool is preferred, except WhatsApp. WhatsApp correlation results show that is connected with almost all aspect of control or monitoring perception, but nonetheless, we cannot deduce causality here because WhatsApp was the tool most commonly used across the entire sample by far. Unlike Signal, security and privacy are not the main features of WhatsApp, and it is possible that people are using it for its other affordances or because of the network effect.

5.2.2 Tangible outcomes of Internet use: achievement and satisfaction

The target measurements of the study are the tangible outcomes of Internet use, as defined and described in the literature review to be the opportunities people are gaining as a result of Internet use to enhance their lives. The tangible outcomes are measured based on the methods detailed in the Methodology chapter, through a survey that is informed by the DiSTO framework, and a series of sequential explanatory interview. Four pages of the survey were dedicated to questions aimed at measuring outcomes in the fields of Economy, Culture, Social Activity, and Personal Development.

Each of the fields, as described earlier, is measured in two dimensions, Achievement and Satisfaction. The achievement dimension aims at measuring the achievements in activities the individuals are gaining through the internet in comparison for conducting the same activities offline. The satisfaction dimension measures how individuals feel satisfied with using the Internet for activities, in comparison with satisfaction from conducting the same activities offline as well. The combined results of each of the questions produce the achievement and satisfaction for the first level of aggregation as described in the Methodology chapter to include Economic Achievement and Satisfaction in terms of Property, Income, and Education/Employment, Cultural Achievement and Satisfaction in terms of Cultural Identity and Cultural Belonging, Social Achievement and Satisfaction in terms of Personal, Formal, and Political, and Personal Achievement and Satisfaction in terms of Health, Self Actualisation, and Leisure.

The mean results of responses for questions of each field have also been used to generate the overall levels, or second level of aggregation of achievement and satisfaction for each of the fields. Table 5-7 show a list of means of the aggregate and sub-fields, or the first level of aggregation, of tangible outcomes of Internet use by country, and by Bahrain and Singapore as one group of countries with high limitations as found in Study 1, and the whole sample. The means show similar trends across the countries and sample, contributing to the validity of comparison among countries, as well as the possibility to deal with Bahrain and Singapore as a group of countries with high limitations.

Table 5-7

Means of Results of Aggregate Fields and Sub-Fields of Tangible Outcomes of Internet Use by Country

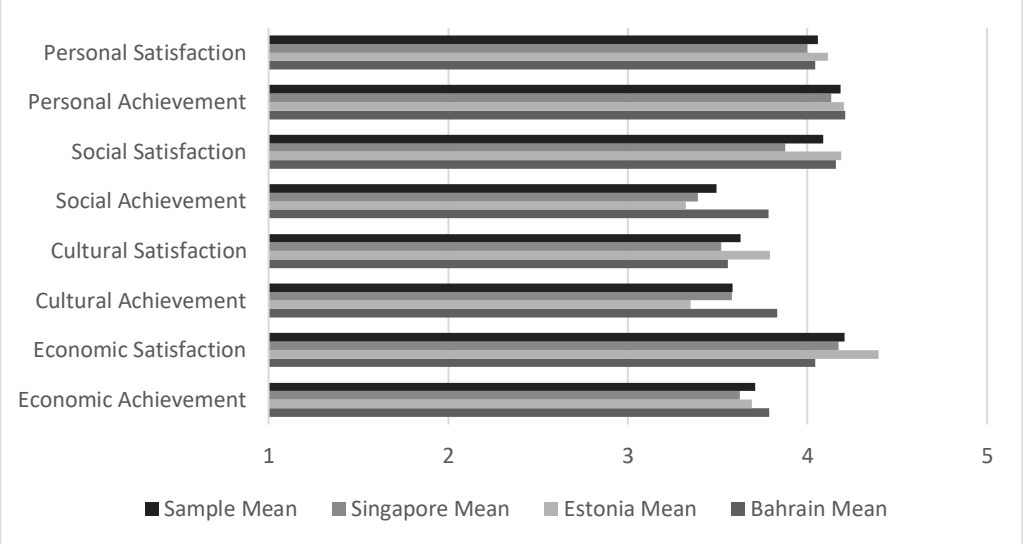
Field	Bahrain	Estonia	Singapore	High Limitations	Whole Sample
Economic Achievement	3.79	3.69	3.63	3.72	3.71
-- Property	3.57	3.61	3.6	3.59	3.59
-- Income	3.3	3.22	3.23	3.27	3.25
-- Education / Employment	4.07	3.95	3.84	3.97	3.96
Economic Satisfaction	4.04	4.4	4.18	4.1	4.21
-- Property	4.06	4.49	4.25	4.15	4.29
-- Income	4.12	4.56	4.3	4.2	4.35
-- Education / Employment	4.01	4.29	4.05	4.03	4.12
Cultural Achievement	3.83	3.35	3.58	3.72	3.58
-- Identity	3.77	3.47	3.59	3.69	3.61
-- Belonging	3.89	3.17	3.58	3.75	3.55
Cultural Satisfaction	3.56	3.79	3.52	3.54	3.63
-- Identity	3.46	3.64	3.51	3.48	3.53
-- Belonging	3.7	3.78	3.53	3.62	3.68
Social Achievement	3.78	3.32	3.39	3.6	3.49
-- Personal	3.92	3.2	3.46	3.7	3.51
-- Formal	3.8	3.36	3.21	3.5	3.44
-- Political	3.46	3.65	3.38	3.42	3.51
Social Satisfaction	4.16	4.19	3.87	4.03	4.09
-- Personal	4.34	4.17	3.99	4.17	4.17
-- Formal	3.96	4.02	3.55	3.73	3.85
-- Political	3.91	4.39	3.88	3.89	4.09
Personal Achievement	4.21	4.2	4.13	4.17	4.19
-- Health	4.09	4.07	3.97	4.03	4.04
-- Self Actualisation	4.31	4.49	4.38	4.34	4.4
-- Leisure	4.2	4.1	4.06	4.14	4.12
Personal Satisfaction	4.04	4.11	4	4.02	4.06
-- Health	3.88	4.04	3.79	3.84	3.91
-- Self Actualisation	4.13	4.29	4.15	4.14	4.2
-- Leisure	4.05	4.01	4.04	4.05	4.04

Survey questions on outcomes of Internet use were answered on a five-point Likert scale, with 3 set as neutral, 4 and 5 meaning that the person did achieve the activity in question online better than offline, for the achievement questions, and satisfied with the online affordances for doing the activity asked about in satisfaction questions. While points 1 and 2 meant the opposite, with the respondent finding that doing the activity offline helps them achieve better results than online and that they are not satisfied by the related online affordances. For the aggregates, the threshold was to have results over 3.5 to indicate positive response, results under 2.5 to indicate a negative response, and anything in between as neutral, in compliance with the reference framework project report (Helsper, van Deursen and Eynon, 2015).

In terms of aggregates at the field level, higher levels of satisfaction and achievement were contested between Bahrain and Estonia, with Bahrain leading in level of achievement and Estonia leading in satisfaction of all the four fields. The field with the overall highest levels of both achievement and satisfaction across the sample is the Personal Development field, as shown in figure 5-2. The results show that the level of achievement and satisfaction of using the Internet is indeed positive with all of the fields having results of over 3.5. The Social Achievement field had a rounded mean of 3.5, barely on the positive side, meaning that although individuals feel that the Internet provided affordances and opportunities to achieve better outcomes in life in all aspects, respondents did not feel that the Internet did enhance or advance their personal, formal, and political social activities as much as with other fields.

Figure 5-2

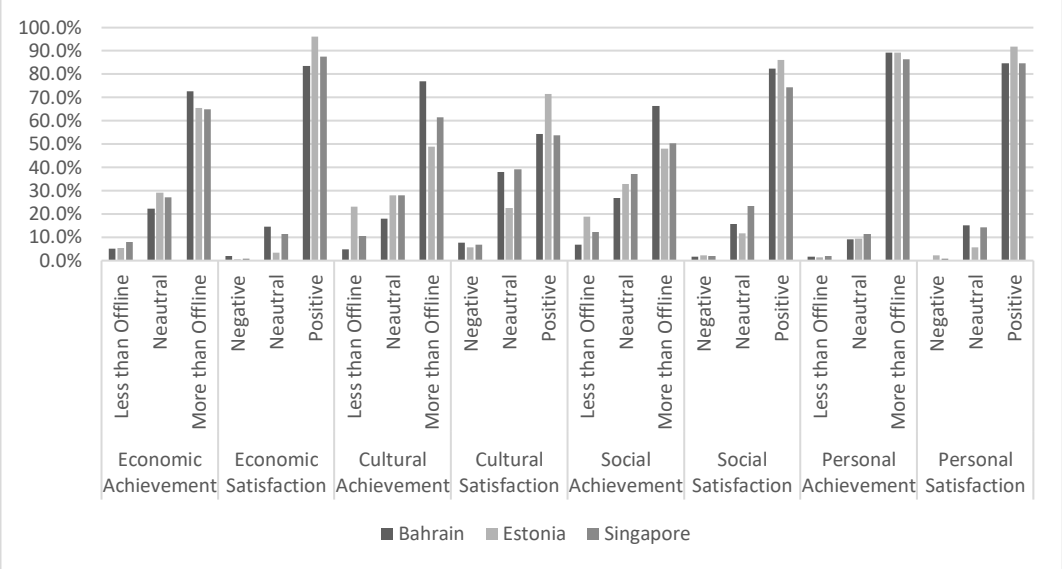
Tangible Outcomes of Internet Use Mean per Field and Country



A closer look at the perceived achievement and satisfaction in terms of tangible outcomes of Internet use by country, as represented in figure 5-3 show again how respondents in all of the countries, over all of the fields, feel that the Internet did contribute positively to their tangible activities, with very little polarisation between positive and negative. In other words, not many people disagreed that the Internet helped them achieve better in their lives, while some were neutral, and the majority agreeing on the proposition. Respondents from Bahrain had views that are more positive when it comes to achievement, while respondents from Estonia showed higher satisfaction, and Singapore sitting in between in all of the fields, the findings were discussed in the interviews as will be explained in the section on interviews.

Figure 5-3

Expression of Tangible Outcome of Internet Use by Field and Country



The variance between achievement and satisfaction across countries reflects general contentment in services available and ability to use them in Estonia, while in Bahrain there is higher discontentment but at the same time, indicating that they still achieve more using the Internet than through offline methods in different activities. When crossing this with the perception of Internet freedom discussed earlier, we can see that there is a negative relation between perception of monitoring and control of Internet access and satisfaction with Internet use outcomes.

Respondents in Estonia showed low level of perceived monitoring and control from any party at 57%, table 5-5, with overall satisfaction at 4.14, while Bahrain and Singapore had very high levels of perceived monitoring and control from any party at

89% and 86% and overall satisfaction levels at 3.94 and 3.92 respectively as clear in table 5-8. Nonetheless, achievement is different, and does not follow the same pattern with respondents from Bahrain and Singapore indicating better achievements using the Internet than Estonia.

Table 5-8

Overall Achievement and Overall Satisfaction by Country

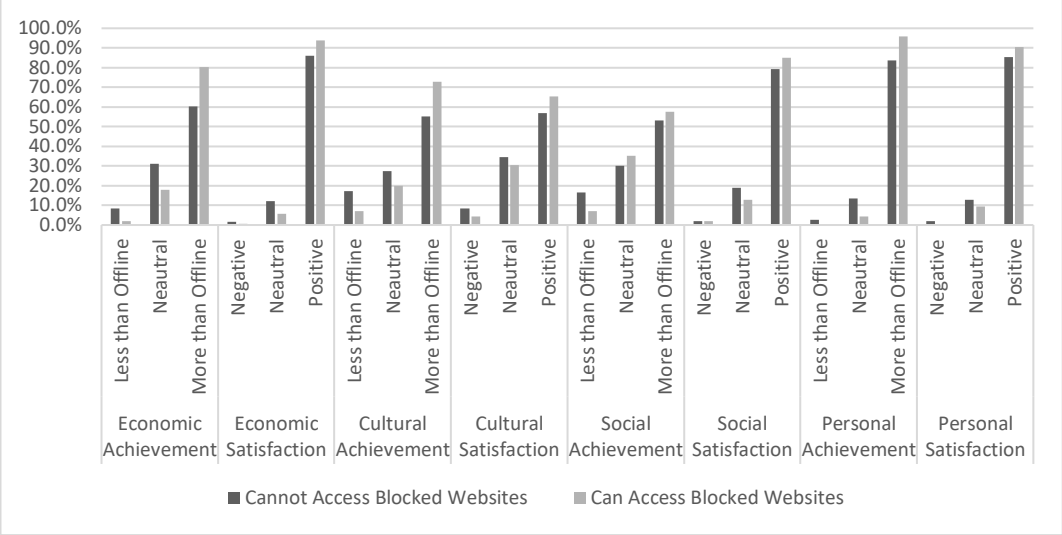
	Overall Achievement	Overall Satisfaction
Bahrain	3.87	3.94
Estonia	3.61	4.14
Singapore	3.68	3.92

A helpful method to look at the reason for the variance in patterns of achievement between the respondents would be to look at the whole sample as one community and study the different predictors that contribute to the variance. This method is compatible with the transformative-emancipatory perspective this research is influenced by, as detailed in the methodology chapter. One of the main predictors that affect the agency of people to evade discontent of Internet openness and perception of monitoring and control as advised by the interviews is the ability to bypass blocking and escape immediate network monitoring.

The achievement and satisfaction levels of as reported by respondents in connection with self-assessed ability to circumvent blocking and access blocked websites is shown in figure 5-4, and with ability to bypass monitoring is shown in figure 5-5, across the four fields of tangible outcomes, each as achievement and satisfaction. To demonstrate self-efficacy in dealing with situations related to blocking and monitoring, as defined to be part of the overall network controls applied in forms of artificial Internet limitations.

Figure 5-4

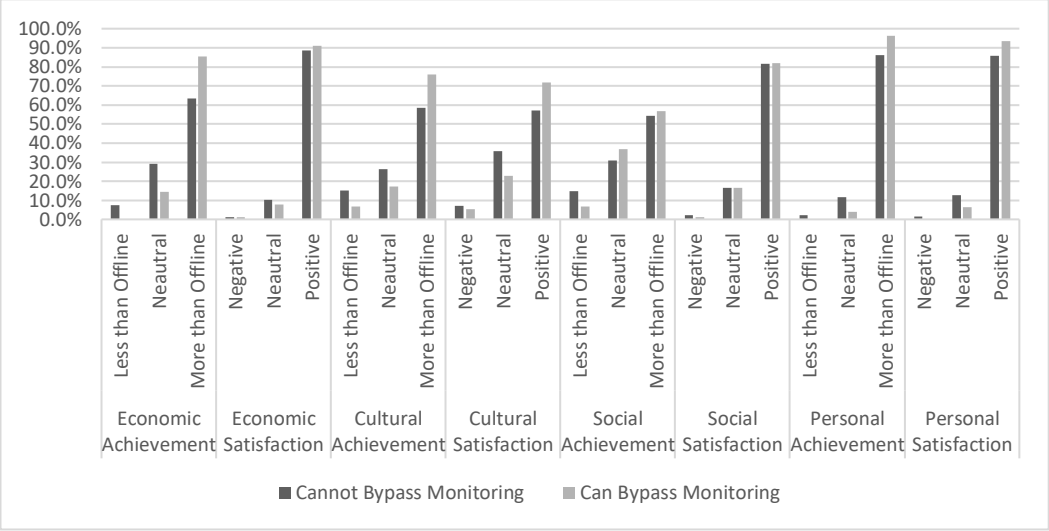
Tangible Outcomes by Field and Ability to Access Blocked Websites



The figure shows that people who expressed that they can access blocked websites have indeed higher levels of achievement and satisfaction across all of the fields of tangible outcomes of Internet use studied. Showing, with no doubt, that even if you were discontent with your Internet access because of perception of monitoring and control you can still reap the benefits of the Internet to achieve better in activities and be more satisfied if you had the agency to bypass said artificial limitations on Internet access. This discontent is not related to the quality of access. The only field where respondents with the skill to bypass monitoring and people without that skill scored closely was the Social Satisfaction, with less than 1% difference, this field will receive further scrutiny to understand this later in this research.

Figure 5-5

Tangible Outcomes by Field and Ability to Bypass Monitoring



People who expressed that they know how to access blocked websites were less likely to be neutral in aspects of achievement and satisfaction, except for the Social Achievement field, as shown in figure 5-4. A similar result is found through the comparison between the overall tangible outcomes and the skill to bypass monitoring, except that here the fields that this relation does not apply are the social achievement and the social satisfaction fields. This finding and the previous one on the closeness in results in the field of social satisfaction and skill to bypass monitoring further indicate the uniqueness of the social aspects when compared to other tangible outcomes of Internet use. This status of the satisfaction field receives further investigation when looking at predictors of each field in details.

A valid argument would be to look at skills to bypass Internet limitations as part of the overall higher digital skills, and thus the people with those skills may report higher achievement as a result of higher general ability to perform the activities in question, and not only because of the specific ability to bypass Internet limitations. To factor for this argument in an effort to isolate the effect of this particular set of skills, the research included indicators on the actual use of the skills to bypass Internet limitations. The actual use, or operationalisation, of the skills to bypassing artificial Internet limitations of monitoring and control can be understood through a look at the use of circumvention tools. As the purpose of these tools is to provide relief from artificial Internet limitations set on the local network by shifting the access to appear as if coming from location different to that of the user.

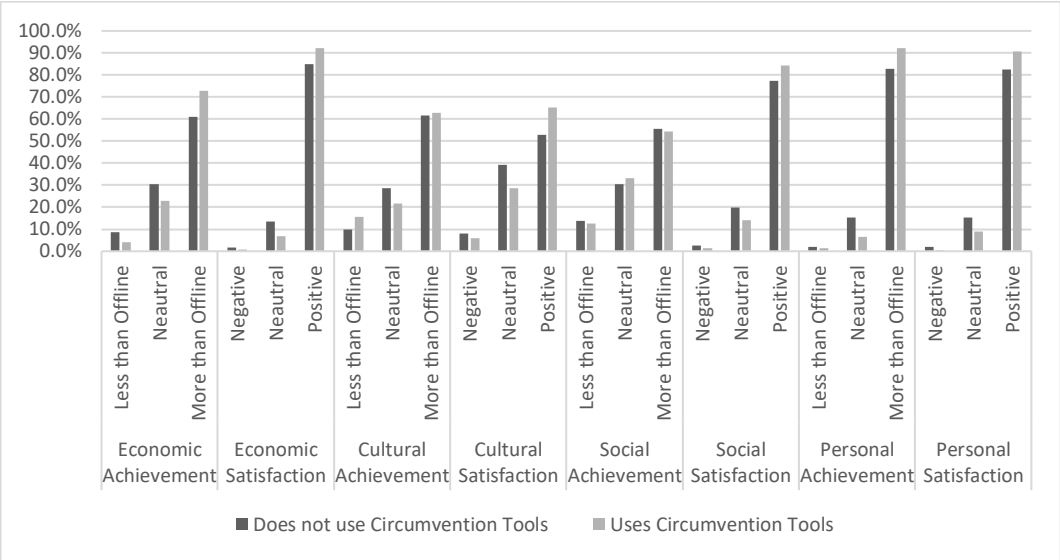
The survey included questions on whether the respondent is using any of the three main technologies for circumvention, Tor Network, Virtual Private Networks, and Proxies, these tools serve the similar goal of escaping immediate network but through different technical means. A new scale was created combining the responses to the three questions to indicate whether the respondent has used any of these tools in the past year. This scale was later mapped to perceived levels of achievement and satisfaction with the results illustrated in figure 5-6 to get an idea on the difference in satisfaction and achievement in tangible outcomes of Internet use because of using, or not using, circumvention tools.

A further proof to support the suggestion that the use of circumvention tools is the operationalisation of skills of bypassing artificial Internet limitations of monitoring and control lies in the manner of connection between the use of circumvention tools and the fields of achievement and satisfaction of Economy, Cultural, and Personal, and the Social

Satisfaction. The manner of the connection is similar to that of skills to bypass limitations, showing yet again the role played by opportunities to achieve offered by the ability to bypass limitation.

Figure 5-6

Tangible Outcomes by Field and Use of Circumvention Tools



In short, respondents that use circumvention tools found that they are able to achieve more and be more satisfied with activities in these fields through the Internet when compared to the offline world alone. The same people indicated that they are able to achieve slightly less in the Social field using the Internet compared to doing these activities offline, in an indication to a possible side effect of the escapism affordance provided by the use of circumvention tools, or the existence of other predictors to explain this behaviour. The different predictors of each of the tangible outcomes of Internet use are detailed next with statistical correlation and regression to indicate significance and magnitude to explain the results of the research better.

5.2.3 Predictors of tangible outcomes of Internet use

Questions on classical predictors for tangible outcomes of Internet use as advised by the literature review were covered in the survey to fortify the previous analysis on relations between agency for bypassing artificial Internet limitations and tangible outcomes of Internet use, namely age, sex, years of Internet use, education level, and employment status. This section looks at predictors of the fields at the highest level of aggregation for achievement and satisfaction of each. The predictors include the classical predictors and predictors related to artificial Internet limitations in terms of perception, donated by the composite scale *Perception of Limitation*, and ability to bypass monitoring

and control, to achieve a rigorous understanding of what affects tangible outcomes of Internet use and at what scale.

Another hypothesis tested in the following analysis is the role of skills of bypassing limitations, as invited by perception of limitation, in minimising the effect of artificial limitations on tangible outcomes of Internet use as characterised by higher levels of achievement and satisfaction in the fields of outcomes tested. These relations are tested through mediator analysis when correlation circumstances allow that, as this analysis require each of the predictors to have a significant correlation with the dependent variable. When needed, analysis at sub-field levels is also included in determining specific tangible outcomes and the predictors of it to point out relations as a more detailed level, where there is significant difference between the correlations at the field and the sub-field levels to account for behaviours that may not be harmonized with other sub-fields of the same field.

Testing the measured scales for goodness of the data for correlation through testing for normality and asymmetry was conducted by calculating skewness and kurtosis values for the field scales, and comparing the values to what was advised by Westfall and Henning (2013). Westfall and Henning advised that where absolute values of skewness higher than two indicate that the variable is asymmetric, and values of kurtosis greater than or equal to three indicate that the variable's distribution is different from a normal distribution, with a tendency to have outliers.

Table 5-9

Summary Statistics for Aggregate Tangible Outcomes of Internet Use Variables

Variable	N	Min.	Max	Mean	Std. Deviation	Skewness	Kurtosis
Economic Achievement	418	1.00	5.00	3.71	0.74	-0.54	0.46
Economic Satisfaction	415	1.00	5.00	4.21	0.63	-1.25	3.15*
Cultural Achievement	355	1.00	5.00	3.58	0.86	-0.65	0.46
Cultural Satisfaction	340	1.00	5.00	3.63	0.80	-0.40	0.83
Social Achievement	361	1.00	5.00	3.49	0.84	-0.37	0.03
Social Satisfaction	364	1.00	5.00	4.09	0.66	-0.65	0.79
Personal Achievement	362	1.00	5.00	4.19	0.61	-1.03	2.05
Personal Satisfaction	359	1.00	5.00	4.06	0.57	-0.85	2.53

Note. '' denotes the variable kurtosis value reflects a tendency for distribution different from normal.*

The results of the skewness and kurtosis analysis for the Internet use outcomes fields are summarised in table 5-9, showing that all the variables fulfil the skewness requirement displaying symmetry, and all but the Economic Satisfaction have kurtosis values that indicate normality in distribution, enabling the move forward with the correlation analysis with confidence in the data collected. A similar analysis was conducted at the first level of aggregates of the tangible outcomes of Internet use, and displayed similar results, with the Economic Satisfaction Aggregate in terms of Property as the only variable displaying kurtosis values that indicate an abnormality in distribution, details on the results of the statistical analysis are listed in appendix III.

Nonetheless, since the kurtosis values for Economic Satisfaction was not far from the threshold of three, sitting at 3.15, the correlation was conducted but using Spearman's correlation method to counter for that, since no direct comparison is conducted between the factor values, this does not pose problems in the analysis afterwards. Pearson's correlation coefficient offers an improvement in statistical power over other methods, and thus was chosen for correlation analysis, except for Economic Satisfaction which utilised Spearman's correlation coefficient as it is not as sensitive as Pearson's to excess kurtosis, mainly that the variables are continuous scales (Chok, 2010).

Following the testing of validity of data for correlational analysis, each of the fields is analysed to test the independent variables that act as determinants for the achievement and satisfaction of each field, to answer the research questions by testing the effect size and significance does variables related to Internet limitations have on tangible outcomes of Internet use. The results are detailed in the following sections, with overall analysis to follow in the analysis chapter.

5.2.3.1 Economic field

Tangible outcomes of the economic field include the achievement and satisfaction the person attain as a result of the affordances and opportunities provided by the Internet in relation to economic activities. The activities, as detailed in the methodology chapter, are the dimensions of achievement and satisfaction in relation to property, income, and education or employment. These fields measure whether people were able to have better opportunities in achieving better outcomes because of the Internet use compared to opportunities available offline only, and the level satisfaction perceived as a result of using the Internet for each of these activities.

To answer the part of the research question on the relation of Internet limitations and tangible outcomes of Internet use, the effect of determinants of Economic component

of the tangible outcomes was studied by conducting Pearson statistical correlation coefficient analysis of survey responses to predictors related to economic achievement and satisfaction to measure the effect of these determinants. The predictors included the set of classical of Age, Years of Internet Use, Sex, Education Level, Employment Group, while the research determinants tested included Perception of Limitation, Skills to Bypass Limitations, and Use of Circumvention Tools. These sets of predictors make use of the discussion in the literature review, and the design in the methodology chapter, in compliance with the reference framework.

The results, presented in table 5-10, indicates the existence of a significant correlation between a set of classical and research predictors and economic achievement and satisfaction fields as dependent variables. The independent variables in this analysis include the classical predictors of age, number of years of Internet use, sex, education group, and employment group, as advised by the literature review. While the research predictors include perception of limitation, skill to bypass limitations as a composite scale of skills to bypass blocking and monitoring, and the use of circumvention tools as a composite scale of using different tools, as advised by the analysis earlier in this chapter and the interviews.

The field of economic achievement across the research sample was correlated to skills to bypass limitations, use of circumvention tools, age, sex, and perception of limitation, ranked by order of effect size. Skills to bypass limitations had very high significant correlation at 0.000 level, while the rest had a statistically significant correlation at 0.05 level or less. This mixture of classical and research predictors is expected to be the case with most of the fields, as it is unrealistic only to have one or two predictors to have a high effect on a general field like the economic achievement.

Table 5-10

Classical and Research Predictors Effect on Economic Achievement and Satisfaction in the Sample and in Sample from Countries with High Level of Limitations

	Whole Sample		High Limitation Countries	
	Economic Achievement	Economic Satisfaction⁂	Economic Achievement	Economic Satisfaction⁂
Age	-.120*	0.062	-0.076	0.053
Years of Internet Use	0.003	.167**	-0.006	.124*
Sex	.108*	-0.085	.147*	-0.021

	Whole Sample		High Limitation Countries	
Education Level Group	-0.002	0.063	-0.052	0.060
Employment Group	0.002	-.112*	0.063	-0.097
Perception of Limitation	.101*	-.141**	.194**	0.015
Skill, Bypass Limitations	.259**	-0.014	.238**	0.066
Use of Circ. Tools	.187**	.135**	.159**	0.104

*Note. '**' denotes correlation is significant at the 0.01 level (2-tailed), '*' denotes correlation is significant at the 0.05 level (2-tailed). ⁂ Correlation calculated using Spearman's method rather than Pearson's*

The direction of influence of the age was the only one going in the negative direction, indicating that the younger the person is, the higher the potential for them to achieve and report better economic achievement. The other predictor showed that the higher the skills a person have in bypassing both of the artificial Internet limitations tested, monitoring and control, as measured by the composite scale *skills to bypass limitations*, the higher perception of limitation, if they use circumvention tools, and identify as males, then they have higher probability for accessing potential to achieve and report better economic achievement.

The behaviour and effect of the classical predictors is compatible with that of previous research as advised by the literature review section on predictors. For the research determinants, or predictors, of tangible outcomes of Internet use, the skills to bypass artificial Internet limitations had the highest effect of economic achievement with the very high significance of the correlation, higher than that of perception of limitation. This place a signpost to the assumption described earlier of the skills to bypassing limitations being part of the overall digital skills, and thus may not reflect the exact effect of limitations on tangible outcomes of Internet use. Although this assumption is valid at face value, the action of utilising the skills through use of circumvention tools explains better how having the skills, by itself, is not enough to reap the benefits of the open Internet, but acting upon it when limitations are perceived is needed.

When placing the skills aside to eliminate the effect of overall digital skills, and analyse economic achievement as a dependent variable through regression with use of circumvention tools and perception of limitation as independent variables, the result shows that the model is highly significant at 0.000 level. The results suggest that the model of higher perception of limitation coupled with the use of circumvention tools is indeed significant in determining the tangible outcomes of economic achievement,

supporting the argument that individuals that are less affected by artificial Internet limitations are less exposed to digital inequalities in terms of economic achievement.

A look at the same correlations of table 5-10 for the countries that have high levels of artificial Internet limitations of monitoring and control as concluded in Study 1, Bahrain and Singapore, show little change in the predictors presented by the age factor losing it significance leaving sex as the only classical predictor relevant to economic achievement for the sample. Perception of limitation moved to the second significant predictor after skill to bypass limitations with higher significance that that with the whole sample. The change can be explained by that in the countries with higher limitations, being conscious about the limitations help the individual achieve better economic outcomes by factoring for the Internet limitations and adjusting their behaviour, possibly through the use of circumvention tools, which proved to have a significant effect within the countries with high limitations.

The data for the Economic Satisfaction, on the other hand, displayed kurtosis value of slightly higher than three (3.15), which reflect a tendency towards abnormality in distribution, and thus the correlation coefficient was calculated using Spearman's method as justified earlier. The correlation here showed that the determinants for Economic Satisfaction of the sample across all countries studied included years of Internet use as the primary determinant, followed by the perception of limitation, use of circumvention tools, and finally the employment status, in order of importance of effect as shown in table 5-10. The direction of effect shows a clear image of the way the dependant variables are affecting the level of satisfaction people have with Internet affordances related to Economic activities. The data show that the more experience of using the Internet a person has and the higher use of circumvention tools are correlated with higher satisfaction, while the more limitations on the Internet access people perceive the less they are satisfied with their Economic activities online.

