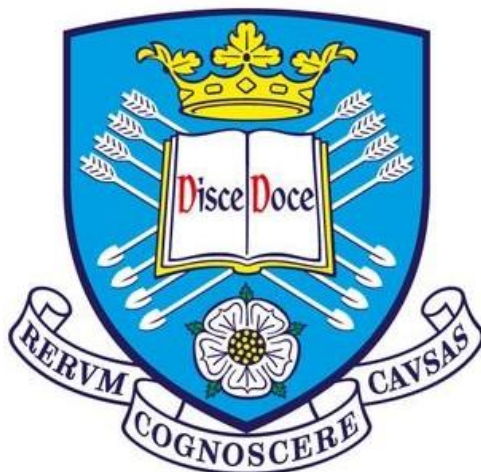


Assessing the Digital Divide in Tertiary Education in Sierra Leone through the COVID-19 Pandemic



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Abstract

The outbreak of the Coronavirus pandemic in March 2020 exacerbated the dependency of internet connectivity in education, forcing universities across the world to confront unprecedented challenges that simultaneously exposed already existing deficiencies. This thesis, focussing on the University of Makeni in Sierra Leone, examined these existing disparities. It employed two surveys to investigate the student's digital skills and internet access rates. The first quantitative sampling survey identified the student's data costs and computer ownership levels across each educational department. After an assessment of these results, the second qualitative survey further examined the student's digital abilities and any socioeconomic implications that prevented them from accessibility. The findings highlighted that the pandemic exacerbated the already existent digital divide in education. It further indicated multiple constraints that prevent students from gaining these digital services. In evaluation of the data, the thesis proposes numerous perspectives of solutions towards bridging the digital divide.

Acronyms

CA	Capability Approach
COVID-19	Coronavirus
DD	Digital Divide
ICT4D	Information and Communication Technology for Development
ICTs	Information and Communication Technologies
NGO	Non-Governmental Organisation
SDGs	Sustainable Development Goals
UNIMAK	University of Makeni

1. Introduction

Internet access and connectivity is increasingly becoming a necessity to sustainable development, with the digital world becoming more successful in developing greater opportunities for cultures and society. The Sustainable Development Goals (SDGs) recognise this by tracking the importance of individuals using the Internet as an indicator (SDG 17.8.1). Extending the opportunities that internet infrastructure can bring is crucial to stimulating areas of economic activity, while allowing a transition in developing economies from a resource-based economy to a knowledge-based one (Guerriero, 2015). Recent literature on the study exemplifies its importance to a modern future with many scholars suggesting the urgent need of making it a basic human right (Huang, 2019; Reglitz, 2019; Voitsikhovskiy, 2021). However, the Internet's importance has not been sufficiently recognised globally, and more must be done to integrate the digital civilisation and sustainable development agendas. Failure to identify the significance of the Internet in this present era could mean that crucial opportunities to achieve development goals may be missed.

The outbreak of the Coronavirus pandemic (COVID-19) in March 2020 has exacerbated the dependency of internet connectivity in education, forcing universities across the world to confront unprecedented challenges that simultaneously exposed already existing deficiencies. As national "lockdowns" responded to the rapid spread of the disease across the globe, an educational emergency with interrupted conventional schooling nationwide school closures became a by-product. While the educational community has made concerned efforts to maintain adequate learning during this period, students have had to rely on their own personal resources as teaching has turned online. This, in particular, has been specific to mostly tertiary education where there has been a huge reliance on expanding their connectivity to include online learning in their graduate experience.

Ultimately, COVID-19 has triggered a digital transformation in education forcing the world to engage in the use of online learning (Khalili, 2020). The scale of the crisis, particularly on education, is unprecedented with speculation already emerging of what the lasting effects of this will be and what education may look like in the post-COVID era (Lockee, 2021). One thing for certain, is the increasing dependency of technological capital with the digital divide (DD) being evident among countries and institutions.

The DD, although its conceptualisation has created huge debates in common literature (Compaine, 2001, 2001a; Dewan & Riggins, 2005; Duersen & Helsper, 2015; Fuchs, 2009; Ragnedda, 2019; Ragnedda & Muschert, 2013; Van Dijk, 2005, 2006, 2020; Van Dijk & Hacker, 2003; Warschauer, 2002), generally refers in its most simplistic terms to a ‘division between people who have access and use of digital media and those who do not’ (Van Dijk 2020, p.1). Recent developments to its definition include the use and skills of digital components as well as its beneficiaries to society and culture (Van Dijk, 2020). As expressed, the COVID-19 pandemic has exacerbated these divisions, generating a huge dependency on internet connectivity for education. Fundamentally, these digital disparities have reflected and reinforced the prevalent differentiations of class, gender, age, race, location, disability and other social indicators (Zezeza, 2021). Thus highlighting the need to reimagine how teachers deliver and support educational learning to students no matter where they live or to what tools they have access (Correia, 2020). This essay will explore these disparities and will ultimately question whether the existing DD has made inequalities in learning outcomes grow during COVID-19 and/or ultimately whether the DD itself has grown during the pandemic. More explicitly, this study will examine the digital components for internet connectivity and digital skills in Sierra Leone at the University of Makeni (UNIMAK) (see 3. Research Context). Further, it will question whether the DD has increased in developing countries through the pandemic.