Economic satisfaction relation with Internet Limitations seems to be direct, with knowing that there are limitations set on Internet use lowers the satisfaction of Internet affordances related to economy, with the effect size putting the perception of limitation as being the second important factor after years of Internet experience. This reflects that the chilling effect of Internet limitations perceived, even if not applying to economic websites and services still have its toll on satisfaction. While the actual use of circumvention tools, rather than the skill of bypassing limitations, have a positive effect on satisfaction in this field with effect size just below that of perception of limitation,

suggesting that people who use circumvention tools possibly feel as if they have higher agency and thus higher satisfaction.

The economic satisfaction in countries with high limitations, Bahrain and Singapore, however, does not reflect the same behaviour as the whole sample, with all of the research determinants losing their correlation significance, leaving only the variable of years of Internet experience as the determinant with significant correlation, but with less effect size than what it had with the overall sample. This finding suggests that it is not easy to predict economic satisfaction in countries with a high level of limitations. Nonetheless, interviews in these countries showed that people indeed do use the Internet affordances in the economic field, with considerable local influence and services available, however, the overall lack of trust people have with the Internet for not being fettered with or their activity monitored, further complicates the relation.

The overall satisfaction for the economic field and its sub-fields is high over all the countries, with a mean of 4.21 across the whole sample, as displayed in table 5-10, with people in countries with high limitations displaying slightly less satisfaction, at 4.1. While in economic achievement, the overall sample was less positive, with a neutral perspective for using Internet affordances for increasing income opportunities. Countries with high limitations displayed higher achievement in the economic field and its sub-fields, resulting in a view that people in these countries achieve more, but are less satisfied with the Internet affordances and access they have. This can be connected to the difference in how people in these countries think of their Internet access, where less than a quarter of the sample of these countries showed that they do not feel any party is monitoring or controlling their Internet access, as mentioned earlier.

For sub-fields of the economic fields, which include economic achievement and satisfaction in relation to property, income, and education or employment, had correlations that are summed up in the top-level field of economic achievement and satisfaction, but separately had slightly different predictors. The three sub-fields of Economic achievement among the whole sample showed a significant positive correlation with skills to bypass limitations and use of circumvention tools among the research predictors, details on the statistical analysis data included in Appendix III. In countries of high limitations, the three sub-fields are correlated with skills to bypass limitations, but only economic achievement in terms of activities related to property is connected to use of circumvention tools.

The comparison between factors that affect economic achievement and economic satisfaction shows a clear correlation between skills to bypass limitations and the operationalisation of it by using circumvention tools as a result of the perception of limitation on one side, and economic achievement regardless of location on the other. Satisfaction predictors varied between the overall sample and the countries with high limitations, where the prediction of economic satisfaction in the countries with high limitations was not possible using any of the research determinants, reflecting non-conformity in the relation between achievement and satisfaction. With some people able to achieve and be satisfied, and others able to achieve but, at the same time, are not satisfied with the Internet as a platform for economic activities, in what seems to be a result of perception of artificial Internet limitations.

5.2.3.2 Cultural field

The second field of tangible outcomes of Internet use tested in this research is the cultural field, including the achievement and satisfaction the person attains as a result of the affordances and opportunities provided by the Internet in relation to cultural activities. The activities, as detailed in the methodology chapter, are the dimensions of achievement and satisfaction in relation to identity and belonging. These fields measure whether people were able to have better opportunities in achieving better outcomes because of the Internet use compared to opportunities available offline only, and the level satisfaction perceived as a result of using the Internet for each of these activities.

The set of classical and research determinants and their correlation with achievement and satisfaction of the cultural field were tested through Pearson's correlation coefficient analysis, same as with the analysis of the other fields. The correlations help in understanding the potential effect of the predictor on the variables being measured, here the cultural achievement and satisfaction and their sub-fields. The correlation does not indicate causation but nonetheless produce a good idea on the opportunities change in a predictor have in influencing the achievement and satisfaction and thus produce a good idea on the relation between the predictors and inequalities among communities. The following discussion looks at the fields and sub-fields and the predictors with significant correlations to them.

Cultural Achievement, the ability to achieve better online in activities related to identity and belonging, showed six of the eight independent variables tested as having a significant correlation with the dependent variable. Ordered by the rank of effect size, the determinants are Perception of Limitation followed by Age, then the three variables

Education Level, Skills to Bypass Limitations, and Years of Internet Use with close effect size, and finally Employment Group. Perception of Limitation, the determinants with the largest effect size on cultural achievement activities, had a very high significant correlation at less than 0.01 level, as in table 5-11, showing how people who are aware of the existence of artificial limitations on their Internet access have better chances to enrich their identity and find themselves belonging to closer groups. This was true for the whole sample, as well as the sample from countries with high limitations, suggesting no much difference in cultural achievement across different countries of the study.

Table 5-11

Classical and Research Predictors Effect on Cultural Achievement and Satisfaction in the Sample and in Sample from Countries with High Level of Limitations

	Whole Sample		High Limitation Countries	
	Cultural Achievement	Cultural Satisfaction	Cultural Achievement	Cultural Satisfaction
Age	-.223**	-0.084	-.251**	-0.005
Years of Internet Use	-.165**	-0.013	-.143*	0.004
Sex	-0.043	-0.080	-0.096	0.020
Education Level Group	-.169**	-0.067	-.195**	-0.049
Employment Group	.151**	0.008	.171*	-0.079
Perception of Limitation	.278**	-0.052	.245**	0.100
Skill, Bypass Limitations	.165**	0.044	.152*	0.075
Use of Circumvention Tools	0.084	.119*	0.047	0.055

*Note. '**' denotes correlation is significant at the 0.01 level (2-tailed), '*' denotes correlation is significant at the 0.05 level (2-tailed).*

The skills to bypass limitations have a significant relation as well, although with smaller effect size, nonetheless, the interesting factor here is the use of circumvention tools, which did not display correlation with cultural achievement correlates at levels higher than 0.05m with standard effect size. Showing that operationalising the skills to bypass limitations and perception of the limitation is not required to have better opportunities for achieving in the cultural field, reflecting that artificial Internet limitations as observed in the countries of study may not have a significant effect on achievement.

However, at the same time, the use of circumvention tools was the only determinant tested that showed a significant correlation to cultural satisfaction across the whole sample, while no variables showed any correlation to the cultural satisfaction in countries with high artificial Internet limitations, as apparent in Table 5-11. Cultural satisfaction as measured covers how people feel satisfied with affordances provided by the Internet to allow people to explore their identities, including religious and ethnic, better, and to connect with people from similar age group or people that share religious believes online.

The results for the satisfaction of Internet affordances for this field may be different from other fields as it is strongly reliant over cultural differences across the countries of study, unlike other fields, which utilises a layer of identity that is more common with wider spread uses of the Internet, from economic to social. This note is valid for cultural satisfaction but does not necessarily apply for cultural achievement, which showed similar behaviour across the sample and the countries with high limitations.

A more granulated look at cultural field activities and how its achievement and satisfaction measures contrast across the countries and communities of the study shows a slightly different view, with the statistical analysis data included in Appendix III. Observing the two activities that comprise the cultural field, identity and belonging, we find that the achievement in identity-related activities, including the ability to find information about sexual and ethnic groups identity, is correlated with the same variables as the overall cultural achievement, in addition to use of circumvention tools. While achievement in cultural belonging, measuring how people are able to find and connect with people of similar age sharing similar interests and are able to be more connected with religion or spiritual believes, maintains a comparable behaviour to that of the overall cultural achievement. For countries with high limitations, the only difference between determinants of the overall cultural achievement and that of the more specific achievement in identity and belonging is that it is less likely for education level and skills to bypassing limitations to be correlated with the achievement in activities related to cultural belonging.

For cultural satisfaction, the sub-fields did show some correlation between sex and satisfaction in cultural belonging, with people identifying as females are more likely to be more satisfied in that field. While in countries with high limitations, the higher perception of limitation the person has, the higher they are satisfied with the use of the

Internet in cultural identity-related activities. These show that in countries with high limitations, people that are conscious about limitations are more likely to be able to access information that helps them in building their identities from information on sexuality and ethnic groups. This is particularly interesting given that many of the websites that face limitations in Bahrain and Singapore, as we have seen earlier, fall under categories related to sexuality, religion, and ethnicities. This help in clarifying why, as seen in Table 5-7 earlier, respondents from countries with high limitations showed higher positive outlook for cultural achievement, and at the same time, and less cultural satisfaction for what the Internet offers in the same field, than of Estonia, which showed higher satisfaction than achievement.

Overall, the determinants of the cultural field displayed significant divergence between the achievement and the satisfaction, while maintaining a close mean between the two dimensions, at 3.58 and 3.63, respectively. The means of the dimensions show a slight tendency towards the positive in how people perceive the Internet affordances that allows them to achieve better and be more satisfied, in comparison to same activities without the Internet for the overall sample. The divergence in determinant reflects the inability of both groups of independent variables tested, classical and research, to reflect the two dimensions as an entity, but they do indeed correlate with the achievement, and some with specific aspects of satisfaction, as we have seen earlier.

The verdict for the relation between artificial Internet limitations and the tangible outcomes of Internet use in the cultural field when compared to means and perception of achievement and satisfaction show that in countries with high limitations, people who are conscious about limitations, and are able to bypass limitations, but not necessarily use circumvention tools, are able to achieve better tangible outcomes generally. While the overall satisfaction in cultural affordances in these countries is considerably less than that of Estonia, the country of study that showed little to no limitations.

5.2.3.3 Social field

The social field of tangible outcomes of Internet use, as tested in this research, include the achievement and satisfaction the person attains socially within three types of networks through the Internet, informal, formal, and political networks. As detailed in the methodology chapter, the informal network includes friends and family, and interesting people met online, while the formal networks include clubs and organisations, leaving the political networks to include public bodies and government services. As with other fields, this field measures whether people were able to have better opportunities in

achieving better outcomes because of the Internet use compared to opportunities available offline only, and the level satisfaction perceived as a result of using the Internet for each of these activities.

A review of correlation coefficients to achievement and satisfaction for the whole sample showed the existence of a significant effect of six independent predictors on social achievement, and just one determinant on social satisfaction. The predictors with significant correlations with social achievement are, as displayed in table 5-12, age, education level, employment group, years of Internet experience, perception of limitations, and skills to bypass limitations, in order of effect size from the highest to the least effect. Younger people with fewer years of Internet experience, lower education, who are not employed in full-time employment or are students, have a higher perception of limitation and have higher skills to bypass limitations, have the better opportunities to achieve better with social activities online. These predictors are the same as the ones that were correlated with cultural achievement, showing a possible relation between the two fields of tangible outcomes of Internet use, highlighting another potential for relations that will be considered in a later section.

Table 5-12

Classical and Research Predictors Effect on Social Achievement and Satisfaction in the Sample and in Sample from Countries with High Level of Limitations

	Whole Sample		High Limitation Countries	
	Social Achievement	Social Satisfaction	Social Achievement	Social Satisfaction
Age	-0.240**	-0.01	-0.208**	0.005
Years of Internet Use	-0.187**	0.056	-0.159*	0.065
Sex	0.029	-0.125*	0.037	-0.015
Education Level Group	-0.206**	-0.056	-.232**	-0.102
Employment Group	0.201**	0.022	0.170*	0.025
Perception of Limitation	0.140**	-0.051	0.097	0.094
Skill, Bypass Limitations	0.126*	-0.01	0.155*	0.058
Use of Circumvention Tools	0.023	0.07	0.071	0.028

*Note. '**' denotes correlation is significant at the 0.01 level (2-tailed), '*' denotes correlation is significant at the 0.05 level (2-tailed).*

The sample from countries with high limitations as advised by Study 1 of this research, Bahrain and Singapore, showed a similar behaviour, except that the role of perception of limitation is limited with no significant correlation. The data leave the skill to bypass limitations as the only research variable affecting social achievement in these countries, along with the same classical determinants as with the whole sample.

Social satisfaction, on the other hand, was only correlated with the sex as its only predictor for the overall sample, with people identifying as females more likely to express higher satisfaction with social activities online. For the sample from countries with high limitations, no variable showed a statistically significant correlation with social satisfaction as an aggregate field. The services that are mostly affected by artificial Internet limitations in the countries of the study included fora and other services that facilitate social interaction, contributing to the idea that limitations affect mainly the satisfaction more than achievement. This makes it not easy to predict satisfaction of tangible outcomes of Internet use that is affected by artificial Internet limitations, as we have seen with the cultural satisfaction field, and now with social satisfaction.

The sub-fields of the social field that deals with informal, formal, and political networks showed slightly different behaviour than that of the overall social field. The social achievement in informal networks in the whole sample was the closest in behaviour to the overall field, but with the higher effect of perception of limitation and ability to bypass limitation, overtaking the effect of age and years of Internet experience. The correlation analysis, included in Appendix III, also shows that this achievement in countries with limitations is only correlated with education level, skills to bypass limitations and employment, with the same effect direction as with the whole sample and the overall field. The effect direction suggests that people who are less educated, have higher skills to bypass limitations, and are not employed in full-time employment or are students having the better probability for achievement opportunities in informal social networks.

Social achievement with formal networks, however, showed similar behaviour among the overall sample and the countries with high limitations with the overall achievement in the social filed, with the difference that in the sub-field, across the whole sample and the countries with high limitations, perception of limitation does not show any significant correlation with the achievement. This leaves the skill to bypass limitations as the only skill of the research predictors that have the potential to affect social achievement with the formal networks, with a positive correlation. The lack of

correlation with neither perception of limitation nor the operationalisation of skills to bypass through the use of circumvention tools suggests, however, that this correlation may reflect the overall digital skills people have that would contribute to better achievement, rather than skills specific to artificial Internet limitations.

The interviews with people from countries with high limitations showed the recurring theme of the local organisation in non-personal networks as thriving. Examples of networks mentioned included food-related groups in Singapore and non-political interest groups like entrepreneurs in Bahrain, these networks would not usually fall under limitations set over Internet access, and people may not feel it is as monitored as potentially political groups.

The social communication and interaction with public services and political groups and representatives were covered in the third sub-field of social achievement. This field showed lower than positive results in the countries of high limitations, with a mean of 3.46 in the sample from Bahrain 3.38 in the sample from Singapore and 3.42 in the samples from both countries combined, compared to 3.65 in the sample from Estonia as per table 5-7. These activities, however, did not show any correlation with any of the research predictors, showing a significant negative correlation with age for the whole sample, and age and years of Internet experience for countries with high limitations. This suggests that no matter what your perception of limitations, skills to bypass limitations, or use of circumvention tools, artificial Internet limitations would affect your achievement in this regard. Study 1 concluded that governments of countries with high limitations leave no room for trust in the government when it comes to online services and use of the Internet for political reasons. The same conclusion is confirmed in the interviews and the earlier data in this study showing that people in these countries blame the government for most monitoring and control of their Internet use.

Social satisfaction in the sub-fields for the whole sample showed no correlations between classical or research predictors on social satisfaction in informal and formal networks for the whole sample, and a correlation between the level of education and perception of limitation on one hand and social satisfaction in informal networks in countries with high limitations. The correlation found showed that in countries with high limitations, people with lower education and a higher perception of limitation have higher chances to be satisfied with using the Internet to interact with their informal networks. Social satisfaction in political networks, however, had four predictors with strong correlations in the whole sample, perception of limitation, years of Internet experience,

skills to bypass limitations, and sex, with exciting relation direction. People with less perception of limitation, more years of Internet experience, less skill level in bypassing limitations and identify as females, have the higher chances to be satisfied with using the Internet to interact with public services and communicate with government and political representatives and groups.

This field is the only one where a lower level of perception of limitation, combined with less skill to bypass limitations is correlated with better satisfaction or achievement. The explanation can be that people who are less conscious about the limitations have general fewer qualms about interacting online with public services and political networks online. Nonetheless, these correlations do not show any significance in countries with high limitations, leaving age and years of Internet experience as the only predictors, with positive relation direction.

It is also interesting to note that the overall social achievement and social achievement in personal and formal activities was higher for countries with high limitations than Estonia except the social achievement in political networks, which was less than the threshold for a positive perspective. The social satisfaction showed that in all but the personal network in countries with high limitations expressed less satisfaction than that of the sample from Estonia, showing yet another time the potential of Internet limitations in affecting the satisfaction of use more than achievement in use.

The social field, in its two dimensions, is correlated to some extent with a set of classical and research predictors, that vary at a high level among the sub-fields, with social satisfaction being the harder to predict on an individual level based on the predictors tested. However, the difference in satisfaction at country level shows that people living in countries with a high level of artificial Internet limitations achieve less in the social interactions at the political or public networks, and are generally less satisfied in the social field, particularly with formal and political or public networks. These findings suggest the success of these limitations in lowering satisfaction while failing to have a high effect on achievement at the informal and formal networks.

5.2.3.4 Personal field

The personal field as tested in this research cover ability to access information related to health and lifestyle, accumulating knowledge towards self actualisation, and opportunities for entertainment and leisure, along with the satisfaction of using the Internet for each of those sub-fields. The health and lifestyle aspect looks at the ability to access information on lifestyle choices and opportunities to make better decisions about

health or medical conditions based on information access through Internet use. While self Actualisation aims to measure the affirmation people receive for their overall knowledge received through the Internet, and build opinions on complex social issues as well as the satisfaction of the role the Internet played in that. The leisure aspect looks at affordances of the Internet to make a person happier through access to entertainment and opportunities to go to events offered by the Internet, with the level of satisfaction of the time spent online.

The set of predictors that displayed significant correlation for the personal achievement, as shown in table 5-13, ranks from age, skills to bypass limitations, use of circumvention tools, education level, and employment group, with age being the factor with the highest effect. Younger people with the ability to bypass limitations, who are using circumvention tools, with lower education and are students or unemployed, have better opportunities in achieving better in the aggregate personal field for the overall sample. In the countries with a high level of artificial Internet limitations, the skills to bypass limitations jump to the highest important predictor, followed by education, then use of circumvention tools, and finally age. In these countries, people who have the skills to bypass limitations and have lower education, use circumvention tools, and are younger, have better chances to achieve better in the personal field.

Table 5-13

Classical and Research Predictors Effect on Personal Achievement and Satisfaction in the Sample and in Sample from Countries with High Level of Limitations

	Whole Sample		High Limitation Countries	
	Personal Achievement	Personal Satisfaction	Personal Achievement	Personal Satisfaction
Age	-.211**	-0.06	-.141*	-0.009
Years of Internet Use	-0.063	-0.005	-0.005	0.04
Sex	-0.048	-0.026	-0.006	0.035
Education Level Group	-.146**	-.152**	-.160*	-.170*
Employment Group	.123*	0.09	0.106	0.067
Perception of Limitation	0.007	-0.002	0.088	0.106
Skill, Bypass Limitations	.207**	0.08	.217**	.155*
Use of Circumvention Tools	.200**	.146**	.146*	.156*

*Note. '**' denotes correlation is significant at the 0.01 level (2-tailed), '*' denotes correlation is significant at the 0.05 level (2-tailed).*

The sub-fields of personal achievement showed diverse behaviour among them, with the achievement in the health aspect being correlated to skills to bypass limitations, age, use of circumvention tools, and sex, with people are able to bypass limitations, younger, use circumvention tools, and identify as females showing potential for higher-level for achievement in the overall sample. While in the countries with high limitations, that form of achievement is solely correlated to skills to bypass limitations.

Self Actualisation as a form of achievement and a tangible outcome of Internet use in the overall sample displayed correlation to age, education level, and skill to bypass limitations, with similar effect direction to that of the same predictors in health and the aggregate field of personal achievement. Giving people who are younger, have the skill to bypass limitations, and who have a lower level of education, better opportunities to achieve Self Actualisation as a result of Internet use. Countries with high limitations, however, had an added emphasise on skills to bypass limitations and circumventions use as the first two predictors, followed only by age. The data showed that where there are high limitations, people who are able to bypass limitations and do operationalise these skills by using circumvention tools, are generally able to achieve Self Actualisation as a result of Internet use.

The personal achievement in terms of leisure had the most number of predictors with significant correlations among the personal achievement sub-fields, with five predictors for the overall sample, and four among the sample from the countries with high limitations. In the overall sample, people who are younger, students or unemployed, with lower education level, that use circumvention tools, and have the skills to bypass limitations, in order of effect size, have better opportunities to achieve tangible outcomes related to leisure and entertainment. In countries with high limitations, the actual use of circumvention tools loses its significance, making people with lower education are younger, and are students or unemployed, and have skills to bypass limitations having the better chances for that form of personal achievement.

The difference among the whole sample and the countries with high limitations in the different forms of personal achievement shows that although the limitations found in Study 1 would not affect the achievement in this regard much. Skills to bypass limitations and the use of circumvention tools still play an essential role, particularly with Self Actualisation for countries with high limitations, and in leisure for the whole sample. The later correlation between the use of circumvention tools in the whole sample and achievement in terms of leisure that can be attributed to geo-blocking, the subject

discussed earlier, and which interviews showed that many people do use circumvention tools to bypass it.

Personal satisfaction proved to be less predictable than achievement, in a manner similar to the other fields, with only two predictors showing a significant correlation to personal satisfaction in the overall research sample, giving people who use circumvention tools and are of lower education levels better changes to be more satisfied. In the countries with high limitations, a third predictor is included for people who have the skills to bypass limitations as a predictor with effect size slightly less than that of the use of circumvention tools.

For the satisfaction in the sub-fields in personal outcomes, none of the predictors tested showed significant correlation with personal satisfaction in health for the whole sample and the sample from countries with high limitations. While for the personal satisfaction in Self Actualisation, lower education showed correlation with higher satisfaction in the sample from countries with high limitations, but it was more complicated for the overall sample, with four predictors showing a significant correlation, in order of effect size, use of circumvention tools, employment, education, and age.

The direction of the effect makes people who use circumvention tools, are students or unemployed, with lower education, and are younger, as the advantaged group in satisfaction of Self Actualisation affordances of the Internet. The complexity of prediction was reversed in the satisfaction of leisure aspects, with only two predictors with significant correlation for the whole sample, making people who are with lower levels of education and use circumvention tools having better satisfaction than others do. In countries with high limitations, people that found a need to use circumvention tools have lower education, are able to bypass limitations, and have high perception of limitation to be on the right side when it comes to the satisfaction of the leisure affordances of the Internet. This suggests a negative effect of artificial Internet limitations on opportunities to be more satisfied when using the Internet for leisure.

Overall, that effect can also be seen in the fact that in this research people in sample from countries with high Internet limitations showed lower levels of both, achievement and satisfaction, than the people in the sample from Estonia in the fields of personal achievement and satisfaction, and their sub-fields of health and Self Actualisation, but not in leisure. With a higher difference in satisfaction than that of achievement, in a continuation of the trend of lower satisfaction results in the aggregate fields of tangible outcomes of Internet use.

The personal field, in its two dimensions of achievement and satisfaction as an aggregate and in its sub-fields showed a correlation to a set of classical and research predictors, but the importance of research predictors for the aggregate dimension, particularly use of circumvention tools and skills to bypass limitations, was more critical. At the same time, the perception of limitations did not show any significance, except for a slight effect on personal satisfaction in terms of leisure. These and the divergence in satisfaction and achievement as reported between the countries with high limitations and Estonia show that artificial Internet limitation has the potential to affect achievement, and at a more considerable extent satisfaction, on the personal, tangible outcomes of Internet use.

5.3 Interviews

To support quantitative data collected through surveys in Study 2, and network measurements and reports in Study 1, the research included a set of interviews with a varied sample of people from the countries of research. The interviews proved to be of high value to the research, as they extended the depth of data collected, and provided an explanation for anomalies found, as well as increasing confidence in results collected earlier. The interview followed the design described in the Methodology chapter as sequential explanatory instrument fulfilling Mixed-Methods research requirements as per Creswell and Clark (Creswell and Clark, 2010).

Access to interviewee was achieved through researching for people that fulfil the requirements of the respective fields, and selecting the best people that would provide advice based on experience and affiliation as available through their profiles online, or as recommended by contacts in the countries of research to establish a pool of potential interviewees. The interviewees were contacted through direct emails and messaging through social media platforms, Facebook, LinkedIn, and Twitter. From the pool of 50 people that were contacted, 15 responded and agreed on conducting the interview, of those, 12 actually participated in the interviews and agreed on using the interview details for the research. During the first round of attempts to connect with interviewees, three of each country was interviewed, however, there seemed to be a need to add more representation from Singapore and Bahrain, to be able to reach more information on aspects that seemed contested between interviewees, an additional interview was added from Singapore, and two from Bahrain. The interviews finally covered the countries with five interviews from Bahrain, four from Singapore, and three from Estonia, covering the aspects needed with ample details for the research.

The 12 interviews were conducted with people carefully selected to represent at least two of the sample targets related to the categories and fields of the research, as described in table 5-14. The sample for the interviews was split in half with six identifying as males and six as females, with ages ranging between 18 and 60 years old. The fields correspond with the fields of tangible outcomes of Internet use and the overarching framework of the research as well as information collected to expand and verify on the information collected as part of Study 1 on the status of the Internet and artificial Internet limitations in the countries of the research. Interviewee pool was developed through online researching for people that fit in the categories listed and are active and leaders in these fields, as well as the general public. Table 5-14 lists the fields of interviews as designed in the methodology, along with the sample target of interviewees that would fulfil the requirements for that field and be able to advise on it, along with the list of interviews that fulfilled information for each of the fields by country.

Table 5-14

Fields of Interviews, Sample Targets, and Corresponding Interviewees by Country

Field Code	Field	Sample Targeted	Interviewees
EL	Economic, Labour	Jobseeker	Bahrain: B1, B3, B5 Estonia: E2 Singapore: S3, S4
EC	Economic, Commerce	Online entrepreneur, e-commerce user	Bahrain: B1,B2, B3, B5 Estonia: E1, E2, E3 Singapore: S2, S4
S	Social	General user	Bahrain: B1, B2, B3, B5 Estonia: E1, E2, E3 Singapore: S2, S3, S4
P	Political	General user, local activist	Bahrain: B1, B2, B3, B4, B5 Estonia: E1, E2, E3 Singapore: S2, S4
IG	Institutional, governmental	General user/citizen	Bahrain: B1, B2, B3, B5 Estonia: E1, E3 Singapore: S2, S3
IH	Institutional, Health	General user	Bahrain: B3, B5 Estonia: E2, E3 Singapore: S4
E	Educational	Student, Educator	Bahrain: B3, B5 Estonia: E2, E3 Singapore: S2, S3

The interviews followed a semi-structured flow, beginning with an introduction to the research project, then a statement on data usage and confidentiality followed by consent collection, verbal for voice interviews, and written for in-person interviews. The interview here moves to short discussion to know more about the interviewee and develop rapport and trust, to move to the set of structured questions, with enough flexibility to allow focusing on aspects brought up by the interviewee that deems relevant and important to the course of the research. At the end of the interview, the interviewee is given time to say anything they would like to add that may benefit the research.

Following is a summary of the main themes covered in the interviews and the main takes of it by a country, more detailed summary of each interview is included in Appendix II. The details included in the Appendix help to build the context, comments, and answers of each interview to offer a clear picture on how people with direct knowledge of each of the countries of the study feel about artificial Internet limitations, and how it is affecting outcomes of Internet use. The main themes covered below provide the ability to verify and expand on research findings, thus contributing to the overall reliability of the research.

5.3.1 Interviews on Bahrain

The five interviews covering the situation in Bahrain provided more in-depth details and information on findings of Study 1 and the survey instrument of Study 2, allowing for verification of findings and explanation to build better understanding to the relation between artificial Internet limitations and tangible outcomes of Internet use. The interviews were conducted in Arabic and English, as per the preference of the individual interviewee, with three of the interviews conducted over audio conferencing, and two conducted in-person. The interviews added to the reliability of the research, with the number of interviews increased from the initial three to five to cover aspects that were not covered in full in the first three, or to conclude on aspects that were contested to reach to a broader consensus.

The interviews on Bahrain covered all of the fields and topics sought after in the study design, with at least two interviews for each of the fields. More contested fields, mainly political, social, and relation with the government, were covered with four to five interviews each. The participants ranked from general Internet users to entrepreneurs interested in electronic business and commerce, to prominent activists that were among the first to be prosecuted for online activism in the country. The variety of interviewees provided rich and diverse views on the different aspects, nonetheless, despite the variety

of the views, a set of common reflections can be deduced to offer a good understanding on the status of the Internet and artificial Internet limitations in Bahrain, and how it changed over the years.

The general agreement among the whole sample from Bahrain was that the Internet is vastly available with high access and use rates among the population and that people in Bahrain generally have adequate to good digital skills to be able to use the Internet for much of their needs. Interviewee B2, for instance, expressed pride with the very high Internet penetration rate and use in Bahrain, as well as what they have felt of excellent digital skills Internet users in Bahrain stating that they feel that 80% of the population in Bahrain is "well-versed" in technology, while the other 20% have a lower level of digital skills, but still capable of basic usage of online services.

This high level of adoption is driven by social aspects as per B5, with high use and reliance on social media platforms to interact and communicate, while B3 sees that people use the Internet in all aspects of their lives. B3 further expanded to attribute access to the Internet to multiple phenomena, from effect on clothing choices to eating habits and choices to understanding of accents and dialects of other Arabic-speaking states. This allowed for an increase in exposure to the world, and contributed to the satisfaction of Internet use, as people felt its influence relatively quickly, which B3 does not fail to mention it is a double-edged sword, that can contribute to loss of community and social values at its shoddier end, and to positive social change and participation at the better end.

At the same time, B1 had strong views on the Internet availability in Bahrain, stating that although they agree on the high penetration rate and general availability, there are no guarantees for open access to the Internet. With controls implemented by companies and the government focus on limiting access to political content rather than aiming at protecting end-users from online attacks, resulting in an Internet environment with complete lack of confidentiality and privacy. Bahrain government practices, according to B1, include blocking and filtering of political content that is considered critical to the current regime, controlling media outlets, and surveillance and infiltration targeted at political dissents and human rights defenders, which would ultimately result in incarceration for activity on the Internet. B1 concluded their position on Internet limitations by saying that Bahrain does not respect the freedom of citizens and individuals in the exchange of information and knowledge through the Internet.

A primary drive for Internet use, according to B2, B3, and B5 is electronic commerce. B2 even sees it as the primary useful usage of the Internet in Bahrain, allowing

economic opportunities for Bahrainis by allowing access to better offers and deals, as well as opportunities for people to open their own online businesses, besides what they described as 90% of time spent on the Internet to be spent as "junk time". B3 and B5 agreed with B2 by pointing to a massive wave moving towards online business, including setting up simple stores over Instagram, a field that the government is stepping to regulate and now people can start a business totally based online without requiring any physical presence.

However, the limitations inherently involved with online shopping, like the ability to touch items and try clothes play a significant role in the preference of some people to head to the offline shopping experience, as per B5. Payment methods are also an issue, but there are services that are now available to address that, like *BenefitPay*, the National Electronic Wallet System, a system that enables people to pay to services and other individuals in Bahrain without the need for credit cards, using debit cards and agreements with local banks[13]. The service has also facilitated money transfers among individuals through phone number. B1 pointed to similar limitations to eCommerce, particularly payment methods, summarising it as a two-fold problem, the availability and popularity of credit cards is not yet at a level that would allow for active e-commerce markets, with around 20% penetration. The second problem is the attitude towards paying over the Internet is still unfavourable, with people fearing for their privacy. This attitude prompted for alternative payment business models, from pay on delivery, to dedicated prepaid payment cards, and payment at points of presence to be a standard option for e-commerce in Bahrain, for services from buying groceries to ordering home car wash and laundry services online.

In terms of economic achievement in the labour market, in addition to the opportunities of starting online businesses, the interviewees pointed out that the use of Internet affordances to find jobs is still developing. B5 stated that the case for the online job market differs a lot between domains of work, although for some jobs and companies they rely heavily on recruiting people online, in others, design, for example, handing CVs by hand is the norm, as most do not even advertise online, and one needs to go and ask for open vacancies. B3 had a more optimistic perspective, indicating that this aspect is rapidly growing in Bahrain, with more and more jobs posted mainly online for locals and

[13] Details on the service was verified and expanded through its official website: https://www.benefit.bh/Services/BenefitPay/

expats. Nonetheless, given the social structures and size of Bahrain, traditional methods for finding jobs through physically visiting potential employers and direct recommendations are used mainly.

The first part of Study 2, the survey, concluded that the economic achievement among the sample in Bahrain is the highest of the three countries of study, with an average of 3.79 compared to 3.69 and 3.63 in Estonia and Singapore respectively. The sub-fields of economic achievement in income and education and employment showed similar results, while the economic achievement in property showed that the sample of Bahrain perceives achieving less than the samples of Estonia and Singapore. These results seem to be in negation to the prevailing views of people interviewed for Bahrain, but after discussing the discrepancy with the interviewees, it shows that there are great expectations and potential for economic achievement combined with dissatisfaction with the overall environment around the Internet use, and the supporting environment for electronic commerce in specific. The outlook for higher economic achievement is also reflected in the economic satisfaction reported in the survey, with Bahrain scoring the lowest levels of satisfaction in the economic field and all of its three sub-fields.

Social affordances of the Internet were also covered extensively in the interviews from Bahrain, with interviewees B1, B2, B3, and B5 expressing high levels of reliance on the Internet for social interaction, particularly at the informal or personal level through social media platforms. B3 and B5 went further to say that the Internet did affect the daily lives of Bahrainis are social and news aspects, with more and more people relying on the news they receive online, especially social and health-related news and information more than politics related content. Social achievement is also related to the difference between generations, according to B5, reflecting a possible digital divide among generations. The findings of the survey support the suggestion of the interviewees that social achievement in Bahrain is high. The overall social achievement mean for Bahrain is higher than in Estonia and Bahrain, at 3.78 for the overall social achievement, compared with 3.32 in Estonia, and 3.39 in Singapore, proving to be the only country with social achievement in the positive band.

The sub-fields of social achievement, however, showed that the finding above is valid for the informal and formal achievement scales, but not for the scale of the political network, as the achievement dropped to slightly below the threshold for a positive outcome at 3.46, compared to 3.65 in Estonia, and 3.38 in Singapore.

Satisfaction with social affordances of the Internet in Bahrain showed that it was positive in the overall and all of the sub-fields, but fell behind Estonia in the overall social satisfaction, and formal and political networks, and was the lowest among the countries in terms of informal networks. The discrepancy between achievement ranking and satisfaction was again explained by B1 that blocking and filtering of political content that is considered critical to the current regime, controlling media outlets, and surveillance and infiltration targeted at political dissents and human rights defenders would ultimately result in incarceration for activity on the Internet. The direct and indirect Internet limitations in Bahrain have produced a chilling effect on online expression, but people have coped with that and moved on to utilise the Internet to the fullest in their daily lives, from economic benefits to social, and cultural ones. B1 continued to remark that mistrust with the government forced people to keep a distance and deal with suspicion with government services provided online.

Aside from the strong and direct views of B1, the political environment did nonetheless receive mixed opinions from the interviewees, with B2 stating that active monitoring and surveillance is justified according to especially after the 2011 "political mess", but still left its toll on other aspects of Internet use as well. With this statement, B2 seemed to be negating themselves when they asserted earlier in the interview that there is no website blocking other than blocking of pornography website and torrent-based websites that offer pirated software with no effect whatsoever on the Internet use in Bahrain. B3 did agree with B2 on the scope of monitoring and control of the Internet in Bahrain at the beginning of the interview, stating that they do not feel any limitations on Internet use and that the blocking, if existed, only helps in limiting access to pornography websites and other indecent content which helps in maintaining the conservative feel of the society.

B2 was more inclined during the course of the interview to mention the existence of limitations on a political basis, which is justified in their opinion, but covers "very limited number of blogs and news sites", and that they personally did not feel any limitations. The inputs from the interviews showed how some people in Bahrain tend to neglect the existence of limitations, or feel that the limitations are in a way justified and do not affect them, contributing to the idea that the responses for perception of limitation questions in the survey may be affected by that attitude, with people expressing fewer limitations than they actually perceive. On the other hand, B1 expressed their position on Internet limitations by saying that Bahrain does not respect the freedom of citizens and

individuals in the exchange of information and knowledge through the Internet, showing the difference views on Internet limitations in Bahrain and its justifications, while all agreed on the existence of limitations at various levels.

The restriction on the Internet, according to B5, is not something that has always been there and at the same level, with them remembering that when they were in school the early 2000s, the Internet did not have many restrictions. However, they think that the government monitoring of Internet use can be a reality in Bahrain, but the perception of Internet monitoring overshadows any facts on whether monitoring is persistent or not, which in itself plays a vital role in affecting people's use of the Internet, like thinking twice before posting anything online. B5 sees self-censorship a very touchy subject and hesitantly adds that it is mainly fear of sharing and expressing political aspects and views, more than any other aspect. This fear is consistent with how people are feeling about expressing themselves offline. This view supports the development of Internet limitations as discussed in Study 1, with the increase of focus on limitations happening in the early 2000s, and the maintenance of an environment of fear around free expression, online and offline.

B4 was another interviewee who provided great insights on the artificial Internet limitations in Bahrain from their history to their scope and pervasiveness, benefiting from their first-hand experience with their online outlets being targeted and blocked, to them being persecuted based on online expression and living in exile under constant fear. The account of B1 matched the findings of Study 1 in terms of scope of limitations and reach as reflected in the network measurements, as well as the timeline for development and forging of limitations and the political and legal environment surrounding it as reflected in the report and regulations review part of that study.

The input of B4 expanded the finding of Study 1 on the Internet limitations, and the use of circumvention tools findings of Study 2, by providing details on how many people in Bahrain rely on circumvention tools but are agnostic to it. B4 gave an example for that by pointing to the reliance of people on ready-made scripts distributed by activists like B4 to establish secure connections through circumvention without having to know about the scripts more than that they needed to click on it before accessing the Internet. Consequently, the use of these scripts in the manner described have the potential to affect the results of the questions on the use of circumvention tools in Bahrain by showing an account that is lower than the actual use.

The use of circumvention tools received a good portion of the interviews, to get a better understanding of the tools used and the motivation behind it, as well as the difference in the tangible outcomes of Internet use it may offer. B1 shared a similar position with B4 on how people may be using circumvention tools without realising or putting it in a technical perspective. The motivation use of circumvention tools, according to B1, is a direct result of the restrictions set on Internet use, with people using VPNs and Proxies to maintain privacy and access blocked content. B1 also suggested that some people would express their satisfaction in the survey because many did not have the chance to know any better Internet openness, and even when they do, the fear built through government's controlling policies will push people to overestimate their satisfaction and not to express any frustration they may feel.

On the same subject, B4 suggested that people prefer to use VPNs to circumvent Internet controls in Bahrain over proxies, with popular tools being shared among individuals until a point when the government catches up with it and block it when new ones are circulated again. This practice is encouraged and possible because people in Bahrain are aware of government surveillance and monitoring and put an effort to protect their digital privacy. As a result, Internet use and tangible outcomes, according to B4, may not be affected much aside from political participation and expression using real names. However, the one practice that B4 sees had the most effect on Internet use, and left people with minimal agency to circumvent it, is Internet shutdowns, similar to what happened in Duraz area. The Internet in the Duraz area was shut down in the night for over a year, with the ISPs claiming that it is due to technical problems, the practice that was covered in Chapter 4.

On the other end, B2 connected the increase in the use of VPNs and proxy services to youngsters trying to access websites with "immoral" content or to access services blocked by other countries when visiting them, giving an example of using a VPN to do WhatsApp calls from the United Arab Emirates. However, later on, with more trust established during the interview, B2 added that part of the surge came after events of 2011 when people wanted to access blocked blogs and news sites, negating their previous ascertain on type of websites blocked. These views were also shared by B3, who said that circumvention tools are used to access blocked content, which they see as only pornography websites. Later on, B3 added that they know some people that use circumvention tools when they are outside of Bahrain in countries that are more restricted to be able to access the Internet and to call home and friends using Internet telephony

services that are blocked in neighbouring countries like the United Arab Emirates and Saudi Arabia. Another use, according to B3, was to access games and content that may not be available in Bahrain because of geo-blocking.

A different outlook on the use of circumvention tools in Bahrain was provided by B5, who feels that a lot of people in Bahrain use circumvention tools with the primary motivation to bypass geo-blocking and access online content as with Netflix, and Pokémon Go when it was first released, as it was not available in Bahrain. Nonetheless, B5 did not underplay the role of Internet limitations, which they see as coming mainly from the government blocking explicit content and building an environment of fear of monitoring.

The percentage of people using circumvention tools in Bahrain as found in the survey instrument of Study 2 to be around 50% for each of VPN and Proxies, was challenged by B2 and B3, suggesting that the numbers may be less, and B2 suggesting it to be more in the range of 30-40% for VPN. While B1 and B4 both suggested that the actual number of people that use circumvention tools, as mentioned earlier, is larger than the number of that would do so knowingly and admit to doing so. These conflicting views on the outcomes of the survey suggest that the numbers may be accurate, as even the most conservative numbers suggested by B2 still indicate that a large number of the population do use circumvention tools.

For the rest of the tangible outcomes of Internet use fields as categorised for the interviews, namely institutional from the public service and government perspective, institutional from the health perspective, and educational, showed that interviewees from Bahrain feel that there are more and more uses and reliance on the Internet to achieve activities related to these affordances. The potential for more use exists with more skill development and supportive environment needed.

The interviews from Bahrain provided remarkable views and explanations for the research, supporting the findings of Study 1 and the survey instrument of Study 2. Including the existence of artificial Internet limitations in Bahrain at several levels, and the predominance of a perceived monitoring and control environment that affects the ways people use the Internet and express themselves online and offline, and as a result affecting tangible outcomes of their Internet use. The interviewees also provided confidence with the number of people using circumvention tools and the general perception of limitations, as well as the levels of achievement and satisfaction in the various fields of Internet outcomes as found by the survey.

5.3.2 Interviews on Estonia

The Interview instrument for the research of Estonia did not require as many interviews as Bahrain or Singapore, as the outcomes of Study 1 and the survey instrument of Study 2 showed that the Internet environment in Estonia in terms of artificial Internet limitations and uses did not show the level of complication as in other countries. Estonia in this research played the role of the control country, with minimal Internet limitations and the three interviews covering Estonia provided the explanation needed for the outcomes of the previous research instrument. The three interviews on Estonia were conducted in English using audio conferencing.

The interviews covered all aspects aimed at for the interviews, of Economic Labour (EL), Economic Commerce (EC), Social (S), Political (P), Institutional/Government (IG), Institutional/Health (IH), and Educational (E) fields. The interviewees included an expert in the issues of technology and society, E1, who was able to provide an expert view on the Internet and its uses in Estonia, including the history of social transformation using technology. The second interview was with E2, who is a technical person with experience of living inside and outside of Estonia. While the third interview was with a health expert, E3, who themselves are not a technical person, thus able to provide an overview of the general user,

The three interviewees agreed on the findings of Study 1 on the status of the Internet in Estonia, including the historical development of access availability following the dissolution of the Soviet Union in 1991, when the new Estonian leadership steered the country towards successful use of technology after the independence and state-building following the dissolution. E1 explained how much of the focus on state building was on developing the infrastructure and skills of Estonians, including providing schools with Internet connectivity and computers across the country, as part of the Tiger Leap project.

E2 and E3 added that they are proud of the speed available and services of Internet Service Providers. For affordability, they believe that the Internet cost is generally acceptable at prices approachable for most people, with a high level of competition between providers resulting in many offers available over different technologies available depending on location. E3 clarified that in the rural areas Internet availability in a bit problematic especially with problems recently arising with the landline telephone network, however, the ministry of telecommunication promises a 100% coverage, which is almost done according to E3. About affordability, E3 confirmed that Internet access is

very affordable for the typical household, as well as having affordable prices for mobile Internet, with plenty of options including Internet over wireless and fibre. They also praised the high level of customer service available.

In terms of tangible outcomes, economic benefits are clear, according to the interviewees, with a variety of online stores available that includes several local retailers offering popular services, in addition to the leading international players, like Amazon and eBay. Electronic commerce is highly relied on in Estonia as per E2, with a good supportive environment from payments to the delivery network. The interviewees have highlighted the ease of creating new business, where you can do that entirely online, and later manage that business online as well, including submitting taxes and managing bank accounts and activities. The latter services were experienced first-hand by E3, who is providing services to the citizens through an online speech therapy platform, this experience proved to them that setting up an online store and starting your business is relatively easy, and requires only a few hours if one had enough ambition and motivation.

Setting up business through the Internet is part of a wider array of services offered as part the eGovernment initiatives in Estonia, which according to E3, are first-class services that allow one to do anything online, as the saying in Estonia, you can do it all online except getting divorced, joking that they are working on it now. At the same time, E1 responded to a specific question on whether moving to digital-only governmental activities, as in tax submission and voting, will result in the exclusion of some people, E1 clarified that this is possible mainly with elderly people who may ask someone else to help them in it, but will not result in total exclusion.

E2 also described how the eGovernment services are prevalent in Estonia, covering most facets of interaction with the government, providing ease of use and speed for services. One example they mentioned was tax filing, which allowed citizens to submit their taxes easily with few simple clicks, as the information is already available to the government. Access to health services is also included in the electronic services as per E2, in addition to the extensive use of the Internet by people to benefit themselves and learn more about their health and health conditions.

E3 provided an expert view on the health services offered online, as being a practitioner that provide health-related service online themself, as well as being involved in the public services related to health. E2 evaluate online health services as being humble compared when compared to other public electronic services, eHealth services in Estonia are not where they should be. The functionality offered through patient portals is limited,

with people having access to view their information now with no much interaction, except for digital registration system, which was added recently did not have that much use so far. Another aspect is that elderly people and people with more severe illness rely on institutions and not the services provided online, while the younger generation that is more familiar with information-seeking online help themselves through eHealth services knowledge available and services provided.

E3 stated that the work they are involved in, which is connected to the government, has a vision towards a patient-centric health system with eHealth services as the tool. At the same time, E2, as a user of online health services, showed satisfaction with what was offered, especially when comparing it with services available other places in the world, with the extensive use of the Internet by people in Estonia to benefit themselves and learn more about their health and health conditions. The changes E3 hinted at where covered in further elaboration by E1, who added to the interview that they are working on rewriting the country codes, which are the rules that the eGovernment follows, to service design rather than IT design, allowing it to accommodate changes in a better manner.

In addition to the high satisfaction with Internet services and achievement in the tangible outcomes by means of Internet use, the interviews also covered freedom of expression and Internet openness. E1 considers the Internet in Estonia to be free, with no restriction on access or content and cites that they see no much social limitations on Internet use in Estonia. Nevertheless, they later mention constant pressure to control expression online coming from political groups, especially with the spread of fake news and weaponisation of social media for political gains. E1 makes it clear that fake news is well spread over Estonian networks, sometimes through external influence, to the point that people in Estonia got used to it, and it became normalised, with little influence and ability to convince people, who learned how to check the facts by time and experience and allowed for further involvement in politics online.

The sense for Internet openness in Estonia was also shared by E2, who noted that people in Estonia use online media to express their different views, including political, openly and with no worry for consequences, unlike other places that E2 lived in, where it is possible to be summoned by authorities based on your online activity as what E2 noted. This created a healthy online environment for discussion and debate. However, E2 shared their concern about the social aspect of the Internet, stating that it is causing a decline in

direct relationships and communication, with people focusing on their phone all the times, even when they are with family or friends.

These optimistic views on the current state of the Internet in Estonia, combined with worry on the future from potential negative results reflect the healthy conversations on the future of the Internet hinted by E1, but also reflects the voices calling for more controls on the Internet, whether to target misinformation, or to improve quality of social life. This should be viewed in light of Study 1 findings on the eagerness of Estonian regulators to lead in regulations supporting freedom of access and expression while maintaining compliance with European Union regulations, with high focus on cyber-security, as balancing these regulations is a hard aspect that may lead to inadvisable artificial limitations on the Internet. The regulations may also lead to an environment of self-censorship, which interviewees on Estonia showed that it is not an issue currently in the country.

Despite the environment of general openness of the Internet in Estonia, the survey instrument of Study 2 showed a notable percentage of the sample stating that they have used circumvention tools, particularly VPN, over the past year. The interviews dwelt to answer that non-expected finding, especially that the research began with the expectation that circumvention tools are used to bypass artificial Internet limitations with a focus on limitations set to limit people's agency in expression and access to information for political reasons.

While E2 stated that they do not feel many people use VPN because there is no need to it as everything is open and there no sense to fear any surveillance or monitoring, the other interviewees had a different take. E1 and E3 expressed their agreement with the number of people using circumvention tools in Estonia as found, explaining the primary motivation to be bypassing geo-blocking, or as E1 puts it, the very bad access to films and content online, particularly on Netflix, forces people to fake their location and use circumvention tools to access the content they like. E3 shared the view of geo-blocking to access online content not available to Estonian networks, adding that people also may use it for business to access corporate networks, and education, to access institutional database access. Another major reason for using VPN, which E3 did theirself, is to access online content that is geo-blocked but from outside Estonia to access content only accessible from inside Estonia, as with some of the national television channel content.

Internet is Estonia is also crucial in forming individual identities, as described by E3, enabling people to affiliate themselves with people feeling more connected to their

online acquaintances, including groups and networks they are using, and what news they read, with people using the affordances of the Internet to identify themselves based on their interests rather than their geographical location. This is facilitated with the standing of the Internet in Estonia as being free with no limitations other than cost to some extent and general literacy on knowing how to use connected and smart devices. E3 compared the limitations to other countries in terms of blocking and controls especially that no political party is thinking of extending any control or power over the Internet, unlike other places like Russia. However, despite that, the survey sample for Estonia did not report achievement levels in the related cultural fields, nor in any of its sub-fields of identity and belonging compared to other countries, but it did report higher satisfaction here, as well as higher achievement in personal achievement's sub-field of Self Actualisation.

The satisfaction of the Internet uses mentioned above, was reflected in the findings of the satisfaction of tangible outcomes of Internet use fields in the survey of Study 2, which showed that satisfaction levels for all the four top-level fields of Economic, Cultural, Social, and Personal activities online is higher in Estonia than the rest of the study countries. However, the achievement levels reported by the sample from Estonia varied in position to the other countries, with Estonia leading in three sub-field economic/property, social/political, and personal/self actualisation. The disparity between achievement and satisfaction levels reported by the countries shows yet another time that artificial Internet limitations have a higher impact on satisfaction than it does on achievement.

The interviews from Estonia played the role expected of them to provide confidence in the findings of the previous research instruments, and to provide additional insight and explanation for those findings. That was clear in this section with the input from interviewees matching most of the findings, especially with the level of satisfaction. However, the level of achievement in outcomes as portrayed in interviews is higher than that expressed by the survey sample when compared to the results from the rest of the research countries, indicating that people perceive more outcomes than is currently offered by the technology. The interviews also provided a critical input explaining the use of circumvention tools despite the apparently open Internet environment. Despite the fact that the number of interviews for Estonia is less than the number of interviews for Bahrain or Singapore, the input collected provided a clear picture that supported the research significantly.

5.3.3 Interviews on Singapore

Singapore interviews followed the same pattern and process of interviews as with the interviews for Bahrain and Estonia, with interviewees being selected to provide expert advice to cover all of the aspects aimed at in the fields of interviews as described in the Methodology chapter. The interviews on Singapore were conducted in English, with two of them conducted in-person, and two conducted through online audio conferencing facilities on mediums to support the anonymity of individuals. The interviews aimed at providing details and information on findings of Study 1 and the survey instrument of Study 2, as a method for verification of findings and explanation to build better understanding and confidence in answering the research questions.

As with the interviews on Bahrain and Estonia, the interviewees on Singapore expressed how high they regard Internet services in Singapore in terms of quality and availability. S2, for instance, expressed how they see the essential and crucial role of the Internet in the development of Singapore as an economy and community as a global platform that is moving towards using as a central location for all of our information, including files we share and store online, and data on our Internet use of different platforms. S1 and S3 shared a similar perspective but highlighted an essential difference among generations when it comes to outcomes of Internet use.

While S1 sees themself as being of a generation that knows the world through and with the Internet, with online tools and websites, as well as applications, being their primary gateway to communication, social interaction, knowledge and information gathering, and business. S3 sees that Internet is used positively by almost everyone in Singapore, with a distinction between the uses across generations. The older generation, according to S3, tend to rely more on the Internet to communicate with family and friends, and for entertainment in the form of following television shows and dramas online. While the generations of people who are younger than 40 years old, rely on the Internet as a news source to stay informed and up to date with what is happening in Singapore and the wider world, in addition to communication and entertainment.

Use of the Internet beyond communication, entertainment, and accessing news is still not as expected because people feel an alienation between their daily lives and the Internet according to S3 as people look at it as a media that serves as a window on themselves to the government, making it hard for the Internet to become a normalised part of daily activities as. S4 shares a similar view with the Internet in Singapore being used mainly for leisure, with and one of the trending aspects is blogs and discussion on

food, saying that this is because “in Singapore, people have a tendency to talk more openly about food rather than for example politics”.

Tangible outcomes of Internet use for the economic field was common among the interviewees, falling for some under leisure and entertainment, as S1 described the Internet as their main shopping destination, if not for actual purchases, to browse what is available at stores and go in person to purchase, especially for clothes and equipment. Online shopping and conducting business online, in addition to communication affordance, are the main drivers behind Internet adoption in Singapore, especially that it provided a promise for a more free atmosphere for expression, nonetheless, S1 points out to an increase in practices by the government to address hate speech and what is being labelled as fake news outlets online. The practices have also affected many regular people that were trying to speak their mind, which resulted in increased mistrust in the platform and transcending of the general fear culture from the street to the online world.

For the other fields of tangible outcomes of Internet use, education stood out as an area where interviewees felt there were no restrictions and more people and institutes are turning to the use of the Internet to access and provides educational material and services. S3 for instance, said that people in Singapore are open and comfortable to access educational material and courses available over the Internet, even if it did not originate from Singapore, as Singaporeans, according to S3, considers themselves active members of the global online community, or network society. The survey found that the sample of Singapore looked positively at economic achievement and satisfaction in relation to education. Another aspect that was looked at positively in the survey is the personal achievement and satisfaction in relation to health services offered an available online. S2 confirmed that attitude by praising were the health services offered online, whether public, or from other sources, is heading, as they think it is doing a good job in reaching out to people over the Internet.

The Internet facilitated cultural, and identity development in Singapore was also covered, with S4 seeing that the Internet is allowing for more access to culture-related content, and allowing for art to reach a wider audience beyond the creative sector. In term of identity and affiliation, S4 said that new forms are being developed based on the affordances of the Internet, connecting people with similar interests, even decreasing the importance of the Singaporean aspect of people’s self-identification.

Despite the limitations, S1 states that most people would ignore the perception of limitation and use the Internet for business, communication, and entertainment with no

worries as long as they avoid political content, even the official discourse. This effect came to a realisation during the interview with S2, which showed that they are wary of speaking of official limitations and restrictions on the Internet, ignoring the questions on government involvement and focusing on Internet limitations in workplace or school. For example, when asked about the reports on website blocking in Singapore, they said that it is justified especially in the banking industry because you have a lot of information that you do not want employees to leak out, so companies limit access to work-related content and sites only.

A similar practice was described by S3 as a disconnection between Internet uses that may be deemed non-political versus what is deemed as political, including discussing current affairs. The disconnection, according to S3 is part of tactics people of Singapore developed to deal with government policies by altering their activities that can be seen by the government, including those over the Internet, as a form of self-censorship and methods to stay off the government radar. At the same time, people in Singapore developed methods to express themselves freely while avoiding that monitoring, effectively constructed multiple groups of activities people deal with in separation, activities that are passable to be monitored, and activities that people prefer to keep off the eyes of the government.

The political expression online was affected by a change in Internet openness and even quality after the narrow win of the incumbent ruling party People's Action Party in 2011 according to S4, where the government extended its control over the Internet. S4 sees this as a turning point in the voices of the opposition over the Internet, but there came many rules that controlled online expression, including a rule requiring blogs and websites talking about politics to register with the authorities in compliance with the findings of Study 1. S4's advantage of being able to see the Internet from inside and outside Singapore allowed them to feel the change in the level of openness, while their friends in Singapore would not know that a website was stopped, because they just would not see it. Another aspect was a sudden surge of trolls on discussion fora that would repeatedly publish "rubbish" that would undermine the reliability and respect of the platform, a practice that was not fully covered in the reports studied in Study 1.

Study 1 described the method of Internet control in Singapore as the Singaporean model for artificial Internet limitations, a model that relies on spreading an environment of fear and self-censorship while taunting blocking and surveillance, without necessarily implementing widespread blocking and filtering on Internet websites and services. The

interviews touched on this subject, with S4 confirming that model, and further expressing confidence that rumours of what is allowed and what is not supposed to be discussed online affect how people use the Internet for political expression, creating an environment of self-censorship.

This model, according to S4 and S1, is carried on from the days before the Internet, through the early days of the Internet reaching current time. In the early days of the Internet, before Social media Sites, pornography and websites related to drugs were the only websites that people could not access, but after some time, the government realised that existing measures and laws could not handle the Internet as expected, encouragement creation of new rules, which people did not protest as S4 said. A related point of view was expressed by S1 on the transcendence of the general fear culture from the street to the online world, as discussed earlier, putting the online expression especially when it comes to politics a zone people in Singapore avoid. S3 reflected how they feel the split in how people interact with the Internet, between what they want to be seen, versus what they do not what to be seen, is an extension to general culture in Singapore that was developed as a form of resilience to increased monitoring and surveillance in the country.

The Singaporean model is seemingly successful in affecting people's use of the Internet and the opportunities they receive online, as shown in the survey results, which showed that the sample from Singapore did not express achievement or satisfaction in any of the tangible outcomes of Internet uses measured higher than the other two countries. Even further, the economic achievement with income, and the social achievement, with all of its sub-fields of personal, formal, and political networks, did not pass the threshold for positive achievement, reflecting that the sample has more of neutral feeling towards affordances of the Internet in these activities. This was in line with the interviews where interviewees consistently limited the uses of the Internet in Singapore to mere communication and entertainment for much of the population.

The social achievement with public and political networks, which included interaction with public services available online and the government, fell under the group of activities, that people in Singapore feel passable to be monitored as per S3. The result is that people provided a positive attitude and outlook to these activities in terms of satisfaction but not an achievement, as they are trying to make the most of it to save themselves time and effort, as S3 put it. The online activities included applies to licenses and other electronic government-related processes, but fell short in terms of political

expression, except when it is in line with the government and the main party official discourse.

The use of circumvention tools in Singapore was the lowest among the sample, sitting at 42% for VPN and 20% for Proxies, which the interviewees found as plausible. S4 went further to clarify that people in Singapore did not rely on circumvention tools in the past, but it is increasing with the increase of blocking and the influence of Chinese use of circumvention tools, which was facilitated through the strong social ties between Singaporeans and Chinese. S4 said that if they were in Singapore right now, they would use circumvention tools to bypass blocking, and protect themselves from monitoring and surveillance. This assertion comes from the feeling that someone is always monitoring, fortified by observing a sudden drop in speed that coincided with elections, despite thinking that technology to manage increased demand is there, S4 believes that change in quality is related to the introduction of surveillance facilities. The increase in the use of circumvention tools was also pointed at by S1 and S2.

The set of interviews on Singapore provided the required level of confirmation and expansion to the findings of the previous research instruments, from network measurements to researching reports and regulations, and the survey. The interviews did support most of the findings, particularly where people are more satisfied with Internet affordances, and the positive outlook many have for the opportunities the Internet is offering to enhance people's lives. However, the main take was an understanding on how people in Singapore tend to shape their online behaviour to suit what they believe would save them troubles with the government, having two sets of activities, the activities that are passable under monitoring and surveillance, and the activities that people prefer to keep private form the government. However, even with these tactics, the Singaporean model of artificial Internet limitations that transcend fear of expression from the offline world to the online arena is seemingly effective in curbing people's usage, and in turn limiting tangible outcomes to simple uses looking at the Internet mainly as a mean for communication and entertainment, and food.