2. Literature Review

The discourse and practice of the DD can be understood in relation to an evolution of debates for its conceptualisation and definition, where three main levels constitute to how the divide is essentially calculated. It will further interpret the digital literature in an academic setting with the influence of the COVID-19 outbreak.

2.1 Conceptualising the DD

2.1.1 – The First Level Divide

The term ‘digital divide’ emerged in the 1990s to define inequalities in access to ICTs, framing it with not having access to ICTs due to a discrepancy in access to technology resources between socioeconomic groups (Compaine, 2001; Robyler, 2003, p. 191). Even though it is a relatively new phenomenon, research on the DD has “created its own literature and [has] gained the reputation as a legitimate academic field” (Wang, McLee & Kuo, 2011). Despite its rapidly increasing recognition in the onset of technology, there is not a clear and distinct definition, as well as there not being a specific scholar that coined the term.

In the early stage of its discourse, access to the Internet and ownership of ICTs was seen by scholars as the crucial factor in denoting digital inequalities, with most literature heavily distinguishing the divide between two different social groups; the so-called information “haves” and “have nots” (DiMaggio & Hargittai, 2001; Van Dijk, 2005). Castells (2002, p.269), considered to be one of the key scholars in the digital world, defined the divide as “the inequality of access to the Internet” and suggested that it is “not measured by the number of connections to the Internet, but by the consequences of both connection and lack of connection”.

This binary identification that masked the first level of the divide fundamentally reduced the phenomenon to a technological and economic issue, where the social implications of a DD are underestimated and undervalued (Ragnedda, 2019). It theoretically considered that the differences of accessibility to ICTs will gradually disappear due to socioeconomic transformations, where global technology adaptation with reduced prices and more accessible interfaces would decrease any divide (Compaine, 2001). However, defining the divide in

such simplistic terms sounds problematic and fails to understand its multidimensionality, as well as the exclusion of necessary factors (Warschauer, 2002). Accessibility alone cannot value neither how much users benefit from the Internet, nor what users do online. This standardised approach, may be useful for its time in describing the adoption of ICTs, but is impractical in labelling a DD, as it fails to analyse the socioeconomic and sociocultural inequalities that are present in the base of the differences in accessing the Internet (Ragnedda, 2019).

2.1.2 – The Second Level Divide

The first level of the divide was long seen as the most practical way in assessing the vast difference of inequalities in accessing the Internet and that the problem would be solved when a country's Internet rate reaches saturation. However, a wave of theoretical research in recent years has called for the reconsideration of the DD's restrictive one dimensional notion, arguing that such a complexed phenomenon cannot be analysed by one point of view (Dewan & Riggins, 2005; Fuchs, 2009; Van Dijk, 2006). With the divides in Internet skills and type of use continuing to expand even after physical access is becoming more universal (Van Duersen & Van Dijk, 2019). Therefore, from this observation that social cleavages are not essentially depicted to access to ICTs, the second level divide offers a more multidimensional approach and focuses on digital skills and the actual use of ICTs (Dewan & Riggins, 2005). This new path centres more around material access than physical access, concentrating on the instrumental and creative skills, as well as communication abilities (Correa, 2010; Duersen & Van Dijk, 2019; Van Dijk, 2006).

The transition in the portrayal of the DD from a dichotomous division to connect digital inequalities to social inequalities has transformed it from a technological problem towards a social problem (Ragnedda & Muschert, 2013). Users who find themselves in a position of social advantage tend to consolidate these privileges to the detriment of social categories slower to adopt and properly use new technology (Ragnedda & Muschert, 2016). However, the description of what classification skills constitutes as necessary digital skills has been argued and effectively changed over the years. It was soon realised that there are several dimensions of these skills and not only basic use skills and their value varies depending on social circumstances (Duersen & Van Dijk, 2010).

2.1.3 – The Third Level of Digital Divide

Unlike the first two levels of the DD, which concern access and the use of ICTs, the third level refers to the differences in the ability to mobilize digital resources to achieve specific objectives (Aissaoui, 2021). Scholars have determined the ‘digital skills’ that are present in the divide are not just simple skills, but should also include the capacity to search for meaningful information, managing professional contexts online, be aware of the potentialities of ICTs and increase social and cultural capital (Ragnedda, 2019). In simpler terms, in this digital epoch, motivation, education and the quality of information that is acquired online have consequences for life opportunities in the social realm.