5.4 Summary

This chapter covered Study 2, the part of the research that aims at measuring and understanding the tangible outcomes of Internet use as a measurement for digital

inequalities and access to opportunities in the different communities studied. The Study made use of mixed methods with a qualitative leg in the form of a survey available to Internet users in the countries of Bahrain, Estonia, and Singapore, and a qualitative leg in the form of sequential explanatory interviews in the same countries. Both instruments followed the design described in the Methodology chapter and this chapter discussed how they were carried, with the data analysed and the main findings produced.

The survey collected useful responses from a sample of 459 respondents from the three countries of study. The respondents spanned across age groups, years of Internet use experience, education and employment groups, as well as sex as classical sociodemographic indicators. The survey included questions aimed at identifying the tangible outcomes of Internet use in the field of economic, cultural, social, and personal activities online. The survey also included questions to gather individual research predictors that measure the perception the individual has of limitations on their Internet access, their ability to bypass those limitations, and the operationalisation of those skills by means of circumvention tools.

Leading indicators of the sample along with correlations with classical and research predictors showed across the whole sample, and then over two groups of countries, countries with high limitations on Internet access, Bahrain and Singapore, and Estonia as the country with low Internet limitations, as advised by Study 1. The main findings for the survey and correlations can be summarised as follows:

1. In countries with high limitations, less than 14% of the sample felt that their Internet access is free with no party monitoring or controlling their Internet use and access, compared to 43% in Estonia.
2. The sample indicated that most monitoring and control is done through the government, followed by their ISP, and lastly their school or workplace.
3. In the sample, skill to bypass limitation is correlated with perception of limitation, and then the use of circumvention tools is correlated with the skill to bypass limitations.
4. Achievement varied among countries across the tangible outcomes of Internet use fields, generally, Bahrain reported higher achievement than Estonia, except with economic achievement with property, social achievement with public and political networks, and personal achievement with actualisation, where Estonia was ahead.

5. The overall satisfaction of Internet is reportedly lower in all of the overall fields and sub-fields in countries with high limitations than in Estonia, except for social satisfaction with personal networks, and personal achievement with leisure where Bahrain was in the lead.
6. Respondents who reported that they are able to bypass limitations reported higher achievement and satisfaction across all of the fields.
7. Respondents who reported that they use circumvention tools reported higher achievement and satisfaction across all of the fields, except the social achievement.
8. The research predictor of perception of limitation is significantly correlated with higher achievement in the economic, cultural, and social fields for the whole sample, and just the economic and cultural field for the countries with high limitations. It was only correlated with satisfaction in the economic field for the whole sample.
9. The research predictor of skills to bypass limitations is significantly correlated with higher achievement in all of the fields for the whole sample and for the countries with high limitations and only correlated with satisfaction in the personal field for the sample form countries with high levels of limitations.
10. The research predictor of use of circumvention tools is significantly correlated with higher achievement in the economic and personal fields for the whole sample and the countries with high limitations. It was also correlated with satisfaction in the economic, cultural, and personal fields for the whole sample, and just the satisfaction in the personal field for the sample from countries with high limitations.

The second instrument was a series of interviews conducted with carefully selected individuals that are expert on the countries of research, to verify and expand on the findings of Study 1 and the survey of Study 2. The 15 interviews generally approved the findings of the research and provided vital insight to fortify the findings with a better explanation for outcomes of the research. Main findings of the interviews can be summarised as follows:

1. Interviewees agreed on the high numbers of users of circumvention tools, particularly VPN, found in the survey, 59% in Estonia, 45% in Bahrain, and 42% in Singapore. In Estonia, that was explained as a way people use

to bypass geo-blocking and access more content online. In countries with high limitations, the same reason was reported, but interviewees suggested bypassing Internet limitations of blocking and monitoring as the primary motivation.

2. Interviewees form Bahrain suggested that many people do use circumvention tools without technically knowing that, as for some it is how they know the Internet is accessed, suggesting that the number of users in Bahrain may be under-reported.
3. Interviewees from Bahrain also noted that the circumvention tools are only useful with some types of blocking, for others, as in total shutdown of Internet connectivity, which some parts of the countries experienced, are useless.
4. Interviewees from countries with high limitations confirmed the findings of Study 1 of the details of practices in place in their countries in relation to limiting access and the evolution of it over the years, whether the more technical blocking methods as in Bahrain, and the methods relying more on environment of control and fear as in Singapore.
5. Interviewees from Singapore suggested that people have coped with the environment of fear surrounding open Internet use and free expression by shaping their use to what they think is acceptable by the government as their activities that they do openly online, while being very careful with other activities and may use circumvention tools at that time. Nonetheless, the Singaporean model is seemingly effective in curbing people's usage, turning the Internet, mainly to a mean for communication and entertainment.

The findings of this study confirm that there is substantiated evidence to support that artificial Internet limitations effect how people use the Internet, and how they make use of it in their daily lives to access opportunities otherwise unavailable, with limitations affecting satisfaction more than achievement. The discussion chapter later on mixes the findings further with the literature reviewed to achieve conclusion on the research questions, with its potential to affect communities where new networks are being set up with limitations included as part of its design.

Chapter 6

Discussion:
Connecting Internet Limitations with Tangible Outcomes of Internet Use

6 Discussion: Connecting Internet Limitations with Tangible Outcomes of Internet Use

6.1 Introduction

Hopes to advance communities through technology have been accompanying new technologies since at least early days of electrical communications, when breaking the barrier of time and space and allowing additional opportunities for people to interact and access and share information, enlighten the masses and add material to aspects of life as summed up by Nikola Tesla (Tesla, 1904). The digital forms of communication, particularly the Internet, was not different, in offering the potential for people from around the world to communicate and access information in a manner that surpassed every previous technology in adoption and potential for empowering individuals (Shane, 2004). However, that did not come without inequalities, whether propagated from existing inequalities, or novel to the digital world, predicted by several individual and collective attributes, from access to resources to the political environment and local policies regulation what people can access and do online.

In this context, this research explored the specific forms of inequalities in access mandated by artificial Internet limitations, and their differences among various communities, to understand nuances of Internet usage through the lens of tangible outcomes. This chapter aims to building on the knowledge developed throughout the previous chapters to offer response to the two research questions, contributing to the knowledge on the effects of artificial Internet limitations on tangible outcomes of Internet use as the first research question. As well as providing material to support decision-making and shaping expectations of communities with Internet access that is artificially limited, including some of the projects for connecting new Internet users, as a response for the second research question.

The chapter goes through the same structure as the research so far, from establishing the grounds for analysis based on the literature review, including the concepts and predictors of differences in opportunities and digital inequalities, to laying the details of the studies conducted. Then the chapter goes to cover the findings of Study 1 and the differences in artificial Internet limitations across communities studied as a foundation for comparison, as well as Study 2 and the outcomes of the investigation on the tangible outcomes of Internet use in those communities with

focus on the effect of different predictors on these outcomes. The findings are discussed to provide advice for an application on other networks, particularly which are limited by design, to predict outcomes of use among the communities they will serve as in Study 3.

6.2 Grounds for analysis

With the development of the Internet to become the base for digital communication in the current human era, opportunities offered by technology expanded horizontally to cover broader aspects of the daily lives of people. Nevertheless, the role played by the Internet is dependent on a series of variables that dictate who can do what, in an extension of inequalities to the digital world. Internet adoption and usage were more complicated than those of previous technologies, as making use of it relied on a collection of variables from the availability of electricity, devices, and connectivity, and the specific sets of skills required by the individual to be able to access and use the Internet. However, these variables were still unable to capture the full picture to predict inequalities in what outcomes and benefit people get from the Internet.

The variables affecting digital opportunities were studied in the field of communication as predictors for the diffusion and adoption of the Internet and differentiation in access and use through positional, personal, technological, and other factors. The literature review looked through main theories in the field including van Dijk's sequential model for technology adoption, which transitioned from adoption to participation in society, whether economic, social, spatial, cultural, political, or institutional (van Dijk, 2005a). The difference in digital access to opportunities, or the digital divide, continued to receive research to understand what predicts it in the hope of mending it to fulfil the hopes for equality and advancement of humanity.

The digital inequalities research included researching the three primary levels of the digital divide, with the difference between who has access and who does not, as with the first level of digital divide (van Dijk and Hacker, 2003). And the second level of digital divide looked at the difference in the ways people use the Internet online and the digital skills they possess, or lack of thereof (van Dijk, 2006; Parent and Cruickshank, 2009; Ragnedda and Muschert, 2015). This level introduced factors that have the potential to cross-cut classical social stratifications reflection on digital inequalities, as well as the third level of the digital divide pushed forward research on

digital inequalities to study the tangible outcomes of Internet use, in what is known as the third level digital divide (van Deursen and Helsper, 2015; Ragnedda, 2017).

Researchers like van Dijk summarised differences to revolve around four main categories of inequalities, including the immaterial inequalities as life chances and freedom, material inequalities including capital and resources, social inequalities such as position, power, and participation, and educational inequalities such as capabilities and skills (van Dijk, 2006). The variation in opportunities in these categories had the potential to capture most differences on the individual level, as well as wider differences that affect wider communities in a multidimensional perspective of inequalities, however, as qualified by the literature review, the body of research studied covered predictors of access with no much coverage on differences in limitations imposed on access. The limitations covered in the body of research included what is imposed on a small scale of communities as in schools or libraries on access to knowledge, or on political participation in countries, as discussed by Wagner & Gainous (2013) and Yang et al. (2013). Nonetheless, the limited coverage of the issue of fettered or artificially limited access and its effect on digital inequalities offered the grounds for this research.

Inequalities in the digital world encompasses individuals within communities and structures of the connected, as part of the Network Society, defining the interactions and power relationships across social actors in relation to the online world, with the asymmetrical influence guiding the opportunities different parties receive and possibly intensifying alienation and social inequalities as a cost of technology (Castells, 2004, 2011; van Dijk, 2005b). Although Castells view of the network society is not necessarily technical, their description of the network society fits the structures of the digital society, with different players exerting their powers to control the infrastructure and media, the message, and the relations between nodes of that structure.

This research built on the body of knowledge of differentiation among individuals in the opportunities as mandated by differentiation in artificial limitations imposed on their Internet access as communities. The artificial Internet limitations are the controls set over the Internet that shape the access, as described in the literature review to include content, website, and service blocking and censorship, as well as speed control and other access limitations to full Internet shutdowns. The common

among these limitations is that they fall under the networking and network-making powers of the network society putting the decision power in the hand of gatekeepers and network programmers (Hargittai, 2000; DiMaggio and Hargittai, 2001; Castells, 2011). These actors can be the controllers of the immediate networks as with school or workplace networks, to broader networks Internet Service Provider, and national networks governed by governmental regulations and influence.

Studying the differentiation in opportunities online, or digital inequalities is manifested in this research as the study of opportunities of tangible outcomes of Internet use for individuals, relying on the framework developed by the Digital Skills to Tangible Outcomes project (Helsper, van Deursen and Eynon, 2015). However, the effort taken to minimise the size of the survey within the framework limited the outcomes to general common aspects, and did not capture, for instance, issues directly related to freedom of expression, leaving it to be deduced from other tangible outcomes, such as communication within the public networks and from the other research instruments, including the interviews. Nonetheless, this framework offers the potential to understanding differentiation in usage, especially among communities with high Internet adoption rates and high digital skills to understand how digital inequalities are either normalised and faded away or stratified through an enduring pattern of inequalities. To measure the change in opportunities as a function of artificial Internet limitations, the research looked at three communities part of the global network society that differs in the level of artificial Internet limitations, Bahrain, Estonia, and Singapore. Finally, the outcomes are compiled as predictors of outcomes that can be projected to other limited networked communities to predict outcomes there.

6.3 Artificial Internet limitations in communities studied

Analysis of network measurements collected through tests on networks operating in the countries of study reflected the current state and the forms of artificial Internet limitations that are implemented as part of these networks, and the extent of the limitations with details on what categories of content and services is being controlled as a form of applying network powers. However, as clarified in the chapter on Study 2, these results apply to the lists of websites and services tested, leaving a room for other websites and services that may be controlled to not being documented or tested, and producing false negatives. While false positives, or the mis-

categorisation of a service as blocked while it is not, is less likely to happen within the testing framework.

All of the three countries studied showed levels of artificial Internet limitations applied to networks in it, with most of the limitations being enforced by the respective governments and implemented by the Internet Service Providers, the power exerted by the governments stem from the regulatory environment and requirements set to license the companies to operate. This displays a level of governmental control that challenges trends of communication sector as predicted by van Dijk, who argued that the private sector will set loose of governmental control to be the final result of regulatory development (van Dijk, 2005b, p. 84), or at least indicate that the current situation is far from what it may achieve in the future.

van Dijk's predictions have also suggested the need for measures governing computer networks to protect against threats on privacy produced by the expansion of networks and integration with individual lives while control and authority are unchanged, through legislation, self-regulation, and technological solution (van Dijk, 2005b, p. 117). However, the findings of Study 1 suggest that the legislation is moving towards protecting the status quo under the pretext of protecting public morals and racial and religious sensitivities of the society in a manner that implies imposing artificial limitations on Internet use. The limitations were found to be direct limitations through technical blocking and filtering, and indirect through regulations that penalise forms of use and expression, in a manifestation of the *code relations* as an instrument of power, as described in the literature review.

In Bahrain, these limitations were found to be a continuation of the government’s 1990s history of telephone and correspondence monitoring and surveillance concepts extended in the form of monitoring of Internet activity and imposing controls on access. The controls targeted outlets and services that are deemed critical to the regime in Bahrain, especially when it comes to criticism of the ruling family, as well as websites and services that fall under various categories of content, particularly gambling, pornography, and anonymization and circumvention tools. The limitations did not leave content and services that fall under other categories sparred but are more selective by limiting less number of websites that fall under the religion, news media, human rights issues, LGBT, and communication tools categories as tested.

The results also showed symptoms of dynamicity of the blocking across time and variations between networks, implying that there is no one central filtering system covering all networks, but slightly different setups in different networks that follow governmental instructions. The government control over the Internet took several shapes over the years, with multiple bodies established and regulations issued to control media and information especially online, reflecting how important the government thinks of the Internet as a mobilisation media. The executive branch did also interfere with the Internet with what seems to be efforts to ordain the environment of fear among the citizens of Bahrain when it comes to online activity by issuing messages to the public warning of the repercussion of sharing misinformation or even following accounts that do so, as reported in Study 1.

The main form of technical blocking in Bahrain as found through network measurements is based on as URL blocking, which can be bypassed using simple circumvention, including changing domain name servers used to ones that are not controlled by Bahraini ISPs or using tools as with proxies and VPNs. However, other forms of limitations have been practices in Bahrain that did not allow for a margin of circumvention, as with Internet shutdowns and deep packet inspection. Despite the high limitations found to be affecting access to anonymization and circumvention tools and the blocking on related services, such as the underlying TOR network, the research found that there is a high level of use of these tools in Bahrain with half of the survey responders stating that they use at least one of those tools. The interviews suggested that the actual scale of use of circumvention tools is likely higher than reported because many people do use it without realising the technical terms for it.

Another form of artificial Internet limitations in Bahrain takes the form of wide-scale surveillance assisted by technologies implemented to monitor online activity, and plans to implement centralised Internet control and monitoring solutions, as advised in Study1. In addition to that, Study 1 also unveiled targeted surveillance and technical attacks against individuals, including dissidents and people expressing their opinion online, which, when accompanied with the media coverage it brings along, contributes to the intimidation of people in Bahrain from the consequences of Internet use.

Internet limitations, whether through access control or monitoring and surveillance, are highly visible to people in Bahrain as reported in the survey and

interview instruments of Study 2, with 89% of respondents to the survey feeling that at least one party is monitoring or controlling their Internet access. This visibility provides fertile soil for a political stronghold on the Internet that produces a chilling effect on Internet use and a high level of self-censorship. However, the survey of tangible outcomes of Internet use showed otherwise, as the visibility of limitations in Bahrain does not appear to be negatively affecting achievement in the general tangible outcomes of Internet use, but is clearly affecting satisfaction.

In Singapore, studying the Internet and the artificial limitations imposed on it showed that there are many similarities with the situation in Bahrain, both countries have very high Internet penetration rates with high availability and affordability in Internet access, and the governments in both are similarly concerned of Internet as a medium and the message that it carries. The motivation form imposing limitations in both countries are labelled as to protect morals and maintain delicate civil equilibrium across different components of the respective societies. Nevertheless, despite these similarities, there are fundamental differences, as observed in this research, in the model used for implementing Internet limitations to serve the announced and subvert motivations for controlling access to media and information.

The model in Singapore puts less weight behind technical limitations while relying heavily on shaping of individual's behaviour online through intimidation and establishing fear in the minds of people in Singapore from use that deems immoral or can be a reason for persecution based on libel laws and content shared or in possession, as well as opinions expressed online. The fear factor is also achieved through light-handed technical controls, particularly transparent blocking, that the network measurements of Study 1 found to be of sporadic nature with the list of blocked websites rotating over time. The rotating blocking results in maintaining an image that only a small number of websites is blocked at any given time while building fear for anyone that is unlucky enough to try to access any of those websites when they blocked through a series of laws. Some of the troublesome laws include the recent Public Order and Safety Act and the works towards laws that target "fake news", which, as described in Study 1, were received as drastically restricting online media and freedom of expression.

The Internet limitation practices in Singapore seem to be more effective in controlling and shaping the use of the Internet, as was established in the interviews

and the survey results conducted as part of Study 2. The interviews confirmed that people in Singapore see the limitations as a fact of life, and as a result, have developed coping techniques by shaping their use as two types, what they think is tolerable by the government as the type of activities they conduct openly. While any other activity that may put them under the radar or under risk fall under a category of uses that people are very cautious with, and may use circumvention tools to conduct.

However, despite these coping techniques, the interviews recognised that Internet use in Singapore is below its potential and is mainly limited to communication and entertainment, a fact that was also reflected in the survey, where Singapore scored the lowest levels of mean achievement and satisfaction in most of the fields of tangible outcomes of Internet use. The only fields where the survey from Singapore reported levels higher than the other country with high limitations, Bahrain, are the economic achievement in terms of property, all of the economic satisfaction sub-fields, and personal achievement and satisfaction in the Self Actualisation sub-field, but it always fell behind what was reported from Estonia.

The country that seemed to be in odds with the other two countries in how Internet affordances are perceived and dealt with in this research is Estonia. Alike the other countries, the Internet is seen as a force for development, but Estonia differs in that there are no official positions that perceive the Internet as source of nuance and a threat to morals and stability, but rather a system that looks at technology as key to state-building, relying heavily on electronic government solutions for public services.

Network measurement in Estonia detected transparent blocking of several gambling websites, a finding supported by the reports and research on regulations by the 2010 law on remote (online) gambling. Other limitations detected showed limited transparent blocking at institutional or corporate networks, while some measurements showed anomalies that may indicate further non-transparent locking, although minimal. The transparency in applying the technical limitations, and the supportive environment for Internet use that does not involve intimidation or coercion for dissident expression and use, had clear results in the survey. One aspect showed that 43% of survey respondents from Estonia reflected that they do not feel that any party is either monitoring or controlling their Internet use, compared to a shy 11% in Bahrain, and 14% in Singapore.

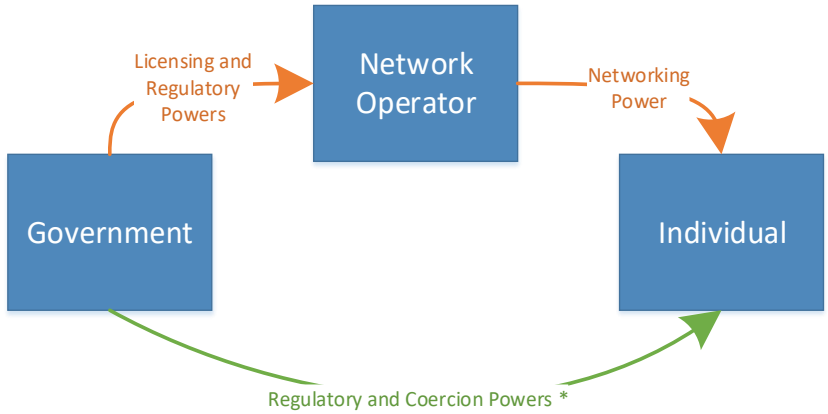
Study 1 also unveiled that through the reports analysed on Estonia, there is an eagerness of Estonian regulators to lead in regulations supporting freedom of access and expression while maintaining compliance with European Union regulations, with high focus on cyber-security. Estonia maintains relatively open Internet access, fettered only to limit gambling websites that are considered illegal and limited blocking on multiple levels, with no repercussions for online expression, resulting in no or little self-censorship.

Structures related to providing and controlling Internet services in the countries studied reflected a tripartite relationship between governments, network operators, and individuals. The governments in all of the countries studied would practice regulatory and licensing powers, in an incarnation of Castells' networked and network making powers, as described in the literature review, over ISPs as network providers to implement Internet controls to fulfil its needs in the form of exercising gatekeeping as part of networking power over individuals. In addition to the controls of blocking and limiting access to content and services that are deemed unlawful, the controls would also include providing the ability to monitor usage. One example of the later is the *lawful access* requirements of the Bahraini Telecommunication Regulatory Authority, which requires network operators to provide means necessary to conduct surveillance and monitoring of individual Internet usage to entities concerned with national or international security (BahrainTRA, 2009).

In countries of high limitations, another form of power relation was prominent in the research finding is the direct implementation of the networked power by the governments over individuals, through the rules, regulations, and practices that empower coercion and intimidation of use that may be deemed illegal or pose threat to the country's ethnic and religious stability or national security. This was clear from the Study 1 findings of the laws implemented, and cases acted on, as well as the interviews of Study 2, and was noticed to take place in countries of high limitations on Internet access. Figure 6-1 shows the different power exerted in the tripartite relationships, with the difference between Estonia as the country with low levels of Internet limitations, and Bahrain and Singapore as countries with high limitations.

Figure 6-1

Network Society Powers Exerted in Countries of Study



*Note: * Denotes powers prominent in countries with high limitations.*

The potential of individuals to spring over digital inequality divides in the countries studied faced artificial Internet limitations that have played a role in shaping individual use of the Internet and their agency to utilise Internet affordances to achieve better tangible outcomes of use. Study 2 showed that these limitations are reported as visible by 77% of the sample who felt that at least one party is controlling or monitoring their Internet access. This effect is challenged by the agency to bypass said limitations, as measured in the survey by the ability to bypass monitoring and accessing blocked websites and services, and the knowledge and use of circumvention tools, table 6-1 shows the results of these factors from different countries of study.

Table 6-1

Levels of Perception of Limitation, Skills to Bypass Limitations, And Circumvention Use in Countries of Study

	Bahrain	Estonia	Singapore
Perception of Limitation	21.61	13.78	20.81
Skill, Bypass Limitations	5.85	4.78	4.75
Circumvention Use	3.72	4.08	3.68

Although the interviews instrument of Study 2 showed that some of the usages of circumvention, principally in Estonia, is motivated by will to access content artificially limited by means of geo-blocking imposed by content providers rather than local governments or network operators, primary motivation in countries with high limitations was reported to be involving bypassing control and monitoring politically driven. Because of the role of the factors of perception of limitation, skills to bypass limitations, and circumvention use have in overcoming artificial Internet limitations, they represented the research variables for determining digital inequalities in the form of tangible outcomes of Internet use.

6.4 Limitations as predictors of tangible outcomes

This research built on the growing literature in the field of digital inequalities to establish the indicators that can be relied on to foresee differences in opportunities among members of the network society who are members of communities where Internet access is widely diffused, an area that was described as a place we know little of (van Deursen *et al.*, 2016). The research set to study predictors beyond the classical sociodemographic and socioeconomic predictors prominent in the field Inspired by the post-modernist approach to digital inequalities as described by Servaes and Oyedemi (2016), and the newer Weberian perspective to digital inequalities (Ragnedda, 2017). This approach allowed for broad multidimensional encapsulation of inequalities and the inclusion of artificial Internet limitations related variables as predictors along classical predictors of digital inequalities.

The approach, as described in the methodology chapter, relied on measuring tangible outcomes of Internet use and contrasting them from two perspectives. The first viewpoint is how inequalities differ between communities that have different levels of artificial Internet limitations imposed, while the second deals with the whole research sample as one network society and studies the inequalities among individuals based on predictors related to individual attributes of artificial Internet limitations.

The first viewpoint provided clear results that linked artificial Internet limitations and related predictors on the community level with tangible outcomes of Internet use in terms of achievement and satisfaction in economic, cultural, social, and personal activities. Study 2 instruments showed that satisfaction in all of the fields

was higher in Estonia than any of the countries with high limitations, Bahrain and Singapore. Bahrain was leading in achievement of most of the outcome fields, as detailed in Chapter 5, except with economic achievement in property, personal achievement in Self Actualisation, and social achievement with political networks.

To understand the differences among different communities, the tripartite groups of the network society as described by van Dijk (van Dijk, 2005b, p. 174), detailed in the literature review, provides an adequate structure to understand the results of the research on tangible outcomes. The structure suggests the *Information Elite* as a group who have the power to make all-important decision in society, in our context, these are who are able to use the Internet in any form or method they like, with no limitations imposed, from the satisfaction levels, the research suggests that Estonia as a community falls into this group. The peculiar aspect here is that the Estonian community is transforming from having its own information elite and access privileged, or *Nomenklatura* (Vartanova, 2002), into becoming one as a community among other countries in the world.

The second and third groups of the tripartite are the *Participating Majority* and the *Disconnected and Excluded*. Bahrain and Singapore seem to be falling in between these groups, as these communities do have high levels of access and do participate in the network society as evident by the achievement levels of the tangible outcomes of Internet use. However, the artificial Internet limitations set on their access, whether direct or indirect, is limiting the satisfaction with the affordances and use of the Internet, as in both countries, and shaping the uses of the Internet access by affecting achievement as prominent in the case of Singapore, where, as interviewees put it, the Internet is used for communication and entertainment. Even in communication, the survey showed that the sample from Singapore achieved less than the threshold for positive achievement in the social field particularly in political and formal networks, leaving entertainment, as represented by personal achievement in terms of leisure, achievement, and satisfaction in personal Self Actualisation, and economic achievement and satisfaction as the highest reported outcomes in Singapore. Through the same view, the outcomes that were not viewed positively in Bahrain were the economic achievement in income, social achievement in political networks, and cultural satisfaction with identity.

When looking at the two countries with high limitations, another relation can also be constructed from the skills to bypass limitations and the use of circumvention tools on the one hand, and the achievement and satisfaction reported by these countries. The relation suggests that activities that would involve using local services, as with the economic activities, as advised by the interviews, are the ones were less use of circumvention use provides better satisfaction and achievement. On the other end, activities that would involve accessing wider networks or ability to participate in more full discussions, such as cultural and social aspects, including political activities, were higher where there were higher skills for bypassing limitations and higher use of circumvention tools.

Social achievement and satisfaction in terms of interaction with public services and political networks as compared among the countries of study showed that achievement and satisfaction was higher in Estonia than in the countries with high limitations, with the survey sample from Singapore providing the lowest levels in both sub-fields reflecting what the literature review described as the democratic divide. This form of the divide is described by Norris (2001) to be the differentiation in the use of the Internet for civic participation and the gap between those utilising the Internet to participate in public discussions and change, and those who use the Internet as passive consumers. The same findings also add to Seong-Jae Min's views on the democratic divide (2010), which found that skills and motivation are essential in addition to access to encourage meaningful use of technology for politics, the addition is that this research showed that coercion as a form of artificial Internet limitation is also influential in this divide, although negatively.

The findings at community level suggest that the ability of using circumvention tools and possession of skills to bypass limitations have the potential to counterbalance artificial Internet limitations by allowing for better achievement. These aspects of skills and use were found to be related with higher perception of limitation, an aspect that the research proved to be connected to lower levels of satisfaction among individuals. The connection between outcomes and perception of limitation suggests a method for measuring embodied coercion practised by the power in control of the networks in countries with high limitations through studying Internet use satisfaction and perceived limitations. The relations described above yet again show that coercion is more effective than technical limitations in deteriorating

Internet open use and satisfaction, especially when combined with a limited ability of using circumvention tools that allow an agency to offset for the deterioration in use.

However, the ability to offset limitations, whether direct or indirect, necessitates knowing how to bypass the limitations and to operationalise that knowledge, with the use of circumvention tools as a possible application. The research suggested that it is possible for people to be using circumvention tools without realising the technicalities behind it, and thus reporting that they do not have the skill to bypass limitations nor do operationalise it. That still does not weaken the position of that measurement as an indicator but suggests a room for quantitative network measurements to count for that more accurately.

Studying inequalities at the community level, despite the merits it offers, would still be limited and prone to influence of other cross-cultural aspects that may wither when reviewing inequalities with predictors at the individual level with the whole sample as members of one network society. Here, studying predictors at the individual level offered wider range of predictors by gauging against sociodemographic indicators as well as research indicators of perception of limitation, skills to bypass limitations, and circumvention use as described earlier.

Analysis of Study 2 showed a relation between possessing skills to bypass limitations and the achievement and satisfaction at the individual level in a manner similar to that at a community level. Individuals who possess the skill to bypass artificial Internet limitations reported higher achievement and satisfaction than individuals who do not possess such skills across all of the fields studied. However, this metric at its own may not entirely reflect the relation and is prone to providing false positives because people may have the skill to bypass limitation as part of the overall digital skills and not necessarily as a response to limitations.

A possible method to factor for the possible false positives related to overall digital skills, actual operationalisation of the skill to bypass limitation through the actual use of circumvention tools offer a metric to connect limitations and the agency to bypassing them to achievement and satisfaction. The validity of that assumption is further amplified when taking into consideration the input from interviews that suggested that the primary motivation for using circumvention tools in the countries with high limitations is to bypass limitations, as explained earlier.

The use of circumvention tools proved to be related at the individual level to higher achievement and satisfaction across all of the fields studied, except the social achievement. The level of opportunities offered by the use of circumvention tools is slightly less than that of the skill to bypass limitation across the fields, suggesting that there is, in fact, the factor of overall digital skills to provide higher opportunities no matter of limitations imposed. The social achievement field showed that people who reported that they do use circumvention tools achieve less than those who do not,

The effect of using circumvention tools to limit that effect of artificial Internet limitations at the individual level can be interpreted through the normalisation of access view of digital inequalities as proposed by Norris (2001). The normalisation view proposes that over time, with more people connected and technology becoming more available to people, the digital divide would shrink to the point that it is no longer relevant, as opposed to the stratification view where the digital divide is maintained as difference in Internet adoption starting point of different social groups dictates difference at endpoints.