As Ragnedda (2019) emphasises, this third stage of the DD offers an amalgamation of the previous stages, tied with the already existing social inequalities. However, it also moves away from just an individualistic standpoint to also an aggregate level, where the problem of technological adoption is tackled with productivity and economic growth (Aissaoui, 2021; Duersen & Helsper, 2015; Pradhan et al, 2018). There was an important shift of not just looking at individual implications to the DD but also social aggregate implications.

Furthermore, the opportunities opened up by the Internet are not exploited due to the political, cultural and economic environment. Roberts and Hernandez (2019) support this point in their study, explaining how the existing literature on the DD is vague, with the attention resting on the binary identification. Further arguing the simplicity of binary identifications, suggesting that they disguise more than they reveal and that it is more accurate and analytically useful to recognise that multiple classes of technology exist. The ‘5 A’s of Technology Access’ framework that they impose in their research looking at availability, affordability, awareness, ability and agency is an effective analytical structure to use as it helps to decentre technology elements and highlights social and political factors that might limit technology access. This thesis is a great example to denote the third level of the DD as it attempts to identify digital inequalities by looking at social implications for the individual as well as their setting and environment.

2.2 Bridging the DD – ICT4D initiatives

In the onset of increasing technology, development organisations, governments, non-governmental organisations (NGOs) and private companies have invested in ICT projects to bridge the DD gap and foster economic development in developing countries. These efforts have sought to implement ICT and internet infrastructures as well as providing devices, software and training to emerging market countries. However, information and communication technologies for development (ICT4D) projects have achieved limited success in achieving their development objectives. The reason for this failure has been debated in connection to the different levels of the DD and if ICT4D projects conform to the requirements for achieving socioeconomic impacts and not just achieving statistical improvements of generalised access.

When implemented successfully, these ICT4D projects can yield positive outcomes. Yet, such success stories are few and far between, particularly due to inadequate sustainability (Best & Kumar, 2008). The reality is that most ICT4D projects are initiated by researchers in the Global North (developed nations in the Northern Hemisphere) in an attempt to assist development in the Global South (developing nations in the Southern Hemisphere) which underscores the existence of these power imbalances (Galperin, 2010). Multiple factors within the discourse explain the common failure of these projects. Chipidza & Leidner (2017) explore these dynamics, finding that ICT4D literature lacks the connection of ICT use and development with projects characterising development differently: 1) development as expanded digital inclusion, 2) development as increased economic productivity, 3) development as expanded freedom, and 4) development as increased well-being. Further suggesting that power asymmetry under the lens of post colonialism might lead to beneficiary communities resisting further ICT interventions.

Moreover, Kleine (2010) further examines the common failure of ICT4D projects and suggests within her work that instead of attempting to make ICTs fit with a formulation of impacts and economic growth in development, the ICT4D field should be used as an example of a development process which needs to be ‘analysed in a systemic and holistic way’. Further, identifying a Choice Framework that encapsulates Amartya Sen’s capability approach (CA) to offer a different method of thinking about development as an individual freedom rather than economic growth. In terms of ICT4D, the CA looks at the contribution that technologies may have in terms of increasing the capabilities and functionality of citizens

in their society (Hatakka, 2013). Although the CA approach used in ICT4D projects does aim to tackle social, cultural, economic and political problems, other differing obstacles can hinder its implementation. As Thapa & Sæbø (2014) suggest in their ICT4D project review, conversion obstacles such as illiteracy, poverty, a lack of physical infrastructure and political pressures can hinder the relationship between ICT (means) and capabilities (freedom to achieve). Furthermore, they also add how individual preferences and their ideologies can interfere with the desired functionality of the implementation. For example, a farmer could be given such priority of digital technology but would rather learn about farming than computers. This opportunity could have been shared with another citizen that would use the technology more effectively. Consequently, the social, cultural, religious and political contexts are essential and need to be taken into account when designing ICT4D projects.

Furthermore, there is also a relatively detailed amount of literature referring to the inequities that come with the interventions of technology innovation. Fang et al. (2019) explore this view of privilege, revealing in their analysis that sociodemographic factors that shape internet access are determined by factors including education, income, age, gender, disability status, immigration status and urban/rural residency. Suggesting that these factors are connotations that lead to the distinct positionalities of privilege and wealth. In comparison, Calderón Gómez (2019) also shares this understanding, proposing the concept of 'technological capital' as a means of placing a person's socioeconomic conditions in line of accessing internet resources.