When looking at the achievement dimension of tangible outcomes of Internet use levels as different endpoints, and the opportunities held through imposing artificial Internet limitations as starting point. The agency provided by the use of circumvention tools appear to be bridging the gap, and offering people falling in the limited group the opportunity to achieve equally or better than people in the non-limited group. The gap here is normalised, but at the same time, people who do not use circumvention tools are still affected until their agency is developed to counterbalance the limitations.

However, the satisfaction dimension has a different trend, which can be described under the stratification view, where people under limitations as a starting point, report less satisfaction as the endpoint than those who use the Internet unfettered. Thus effectively maintaining different strata of individuals based on their ability to bypass artificial Internet limitations and the operationalisation of that ability. As we have seen earlier, the indirect limitations have a more substantial effect in this regard, with coercion as the main power that is limiting the individual from enhancing their opportunities for better outcomes of Internet use.

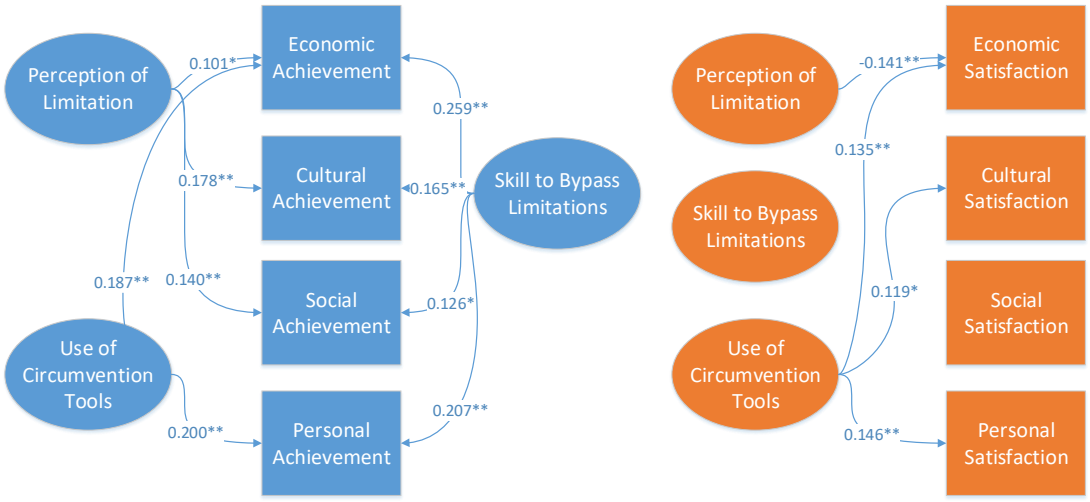
Study 2 went further to study the correlations between classical and research predictors at one end, and the different fields and sub-fields of tangible outcomes of

Internet use. The tabulation used so far between findings offered a good overview of the results, but statistical correlations offer a more particular view of the predictors that displayed significant correlation and the effect size of that correlation. The statistical correlations were generally in agreement with the tabulation results, but some of the relations did not pass the significance threshold assessment, and thus dropped.

The correlations that passed the correlation significance threshold for the main fields of tangible outcomes of Internet use are summarised in figure 6-2, demonstrated as achievement and satisfaction of each of the fields. For achievement, the predictor representing how aware an individual is about limitations set on their networks, the perception of limitation, is positively correlated with economic, cultural, and social achievement, meaning that people who are more conscious about limitations have better opportunities in achievement.

Figure 6-2

Correlations between Research Predictors and Tangible Outcomes among the Whole Sample

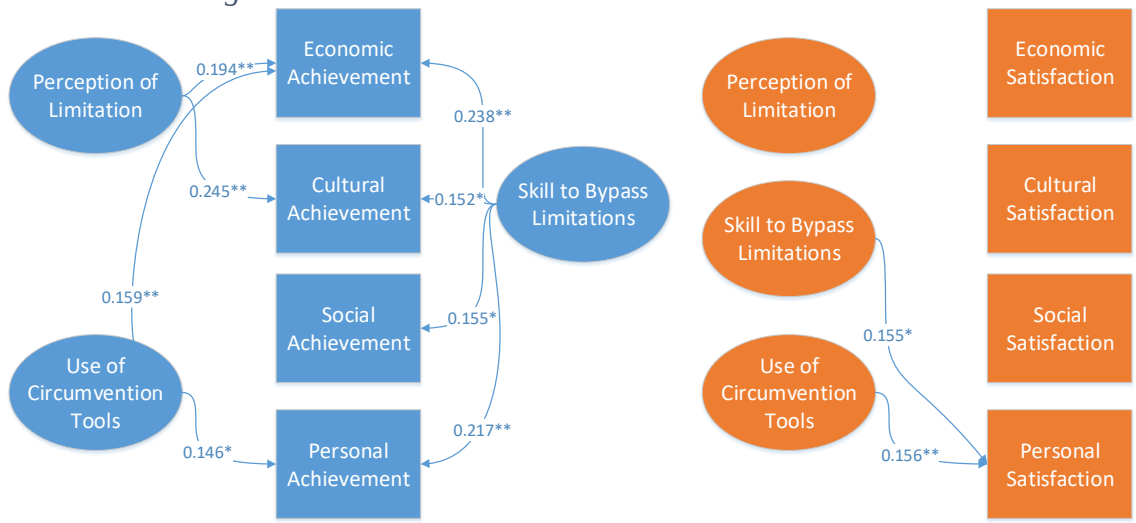


Skills to bypass limitations proved to be positively correlated to all of the tangible outcomes of Internet use, with the highest effect on economic achievement and personal achievement, followed by cultural and personal achievements, respectively. At the same time, the operationalisation of those skills, the use of circumvention tools, proved to be positively correlated with economic and personal achievement.

The behaviour of the predictors in countries with high limitations was slightly different from that with the whole sample, with perception of limitations affecting economic achievement and cultural achievement, as detailed in figure 6-3. The skills to bypass limitations proved to be important in predicting all of the four fields of achievement, as well as personal satisfaction, while the use of circumvention tools was correlated with personal achievement and satisfaction.

Figure 6-3

Correlations between Research Predictors and Tangible Outcomes in the countries with High Limitations



An explanation for the positive correlations of research predictors is the coping mechanisms, as advised by the interviews, where people that are aware of the limitations, although may not be satisfied, develop techniques related to use of Internet activities. The techniques, as described in by the interviewees, particularly in Bahrain and Singapore, involve developing skills to bypassing limitations and using circumvention tools. However, as the survey results and further explanation from interviews concluded, the coping practices predict different outcomes in satisfaction. The satisfaction with the tangible outcomes of Internet use proved to be harder to determine using the research predictors, with the perception of limitation negatively correlated with economic satisfaction, while the use of circumvention tools provided opportunity to enhance levels of satisfaction in personal, economic, and cultural fields respectively.

The positive correlation between the use of circumvention tools and satisfaction is particular in that it does not follow the same findings of the study at community level, which showed that people in communities with high levels of

limitations are less satisfied in general with internet affordances. To look further into this finding, the correlations between use of circumvention tools and levels of satisfaction at the individual level in the countries of high limitations were examined, to find that use of circumvention tools in these countries is only significantly correlated with the personal satisfaction field. The examination suggests that the difference in results comes from the high levels of satisfaction reported from users of circumvention tools in Estonia, who are the highest among the whole sample at 60% of respondents from Estonia. Since use of circumvention tools in Estonia is motivated by limitations set by content providers as a form of geo-blocking as found earlier, it is fundamentally different from the forms of limitations of interest to this research at this level but is relevant to Study 3. As a result, it seemed logical to drop the assumption of correlation between use of circumvention tools and satisfaction at individual level across the whole sample, and maintain it with countries of high limitations and at community level.

The various outcomes of Internet use and their satisfaction, and the relationships found with artificial Internet limitations provide a substantiated view to support the hypothesis that artificial Internet limitations do affect Internet use, even when they are limited in technical implementation and covering a limited number of websites and services. In fact, the higher effect comes from coercion and intimidation of monitoring and surveillance of Internet use that leads to prosecution, as with the case in Singapore, and to some extent, Bahrain. Predictors related to limitations had equal of higher correlation with outcomes than classical determinants, suggesting the necessity of including artificial Internet limitations as a factor when studying digital inequalities.

6.5 Summary

Building on the knowledge assimilated in the literature review, this chapter set to explain the compiled findings of Study 1 and Study 2 to answer the first research question, what is the relationship between artificial Internet limitations and tangible outcomes of Internet use, following the design set in the methodology chapter. The aim is to test the hypothesis that artificial Internet limitations do indeed.

The Internet, as a digital form of communication, offers the potential for people from around the world to communicate and access information in a manner that allows for digital inequalities, in theory, to diminish away as better access is

available to more people. However, in practice, digital inequalities seem to be persisting, taking different forms and shapes. This research proved that even among communities with very high Internet availability, digital inequalities persist as a result of artificial Internet limitations. To reach an informed conclusion, this research surveyed the field of digital inequalities to enumerate the most common predictors studied and worked to augment them with predictors that are able to perceive the limitations and agency in relation to the hypothesis. The classical determinants in the current dominant body of knowledge follow classical socio-economic inequalities determinants, with socio-demographic and socio-economic factors. This research extended the predictors with variables that reflect the existence of limitation and perception, as well as the agency to bypass limitations in the form of skills to bypass, and the operationalisation of that skill by means of circumvention tools use, following the post-modernist view of inequalities. This view, in contrast with the structuralist and culturalist views, allowed for capturing most variation in opportunities on the individual level, by allowing for different variables from different groups to be studied, as well as differences that are more extensive to affect wider communities, in a multidimensional perspective of inequalities.

The artificial Internet limitations found to exist in the networks studied in the form of governments practising *networked* and *network making* powers through regulatory and licensing enforcement over ISPs, as network providers, to implement Internet controls to fulfil its gatekeeping and control needs as part of *networking power* over individuals. In Bahrain and Singapore, the Internet controls followed suit long traditions of media and message controls, with an additional power found prominent and exerted by the government directly over individuals. Through regulations and practices that empower coercion and intimidation of media use that may be seen as a threat to the regime under the pretexts of protecting country's ethnic and religious stability and national security.

On the individual level, some of the people surveyed in all of the countries of the study expressed, at different levels, which they are conscious about the limitations set on their Internet use, have the skills to bypass these limitations, and do use tools that allow utilisation of the skills to bypass limitations through using circumvention tools actively. These parameters were found to effect tangible outcomes of Internet use, with some fields of the outcomes showing higher correlations with these determinants than other outcomes, suggesting that the effect is not uniform over all

forms of outcomes in terms of achievement and satisfaction. The effect was more apparent with the satisfaction than that with the achievement, suggesting that individuals tend to find ways to exploit Internet affordances no matter of the limitations imposed on them, but this does not mean that their dissatisfaction coming from the limitations is compensated for.

The research did also conclude an important aspect related to the limitations, the assumption pertinent to agency counterbalancing artificial Internet limitations is that it is possible to circumvent these limitations and bypass controls and monitoring that are part of it. The practices in the countries studied did show that circumvention is possible despite the efforts put in place to limit the accessibility of websites and services that offer such abilities, however, when more extreme measures have been taken, as with regular network shutdowns in areas of Bahrain, circumvention was not possible, and the effect would be much more strident. Nonetheless, the research indicates, with no doubt, that people find their way to the network society.

Chapter 7

Study 3, Tangible outcomes as predicted for the Internet for the Next Billion(s) networks

7 Study 3, Tangible outcomes as predicted for the Internet for the Next Billion(s) networks

7.1 Introduction

This chapter investigates Internet for the next billion projects through the knowledge on the predicted tangible outcomes of Internet use by determinants related to artificial Internet limitations developed in the previous chapters to indicate opportunities at a community or individual level, and the digital inequalities constructed or eradicated. The Internet for next billion access is discussed as a community of mainly new Internet users having that form of access as their only or primary medium. As a response to the second research question, the chapter is an application for the research findings and is meant to provide information to support policy decision-making in relation with Internet availability and forms of it by highlighting the consequences of artificial Internet limitations and thus contributing to the transformative prospects of the research.

Connecting the next billion aims at reaching the unconnected where being connected is not a matter of choice by building and extended infrastructure, and making access more available, necessarily addressing the primary condition of being on the right side in terms of digital inequalities, access. The unconnected in this case, and as found earlier, are mostly from countries with the lowest income resulting in the global digital divide (WorldBank, 2018), essentially the *disconnected and excluded* at the periphery of the information society as described by van Dijk (2005b). The global digital divide was also described as an aspect of the economic divide between countries, resulting in the countries on the wrong side to be deprived of political power and related cultural skills. Which are a requirement for active participation in the information society as per Fuchs and Horak, indicating a digital apartheid as a result of hundreds of years of exploitation, exclusion, and dependency (2008).

To address the global digital divide on the international level, connecting countries and communities that are on the deprived side of the divide was declared as a priority in multiple fora, from World Summit on the Information Society to the UN General Assembly (WSIS, 2003b, 2003a; UNGA, 2015a). Connecting the Next Billion(s), as described by the 2015 and 2016 Internet Governance Forum (2015, 2016) remained a priority and was included in the Sustainable Development Goals to be achieved by 2030 (UNGA, 2015b, sec. 9). However, the literature review highlighted that much of the effort conducted to reach the unconnected masses are led by companies with ambitious projects, from Company X Project Loon (Alphabet, 2017), to connect regions

through a network of connected balloons, to satellite constellations by OneWeb (2016), and another by SpaceX (Moon, 2016). Nonetheless, one of the few projects that materialised to be used in several regions around the world is Facebook's Internet.org, which at this time relies on using existing mobile infrastructure to provide free access, with research on using drones to provide access (Facebook, 2017; Internet.org, 2017).

The drive behind these projects to connecting the unconnected was discussed in the literature review based on the perspectives of shifts in Internet economies and the valorisation potential more connected people bring leading to digital labour and cyber-proletariat (Andrejevic, 2012, 2013; Fuchs, 2012, 2014; Dyer-Witheford, 2015). The potential brought by more users instigated a connectivity race among the corporations that are in a position of power to be able to exploit the valorisation potential to their benefit, notably Google, through its sister company Company X, and Facebook (VentureBeat, 2016; Yim, Gomez and Carter, 2016). The position of power of Company X and Facebook put them in the position of holistic network providers, compared to infrastructure providers, like SpaceX and OneWeb.

Although the methods different projects are taking differ immensely, the common form expected from any effort to connect the next billion is the abstract form of access to having the affordances to reach websites and online services. However, from the little information available on the technicalities behind some of the projects, such as Project Loon, it can be concluded that difference in range of access and other artificial Internet limitations seem to be setting different endeavours apart, with the holistic network providers having higher interest in keeping the users within their networks, or walled gardens. The maintenance of users within the network is a requirement for the valorisation of access, and with the scale of the network covered by each of the two companies mentioned. Each constitutes a considerable array of services, offered either directly or through partner sites. Alphabet's network constitutes of all of Google services, including YouTube, and extends to any website were advertisements are served by Google, while Facebook's network constitutes of the company's social media platforms, including WhatsApp and Instagram, as well as the flagship Facebook platform and its partner sites.

Facebook's efforts to reach to the next billion users can be identified as two-faced. The first face is researching into technologies to extend Internet infrastructural reach to remote areas, particularly through the drones mentioned earlier (Facebook, 2017). The second face is an effort that utilises current technologies by offering free access to connectivity to where there is already mobile service provisioned through collaborating

with mobile network operators as with the current Internet.org model through the *Free Basics* platform (Internet.org, 2017). Since Free Basics is the only project that has been provisioned and used by individuals in multiple areas, 61 countries as of 2017 (Internet.org, 2017), it is best positioned as a case study for Study 3, with the countries covered in Study 1 and 2 not of the countries where the platform is available. The position of Free Basics allows reflecting the research findings on the service available to predict the contribution towards the bridging of access gap and digital divide enable digital equalities or establishing inequality as part of its design.

7.2 Facebook's Free Basics

The model used with Facebook's Free Basics is a form of zero-rating services in its essence. The zero-rating model is a spectrum of services and initiatives that differ in their taxonomy and motivation but share the concept of allowing access to select Internet services and content without incurring data charges or the data being deducted from their data allowance (Bates, Bavitz and Hessekiel, 2017). Although zero-rating offers a more comprehensive access to people by eliminating the need for funds to access content and thus have the potential to eliminate first level of digital divide, if one has access to a suitable device and network, it has been received with mixed views.

Although views in support of zero-rating showed the benefits, it brings in increasing access as a stopgap measure, and a critical drive to enable innovation and consumer choice, as in the limited research of Lyons (2015). The counterpart had stronger views, and zero-rating has being accused of creating artificial scarcity and raising the price of the open internet, and in the process, jeopardising network neutrality rationale, which assumes that all traffic passing on the network is of equal importance and that the network should be agnostic to the traffic passing through it (Belli, 2017). The result would be creating a "tiered Internet ecosystem without providing meaningful benefits to the targeted beneficiaries" (Bates, Bavitz and Hessekiel, 2017). The effect of zero-rating in limiting access to a specific set of services has also been categorised by DeNardis as one of the five destabilising trends in Internet governance emerging issues (2015).

Facebook's Free Basics platform was launched as Internet.org in August 2013, as an initiative from Facebook, Ericsson, MediaTek, Nokia, Opera, Qualcomm, and Samsung to "connect the next 5 billion", and potentially to increase Facebook's market base (VentureBeat, 2013). The service allowed access to sets of websites without incurring data charges, the sites available differed by country, for example, when the service was launched in Pakistan early 2015, the platform included 17 websites (Attaa,

2015), the potential for adding new services was still limited with no open process to adding new services.

Changes to the service to allow additional services to be included to the Internet.org platform was announced on May 2015, with the possibility for developers to submit their services to be included as part of the zero-rating offering. However, they were expected to encourage people to become paying Internet users and access the "broader Internet" as described in the official Facebook press release (Facebook, 2015a). The list of available services differ by country, but an example of how the service looks on Zain network in Jordan and what services are included as standard, as well as what services can be added is included in appendix IV.

The announcement received backlash for the walled garden approach to the Internet it offers and breaking the concept of net neutrality, and concerns related to privacy, security, and net neutrality, as the platform during its first days did not support encrypted communication, including the Secure Socket Layer (SSL/TLS) and the Secure Hypertext Transfer Protocol (HTTPS) (Gillula and Malcolm, 2015). Lack of encryption support meant that all the traffic passing through the network, including passwords and messages, is prone to eavesdropping by all the parties on the connection, from the ISP to the Facebook proxies, all the way to the servers of the service providers and back. Facebook addressed part of the encryption problems few days after the first launch by supporting SSL/TLS encryption on the Android app but did not tackle the HTTPS issue, or users of other platforms (Facebook, 2015a), but that was not enough to stop the backlash.

Criticism of the platform continued with opinion pieces discussing nuances of the platform, including a clause in the participation guidelines that give Facebook non-exclusive rights to any intellectual property content posted on or in connection with the company. As well as a feature that will warn users who have data packages when they try to access any service outside of the platform's walled garden (Pahwa, 2015). The platform was later rebranded to Facebook's Free Basics in September 2015, with more than 60 new services announced with availability dependant on the market, as well as announcing that they have partially addressed the HTTPS encryption for secure browsing issue, and dropping statements that could allow Facebook to censor content (Facebook, 2015b).

Nonetheless, the changes to the platform did not fulfil the expectations, as the encryption proposed would encrypt the data between the end user's device and Facebook proxy, where it will be decrypted, and then encrypted again where possible between

Facebook's proxy and the destination website. This method grants Facebook the ability to read all the traffic transmitted with no protection to the user's privacy. The platform was still seen as a walled garden, with Facebook maintaining the ultimate gatekeeping powers, making it "still true that Free Basics would be much easier to censor than the real global Internet" (Gillula, 2015).

Free Basics had its share of criticism and even activism against the service, In India for, instance, shortly after the platform was introduced to allow access to the estimated 75% of Indian population that do not have Internet access, net neutrality activists campaigned against the practices of picking-winners by selecting what services are offered free of charge (Godwin, 2015). Because of the campaigns and despite some voices that defended the practice by arguing that it does not break net neutrality because "differential pricing is an accepted practice both by private as well as government providers of services" (Tripuraneni, 2016) several companies pulled off from the initiative (HNGN, 2015). Later on, the Indian telecommunication regulator banned all zero-rated services, partially because of the affluence of the privileged place the Save the Internet (STI) campaign to support net neutrality services came from, and the techno cultural appeal it had over policymakers (Prasad, 2018).

At the same time, research on Internet use barriers and user strategies in parts of Africa concluded that "none of the new Internet users that formed part of the focus groups reported that they went online because of the availability of Free Basics" (Chair, 2017). XL Axiata, a telecommunication provider in Indonesia, ditched the service shortly before its launch on its network following the controversy behind the initiative and concerns over its business model. The business model forces telecommunication provider to shoulder the data transfer to Facebook's proxy and the marketing costs, however, the power of Facebook allowed it to find another telecommunication provider in Indonesia that was ready to collaborate, Indosat (Freischlad, 2015)

7.3 Artificial Internet limitations on the platform

The platform, which differs from Facebook Zero service, a stripped-down version of Facebook offered as a zero-rated service, continue to offer access to a predefined set of websites and services that vary by country at no cost, and allowed website operators to submit their websites to the platform through a process that involves Facebook approval. The approval, however, was found to be strictly technical in practice, but still allowed Facebook the final say in what to be included and what to not (Singh *et al.*, 2017). Technical requirements for websites to be included within the Free Basics service offering

is that the website should operate without using any JavaScript, iframes, video and large images, and flash and Java applets, while technologies that would allow for tracking and identification of individual usages, such as cookies, original IP address, and tracking is allowed (Facebook, 2019).

The limited empirical studies on Free Basics found out that the services offered through the platform pass through two proxies controlled entirely by Facebook before being delivered to the end-user, while the official technical documentation suggests one proxy (Singh *et al.*, 2017; Facebook, 2019). It is not clear, however, whether traffic between the two proxies is encrypted or not, but it would, nonetheless, add additional hops that add to the route travelled, and thus, affecting performance. The model of encrypting communication between end-user and platform proxy, decrypting it, and then re-encrypting it again between the proxy and service server, particularly for accessing Free Basics from the web browser, is called dual certificate system by Facebook (Facebook, 2019). The naming of the certificate system provides a false sense of security by implying that the system uses double certificate encryption, rather than two separate encryption certificates with an unencrypted gap in between.

Even when the traffic is genuinely encrypted end-to-end with a single certificate, not allowing Facebook to monitor the material and content passing through its proxies unencrypted, the single-node structure where all of the traffic must pass through allows Facebook to collect information on usage. The information Facebook may still be able to collect includes what sites individuals are accessing, how long are they staying there, and their whole path of Internet browsing. The information is then used to inform Facebook on what kind of information the individual is interested in to display more of on user's news feed (West and Roberts Biddle, 2017).

Being in the middle between the end-user and the website service provider with the ability to view the message transmitted was covered in Study 1 through the testing for middle boxes as part of the OONI tests, which results in no confirmed existence on the networks tested, even in countries with high limitations. The existence of Facebook proxy as a middle box with no limited access to the message places Facebook in a position of control, even countries with high limitations do not have.

Circumvention potential, or the possibility of users of Free Basics platform to get over the walled garden and access websites and services available on the global Internet, cannot be wholly tested without having access to the network itself. In the case of people with no data packages, testing would not work, as the platform would not allow any

access not going through Facebook's proxies, while for people with data packages testing would return results for the mobile network rather than Free Basics'. However, the design of the service allows for a minimal opportunity for traffic to pass through the network without being analysed thoroughly by Facebook, especially that the content is decrypted at the proxies controlled by Facebook, and thus very little window for circumvention.

Several unofficial online resources promise the ability to use Free Basics as a gateway for an open Internet at no charge. These resources suggest using specific proxies and VPNs to piggyback traffic over Free Basics traffic, the methods described does not necessarily mean that the design of the service allow for a window of circumvention of the service boundaries to accessing the open Internet. The online resources point out the possibility for utilisation of specific services included in Free Basics that act in a manner different that they are supposed to, and offer access to the Internet by acting as a proxy, with several resources refer to a service called *epage.cf*[14] or a proxy available through a service on a news website called *todaydb*[15]. Other resources refer to the possibility of going around the Bing search engine offering for Free Basics by accessing the HTTPS version of the search engine, which resembles more the full version of the service, and use the video preview feature to view the first 30 seconds of YouTube videos[16].

The methods described earlier refer to possible loopholes in the services that can be amended at any time, and not a circumvention tool that relies on the standards of the Internet to operate, testing for the methods conducted on Free Basics as available in Jordan showed that the two services are no longer available to be added to the platform. Figure 7-1 shows the results for trying to add *epage* to the Free Basics platform on Zain mobile network in Jordan, indicating that the service is no longer available. As a result, the conclusion on the inability of circumvention tools to allow for open access on Free Basics still stands. It is interesting to note that these resources are available outside of the Free Basics walled Garden, mainly on YouTube, while the search for similar content available on Facebook for instance, did not result in any meaningful results, indicating that people with only exposure to the Free Basics walled garden will not have the opportunity to know about these methods.

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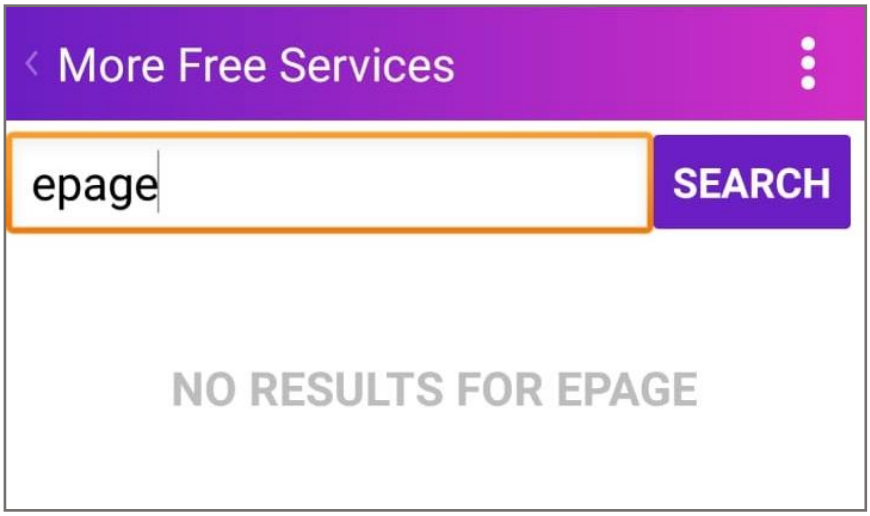
[14] See https://www.youtube.com/watch?v=w17T53eHHX4 and https://www.youtube.com/watch?v=bq8RBlXyy9o

[15] See https://www.youtube.com/watch?v=WmdZ5QONdDE

[16] See https://www.youtube.com/watch?v=4nvtm8Y4CTQ and https://www.youtube.com/watch?v=8aVlM4EIm6Y

Figure 7-1

Results for Searching for epage Service on Free Basics on Zain Network in Jordan



The position of Facebook within this platform, before and after the change from Internet.org to Free Basics, is controlling who joins the network, setting the environment of use, and having the potential to control and view every request passing through their proxies that are a necessary part of the network. Facebook here assumes much of the network powers as described by Castells through its control of the Free Basics platform, which, when adding the control of the Facebook as a platform and partner services to the mix, makes it the ultimate controller. The powers assumed by Facebook in this regard span over the medium, the message, and unrivalled power to exploit users, who have very little ability to jump outside of the walled garden, as digital labour to produce value to the company. The power is further felt when looking at how many users of Free Basics consider Facebook to be the Internet (Willems, 2016).

The innate direct and indirect artificial limitations set by the Free Basics can be viewed as similar to those set technically in Bahrain and Singapore as found earlier in this research. With Facebook's ability to control what people can access as direct limitations, and the vast surveillance potential as indirect limitations, however, the motive for control here comes from valorisation expectations more Internet users bring rather than controlling media discourse and communication to serve a political regime. The other difference between artificial Internet limitations studied earlier and Free Basics as a platform, lies is in the scope of the limitations. In all countries studied as part of Study 1, it was found that the blocking targets a subset of available Internet resources, while in the case of Free Basics the user is confined to the few services available within that walled garden with everything else prohibited.

Indirect limitations in the form of coercion and fear building aside from warnings of potential charges when attempting to clicking on a link to outside of the services allowed, on the other hand, are dependent on the country the Internet or Free Basics is offered. These limitations are not connected directly to the network infrastructure, but rather practised through other media to intimidate individuals from using the platforms for anything that may be deemed critical and is reflected through the perception of limitation variable and are connected to the overall political environment in the country of concern. Thus, no generalisation on the effects of these limitations will be offered beyond the potential for platforms to allow for circumvention of surveillance on the immediate network and the monitoring potential for the traffic while placing the values for perception of limitation as dependant on the community.

7.4 Predicted effect on digital inequalities

Although the Free Basics platform offers the sole opportunity available for some people to access online services, it still puts their use, and in turn themselves, in a position of being controlled within the walled garden of the platform, and their activity being ultimately monitored by Facebook, anywhere within the walled garden, including beyond the Facebook platform. The controls on the network as being strictly implemented with little if no potential for circumvention allows for a safe assumption of the Free Basics platform at a community level to be a network with significant limitations, as with the networks of Bahrain and Singapore as concluded in Study 1. The limited agency available for individuals allows for the safe assumption that even when the perceived limitations are high, and skills to bypass limitations exist, the possibility of successful operationalisation to circumvent access and monitoring controls converges to null.

The limited agency for individuals to decide what services they would like to use outside of the walled garden resembles the Internet shutdowns described in earlier chapters, where the individual is confined with no hope for access, and everything beyond the perimeter set by platform controllers is shut down, making people see the walled garden as the whole Internet. The perimeter, however, still allow for a glimpse of connectivity affordances within the approval of the ultimate gatekeeper, in this case, Facebook.