Moreover, in a modern reality where internet dependency has become crucial to fulfil basic tasks, multiple theories have sought to explain how internet access could attain the status of basic right. This technological development goal, although currently unrealistic, offers a target in development for the first level divide to be depleted so the notion of connected or disconnected can be diminished. Reglitz (2019) argues this development goal that through recognising the importance of digital access as a component for social and cultural inclusion, the Internet should be a basic human right, provided publicly to those who cannot afford it. Accepting this claim transforms a global perception of the Internet from technology to that of a basic right. Voitsikhovskiy (2021) further explore this view, suggesting that an adoption of the Internet as a human right would inevitably allow individuals to exercise other human rights, such as the right to information, freedom of speech, the right to education and the right to freedom of assembly and association. Moreover, there needs to be a philosophical and psychological transition of the notion of internet access to being considered a universal

entitlement rather than a luxury. Other approaches have suggested that international customary law could apply yet despite repeated claims by international institutions to address modern digital challenges through a human rights lens, this assortment of legal approaches has failed to garner a consensus view in the international community. Shandler & Canetti (2019) reviews merits of these arguments, suggesting an auxiliary right hood is the most promising approach but further research is required to substantiate these claims.

Fundamentally, this approach is an adequate method in achieving a universal connection of the Internet. Yet, this argument is difficult to fully adopt as development goals such as obtaining clean drinking water and the end of malnutrition for all remain unachieved.

However, it a futuristic development goal that is not unreasonable when we live in a society that is so dependent on online connectedness.

2.3 Digital Divide in context – In education and COVID-19

The current COVID-19 pandemic has exposed the discourse present on the DD and has called for an urgent re-evaluation of the components of the early stages of the divide. This has come due to the generalisation of access to ICTs in the world where attention has changed towards the inequalities of use and digital skills (Duersen & Van Dijk, 2018). Our current experience with the pandemic shows how precarious ICT access is in many countries and regions in the world as the movement online of essential activities has took an inadequate internet service from inconvenient to an absolute emergency (Lai & Widmar, 2021). It has revealed significant importance in terms of e-skills between professors, students, workers, businesses etc. Access and digital skills are two instrumental components that need to be revisited in bridging the gap of the DD. Subsequently, the pandemic has unintentionally questioned a new level of the divide that combines the existing third level divide with a revisit of the first and second levels of digital skills and accessibility.

Although literature regarding these e-skills and access dependencies during the pandemic is scarce due to its modernity, some pieces of literature have highlighted the inevitable inequalities existing among learners through this disruption of education. Azubuike et al. (2021) explored these imbalances for children in Nigeria, highlighting a relationship between

the socioeconomic status and the DD in accessing remote learning. Moreover, concluding there were significant differences among students in their access levels to remote learning. Additionally, Zeleza (2021) also examines these educational challenges exposed by the pandemic in Africa in general, demonstrating the existing deficiencies that have been exposed. Further, suggesting how COVID-19 should be a wake-up call to African universities and countries to strengthen their research capacities, science, technology and innovation systems. Consequently, both studies stress that the DD was and still is evident throughout COVID-19 among countries concerning technological components in terms of access to broadband, electronic gadgets, data costs, digital literacy and overall institutional technological preparedness. This study will explore these disparities and the divide explicit to Sierra Leone and Africa in context and also question whether the existing DD has made inequalities in learning outcomes grow during COVID-19 and/or ultimately whether the DD itself has grown during the pandemic. Furthermore, it will also investigate the perceptions of the students themselves in online education as well as the digital abilities they may possess.

3. Research Context

This thesis explores the educational disruption due to COVID-19 explicitly in Sierra Leone at UNIMAK. Furthermore, it examines if the DD has worsened through the pandemic, underlining the student's internet access levels as well as investigating any digital discrepancies that are in place. This section outlines the research context of Sierra Leone, describing its disruption to education as well as the current digital components and statistics in comparison to the rest of the world.

3.1 Disruption to Education in Africa and Sierra Leone

Universities in Africa are among the worst affected from the pandemic and least able to manage due to their pre-existing capacity challenges. One of which alludes to the poor state and maintenance of physical and technological infrastructures with these challenges also compounded by worsening financial strains (Zezeza, 2021). Closing of university campuses affected all aspects of universities with their revenues from auxiliary services plummeting, student enrolment and government funding decreasing and philanthropic donations falling (Zezeza, 2021).

UNIMAK was one of these universities affected as education was mobilised. The pandemic made the university close its campuses and enforce online teaching.

3.2 Current Digital Trends in Africa and Sierra Leone

Over the last few recent years, the region has seen a steady, albeit small increase in most areas of ICT infrastructure, access and use. The 'Digital Trends in Africa 2021' publication by the International Telecommunication Union (ITU) outlines this continued progress, highlighting major improvements across the continent in these areas (ITU, 2021). Overall, the percentage of the population in the region that lives within reach of mobile cellular signal, is estimated to be at 88.4 %, with just over 77% now within reach of a 3G signal. The percentage of individuals using the Internet was 28.6% by the end of 2019, an increase from previous results of 24.8% in 2017. Nevertheless, the ITU database highlights a persistence DD present within the region, indicating there is a very significant gender gap and a

rural/urban divide. In 2019, only 20.2 % of women used the Internet, compared with 37.1% of men. As well as this, only 6.3% of rural households had access to the Internet in 2019, compared with 28% of urban households.