Any content developer, being private or public, including governments with eGovernment services or national eHealth services for example, is required to shape their services to fit the technical specifications set by Facebook. They also need to seek the platform's approval, and accept that Facebook will have the ultimate power to monitor

all traffic passing through, unencrypted, with the controller reserving the right to stop any service at their discretion.

Level of control exercised by Facebook as a corporate ultimately matches the corporate control described in the literature review following DiMaggio and Hargittai's (2001) aspect of corporate abilities to altering individual-level incentives and constraints to produce inequalities in technology and access, but here on decisions on services available and control on it, rather than decisions on devices or network infrastructure. Digital inequalities in this regard can be described to be stemming from the ability to access the open Internet as well as accessing websites that include features using technologies not supported by the technical requirements of the platform, including large images and videos. Measuring these inequalities would require a dedicated effort at the community level to compare affordances and discuss how the difference is affecting individuals.

The digital inequalities as covered in this research compared the difference in starting points of individuals in terms of access to the Internet from environments with different levels of artificial Internet limitations, and the difference in end points in terms of tangible outcomes of Internet use. The research concluded on the effect of the limitations and the set of related predictors and their potential effect on digital inequalities. For the Internet for the Next Billion(s) platform chosen, Facebook's Free Basics, the application of findings of studies 1 and 2 have the potential to advise on the expected effect of the innate limitations, as the starting point, on individual's opportunities as the end points.

The main take on the innate limitations of Free Basics is that they hinder individual's ability to choose the services they use, possibility of accessing services outside of the walled garden, and accessing services with rich content facilitated by technologies not supported in the platform. Although the predictors were measured at individual's level in the communities studied in Study 2, the stringent controls of Free Basics impose the predictors for individuals using the platform to be limited to the potential available within the network, which is in the case of the ability to using circumvention tools is almost non-existent. Table 7-1 shows comparison between predictors as averages in different communities studied, and how it is expected to be within Free Basics platform based on available affordances.

Table 7-1

Comparison between Groups Studied and Free Basics

	All sample studied	High Limitations	Low Limitations	Free Basics
Existence of direct limitations	Vary by country	Medium to High	Low	High
Existence of indirect limitations	Vary by country	High	Low	High
Perception of limitations [(a)]	High (77%)	High (87%)	Medium (57%)	Vary by country
Skills to bypass limitations [(b)]	Medium (42)	Medium (50%)	Low (38%)	Irrelevant
Use of circumvention tools [(c)]	Medium (57%)	Medium (50%)	High (70%)	Low, not possible on the platform

Notes: (a) see table 5-5, (b) see table 5-3, (c) see table 5-4

Values of table 7-1 for Facebook's Free Basics were based on the discussion earlier on the platform and its affordances and limitations. The values for artificial Internet limitations are based on the available websites and the blocking for everything that is outside of the limited walled garden for the direct limitations, and the ultimate monitoring and surveillance powers Facebook is granting itself for the indirect limitations thus the level of both is considered high. While the perception of limitation, as described earlier, is dependent on the overall political environment of the country or community, thus it is left with no generalisation on the platform level. These assumptions place communities with Free Basics in a similar position to those within the High Limitations group, so further predictions will be based on what was found for the countries in that group.

The variable that can be generalised on individuals within the Free Basics walled garden based on affordances of the network itself is the use of circumvention tools, as using these tools can be safely considered to be futile in bypassing innate limitations of

the platform based on the discussion on its design earlier. The design of the platform places Facebook in total control over the message being transmitted, and any possible use of circumvention tools have the potential to be flagged immediately at the Facebook proxy, which acts as a middle box with ultimate access to the traffic.

In relation to the use of circumvention tools and its reliance on the possibility of circumvention available over the network, which is low at best at the Free Basics platform, the skills individuals have that allows them to bypass limitations is irrelevant here. No matter what the skills the individuals have the inability to use circumvention tools makes it fruitless, and thus the measurement or prediction of a value for that variable is not valuable, leaving the only variable that can be used to predict outcomes of use of the limited network affordances of Free Basics to be the use of circumvention tools.

The research so far showed that the use of circumvention tools in countries with high limitations is positively correlated with economic achievement and personal achievement and satisfaction. Since we have the expected effect of the use of circumvention tools as an independent variable has on the tangible outcomes of Internet use as concluded in Study 2, we can deduce the effect of having the circumvention use as null, as in the expected case of Free Basics.

The general formula for estimating values through regression is as in the formula $\gamma = \beta_0 + \beta_1 x_1$, where γ is the predicted value of the tangible outcome of Internet use, β_0 is the y intercept, or the constant value, β_1 is the slope or correlation coefficient, and x_1 represents the value of the independent variable, here the use of circumvention tools. Since x_1 is negligible and can be considered to be zero in the case of Free Basics, the formula becomes $\gamma = \beta_0$. Table 7-2 shows the y intercept as found in Study 2 for the overall sample covered, and from the countries with high limitations.

Table 7-2

Base for Tangible Outcomes of Internet use in Communities with High Limitations

Field	y Intercept in Communities with High Limitations
Economic Achievement	3.202
Personal Achievement	3.775
Personal Satisfaction	3.633

Using the base values for tangible outcomes of Internet use from the results of Study 2 has the risk of applying values collected from a group of communities to other very different communities. Especially that the communities studied in Studies 1 and 2 are communities with high access and availability of the Internet, while communities covered by Free Basics have only availability of services within the walled garden, and may not possess digital skills similar to people in Bahrain, Estonia, or Singapore. However, given the limitations of this research, and the limited research available on the tangible outcomes of Internet use and digital skills among the users of Free Basics, this provides a good potential for approximation for outcomes.

The approximation suggests that individuals within the Free Basics walled garden, bound by the zero circumvention potential it carries, are expected to achieve less than expected in economic activities, and just towards the positive side in personal achievement and satisfaction, while there is no enough evidence to support approximation for other tangible outcomes. However, these suggestions are bound to the availability of services that offer these affordances. In the personal fields, where it is estimated that people will be able to achieve slightly positively within a highly limited environment without the need for using circumvention tools, the affordances are related to health, Self Actualisation, and leisure. It is still possible for Facebook's Free Basics walled garden to include services that allow for that, for example, in Jordan, as shown in Appendix IV, no health-related sites are among the standard offering, while the additional services include *Your.MD Health Guide and Symptoms Checker*, while no services indicated offered information on sex and sexuality, for instance. The offering still limits the individual to a limited source of information compared to users of the open Internet.

Other aspects that are worth discussing is the network effect forced by the Free Basics platform, as individuals are bound to connect with people that use the social media services available through the platform. For instance, users of Free Basics alone would not be able to connect with people that use Twitter or Telegram, while being able to connect with people that use Facebook, and at the same time, are bound to the walls for Facebook as long as they are not moving to a service that allow access to the global Internet. The discussion chapter also concluded that people in communities with high limitations are bound to be within the *Participating Majority* and the *Disconnected and Excluded.* At the same time, the limited affordances for active civic participation in the network society leave them as passive consumers.

In conclusion, Free Basics does offer the opportunity for people who do not have access available otherwise to connect and use a limited portion of the global Internet and are able to use the services as long as they, and the people they communicate with, are within the walled garden. While it is predicted that the users of Free Basics as a highly limited community with no potential for circumvention, would have chances to develop at the personal field in terms of achievement and satisfaction, while remaining at the edges of the information society as passive consumers and digital labourers for the party in control of the walled garden.

7.5 Summary

Through this chapter, Facebook's Free Basics platform was investigated as an example for the Internet for the next billion projects, to apply the findings on predictors of digital inequalities through the lens of tangible outcomes of Internet use on the network developed through this research. The investigation made use of the determinants related to artificial Internet limitations as developed in the previous chapters to indicate opportunities at a community or individual level, and the digital inequalities constructed or eradicated in relation to the artificial Internet limitations part of the platform

Facebook's Free Basics is a form of zero-rating services in that it allows access to a selected set of Internet services and content without incurring data charges or the data being deducted from the users' data allowance. The service has changed over the years from a very limited offering to a more open platform where content developers can submit their websites to be included, given they satisfy Facebook's technical requirements and approval. In addition to the powers stemming from maintaining the right to approve or reject services, Facebook also have the power to monitor all traffic coming from the web browsers to the platform at its proxy servers unencrypted in manner even countries found to be implementing high limitations do not have. The unmatched ability to monitor traffic and the high limitations set on access to content out of the walled garden available places the platform within the high limitations communities.

Research predictors developed included perception of limitation, skills to bypass limitations, and use of circumvention tools. However, reflecting these predictors on individuals within the Free Basics communities is not straight forward, as the perception of limitation is related to overall political environment in the country of concern and is a result of practices through different media to intimidate individuals from specific uses of the platform, thus not directly connected to the infrastructure or platform. Studying

perception of limitation is possible through gathering data from individuals in a specific country, which is not possible in our case.

The second predictor, the skills to bypass limitations was proven to be irrelevant in the case of Free Basics, as the possibility of circumvention available over the network is very low if not existent based on analyses of the network design, thus no matter what the skills are, individuals will not be able to utilities them. The utilisation, which is described by the third predictor, use of circumvention tools, is estimated to be at null in the case of Free Basics, as the circumvention tools cannot be used on the network thus the approximation can only rely on this predictor. The previous studies showed that the predictor of use of circumvention tools at null value is connected with less than positive achievement in the economic field, and slightly towards the positive in the personal achievement and satisfaction.

Nonetheless, no matter what achievements or outcomes are predicted, the fact that the offering within the walled garden is very limited means that the networks the individual can be part of is limited to the networks available through the platform. Moreover, that they can only connect with people outside of the platform if those people were using services available within the platform.

The discussion concluded that opportunities provided by Free Basics wither in front of the limitations set, leaving people with only access to that platform as passive consumers and part of the disconnected and excluded groups, as the platform limits the potential for meaningful participation in the network society.

Chapter 8

Conclusion

8 Conclusion

This research aimed to study artificial Internet limitations as a factor in determining digital inequalities, with a focus on the limitations that constitute limiting access to the open Internet, in the practice of creating Internet walled gardens. The research relied on two-tier approach, with two studies to analyse the limitations and their effect on tangible outcomes of Internet use in three countries selected to cover different levels of limitations and related practices, while sharing characteristics that limit the effect of digital inequality determinants not related to access limitations.

A third study was implemented as a practical implementation for the findings on Facebook's Free Basics network serving as one of the projects to reach new Internet users, commonly referred to as Next Billion(s), reflecting the findings on the network with its innate limitations following the transformative-emancipatory perspective adopted by the research.

The first two studies aimed at measuring change in opportunities as a function of artificial Internet limitations by studying three communities that are part of global network society and differ in levels of artificial Internet limitations, Bahrain, Estonia, and Singapore. The selection of these countries allowed for studying effects from two dimensions, by looking at differences among countries as well as looking at all of the Internet users in these countries as one part of the network society with communities identified by the Internet limitations they face.

8.1 The Research

The first study established the grounds for comparison in terms of artificial Internet limitations across the countries studied, Bahrain, Estonia, and Singapore, through a mixed-methods approach to enumerate Internet access opportunities and artificial Internet limitations by the means of network measurements and a review of related reports, laws, and news. The artificial Internet limitations covered included the direct limitations that control access through technical measures and the indirect limitations that entice self-censorship and changes in behaviour. The first study achieved its goals and provided a clear landscape for what forms of limitation are in effect in each of the countries, the scope of these limitations, and the overall related environment, being legal or technical, with validity confirmed across the different

research methods used. The selection of countries proved to also be suitable in terms of access and skills, with the three countries sharing very high Internet adoption and availability levels, as well as acceptable digital skills across the populations, and a shared aspiration to the Internet as a gateway to development and prosperity.

The study established that each of the countries had different models and scales of artificial Internet limitations exerted on them, but all of them shared a reliance on exerting regulatory power by the respective government on Internet service providers operating within their jurisdiction to implement limitations and controls. The shared model of limitations was exerted through transitive properties from the government on network operators as licensing and regulatory powers, to the individual in a form of Network Power. Another form of limitation was through direct implementation of Networked Power by the governments on individuals through the rules, regulations, and practices that empower coercion and intimidation of using the medium, this form was found to be in effect in Bahrain and Singapore. The latter form of power exertion, in addition to the findings of high use of Internet controls, places Bahrain and Singapore in a group of communities with high limitations. In these countries with high limitations, Internet controls were found to be an extension and continuation of governmental policies on the control of media, correspondence monitoring, and surveillance concepts.

Singapore displayed a model of limitations that is highly reliant on establishing fear and extending the stronghold on individuals behaviour from the offline world to online practice, accompanied by light-handed technical controls that are designed to rotate transparent blocking over websites and services that are deemed immoral or a threat to national equilibrium. Bahrain exerted similar from of artificial Internet limitations as Singapore, but the research found that the approach was different, with a higher reliance on technical blocking through practices ranging from transparent to non-transparent blocking, to complete Internet shutdowns in specific geographical areas. The use of direct controls were accompanied by indirect practices, similar to those in place in Singapore, to maintain a level of fear that is thought to produce self-censorship. Estonia sat as the country with very narrow limitations covering a single form of websites at a national level, unregistered remote gambling websites, with high transparency regarding what is being blocked, without any indirect limitations recorded.

The second study fulfilled its goal of providing a body of knowledge on tangible outcomes of Internet use as a measurement for digital inequalities through a survey, and a set of sequential exploratory interviews that provided higher validity to the findings and shed light on the reasons behind the difference in use and explanations for peculiar findings. The study covered four aspects of tangible outcomes of Internet use, economic, cultural, social, and personal, through measuring achievement and satisfaction in relation to activities conducted online, and mapped a set of predictors combined from classical predictors of digital inequalities as well as predictors specific to this research advised by the literature review. Classical predictors included age, years of Internet use, sex, level of education, and employment status, while research predictors, built on the growing literature in the field of digital inequalities, covered individual agency to counterbalance the limitations, from the perception of limitations to the ability of the individuals to bypass limitations, and the materialisation of said ability by means of circumvention tools. The findings of the second study further showed the suitability of the country selection, demonstrated by the comparability of the results from studying tangible outcomes of Internet use.

The research relied in part on the perspective of network society, where the whole sample was treated as one society with communities differentiated by levels of artificial Internet limitations levied, to build knowledge on the role of predictors related to Internet limitation in determining digital opportunities. The findings at the community level showed that the skill to bypass limitations is correlated with perception of those limitations, and in turn, the use of circumvention tools is correlated with the skill to bypass limitations, reflecting the motivation for acquiring skills to bypass limitations an individual gets when they perceive limitations, and materialising the skills into use of circumvention tools.

The respondents who reported higher skills in bypassing limitations reported higher achievement and satisfaction across all of the fields, while the practice of using circumvention tools was found to produce higher achievement and satisfaction across all of the fields studied, except the field of social achievement across the sample. The role of use of circumvention tools had more weight than the skills to bypass limitations to counter the factor of general higher digital skills and focus on the actual operationalisation of efforts to bypass limitations. The perception of limitation and use of circumvention tools proved to be directly related to increased achievement in

topics where Internet controls in countries with high limitations is high. For instance, individuals that are conscious about limitations are more likely to be able to access information that helps them in building their identities from information on sexuality and ethnic groups, two categories with several websites found to be among the blocked in Bahrain and Singapore in Study 1.

The agency provided by the use of circumvention tools appear to be bridging the gap and levelling the field of achievement by offering people falling in the group of high limitations the opportunity to achieve equally or better than people in the non-limited group. The gap here is normalised, but at the same time, people who do not use circumvention tools are still affected until their agency is developed to counterbalance the limitations. The satisfaction, however, does not seem to be enhanced by the use of circumvention tools in the same manner as achievement.

Higher limitations were also found to be correlated with lower social achievement and satisfaction in terms of interaction with public services and political networks. And thus, can be seen as evidence of the democratic divide discussed in the literature review, putting the Internet users in communities affected by high artificial Internet limitations in the position of passive consumers limiting meaningful use of technology. At the same time, coercion, as a form of artificial Internet limitations, had a higher effect on the democratic divide, resulting in users in Singapore, as the country with the highest levels of coercion, to limit their usage to be mainly around entertainment and discussion of food, as concluded through the studies.

Interviews advised that in Bahrain and Singapore the use of circumvention tools was primarily motivated by a will to bypass artificial Internet limitations such as blocking and monitoring, and are used by half of the respondents despite websites related to these tools being among the categories blocked, as found in Study 1. While in Estonia, the use of circumvention tools was driven by the will to access geo-blocked content, with limited fear of their access being monitored or controlled, this important finding deserves further research on its own to study what motivates shifting access location to receive benefits. Another finding advised by the interviews was that the reported volume of use of circumvention tools is possibly under-reported, as it is a common practice, in particular in Bahrain, with many people using it without realising its technical name.

The discussion chapter confirmed that substantial evidence existed to support that artificial Internet limitations affect how people use the Internet, and how they make use of it, in their daily lives to access opportunities otherwise unavailable, with limitations affecting satisfaction more than achievement. Artificial Internet limitations played a role in shaping individual use of the Internet and their agency to utilise Internet affordances to achieve better tangible outcomes of use and thus their potential to spring over digital inequality divides in the countries studied. Study 2 showed that the limitations are reported as visible by 77% of the sample who felt that at least one party is controlling or monitoring their Internet access.

The findings at community and individual levels suggest the ability to use circumvention tools and skills to bypass limitations has the potential to counterbalance artificial Internet limitations and allow for better achievement, and is connected to higher perceptions of limitation and also lower satisfaction levels. The outcomes show that individuals tend to find ways to exploit Internet affordances in defiance of the limitations imposed on them, but with apparent dissatisfaction resulting from the limitations. The ability to offset limitations, whether direct or indirect, necessitates knowing how to bypass the controls and the act of operationalising this knowledge by means of circumvention tools as a possible application.

The research was influenced by the transformative-emancipatory perspective to mixed-methods research as described by Martens (2003), a perspective that addresses inequalities through working with groups with different opportunities and powers from the perspective of communities. For this research, the adoption involved looking at the Internet users worldwide as one community, with the difference in Internet limitations imposed on sub-communities grouped in countries as a source of difference in power, comparing the tangible outcomes of Internet use as a divergence in opportunities and a rendition of inequalities.

8.2 The Application

In an attempt to operationalise the findings of the first part of the research as a model for predicting digital inequalities as a function of artificial Internet limitations, Study 3 applied the correlations found in network communities with tighter access limitations portrayed as walled gardens offered as forms of zero-rating. The network chosen for the application was Facebook's Free Basics, a platform launched to connect

the next billions of people that do not have affordable Internet access. Despite the benevolent aims of the platform, another goal is floated as being more in line with Facebook's business model, using the platform to increase its market base, this goal is further supported by the design of the platform that gives Facebook near unlimited potential for surveillance and tracking of users. With the company providing the access and service, it installs itself in the position of holistic network provider with unmatched potential for control that exceeds what was detected in the cases of countries with high limitations studied.

The platform in question differs from networks in countries with high limitations studied in that the controls on the network are driven by valorisation expectations more users bring to the platform, rather than controlling the media discourse and communication to serve a political regime. The economic drive resulted in the difference in the scope of limitations and controls set on the network, which in the case of Free Basics is not limited to a set of websites and services, but rather the user is confined to the few services available within its walled garden with everything else prohibited with near-zero potential for circumvention. The tight boundaries of the walled garden the user is allowed to function within limits the agency of individuals to decide what services they would like to use outside of the walled garden. Leaving people with no other access option with no hope for access to anything beyond the perimeter set by platform controllers, resulting in people perceiving the walled garden as the whole Internet.

Research predictors developed in the first two studies of the research included perception of limitation, skills to bypass limitations, and use of circumvention tools. However, reflecting these predictors on individuals within the Free Basics communities is not straightforward, as the perception of limitation is related to the overall political environment in the country of concern and is a result of practices through different media to intimidate individuals from specific uses of the platform, thus not directly connected to the infrastructure or platform. Studying perception of limitation is possible through gathering data from individuals in a specific country, which is not possible in this case. The second predictor, skills to bypass limitations, was proven irrelevant in the case of Free Basics, while its utilisation in the form use of circumvention tools is estimated to be at null in the case of Free Basics as the circumvention tools cannot be used on the network thus the approximation can only rely on this predictor. The previous studies showed that the predictor of use of circumvention tools at null value is connected with less than

positive achievement in the economic field, and slightly towards the positive in personal achievement and satisfaction.

The application of the findings in the case of Free Basics concluded that opportunities provided by the platform wither in front of the limitations set, leaving people with only access to that platform as passive consumers and part of the disconnected and excluded groups according to van Dijk's categorisation, as the platform limits the potential for meaningful participation in the network society. No matter what achievements or outcomes are predicted, the fact that the offering within the walled garden is very limited means that the networks the individual can be part of is limited to the networks available through the platform, and they can only connect with people outside of the platform if those people were using services available within the platform. This study highlighted the digital inequalities as predicted in the model developed throughout the research to provide advice on the consequences of artificial Internet limitations and instigate further research on the risks and social consequences of these limitations.

8.3 Contribution and Implications

The contribution of this research to knowledge can be summarised in two main aspects, the first is unmasking differences in access as a predictor for digital inequalities, with focus on artificial Internet limitations as a source for these differences. The second main aspect of contribution is covering communities that are understudied in terms of access and tangible outcomes of Internet use. These two aspects provide much needed input into two main fields of media studies, digital divide and Internet censorship. The two fields here have been developing in two separate spheres, as digital divide studies look at access through one lens regardless of what can and cannot be accessed, while censorship studies does not treat difference in access as a predictor for life opportunities. The bridging offered by this research sheds light on the role artificial Internet limitations, including censorship, play in creating differences in access that transcends politics to technology and society.

In terms of other practical contributions as of submission date, the research advised a series of publications that utilised concepts developed throughout to discuss digital inequalities and digital inclusion in different areas of the world. As well as studying artificial Internet limitations and access controls as a source of power to support colonialization, in what the researcher is calling Weaponisation of Access. Other contributions included presentations at conferences to present findings,

including conferences with non-academic Internet governance actors in an attempt to provide information for policymakers in relation to artificial Internet limitations. The latter allowed for the development of a set of key takeaways that can be used as policy recommendations:

- People always find a way: direct artificial Internet limitations in the form of blocking of services and websites rarely works, as individuals tend to find their way around these controls, including with the use of circumvention tools, even when websites that make these tools available are blocked.
- Indirect limitations are more effective in shaping behaviours: coercion and intimidation of certain uses of Internet affordances was found to be more powerful in affecting user behaviour than direct limitations alone.
- Direct and indirect artificial Internet limitations cause less satisfaction with Internet affordances, and thus can result in disgruntled individuals.
- Projects that provide access to a limited set of services in tightly confined walled gardens, as with Facebook's Free Basics, do not necessarily contribute to the bridging of digital divides as expected. But rather it provides larger market access to users who treat these walled gardens as their whole Internet, giving the controlling provider, in essence the holistic network provider, unmatched powers over the individuals and support the potential for digital exploitation.

In addition to policy advice and direct contribution to knowledge in the form of publications, the research also provided the basis for treating differentiation of access as predictors and variables that can be added to the set of classical variables used in digital inequalities research. The basis offered has the potential to provide better views on differences between individuals and communities, not only based on individuals' traits, but on the network environment and the power balance they are part of as members of the network society.

Further contribution to the knowledge offered by this research included practical contributions that have already left their mark, including developing the framework's survey used in the research to three new languages, making versions in

Arabic, Estonian, and Mandarin available for sharing with the academic community. The Arabic version was already shared with the framework developers in LSE to be used in a project on Kuwait. The research also provided support in the form of contributing network measurement collected for the research to OONI databases, some measurements came from areas with no measurements previously collected, as with Bahrain. The research also influenced the Association for Affordable Internet (A4AI) to include the concept of artificial limitations as developed in this research as part of their definition of *Meaningful Connectivity*, a new standard to measure Internet access.

The contributions and impact listed above demonstrate how needed this research was, and how timely it is, whether in the academic world, or the practice-oriented world, thus further validating the goals and motivation behind the research project, and supporting designing and conducting further research.

8.4 Limitations and Future Prospects

The research was ambitious in covering three less-studied communities while having limited resources and direct access and representation in those communities, the implications of this limitation can be seen in the limited sample size. The research tried to compensate for this limitation by introducing the instrument of interviews with key individuals carefully selected based on position and expertise as a form of validation for the findings, as well as to provide details on network habits in the communities. Nonetheless, a more representative sample would definitely enrich the research further, and possibly point out more minute effects.

The second limitation the research faced was the dynamic nature of limitations and networks, as it was evident that all of the artificial Internet limitations studied on all of the networks changed over time. With the limited data available on the networks at any moment of time, researching the limitations as a longitudinal process with the more common limitations highlighted helped in this regard. The launch of *AccessCheck* as a tool that aimed to provide real-time checking of limitations was promising for the matter especially that it utilised network-testing methods similar to what is adopted in this research. However, the tool did not provide testing for networks in Bahrain, and had limited testing abilities in Singapore through the use of virtual servers there that holds the potential to not be representative of the networks individuals are using, but rather to what access is available to business networks. In

this regard, the limited number of network measurements collected, particularly from Bahrain, posed another limitation for the research, which did not allow for complete empirical testing of all the services and networks. Nonetheless, the data collected still offered good insight into the status of the network there in a manner compatible with what was found in the secondary research conducted in analysing reports and news on Internet limitations in Bahrain.

Although the data collected allows for discussions beyond those currently included in this dissertation, limitations related to the format played a role in setting the scope to be focused on researching the main elements, while providing knowledge that may be used for future research. Further research and publications can rely on the data collected by offering different perspectives in relation to tangible outcomes by studying the achievement and satisfaction relationships across the different fields, and even within the fields by studying relationships between specific activities, and the various independent variables collected, such as place of use and devices used.

There is also further research potential in expanding the studies horizontally by covering more populations with more representative samples, where this research may serve as a pilot study for larger scale analysis of the role of artificial Internet limitations. Another potential would be to expand the research vertically and look at further nuances in access differentiation from one side, and other measurements for digital inequalities on the other side.

Researching differentiation in access through the lens of artificial Internet limitations, including censorship, offer a fresh and original analysis of the predictors of digital inequalities. This carries the potential to extend the research to communities where access in terms of availability and affordability is not an issue. This include whether in communities with high Internet access or communities where access is subsidised and thus is not, by itself, a hurdle of use. This dissertation served as an example of such view, focusing on artificial Internet limitations and their effects on digital inequalities to highlight the consequences of recent normalised practices of limiting access as a form of control. The practices that produce differentiation in Internet access among members of the network society affecting individual opportunities in life, to conclude that not all Internet access is equal.

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Appendices

Appendix I: Survey

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Appendix II: Interviews Summary

Interview Code B1

B1 was one of the key entry points to access responses to the survey in Bahrain, as being a self-proclaimed influencer, have shared the survey through their social networks, and asked other key people in Bahrain to do so. Having someone like B1 promoting the survey provided trust in the survey to Bahrainis, and offered larger exposure to different groups of people, as B1 is well networked and known in the Bahraini online world. B1 have also provided time for an interview where they have expressed their views on the status of the Internet in Bahrain, and the limitations they face. This interview was conducted in Arabic and fulfils the sample targets of Economic Labour (EL), Economic Commerce (EC), Social (S), Political (P), and Institutional/Governance (IG) fields.

B1 stated that although there is a high rate of Internet access in Bahrain, the networks suffer from severe restrictions resulting in denying people freedom of use of the Internet. B1 had strong views when it comes to policies related to freedom of expression in general in Bahrain, including online, after gaining their trust, they have freely expressed these opinions through the interview, to reflect the position of a regular Bahraini citizen who is interested in politics, but not necessarily involved in it formally. B1 sees that there are no guarantees for open access to the Internet, and that controls implemented by companies and the government focus on limiting access to political content rather than aiming at protecting end-users from online attacks, resulting in an Internet environment with complete lack of confidentiality and privacy.

Bahrain government practices, according to B1, include blocking and filtering of political content that is considered critical to the current regime, controlling media outlets, and surveillance and infiltration targeted at political dissents and human rights defenders, which would ultimately result in incarceration for activity on the Internet. B1 concluded

their position on Internet limitations by saying that Bahrain does not respect the freedom of citizens and individuals in the exchange of information and knowledge through the Internet.

B1 sees that the high use of circumvention tools is a direct result of the restrictions set on Internet use, and people are using VPNs and Proxies to maintain their privacy and access blocked content. However, many people would express their satisfaction in the survey because either they did not have the chance to know any better, and even when they do, the fear built through government controlling policies would push people to overestimate their satisfaction and not to express any frustration they may have, according to B1. They have also made it clear that many people do use circumvention tools without realising.

In terms of tangible outcomes of Internet use, B1 feels that the direct and indirect Internet limitations have produced a chilling effect on online expression, but people have coped with that and moved on to utilise the Internet to the fullest in their daily lives, from economic benefits to social, and cultural ones. However, the mistrust with the government forced people to keep a distance and deal with suspicion with government services provided online, which some see as an attempt by the government to identify individual online personas. For the way forward, B1 expressed that there is a dire need to develop people's awareness on the Internet as a gateway for change-making, and an increased reliance on technology to build the society offers the potential for individuals to enhance their life opportunities and the society to move to a more participatory and open environment. Currently, there is a clear increase in the reliance of the Internet as a tool for trade and commerce, as well as access to wider labour markets.

Interview Code B2

The second interview for Bahrain was with B2, a serial entrepreneur interested in digital and online businesses endeavours. B2 is based in Bahrain, and have interests and market knowledge particularly with the Business to Customers online commerce, which is a valuable input to the research, as it offers direct experience with user habits of online services in Bahrain. Especially when taking into consideration the size of some of B2's business, which serves 12,000 active users on a daily basis. The language used in the interview was mainly English with some Arabic at the end. This interview fulfils the sample targets of Economic Commerce (EC), Social (S), Political (P), and Institutional/Governmental (IG) fields.

B2 began the interview with noting how proud they are with the very high Internet penetration rate and use in Bahrain, as well as what they have felt of the very good digital skills Internet users in Bahrain have based on realisation supported by their knowledge on digital services offered in Bahrain. B2 gave examples on the level of complexity of user interfaces that people are capable of using and interacting with at ease, considering 80% of the population in Bahrain as "well-versed" in technology, while the other 20% have a lower level of digital skills, but still capable of basic usage of online services. B2 sees that language is not a barrier for Internet use in Bahrain, especially that English is widely spoken, and there are several resources and services available online in Arabic that serves most of the needs of people from the Internet.