The report also outlines some significant statistics present to Sierra Leone which can be compared and contrasted to the continental figures. As of 2019, 80% of the population is covered by a mobile-cellular network with 60% of the population covered with at least a 3G network. In comparison, this is lower than the continent average of 88.4% and 77% respectively. Moreover, households with a computer at home in Sierra Leone as of 2017 was 6%. These key statistics will be evaluated and compared to the data findings within this thesis, with the most relevant and applicable being compared.

4. Research Design & Methodology

4.1 Research Aims & Objectives

This thesis evaluates the current disruption to tertiary education during the COVID-19 pandemic, looking into the DD in place in education and if the pandemic has impacted this divide. It focuses on student's internet connectivity rates as well as questioning any socioeconomic and sociodemographic implications that might hinder their access to the Internet and current digital skills. It focuses on the students at UNIMAK in Sierra Leone. Accordingly, the following research questions have been identified:

- What are the main socioeconomic implications preventing students from accessing the Internet?
- What are the digital skills that students in developing countries are lacking, and what policy/ ICT4D initiatives are recommended to overcome this divide?
- What are the internet accessibility and ownership rates present at the University of Makeni and are there divides in place across various parameters?
- Has the COVID-19 pandemic changed the perception of the importance of the Internet in education, as well as general life?
- Has the existing DD made inequalities in learning outcomes grow during the COVID-19 pandemic?

These questions are designed to explore the connection between education and the Internet, where a huge dependency has been placed on student's internet services to be able to access their education from home. They investigate the factors impacting online participation for students and also question the notion of a DD in education and if this has worsened through the pandemic. Consequently, in order for these research questions to be achieved, this thesis shall be guided by the following research objectives:

1. To explore the rates of student internet accessibility during the COVID-19 pandemic
2. To understand the complexities and differences in student's socioeconomic implications that prevent them from internet access and digital skills
3. To assess the gender and rural/urban DD in education and see if the COVID-19 pandemic has exacerbated this divide

4.2 Placement Organisation

The University of Makeni (UNIMAK) is a private university situated in the Northern Province of Sierra Leone. It places social development at the heart of its main ambition, aiming to implement a common ethical praxis for all dimensions of development in Africa through the excellence of education (UNIMAK, 2021).

4.2.1 Virtual Placement & Research Assistants

Due to the current COVID-19 restrictions for global travel, this project had to be undertaken virtually with the help of research assistants located in the study setting. These research assistants consisted of two students studying themselves at UNIMAK and a research supervisor, who is a teacher at UNIMAK that overlooked and also assisted with the research. Their role within the study was significant, as they helped with the data collection aspect, of which could not be achieved virtually (See 4.3 Data Collection).

4.2.2 Research Location

This study was conducted across the two UNIMAK campuses: the Fatima Campus, which is the main campus, located in Makeni and the Sylvanus Koroma Campus based in Yoni. Each campus specialises in different programmes of study and are only located 10 km apart which made it easily accessible for the research assistants in data collecting (Author of this Thesis, 2021).

4.3 Data Collection

The data collected for this research was taken between June and August 2021. It employed a mixed methods approach in the form of two differing surveys: a quantitative sampling survey, followed on by a qualitative questionnaire. The quantitative survey was used as a broad sampling tool to identify students with differing internet access rates across multiple educational departments. This analysed the values across the whole university and gave us a sample size for the second survey. It was not feasible to collect more detailed information

from the entire population of interest, therefore, a subset of the population based on differential results from the sampling survey was used as an estimation to reflect the entire population (Ponto, 2015).

The research assistants were in charge of the data collection for this study. After communicating with them to see the effectiveness and their opinions of the research questions and design, both surveys, along with the consent forms and participant information sheets, were sent to the research assistants for them to print out and begin accumulating the results. They visited the students at the university across both campuses and collected these results on the printed sheets after consent and an acknowledgement of their participation was given.

The combination of the two different methodological surveys enables a broad example to be quantitatively and qualitatively analysed (Clark et al., 2008). As well as providing methodological flexibility, this approach was the most effective way to see statistically the access numbers at the university but also to explore the socioeconomic implications that might be generating a divide (Wisdom & Cresswell, 2013).

With total consideration to the theoretical discourse that surrounds the DD, this research used the 5 A's of Technology Access Framework as imposed by Roberts & Hernandez (2019) when devising the survey questions. Consequently, it ensures that the survey questions inspects the 5 A's suggested in this Framework: availability, affordability, awareness, ability and agency. Subsequently, adopting this technological Framework within the survey questions enables this research to highlight the social, cultural, economic and political factors that might affect a student's digital capital and capability.

Quantitative Sampling Survey

This survey was the first of two within this research. It was used as a sampling tool to identify different educational departments with a variety of internet access results. The survey employed 5 short questions about age, gender, personal computer ownership levels, monthly internet expenditure and where the student mainly lived during the pandemic when education delivery was online. In asking these capacities, this survey enabled a broad spectrum of internet access levels across the university through various parameters.

Overall, 700 students across 7 faculties responded to the survey. Each 'faculty' represented an educational department with multiple programmes of study. The results were then assessed and 4 different programmes of study with a range of internet access results were used for the second qualitative study (2 programmes with the highest access rates and 2 with the lowest).

To minimise printing material, the survey questions were printed on a table with a maximum of 25 respondents. Each sheet was applicable to a different programme and year of study.

Qualitative Questionnaire

As expressed, the subjects used for this qualitative analysis was dependant on the first survey results.

This survey examined more in depth open ended questions focussing on the student's perspectives of online learning as well as asking about any socioeconomic implications that might prevent their access and digital skills. Furthermore, it concentrated on the more detailed questions that would not have been feasible in the quantitative survey.

Overall, 25 respondents were examined across the four different programmes of study.

4.5 Data Analysis

Methodological triangulation was employed throughout this data collection process. It was utilised to enable a variety of data collection while also verifying research findings (Hammett et al, 2015). Furthermore, as expressed, this enables the data to be quantitative and qualitatively analysed where common themes and patterns are identified as well as statistical averages and possible imbalances (Thorne, 2000; Clark et al., 2008).

In order to prevent potential bias, the fieldwork was taken with only the research questions in mind, without any predictions of the outcomes and prejudice (Sanjari et al., 2014).

During the data collection stage, observations, feelings, reflections on positionality, as well as themes present in the research were noted. Additionally, as the research assistants were helping with the research, I noted any interactions or observations that they also made.

4.6 Ethical Considerations

Ethical complexities is an extremely significant factor in development research that needs to be acknowledged and understood to improve the research process. Even if it is virtual, conducting research in a different social, cultural, economic and political setting needs to adhere to the local, as well as universal ethical moralities (Sumner & Tribe, 2008; Varmus & Satcher, 2018). Research in an educational and development environment that focuses on digital inequalities raises many ethical considerations that needed to be addressed to make this study successful. It is also crucial to be aware of the context-specific power structures involved in the research as well as preventing it from being extractive (Adnan & Akbar, 2019).

Furthermore, as the research was conducted virtually with the research assistants collecting the data, it was imperative that they understood and acknowledged the same ethical considerations. It was also paramount that I, the researcher, did not neglect the ethical treatment of the research assistants and ensured that they did not experience any psychological or social risks involved with their assistance of the research (Naufel & Beike, 2013). This could have been apparent with themselves and other students or even teachers at the university. Therefore, it was crucial these risks were avoided; the research assistants were reminded they could approach myself and the research supervisor if they had any concerns.

Firstly, the ethics application for this research was approved by the Ethics Panel at the University of Sheffield, including the consent form conditions and information sheet prior to the beginning of the data collection. Informed consent was attained from all participants before collecting any results. They were required to read the participant information sheet which explained the research in detail as well as the consent form conditions. Once they had acknowledged their involvement in the study, a verbal agreement was received from the participants to the research assistants to participate. Moreover, they were also informed that they were free to withdraw from the project at any given time.

In addition, common theoretical discourse has indicated the concern on confidentiality of personal data collected during questionnaire surveys (Walford, 2005; Tribe, 2014). Therefore, anonymity was imperative throughout this study to protect the privacy of the respondents especially involving any sensitive information. Moreover, as this was a virtual study with sensitive information being shared over digital applications, the research ensured that all data was protected. Only I and the placement organisation had access to the anonymised data.

The surveys also made sure not to use any offensive, discriminatory, or other unacceptable language which could cause harm to the respondent (Adnan & Akbar, 2019). It also did not exaggerate any research aims or objectives that could manipulate results (Sanjari et al., 2014).

Positionality was also a significant factor within the research. Research concerning developing matters, undertaken by foreign researchers is always subject to preconceptions. These presumptions can develop from one's history, but also to contemporary perceptions of the different level of development of communities and society (Sumner & Tribe, 2008). Moreover, this position in cross-cultural research has encouraged ethical concerns of extractive research (Kouritzin & Nakagawa, 2018). Consequently, several principles of ethical preparation such as anonymity, cultural adaptation, reduced integrity by the researcher and assistants and especially making sure consent is not mistaken for consensus were employed to this research.

However, I realised that my position as a male Westerner, perceived as wealthier and more educated, influenced the interactions with the research assistants. I often felt in a position where I was perceived as the superior, where the research assistants devoted all their time to succeed in collecting data to assist in this research. Although their assistance is extremely appreciated and the research could not have been achieved without them, I feel like this power imbalance could have generated socioeconomic implications for themselves with their student colleagues and teachers. Therefore, following this observation, I made it vital that the research assistants were informed with this concern, making sure that they did not enforce extractive data and that they outlined the fundamentals of the research to the respondents before participating.