B2 did shed the light on a trend, they are noticing in the online business market in Bahrain, of quickly moving from a desktop environment to becoming mobile-technology oriented. This move is supported by the increased affordability and availability of connectivity options including third and fourth generations of broadband cellular network technology, as well as the widespread of mobile devices and its dominance as the main device people are using.

However, the tangible outcomes of Internet use time are not high, as B2 estimates 90% of time spent on the Internet to be spent as “junk time”, time spent on social media with no proper content that can benefit oneself accessed, but rather used as a method of entertainment to pass time. The main useful usage of the Internet in Bahrain according to B2 is on e-commerce, which allows economic opportunities for Bahrainis by allowing access to better offers and deals, as well as opportunities for people to open their own online businesses.

Nonetheless, B2 still sees that people did not yet exploit the full economic potential of the Internet in Bahrain, especially given that the supporting environment for online business, particularly online payments, is still yet lacking. The problems with online payment were summarised by B2 as two-fold, the availability and popularity of credit cards is not yet at a level that would allow for active e-commerce markets, with around 20% penetration. The second problem is the attitude towards paying over the Internet is still unfavourable, with people fearing for their privacy. This attitude prompted for alternative payment business models, from pay on delivery, to dedicated prepaid payment cards, and payment at points of presence to be a common option for e-commerce in Bahrain, for services from buying groceries to ordering home car wash and laundry services online.

The fear of online privacy in Bahrain is also connected to active monitoring and surveillance as B2 puts it, which is justified according to them especially after the 2011 “political mess”, but still left its toll on other aspects of Internet use as well. Nonetheless, B2 sees that there is no website blocking other than blocking of pornography website and torrent-based websites that offer pirated software, in a way similar to B3, with no effect whatsoever on the Internet use in Bahrain. B2 also connected the increase in the use of VPNs and proxy services to youngsters trying to access websites with “immoral” content or to access services blocked by other countries when visiting them, giving an example

of using a VPN to do WhatsApp calls from the United Arab Emirates. However, later on, with more trust established during the interview, B2 added that part of the surge came after events of 2011 when people wanted to access blocked blogs and news sites, negating their previous ascertain on type of websites blocked.

When asked to give their opinion on the main results of the research survey, B2 stated that they feel that the numbers of around half of the population using VPNs and proxies to be slightly over what they feel it to be between 30-40%. B2 ended the interview by saying that the main measure that would affect people's use of the Internet is perceived monitoring and controls, with people fearing the use of some services online, and are afraid of fully expressing their views over the Internet, which is in line with the findings.

Interview Code B3:

The third interview from Bahrain was with B3, a postgraduate researcher in the UK, who has lived in Bahrain all of their life, except for when they travelled for studies, which provided them with knowledge and overview of Internet use in Bahrain and in other countries. As per the preference of the interview, the language of the interview was mainly Arabic. B3 was selected for the experience they have on Internet uses as a common user of Internet in both, Bahrain and the UK, as well as their local knowledge of the Bahraini society and laws and regulations there. The interview followed the structure described early, with room for comments, and flexibility to focus on specific issues raised during the interview that may further inform the research. This interview fulfils the sample targets of Economic/Labour (EL), Economic Commerce (EC), Social (S), Political (P), Institutional/Governmental (IG) fields, Institutional Health (IH), and Educational (E) fields.

B3 expressed their satisfaction in the Internet availability and penetration in Bahrain, stating that people use it in all aspects of their lives. One of the main aspects the Internet is affecting is the local culture, where B3 attributes access to the Internet to

multiple phenomena, from effect on clothing choices to eating habits and choices to understanding of accents and dialects of other Arabic-speaking states. This allowed for an increase in exposure to the world, and contributed to satisfaction of Internet use, as people felt its influence relatively quickly, which B3 does not fail to mention that it is a double-edged sword, that can contribute to loss of community and social values.

A success story on how Internet use has affected society according to B3 is its use as a tool for social change, citing *Omar Farouq*, a social media influencer who regularly publishes advice and positive messages to an audience of over 130,000 followers on Twitter[17] and 2.2 million subscribers on their YouTube channel[18]. This influencer also uses their wide audience reach to receive complaints and requests from people, and publicize it and help in delivering it to the government to take actions. One case they mentioned was a road pothole that has gone unfixed for a long time, but when local residents sent to that account and their case was published, the next day the pothole was fixed[19].

People in Bahrain use the Internet to access information, communicate, and conducting ecommerce and ebusiness, based on what the interviewee listed as main motivations for use. B3 feels that almost everyone in Bahrain nowadays orders something online, with several local e-commerce outlets that offer all types of goods and services, despite possible problems in payment methods traditionally used online, credit cards, were many services offer to pay on delivery as an option.

B3 also provided valuable input to the aspects of education and health. On health, B3 pointed out that although locally produced content on health issues is not abundant

[17] Twitter profile: https://twitter.com/omr94_

[18] YouTube Channel https://www.youtube.com/user/omarfaroo8

[19] The researcher could not verify this specific case, nonetheless, it is consistent with other cases on that influencer's account.

people are still able to access regional content available in Arabic, and wider global content available in English. This access potential provided people in Bahrain with rich resources that they could use to learn more about their health, allowing them to make better decisions on health and medical care. Nonetheless, the benefits on the Internet on health relies on personal effort, as there are no institutional and public efforts that aim at enhancing people's life choices and medical care through the Internet according to B3.

While in education, B3 clarifies that there are indeed public efforts towards developing digital skills of Bahrainis at one end and utilising the Internet as an assistive medium for education at the other, from school levels to higher education. The result was the establishment of eLearning units at universities and ministerial level, and the offering of technological tools to assist the educational process, particularly over the Internet. On a personal level, B3 is not convinced that enough people are utilising the full potential of the Internet to access online courses and enhance their opportunities in education.

In terms of job finding and economic benefits of the Internet used in relation to labour, B3 indicated that this aspect is rapidly growing in Bahrain, with more and more jobs posted mainly online for locals and expats, nonetheless, given the social structures and size of Bahrain, traditional methods and direct recommendations are still largely used.

At the beginning of the interview, B3 said that they do not feel any limitations on Internet use and that the blocking, if exists, only helps in limiting access to pornography websites and other indecent content which helps in maintaining the conservative feel of the society, as they put it. In addition, when asked about Internet shutdowns in specific areas of Bahrain, B3 attributed this to probably technical difficulties, and then mentioned that it is possible that these areas would have unrests and demonstrations, and within these demonstrations, people would burn cables and boxes that are part of the telecommunication infrastructure. However, as the interview went on, B3 was more inclined to admit the existence of limitations on a political basis, which is justified in their

opinion, but covers “very limited number of blogs and news sites”, and that they personally did not feel any limitations.

In response to questions aimed at understanding the patterns of use of circumvention tools in Bahrain, B3 mentioned that if it used, it is only to access blocked content, then clarified that they mean pornography websites, as this is the only type of websites that are blocked. Later on, they added that they know some people that use circumvention tools when they are outside of Bahrain in countries that are more restricted, to be able to access the Internet and to call home and friends using Internet telephony services that are blocked in neighbouring countries like the United Arab Emirates and Saudi Arabia. Another use according to B3 was to access games and content that may not be available in Bahrain because of geo-blocking. Nonetheless, they still feel that the percentage of people using circumvention as found in this research, around 50%, is still higher than they think it is.

Interview Code B4

The fourth interview from Bahrain was with a prominent activist who was directly affected by the Internet control practices of Bahrain and had to leave the country after being persecuted as a result of their online activities. Access and trust for this interview were secured following the introduction by an entity aware of the researcher and trusted by B4. The interview provided deep insight into practices and who it affects not only political activists but also common individuals in Bahrain. The interview was conducted mainly in Arabic and fulfils the sample targets of ____??????____.

B4 provided a historical account that matched what was found in the review of reports section of Study 1, including the development of governmental Internet control policies and tactics, from early days of simple blocking based on Domain Name Systems (DNS) for website addresses affiliated with dissidents to more advanced monitoring and surveillance systems and practices. B4 accounts for the common practice of individuals

to use scripts distributed by political and digital activists that would change default DNS settings to bypass blocking by requesting website address through open systems that are not controlled by the government or ISPs. B4 added that people usually did not know about the scripts more than they needed to click on it before accessing the Internet. This shows another method of circumvention and supports the claim that many people are using circumventions tools unknowing the terminology and technical details of it.

One of the practices B4 included was the requirements for registration and licensing introduced circa 2005 by the __information ministry ??? IMDA?___, which provided the legal cover for the prosecution of activists and blocking of blogs and websites deemed critical to the government. However, the government, according to B4, moved from blocking the message to targeting the sender by using surveillance technology to identify individuals and activists based on online activity, as well as attempts to monitor communication tools like Blackberry Messenger, Telegram, and WhatsApp. More recently, the government also limited ability to buying mobile SIM cards to registration and furnishing of government-issued identity card.

The change in policy also included the establishment of an environment of fear around online activity, with public announcements on state television channels to make people aware that the government is capable of reading all the messages and communication in the country, necessarily establishing the illusion of a digital panopticon to control expression and use. Evidence of a similar practice of public intimidation is included in Chapter 4 with the Ministry of interior publishing a tweet threatening people who follow inciting accounts and circulate their posts will be held legally accountable.

According to B4, people prefer to use VPNs to circumvent Internet controls in Bahrain over proxies, with famous ones shared among individuals until a point when the government catches up with it and block it when new ones are circulated again. This practice is encouraged and possible because people in Bahrain are aware of the

government surveillance and monitoring and put an effort to protect their digital privacy, as a result, Internet use and tangible outcomes, according to B4, may not be affected much aside from political participation and expression using real names. However, the one practice that B4 sees had the most effect on Internet use, and left people with very limited agency to circumvent it, is Internet shutdowns, similar to what happened in Duraz area. The Internet in the Duraz area was shut down in the night for over a year, with the ISPs claiming that it is due to technical problems.

A valuable contribution of B4 to the research was input on the collection of network measurement, as they are also working on a similar aim, but have faced problems related to safety and security concerns of people conducting the tests, especially when using dedicated OONI probes. The concerns were partially addressed with the introduction of the mobile OONI probe application, as it made it possible to conduct the tests with plausible deniability on any intent other than testing network speed. The concerns of B4 were reflected in the design of the survey messages and the call for testing included asking people to conduct the tests only when they feel it is safe to.

The personal experience of B4 included their website and blog being repeatedly targeted by blocking, which they addressed by providing scripts to bypass circumvention and providing alternative addresses to access their website. Later on, the targeting was directed at them personally, where they were arrested and interrogated on several occasions, as a result, B4 fled Bahrain, but still lives in the fear of being targeted as part of digital espionage practices they are following of the Bahraini government. The experience of B4 culminates the fears people of Bahrain connect to activisms, including online activism.

Interview Code B5

The fifth interview concerning Bahrain was done with B5, a graduate student who has lived most of their life in Bahrain, and belong to the local culture, allowing them to

contribute to this research with their knowledge on the status of the Internet in Bahrain and compare it to Internet use experience in other countries with fewer limitations set on access. The interview was conducted in English and fulfils the sample targets of Economic Labour (EL), Economic Commerce (EC), Social (S), Political (P), Institutional/Governance (IG), Institutional/Health (IH), and Educational (E) fields.

B5 sees uses of the Internet in Bahrain to be driven by social aspects, with high use and reliance on social media platforms to interact and communicate, while educational is not as prevalent. In terms of electronic services available, the Bahraini government is moving towards digitisation with more services available online, however, not many people interact with these services by themselves, but rather rely on others to help them in it, this is particular with the older generation relying on younger relatives to access e-government services.

The educational aspect is also important, but from B5 experience in teaching, although most schools and universities utilise online systems for administration, the actual learning process is still highly reliant on face-to-face, while student use the Internet to access educational material but with no formal enrolment in online learning, including online diplomas and courses.

In terms of business, there is a huge wave of moving towards online business, including setting up simple stores over Instagram, which the government is stepping to regulate and now people can start a business that is totally based online without requiring any physical presence. However, the limitations inherently involved with online shopping, like the ability to touch items and try clothes play a big role in the preference of some people to head to the offline shopping experience, as per B5. Payment methods are also an issue, but there are services that are now available to address that, like *BenefitPay*, the National Electronic Wallet System, which enables people to pay to services and other individuals in Bahrain without the need for credit cards, using debit

cards and agreements with local banks[20]. The service has also facilitated money transfers among individuals through phone number.

For the labour market and employment, the case differs a lot between a field and another, although for some jobs and companies they rely heavily on recruiting people online, in others, design, for example, handing CVs manually is the norm, as most do not even advertise online, and one needs to go and ask for open vacancies.

A lot of people use VPN, B5 asserts, to access online content as with Netflix, and when Pokémon Go was first released to appear as if they are in other areas bypassing geo-blocking as the main motivation. B5 added that the content blocking exist in Bahrain, particularly form with the government blocking explicit content, while B5 does not feel that work or schools would have additional restrictions, which is something new to some extent, as B5 remembers that when they were in school the early 2000s, the Internet did not have many restrictions. However, they think that the government monitoring of Internet use is a reality in Bahrain, although cannot be sure. The perception of Internet monitoring, as per B5, overshadows any facts on whether monitoring is persistent or not, which in itself plays an important role in affecting people's use of the Internet, like thinking twice before posting anything online. B5 laughed while saying that self-censorship a very touchy subject, and hesitantly adds that it is mainly fear of sharing and expressing political aspects and views, more than any other aspect. This fear is consistent with how people are offline.

One of the main issues Internet use did affect in the daily lives of Bahrainis is social and news consumption, with more and more people, rely on the news they receive online, more in the social and health-related aspects than in political aspect, but this is also related to the difference between generations, reflecting a possible digital divide

[20] Details on the service verified and expanded based on: https://www.benefit.bh/Services/BenefitPay/

among generations. B5, nonetheless, did not hear of any formal digital skills development initiatives, but nonetheless, more and more people are using the Internet with adequate digital skills. The digital skills and increased use of the Internet did affect cultural aspects of the digital generation in Bahrain, where it opened the door to learn about different cultures and learn different ideas, but cultural dynamics are still bound to traditional dynamics, where people pick what to adopt from other cultures and appropriate it in their own practice.

Interview Code E1:

The first interview from Estonia was with E1, an entrepreneur focused on the field of technology, working on projects at the intersection of computing and society, and active in multiple non-governmental organisations dedicated to spreading and governance of technology. The 44 years old was chosen for interview based on their relevance to the subject of this research in terms of work and interests, with access gained through the LinkedIn platform. The interview was conducted in the English language. The interview followed the structure of questions as described in the methodology chapter, with enough room for comments to allow E1 to express their opinion on the subject. This interview fulfils the sample targets of Political (P), Economic/Commerce (EC), Social (S), Institutional/Governmental (IG) fields.

E1 considers the Internet in Estonia to be free, with no restriction on access or content and considers Estonia a success story when it comes to digitisation and Internet use, especially in the economic field, referring this success to leadership. Business and political leaders, according to E1, steered the country towards successful use of technology after the independence and state-building following the dissolution of the Soviet Union in 1991. Much of the focus was on developing the infrastructure and skills of Estonians, including providing schools with Internet connectivity and computers across the country, as part of the Tiger Leap project.

Although E1 cites no much social limitations on Internet use in Estonia, and the high level of freedom of expression online available, they later mention constant pressure to control expression online coming from political groups, especially with the spread of fake news and weaponisation of social media for political gains. E1 makes it clear that fake news is well spread over Estonian networks, sometimes through external influence, to the point that people in Estonia got used to it, and it became normalised, with little influence and ability to convince people, who learned how to check the facts by time and experience and allowed for further involvement in politics online.

E1 clarified the high availability of online commerce platforms and services in Estonia, which people are relying on more and more, highlighting the ease of creating new business, where you can do that entirely online, and later manage that business online as well, including submitting taxes and managing bank accounts and activities.

There are nowadays more projects that can be considered as sister projects to Tiger Leap, as per E1 expression, that target specific groups of citizens, particularly elderly people and young females, with focus on digital skills and job creation. This will extend the outcomes of Internet availability and further include these groups as active users of the Internet, and provides countrywide use of eGovernment facilities as per the governmental plans. In response to a specific question on whether moving to digital-only governmental activities, as in tax submission and voting, will result in the exclusion of some people, E1 clarified that this is possible mainly with elderly people who may ask someone else to help them in it, but will not result in total exclusion.

One of the barriers that have slightly affected Internet use in Estonia according to E1 is language, but only for little kids, as it is not an issue for grownups. E1 discussed that although there is no enough online content available in the Estonian language, people rely on content available in English or other languages, as English is not a barrier for most

Estonians, except for little kids who may still need to learn English to be able to fully make use on English online content.

When asked about the use of circumvention tools in Estonia, namely Virtual Private Networks (VPN) and proxies, E1 confirmed that it is high indeed, and is mainly due to limited content available to access through Estonian networks, saying that there is "very bad access to films, especially on Netflix". E1 also confirmed that the high use is not related to fear of Internet monitoring, or to be able to comment anonymously. This forces people to fake their location and use circumvention tools to access the content they like. Nonetheless, E1 was aware of the downsides of using VPNs and proxies, mentioning that it may leave traces and compromise online privacy.

Towards the end of the interview, E1 reiterated the current position of Estonia as a leader in eGovernment and online freedoms, and mentioned that they are working on rewriting the country codes, which are the rules that the eGovernment follows, to service design rather than IT design, allowing it to accommodate changes in a better manner.

From the previous, we can see that E1 does confirm the finding related to Internet artificial limitations in Estonia, including the high level of Internet openness, and the high level of use of circumvention tools. E1 also confirmed findings of various aspects and pattern of tangible outcomes of Internet use in Estonia, including Social, Political, Economic, and Personal.

Interview Code E2

E2, the second interviewee from Estonia, works in a company that specialises in information technology, but their job is not technical in itself. E2 have been living in Estonia for ten years by the date of the interview and consider themself Internet power user. This interview fulfils the sample targets of Economic Labour (EL), Economic Commerce (EC), Social (S), Institutional/Health (IH), and Educational (E) fields.

The wide spread of the Internet and Internet services was the main issue E2 focused on during the interview, showing pride in the speed available and services of Internet Service Providers. For affordability, they believe that the Internet cost is generally acceptable at prices approachable for most people, with a high level of competition between providers resulting in many offers available over different technologies available depending on location, including Internet over wireless and fibre. They also praised the high level of customer service available.

In terms of tangible outcomes, economic benefits are clear, with a variety of online stores available that includes several local ones, in addition to the main international players, like Amazon and eBay. Electronic commerce is highly relied on in Estonia as per E2, with a good delivery network. On the other side of electronic commerce, the widespread technology culture that emerged after the state-building efforts following the dissolution of the Soviet Union helped in developing high use of the Internet in different aspects, including starting online businesses.

For freedom of expression, E2 notices that people in Estonia use online media to express their different views, including political, openly and with no worry for consequences, unlike other places that E2 lived in, where it is possible to be summoned by authorities based on your online activity as what E2 noted. This created a healthy online environment for discussion and debate.

However, E2 shared their concern about the social aspect of the Internet, stating that it is causing a decline in direct relationships and communication, with people focusing on their phone all the times, even when they are with family or friends. Even if people would feel more affiliated with people they meet and communicate with online, it is still reducing direct interaction and does not make sense when one is out with their friends for example.

E2 also described how the eGovernment services are prevalent in Estonia, covering most facets of interaction with the government, providing ease of use and speed for services. One example they mentioned was tax filing, which allowed citizens to submit their taxes easily with few simple clicks, as the information is already available to the government. Access to health services is also included in the electronic services as per E2, in addition to the wide use of the Internet by people to benefit themselves and learn more about their health and health conditions.

When asked about the use of VPNs and proxies, E2 did not feel that many people do use it, because there is no need to it, as everything is open and there no sense of surveillance or monitoring. This does not comply with the survey results of percentage of people in Estonian using these methods to bypass local networks, however, E2 was clear that there many uses for it other than to hide traffic, including accessing geo-restricted content.

In summary, the interview with E2 confirmed findings from reports on the openness and spread of Internet access in Estonia, as well as the findings of tangible outcomes of Internet users in terms of economic use, as well as political use and freedom of expression. However, they had contradicting expectations of use of circumvention tools. The interview, in general, provided a deeper understanding of the scape of Internet service provisioning in Estonia, and the acceptance of eGovernment services.

Interview Code E3

The third interview focused on Estonia was with a local health practitioner, E3, who is not a technical person, and consider themself a general Internet user, and offers health advise and service online, making them able to provide a specialised perspective on the Internet use from a general user perspective in addition to professional service provider. This interview fulfils the sample targets of Economic Commerce (EC), Social

(S), Political (P), Institutional/Governance (IG), Institutional/Health (IH), and Educational (E) fields.

As common with interviews in Estonia, E3 showed that they are proud of the widespread of Internet services provided in the country, as being similar in other European countries, with very good coverage around the country, except in the rural areas, where it is slightly different. Internet availability in rural areas in Estonia is a bit problematic, as they described it, especially with problems recently arising with the landline telephone network, however, the ministry of telecommunication is promising a 100% coverage, which is almost done. About affordability, E3 confirmed that Internet access is very affordable for the common household, as well as having affordable prices for mobile Internet.

In terms of services available for the public in Estonia to use over the Internet, E3 expressed that they feel that eGovernment services are first-class services that allow one to do anything online, as the saying in Estonia, you can do it all online except getting divorced, and the joke that they are working on it. The state has come really close to the citizens by providing very good services that can be done online, like paying taxes, renewing a driving license, and even registering new companies.

Electronic commerce was another aspect the interview dwelt into, with E3 outlining how popular it is in Estonia as a service offered by most local retailers, as well as through dedicated online retailers. However, E3 prefers to do most of their shopping in person at traditional shops, but definitely, e-commerce is very much used among many people, and there are very good services in place. A similar perspective was given on doing business online, especially with the experience of E3 in providing service to the citizens through an online speech therapy platform. This experience proved to them that setting up an online store and starting your business is relatively easy, and requires only a few hours if one had enough ambition and motivation.

The experience with one of the online health services allowed E3 to evaluate other online health services, portraying that, when compared to other electronic services, eHealth services in Estonia are not where they should be. The functionality offered through patient portals is limited, with people having access to view their information now with no much interaction, except for digital registration system, which was added recently did not have that much use so far. Another aspect is that elderly people and people with more severe illness rely on institutions and not the services provided online, while the younger generation that is more familiar with information-seeking online help themselves through eHealth services knowledge available and services provided. E3 stated that the work they are involved in, which is connected to the government, has a vision towards a patient-centric health system with eHealth services as the tool.

Internet is Estonia is also important in forming individual identities, enabling people to affiliate themselves with people feeling more connected to their online acquaintances, including what groups and networks you are using, and what news you read, with people using the affordances of the Internet to identify themselves based on their interests rather than their geographical location. This is facilitated with the current situation of the Internet in Estonia as being free with no limitations other than cost to some extent and general literacy on knowing how to use connected and smart devices. E3 compared the limitations to other countries in terms of blocking and controls especially that no political party is thinking of extending any control or power over the Internet, unlike other places like Russia.

Nonetheless, E3 sees that many people do have agency in using VPN and proxies to have access to different services, including for business to access corporate networks, and education, to access institutional database access. Another major reason for using VPN, which E3 did theirself, is to access online content that is geo-blocked, from outside Estonia to access content only accessible from inside Estonia, as with some of the national

television channel content, while they realise that other people use it from inside Estonia to access international content, as with Netflix.

E3 ended the interview with reiterating that tangible outcomes of Internet use in Estonia is more related to digital literacy, and that people in the older age groups are not able to use the Internet and benefit from it as with other age groups, in a manner that is similar to other countries, but is getting better with time.

Interview Code S1

The first interview for Singapore was with S1, a Singaporean student doing their undergraduate studies in Europe, with interests in educational, social, and commercial aspects of the Internet. S1's contribution to the research included assisting in spreading the survey through their networks in Singapore, in addition to the insight provided through the interview on the Internet limitations and uses in Singapore. The language used in this interview was English. This interview fulfils the sample targets of Economic Commerce (EC), Social (S), and Educational (E) fields.

The interview began with S1 discussing how they belong to a generation that knows the world through and with the Internet, with online tools and websites as well as applications being their main gateway to communication, social interaction, knowledge and information gathering, and business. S1 noted that everyone they know in Singapore uses the Internet, and that among the general population, most people do have access to the Internet, and use it in a way or another, even if at least to communicate with family and friends over social media platforms.

For many in Singapore, according to S1, the Internet is their main shopping destination, if not for actual purchases, to browse what is available at stores and go in person to purchase, especially for clothes and equipment. Food was another area that people rely on the Internet for, from ordering food to looking for the best places to eat, either using directories or following some of the food-related blogs common and trusted

in Singapore. S1 sees these affordances of communication and ability to conduct eCommerce as the main drivers behind Internet adoption in Singapore, especially that it provided a promise for a more free atmosphere for expression, nonetheless, S1 points out to an increase in practices by the government to address hate speech and what is being labelled as fake news outlets online. The practices have also affected many regular people that were trying to speak their mind, which resulted in increased mistrust in the platform, and transcending of the general fear culture from the street to the online world.

Despite the limitations, S1 states that most people would ignore the perception of limitation and use the Internet for business, communication, and entertainment with no worries as long as they avoid political content, even the official discourse. This attitude increasingly limiting the functionality of the Internet in relation to electronic political participation and activism, except for very few people that are openly opposing the political regime, and are being labelled as dissidents, and potentially persecuted, especially if they were based in Singapore, or do visit Singapore, under the pretext of protecting national harmony and morals. S1 also indicated that they feel that more and more of their friends are using circumvention tools even when they are trying to access websites and services that are not blocked, for the mere feeling of being relieved from governmental monitoring and surveillance.

In terms of educational affordances of the Internet, S1 pointed out that the Internet allows exposure to online courses and content, as well as face-to-face courses offered around the world, which some Singaporeans do join. On the local level, S1 could not comment much except that they have heard of more schools introducing online curriculum to assist in their traditional training and teaching. Giving educational tangible outcomes of Internet use a good room to grow and develop.

The general attitude of people towards the Internet according to S1 differs between generations, with the younger generations relying almost entirely on online

websites and services to access information and entertainment, and to communicate. The older generation, on the other hand, is using the Internet as an auxiliary tool for their daily lives, to provide easier to access services, particularly with access to some news websites and social media platforms. The difference between generations, according to S1, is nearing with more older people are introduced to Internet world and are able to obtain more digital skills.

S1 did not comment on some of the issues brought up in the survey because they thought it would be wise for them to refrain from discussing and aspects they deemed political, including details on Internet limitations, and the connection between changes in the political environment of Singapore and changes in models of control and balance of network powers. But still, S1's input matched to a large extend the finding of Study 1 and the survey in Study 2, particularly with perception to limitations, use of circumvention tools, and levels of outcomes in the Internet use fields.

Interview Code S2

The second interview from Singapore was with S2, an expert in eLearning based in Singapore, with interests in social and commercial aspects of the Internet. S2 has also provided good insight into the business environment and the Internet in Singapore from their experience as an educator and development coach, which contributed to the understanding of digital skills from S2's point of view. The language used in this interview was English. This interview fulfils the sample targets of Economic Commerce (EC), Social (S), Political (P), Institutional/Governmental (IG), and Educational (E) fields.

In setting the ground for the interview, S2 expressed how highly they regard the Internet for playing an important and crucial role in the development of Singapore as an economy and community, including providing data they use in research that is both local and global. S2 also looked at the Internet as a global platform that is moving towards

using as a central location for all of our information, including files we share and store online, and data on our Internet use of different platforms.

However, they believe that despite all the resources the Internet make available, people in Singapore are not exploiting it to the fullest, especially when it comes to self-development and learning from online resources and utilising the communication facilities to augment traditional education towards a full eLearning experience. The move can be seen in the adoption of several educational institutes of the Internet as a method for delivering learning, and offering skills development that included courses related to using the Internet to finding the right resources for studies.

S2 noted here that for some topics, you will need a physical and direct contact to learn, as in laboratory experiments, but for the vast majority of education, the Internet can be used to provide better education experience with full courses offered online. In Singapore, there is some hesitation in adopting a fully online learning experience, but this is changing because of awareness development on the benefits of eLearning, which would contribute to self-development of individuals.

Language is not a barrier for Singaporeans to access and use the Internet according to S2, these days, more online content is now available in different language after a wave of internationalisation. S2 credits this wave to globalisations, which helped in making the Internet more accessible, and in turn, increased how people make use of Internet use, rendering language as no longer a limiting factor.

In terms of skills, S2 pointed out that they noted from experience that digital skills are generally acceptable in Singapore, but most people learn specialised digital skills because of work requirements or learning it on the job, more than on their own, but efforts towards general digital skills development are needed. S2 believes that age plays an important role in determining digital skills and usage of the Internet, where they feel that the vast majority of youngsters conduct their shopping online, for everything from food

to apparel, while older people prefer to go to a physical store to purchase items. There is a shift in buying habits to rely more on electronic commerce, but it is connected again to age, in a similar fashion to digital skills, and S2 states that there is still a long way to go to exploit fully the Internet in the economic field for individuals.

Social relation in the small island nation has been active and based on areas where people live, whether in compounds or neighbourhoods according to S2, nowadays, the context of these social relations is expanding with the use of the Internet, and now it covers more or less the whole country. S2 believes that this is happening largely because people are aware that they need to put efforts towards community development, and now they know what is happening where across Singapore, with a wider pool of people getting together and forming online communities. Some of the specialised online communities S2 praised were the health domain, which they think is doing a good job in reaching out to people over the Internet.

The interview with S2 showed that they are wary of speaking of official limitations and restrictions on the Internet, moving the questions to Internet limitations in workplace or school. For example, when asked about the reports on website blocking in Singapore, they justify it by saying that blocking is important especially in the banking industry because you have a lot of information that you do not want employees to leak out, so companies limit access to work-related content and sites only. Nonetheless, as the interview went on, they were more open and mentioned that people use VPNs and proxy services to access the content they do not to declare, but insisted that blocking is good to stop sites that are not “valid” or service inappropriate content. S2 connected blocking and Internet limitations to rules of digital citizenship, which they see that everybody should have knowledge of and work within it and should not affect your Internet use or opportunities of being active online as long as you are using the Internet judicially.

Adding that freedom comes with responsibility and people should be aware of both, the harms and benefits of the Internet.

Interview Code S3

To fulfil the requirements of interview sample selection from Singapore, the third interview was conducted with a student specialising in network security, who is also involved in online commerce. The language used in this interview was English. This interview fulfils the sample targets of Political (P), Institutional/Governmental (IG), Institutional/Health (IH), and Educational (E) fields.

After introducing the research and collecting consent, the interview began with general questions on the status of the Internet in Singapore to establish rapport. S3 sees that Internet is used positively by almost everyone in Singapore, with a distinction between the uses across generations. The older generation, according to S3, tend to rely more on the Internet to communicate with family and friends, and for entertainment in the form of following television shows and dramas online. While the generations of people who are younger than 40 years old, rely on the Internet as a news source to stay informed and up to date with what is happening in Singapore and the wider world, in addition to communication and entertainment. However, uses of the Internet beyond communication, entertainment, and accessing news, is still not as wide as expected because people feel an alienation between their daily lives and the Internet, looking at it as a media that serves as a window on themselves to the government, making it hard for the Internet to become a normalised part of daily activities.

The opaqueness of the Internet as a technology was notable throughout the interview with S3, especially when compared with how other interviewees who looked at the Internet as an integral part of their everyday activities. This position was not expected from a person who was born with the beginning of this millennium, when over a third of individuals in Singapore were using the Internet, prompting asking S3 to explain further

this position. The reason for the disconnection according to S3 is that people in Singapore have developed tactics to deal with government policies by altering their activities that can be seen by the government, including those over the Internet, as a form of self-censorship and methods to stay off the government radar. At the same time, people in Singapore developed methods to express themselves freely while avoiding that monitoring, effectively constructed multiple groups of activities people deal with in separation, activities that are passable to be monitored, and activities that people prefer to keep off the eyes of the government.

The interaction with public services available online and the government nonetheless, fell under the first group of activities, that are passable to be monitored, with people providing a positive attitude and outlook to these activities, while at the same time trying to make the most of it to safe themselves time and effort, as S3 put it. The online activities included applying to licenses and other electronic government-related processes, but fell short in terms of political expression, except when it is in line with the government and the main party official discourse.

Education was another activity that was well spread in Singapore, with many universities and educational institutes offering online affordances to augment face-to-face education. At the same time, people in Singapore are open and comfortable to accessing educational material and courses available over the Internet, even if it did not originate from Singapore, as Singaporeans, according to S3, consider themselves active members of the global online community, or network society.

The interview with S3 ended with them offering an insight into tendency among fellows to study network security and new technologies as they believe that these topics will be more relevant in the foreseeable future with more reliance on communication technologies to fulfil everyday needs. S3 however, reiterated that the split in how people interact with the Internet, between what they want to be seen, versus what they do not

what to be seen, is an extension to general culture in Singapore that was developed as a form of resilience to increased monitoring and surveillance in the country.

Interview Code S4

The fifth interview from Singapore was with a Singaporean who is currently outside Singapore, and thus has what they described as a different view developed over time of being outside. S4 is a designer who has special interests in national identity and has been in and out of Singapore for the past eight years. The language used in this interview was English. This interview fulfils the sample targets of Economic Labour (EL), Economic Commerce (EC), Social (S), Political (P), and Educational (E) fields.

One of the first comments of S4 was about the change in their views happening after starting to go outside of Singapore for extended periods, as they found that they could speak more freely, and think less of the consequences of expressing an opinion, especially online. S4 described how in Singapore Internet is used mainly for leisure, and one of the trending aspects is blogs and discussion on food, saying that this is because "in Singapore, people have a tendency to talk more openly about food rather than for example politics". People feel that they are discouraged from discussing more serious issues, whether online or offline and turn to other discussions thus engaging the Internet in different aspects of their lives. Food arises again here, as because of the limited space at houses, people meet outside, usually over food, and it became part of the social habit to search for food recommendations online before meeting.

The political expression online is affected through the clear change in Internet openness and even quality after the narrow win of the incumbent ruling party People's Action Party in 2011, where the government extended its control over the Internet[21]. S4

[21] The year 2011 was the first year where changes to the Constitution and election laws permitted campaigning in cyberspace, as a result the New York Times reported that grip on the Internet in Singapore was loosen as in https://www.nytimes.com/2011/05/08/world/asia/08singapore.html.

sees this as a turning point in the voices of the opposition over the Internet, but there came many rules that controlled online expression, including a rule requiring blogs and websites talking about politics to register with the authorities. S4 says that being able to see the Internet from inside and outside they could see a change in openness, for their friends in Singapore, they would not know that a website was stopped, because they just would not see it. Another aspect was a sudden surge of trolls on discussion fora that would repeatedly publish "rubbish" that would undermine the reliability and respect of the platform.

S4 was confident that rumours of what is allowed and what is not supposed to be discussed online affect how people use the Internet for political expression, creating an environment of self-censorship. This environment is carried on from the days before the Internet, through the early days of the Internet reaching current time. In the early days of the Internet, before Social media Sites, pornography and websites related to drugs were the only websites that people could not access, but after some time, the government realised that existing measures and laws cannot handle the Internet as expected, encouragement creation of new rules, which people did not protest as S4 said.

Use of VPN and proxies were not as common in Singapore in the old days of the Internet, but with an increase of blocking, and the influence of Chinese use of circumvention tools, which was facilitated through the strong social ties between Singaporeans and Chinese. S4 said that if they were in Singapore right now, they would use circumvention tools to bypass blocking, and protect themselves from monitoring and surveillance. This assertion comes from the feeling that someone is always monitoring, fortified by observing a sudden drop in speed that coincided with elections, despite thinking that technology to manage increased demand is there, S4 believes that change in quality is related to the introduction of surveillance facilities.

In terms of economy, S4 sees that e-commerce is very common in Singapore with buying and selling over platforms, including Social Networking Sites, is widespread with no restrictions, making the Internet the main market place for many people, in particular, the younger generation. Another aspect is the labour and job market, which is becoming highly reliant on the Internet, with no restrictions observed.

The Internet facilitated cultural and identity development in Singapore according to S4, with the Internet allowing for more access to culture-related content, and allowing for art to reach a wider audience beyond the creative sector. In term of identity and affiliation, S4 said that new forms are being developed based on the affordances of the Internet, connecting people with similar interests, even decreasing the importance of the Singaporean aspect of people's self-identification. The availability of educational material online helped in this aspect, with a clear increase in the use of technology and the Internet to support education.

The interview with S4 demonstrated the self-censorship as being the main factor affecting how people use the Internet, especially in relation to political expression, while feeling that there are no restrictions on economic, education, and cultural aspects. S4 has clearly identified the change in perception people have when they see the difference in Internet openness between inside and outside of Singapore, highlighting an aspect that may have affected the survey results by pushing people towards more positive answers. S4 have also provided testimony on the observed change in rules and quality of the Internet in relation to political events.

Appendix III: Statistics and Calculations

(A) Skewness and Kurtosis Analysis for Fields and Sub-fields

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness	Kurtosis
EAA_Property	379	1.00	5.00	3.5950	1.01520	-0.649	-0.029
EAA_Income	360	1.00	5.00	3.2472	1.09887	-0.330	-0.441
EAA_EduEmployment	415	1.00	5.00	3.9612	0.83536	-0.942	0.970
ESA_Property	380	1.00	5.00	4.2868	0.79781	-1.533	3.332
ESA_Income	381	1.00	5.00	4.3465	0.79599	-1.455	2.632
ESA_EduEmployment	404	1.00	5.00	4.1238	0.68385	-0.905	1.721
CAA_Identity	334	1.00	5.00	3.6108	0.97322	-0.688	0.157
CAA_Belonging	330	1.00	5.00	3.5470	1.00685	-0.639	0.058
CSA_Identity	296	1.00	5.00	3.5270	0.91092	-0.487	0.465
CSA_Belonging	310	1.00	5.00	3.6790	0.89734	-0.514	0.570
SAA_Personal	358	1.00	5.00	3.5098	0.94486	-0.256	-0.310
SAA_Formal	260	1.00	5.00	3.4385	1.20170	-0.639	-0.410
SAA_Political	281	1.00	5.00	3.5107	1.09458	-0.591	-0.116
SSA_Personal	357	1.00	5.00	4.1709	0.79866	-0.987	1.060
SSA_Formal	209	1.00	5.00	3.8541	0.78538	-0.371	0.394
SSA_Political	335	1.00	5.00	4.0881	0.93766	-1.137	1.320
PAA_Health	345	1.00	5.00	4.0449	0.83362	-1.063	1.547
PAA_SelfActualisation	357	1.00	5.00	4.3992	0.64121	-1.201	2.029
PAA_Leisure	346	1.00	5.00	4.1243	0.82384	-1.130	1.999
PSA_Health	298	1.00	5.00	3.9060	0.77496	-0.814	1.647
PSA_SelfActualisation	355	1.00	5.00	4.1972	0.66849	-1.085	2.503
PSA_Leisure	357	1.00	5.00	4.0350	0.79290	-0.940	1.244
Economic Achievement	418	1.00	5.00	3.71	0.74	-0.54	0.46
Economic Satisfaction	415	1.00	5.00	4.21	0.63	-1.25	**3.15**
Cultural Achievement	355	1.00	5.00	3.58	0.86	-0.65	0.46
Cultural Satisfaction	340	1.00	5.00	3.63	0.80	-0.40	0.83
Social Achievement	361	1.00	5.00	3.49	0.84	-0.37	0.03
Social Satisfaction	364	1.00	5.00	4.09	0.66	-0.65	0.79
Personal Achievement	362	1.00	5.00	4.19	0.61	-1.03	2.05
Personal Satisfaction	359	1.00	5.00	4.06	0.57	-0.85	2.53

(B) Factor Analysis for Perception of Limitations

Communalities

	Initial	Extraction
Feel_WorkControl	1.000	.358
Feel_ISPControl	1.000	.442
Feel_GovControl	1.000	.542
Feel_WorkMonitor	1.000	.486
Feel_ISPMonitor	1.000	.412
Feel_GovMonitor	1.000	.613

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.853	47.546	47.546	2.853	47.546	47.546
2	.948	15.805	63.351			
3	.779	12.988	76.339			
4	.699	11.652	87.991			
5	.397	6.614	94.605			
6	.324	5.395	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
Feel_WorkControl	.599
Feel_ISPControl	.664
Feel_GovControl	.736
Feel_WorkMonitor	.697
Feel_ISPMonitor	.642
Feel_GovMonitor	.783

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

(C) Factor Analysis for Skill to Bypass Limitations

Communalities

	Initial	Extraction
[I know how to access a blocked site]	1.000	.842
[I know how to access a restricted website without being caught]	1.000	.842

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.684	84.218	84.218	1.684	84.218	84.218
2	.316	15.782	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
[I know how to access a blocked site]	.918
[I know how to access a restricted website without being caught]	.918

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

(D) Correlations between predictors and subfields

Economic Achievement and Satisfaction Sub-fields, Whole Sample

Whole Sample	EAA_Property	EAA_Income	EAA_EduEmployment	ESA_Property	ESA_Income	ESA_EduEmployment
How old are you?	-0.005	-0.059	**-.159****	0.093	0.073	-0.040
Year_Internet	0.088	0.071	-0.067	**.194****	**.187****	**.110***
Are you?	**.136****	**.150****	0.027	-0.065	-0.098	-0.049
Education Level Group	0.005	-0.006	0.010	0.084	0.064	**.104***
Employment Group	**-.133***	-0.021	0.070	**-.125***	**-.124***	-0.047
Perception of Limitation	0.047	0.095	0.083	**-.102***	**-.133****	-0.060
Skill, Bypass Limitations	**.248****	**.182****	**.168****	-0.061	-0.053	0.044
Circumvention_useSum	**.174****	**.156****	**.137****	0.066	0.088	**.142****

*Notes: ** Denotes Correlation significant at the 0.01 level (2-tailed) * Denotes Correlation significant at the 0.05 level (2-tailed).*

Cultural Achievement and Satisfaction Sub-fields, Whole Sample

Whole Sample	CAA_Identity	CAA_Belonging	CSA_Identity	CSA_Belonging
How old are you?	**-.252****	**-.152****	-0.066	-0.078
Year_Internet	**-.163****	**-.163****	-0.007	-0.056
Are you?	-0.019	-0.048	-0.008	**-.115***
Education Level Group	**-.181****	**-.115***	-0.070	-0.071
Employment Group	**.152****	**.116***	0.001	0.047
Perception of Limitation	**.194****	**.291****	0.055	-0.044
Skill, Bypass Limitations	**.190****	**.113***	0.097	0.024
Circumvention_useSum	**.107***	0.072	0.085	0.100

*Notes: ** Denotes Correlation significant at the 0.01 level (2-tailed) * Denotes Correlation significant at the 0.05 level (2-tailed).*

Social Achievement and Satisfaction Sub-fields, Whole Sample

Whole Sample	SAA_Personal	SAA_Formal	SAA_Political	SSA_Personal	SSA_Formal	SSA_Political
How old are you?	**-.132***	**-.215****	**-.220****	-0.054	-0.024	0.082
Year_Internet	**-.167****	**-.169****	-0.090	-0.016	0.045	**.139***
Are you?	0.070	0.019	-0.061	-0.086	-0.124	**-.119***
Education Level Group	**-.197****	**-.191****	-0.105	-0.079	-0.003	0.012
Employment Group	**.188****	**.158***	0.082	0.072	-0.067	-0.048
Perception of Limitation	**.182****	0.070	-0.035	0.083	-0.064	**-.224****
Skill, Bypass Limitations	**.155****	**.138***	0.012	0.054	0.038	**-.124***
Circumvention_useSum	-0.002	0.107	0.057	0.076	0.120	0.042

*Notes: ** Denotes Correlation significant at the 0.01 level (2-tailed) * Denotes Correlation significant at the 0.05 level (2-tailed).*

Personal Achievement and Satisfaction Sub-fields, Whole Sample

Whole Sample	PAA_ Health	PAA_Self Actualisation	PAA_ Leisure	PSA_ Health	PSA_Self Actualisation	PSA_ Leisure
How old are you?	**-.121***	**-.205****	**-.223****	0.031	**-.108***	-0.047
Year_Internet	-0.022	-0.052	-0.096	0.113	-0.016	-0.048
Are you?	**-.107***	0.033	-0.087	-0.020	-0.020	0.033
Education Level Group	-0.083	**-.127***	**-.178****	-0.067	**-.114***	**-.165****
Employment Group	0.064	0.076	**.200****	-0.044	**.116***	0.102
Perception of Limitation	-0.015	-0.028	0.045	-0.067	-0.022	0.084
Skill, Bypass Limitations	**.135***	**.186****	**.152****	0.003	0.084	0.051
Circumvention_useSum	**.116***	.201**	**.158****	0.097	**.119***	**.126***

*Notes: ** Denotes Correlation significant at the 0.01 level (2-tailed) * Denotes Correlation significant at the 0.05 level (2-tailed).*

Economic Achievement and Satisfaction Sub-fields, Countries with High Limitations

High Limitations	EAA_Property	EAA_Income	EAA_EduEmployment	ESA_Property	ESA_Income	ESA_EduEmployment
How old are you?	0.030	-0.006	**-.131***	**.151***	**.131***	-0.076
Year_Internet	0.083	0.098	-0.090	**.228****	**.194****	*0.045*
Are you?	**.135***	**.236****	0.057	0.030	-0.026	0.009
Education Level Group	-0.021	-0.039	-0.059	0.098	0.089	*0.071*
Employment Group	**-.142***	0.019	**.167****	**-.194****	**-.187****	0.029
Perception of Limitation	**.181****	***.142****	**.174****	*0.094*	*0.076*	**.128***
Skill, Bypass Limitations	**.260****	**.170***	**.132***	0.014	0.019	0.121
Circumvention_useSum	**.211****	0.119	*0.074*	0.033	0.049	**.146***

*Notes: ** Denotes Correlation significant at the 0.01 level (2-tailed) * Denotes Correlation significant at the 0.05 level (2-tailed), Underline denotes significance specific to high limitations, Italic is specific to whole sample but not high limitations*

Cultural Achievement and Satisfaction Sub-fields, Countries with High Limitations

High Limitations	CAA_Identity	CAA_Belonging	CSA_Identity	CSA_Belonging
How old are you?	**-.243****	**-.212****	0.005	-0.015
Year_Internet	*-.158**	**-.144***	0.022	-0.053
Are you?	-0.040	-0.094	0.041	*-0.024*
Education Level Group	**-.195****	*-0.130*	-0.023	-0.085
Employment Group	**.142***	**.144***	-0.077	-0.032
Perception of Limitation	**.217****	**.181****	**.142***	0.055
Skill, Bypass Limitations	**.184****	*0.091*	0.097	0.040
Circumvention_useSum	*0.073*	0.037	0.057	0.016

*Notes: ** Denotes Correlation significant at the 0.01 level (2-tailed) * Denotes Correlation significant at the 0.05 level (2-tailed), Underline denotes significance specific to high limitations, Italic is specific to whole sample but not high limitations*

Social Achievement and Satisfaction Sub-fields, Countries with High Limitations

High Limitations	SAA_ Personal	SAA_ Formal	SAA_ Political	SSA_ Personal	SSA_ Formal	SSA_ Political
How old are you?	*-0.096*	**-.227****	**-.208****	-0.080	-0.038	**.166***
Year_Internet	*-0.098*	**-.179***	**-.173***	-0.002	0.007	**.151***
Are you?	0.021	0.037	0.060	-0.046	-0.015	*0.038*
Education Level Group	**-.214****	**-.253****	-0.140	**-.155***	-0.055	0.067
Employment Group	**.138***	**.205***	0.086	0.116	-0.028	-0.111
Perception of Limitation	*0.098*	-0.022	0.061	**.155***	0.027	*-0.062*
Skill, Bypass Limitations	**.175****	**.196***	0.094	0.120	0.114	*-0.056*
Circumvention_useSum	0.056	0.101	0.080	0.073	0.103	-0.015

*Notes: ** Denotes Correlation significant at the 0.01 level (2-tailed) * Denotes Correlation significant at the 0.05 level (2-tailed), Underline denotes significance specific to high limitations, Italic is specific to whole sample but not high limitations*

Personal Achievement and Satisfaction Sub-fields, Countries with High Limitations

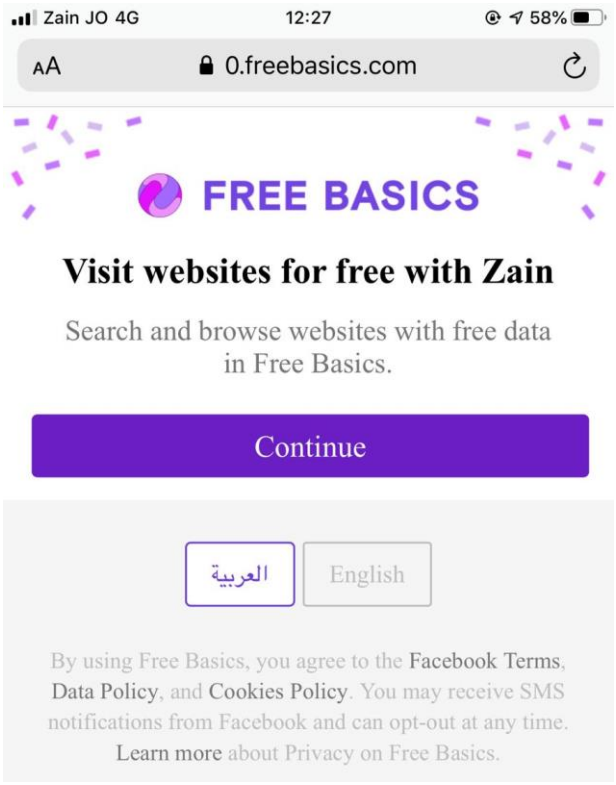
High Limitations	PAA_ Health	PAA_Self Actualisation	PAA_ Leisure	PSA_ Health	PSA_Self Actualisation	PSA_ Leisure
How old are you?	*-0.071*	**-.148***	**-.159***	0.097	*-0.033*	-0.060
Year_Internet	-0.004	-0.041	0.000	0.121	0.024	-0.011
Are you?	*-0.086*	0.102	-0.078	0.048	0.010	0.075
Education Level Group	-0.127	*-0.120*	**-.170***	-0.107	**-.157***	**-.151***
Employment Group	0.104	*0.052*	**.149***	-0.036	0.084	0.100
Perception of Limitation	0.036	0.092	0.120	0.037	0.062	**.137***
Skill, Bypass Limitations	**.143***	**.252****	**.140***	0.041	0.119	**.147***
Circumvention_useSum	*0.080*	**.176****	*0.083*	0.099	*0.066*	**.202****

*Notes: ** Denotes Correlation significant at the 0.01 level (2-tailed) * Denotes Correlation significant at the 0.05 level (2-tailed), Underline denotes significance specific to high limitations, Italic is specific to whole sample but not high limitations*

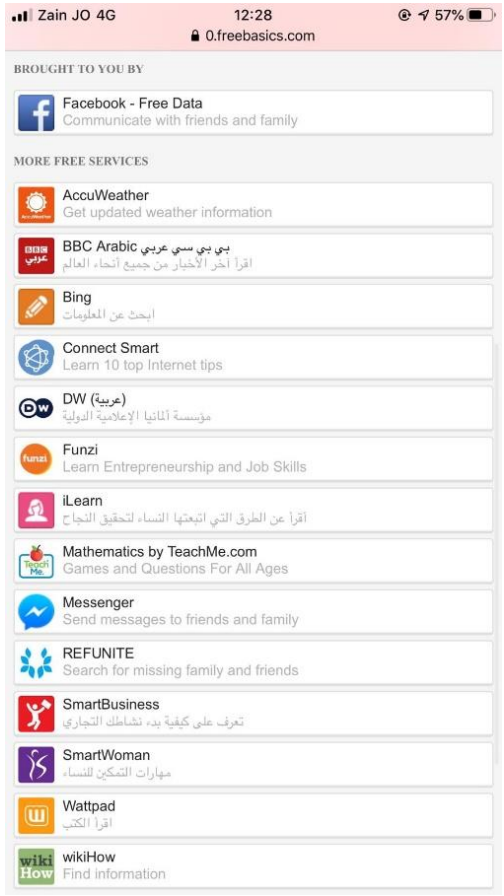
Appendix IV: Example of the Free Basics Service

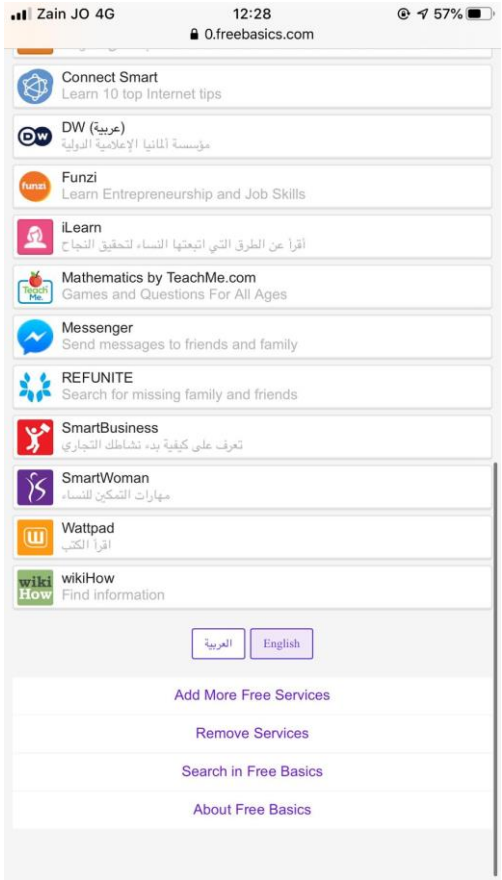
The following is a set of screenshots for Facebook's Free Basics service as available on the Jordanian Zain Mobile Network through the web browser, the Android App experience is identical. The screenshots were last updated on 15th of October 2019 and portray the welcome page, list of main services, list of services available to add, and the search functionality.

Main welcome page

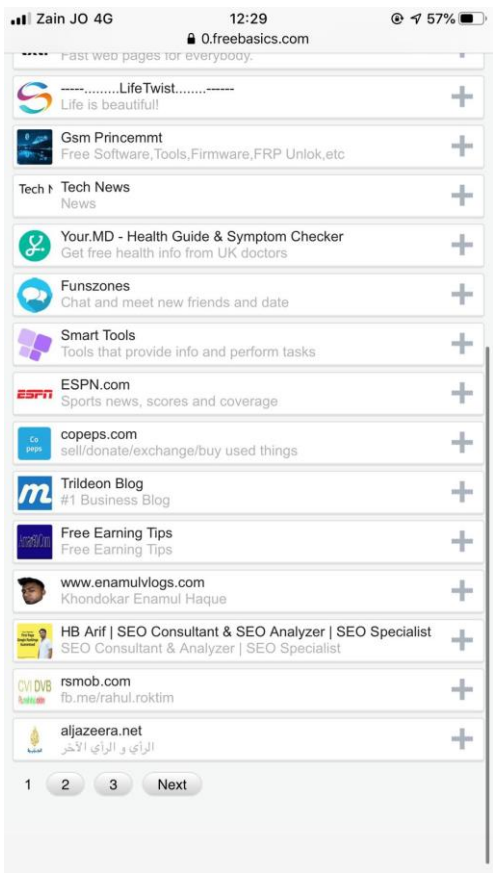


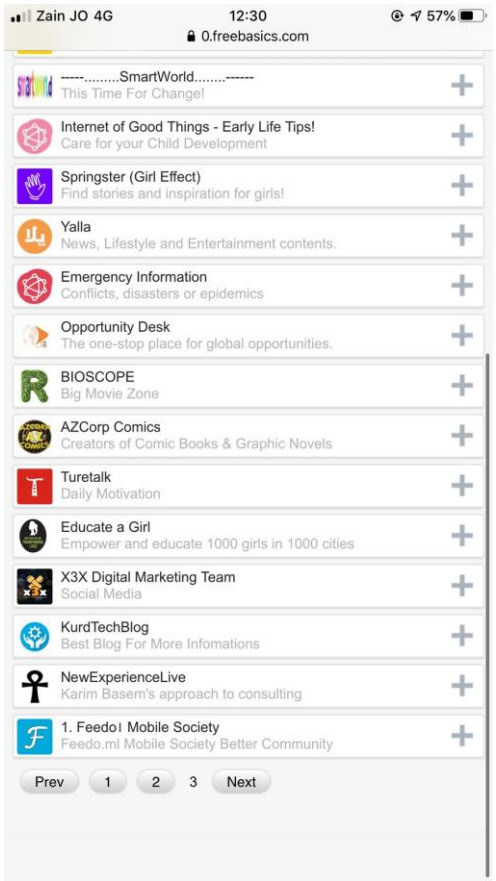
Main page and list of default services

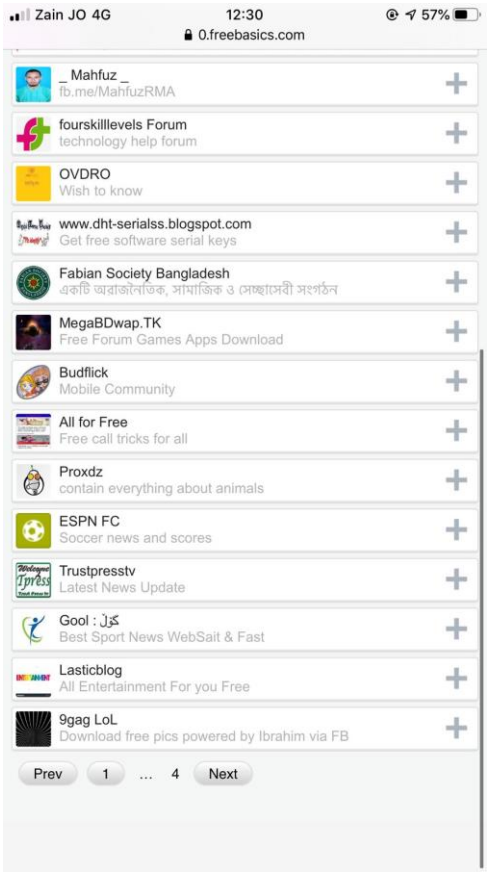




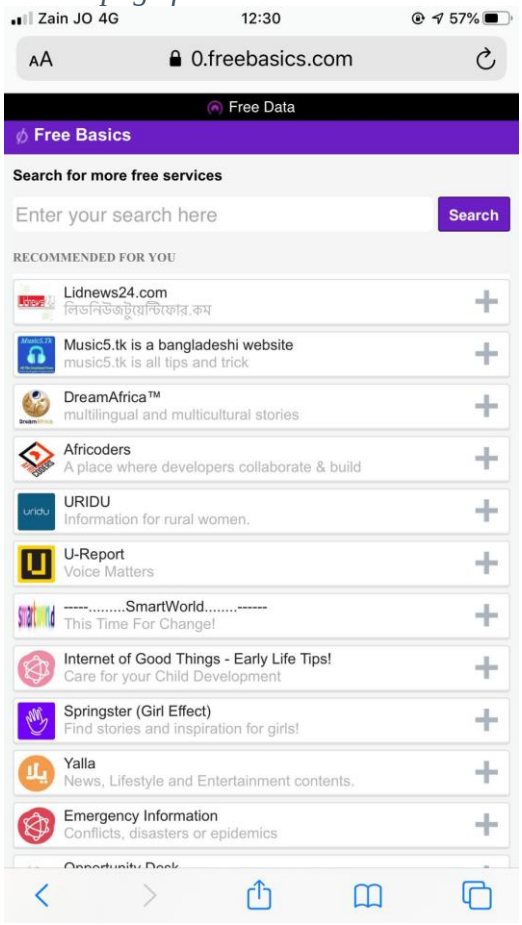
List services that can be added







Search page for additional services



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vvYRjFUA!!/dl5/d5/L2dBISEvZ0FBIS9nQSEh/.

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