Alternatively, the support of the research assistants in the essay also benefitted my positionality as it prevented that cultural adaptation that is a common ethical barrier in existing research in countries produced by a foreigner. The participants could trust the research assistants and be more comfortable in the survey process.

4.7 Limitations

This project encountered a number of limitations that to an extent has developed and transformed the study to how the research was conducted. Firstly, the main inevitable limitation that could not be prevented was that the research was virtual. The study heavily relied on digital communication between myself and the research assistants. Subsequently, this made it imperative that they understood the assignment of the research as well as all ethical considerations so it was completed as the research was ambitious. Yet, it still made it difficult to adapt to any changes or problems with the research as digital communication could be slow and effectively slow down the research. Furthermore, the digital connection between myself and the research assistants sometimes impeded in communications and slowed down the data collection process.

Another limitation regarding the methodology was through the actual format of the quantitative sampling survey. Initially, the questionnaire was meant to be completed by each individual participant on their own sheet of paper to ensure they did not see other student's responses which could manipulate their own. However, this was unrealistic due to the size of the survey as well as printing costs. Therefore, through communication with the research assistants, it was agreed to minimise the usage of paper and to have space for 25 respondents on two sheets of paper. This adaptation effectively transformed the survey making it more economically friendly but also enabling the survey to collect more results increasing its liability and accuracy.

5. Research Findings & Discussion

5.1 Quantitative Sampling Survey Results & Analysis

To examine the research questions and objectives, the most effective way to dissect the survey findings was to see the differing factors and parameters of results. Accordingly, the following findings in the differing factors best analyse the internet accessibility rates from the first survey:

Educational Departments (faculty)

The results highlighted various findings across the different educational departments that were assessed, as well the main findings of this sampling survey identifying the departments with the least internet and data component levels as well as the departments with the most.

As illustrated in Figure 1, the *Postgraduate* and *Mass Communication & I.T.* departments had the highest computer ownership rates with 74.67% and 29.36% of students having a computer at home connected to the Internet respectively. In contrast, the *Humanities & Religion* and *Agriculture & Food Sciences* faculties had the lowest rates of internet connected computer ownership levels with 6.25% and 13.43% respectively. Education was another department that was assessed but was not included as it did not collect enough responses to show reliable results.

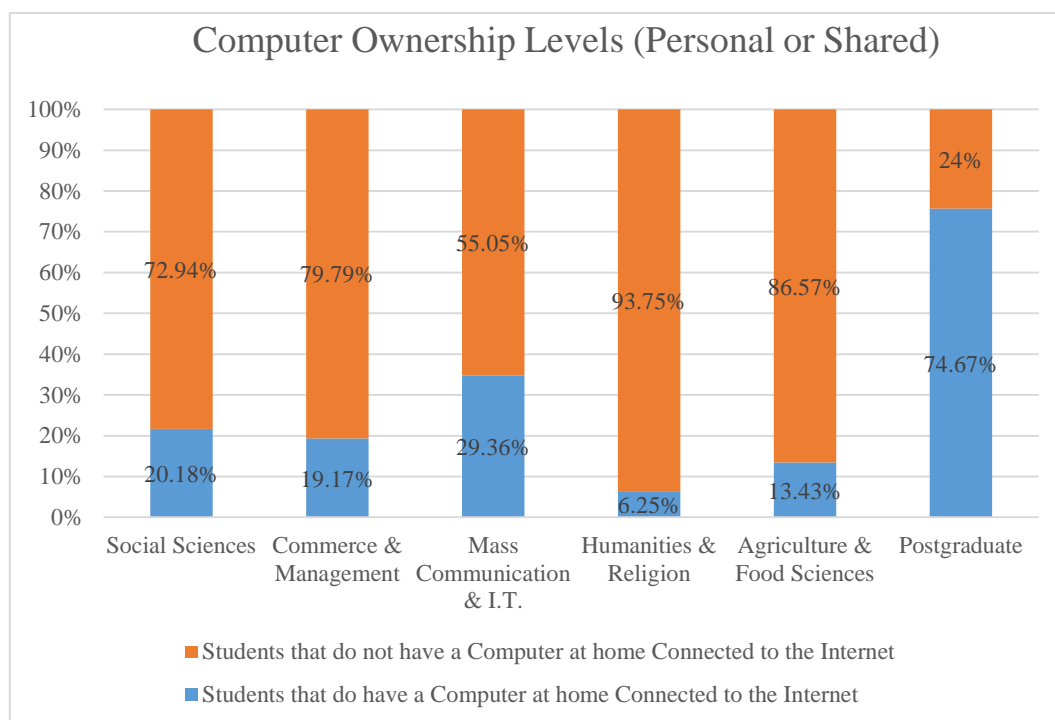


Figure 1 - Computer Ownership Levels within each Faculty at the University (Author of this Thesis, 2021).

Moreover, Table 1 highlights the monthly average spending on phone and data costs. Interestingly dissimilar, the *Social Sciences* department had a higher monthly average of £12.87 compared to *Mass Communication & I.T.* with £9.86. However, the Postgraduate faculty still had the highest result with an average of £17.27. The lowest results also stayed constant with *Humanities & Religion* and *Agriculture & Food Sciences* having the lowest averages of £7.08 and £5.00 respectively.

Table 1 - Computer Ownership Levels & Average Monthly Data Costs for Students at UNIMAK (Author of this Thesis, 2021).

Department of Education	Average Monthly Spending on Phone & Data Costs (SLL)	Average Monthly Spending Converted to GDP (1 SLL = £0.00007)
Social Sciences	183,862 SLL	£12.87
Commerce & Management	118,211 SLL	£8.27
Mass Communication & I.T.	140,886 SLL	£9.86
Humanities & Religion	101,094 SLL	£7.08
Agriculture & Food Sciences	71,448 SLL	£5.00
Postgraduate	246,689 SLL	£17.27

- From the assessment and evaluation of these results, it was determined that the *Postgraduate* and *Mass Communication & I.T* departments would be subjects for the second qualitative survey with the depiction of the highest digital users. Alternatively, the *Humanities & Religion* and *Agriculture & Food Sciences* departments were chosen as the lowest.

Conclusively, these results did not indicate any alarming elements or unpredictable results. The *Postgraduate* and *Mass Communication & I.T.* programmes were anticipated to have the highest digital findings as well as *Humanities & Religion* and *Agriculture & Food Sciences* for the lowest. However, this does not imply that a DD was not present. Ultimately, it seems to be significant and noticeable in the digital dependant studies where students who only have access to computers at the university will have greatly suffered in comparison to the other students who have more accessible devices. In comparison, the DD could also be present at the university through the lower digital rate departments as these students had to rely on other forms of communication with the university. Consequently, the digital exclusion across the university heavily depicts to be an economic DD where a burden has shown on the poorer students.

Gender Differences

The results highlighted significant numbers for gender differences when assessing the internet connectivity and data levels as suggested in Table 2. The average monthly spending on phone and data costs seemed to be indivisible with the male students averaging £10.75 a month and the female averaging £10.59 a month. However, despite their similar spending on mobile costs, gender dissimilarities were present for the computer ownership connected to the Internet data with the male's 32.35% in comparison to 20.86% for women.

Table 2 - Gender differences in Computer Ownership Levels and Student Data Costs at the University (Author of this Thesis, 2021).

Gender	Average Monthly Spending on Phone & Data Costs (SLL)	Average Monthly Spending Converted to GDP	Percentage of Students that do have a Computer at home Connected to the Internet	Percentage of Students that do not have a Computer at home Connected to the Internet
Male	153,549 SLL	£10.75	32.35%	65.78%
Female	151,228 SLL	£10.59	20.86%	73.31%

In comparison, the ITU statistics outlined women's access to the Internet across Africa also to be less, with only 20.2% using the Internet compared to 37.1% of men in 2019. Globally, these rates were increased but the gender disparity was still existent with 48.3% of women used the Internet as opposed to men's 55.2% (ITU, 2021). Although these statistics indicate overall Internet access levels and not ownership rates, both results highlight the male dominance that is existent in technological wealth in developing countries. Studies suggest there can be multiple factors that affect this gender difference. Gil et al (2010) highlights four main barriers that hinder women's access to the ICT use and digital skills: Exclusion from technology education and design; limited free time; social norms favouring men; and financial and/or institutional constraints. These constrictions fundamentally build foundations of the gender divide in technology, exemplifying the desperate need of initiatives to overcome and reduce any divide.

Similarly, these findings have also been outlined in other theoretical studies on the topic indicating the reliability of this research. Rashid (2016) measured the gender differences in the concept of digital inclusion through various factors finding that tertiary education and the ability to use ICTs at home significant. Further, supporting the argument that the issue of digital inclusion needs to be seen in terms of the unique information needs of various socioeconomic groups and in specific social contexts.

As expressed, where ICTs are recognised as having the potential to promote gender equality and women's empowerment, a digital gender divide is still existent. These imbalances during the COVID-19 pandemic have broadened this already existent divide through the enlarged dependency on digital purposes. The constraints suggested by Gil et al. (2010) are components that have worsened during the pandemic creating a further divide. The pandemic has increased the social norms and preconceptions where women invariably bear a disproportionately heavy burden of household and family responsibilities (Power, 2020).

Locational Differences – Rural – Urban

Due to pre-assessed literature and theoretical reading, the results were predicted to identify a rural-urban divide in digital components among students with the ITU data finding that 6.3% of rural households had access to the Internet in 2019 as opposed to 28% (ITU, 2021).

However, the results pictured in Table 3 outline that this was not the reality and there was only a minimal alteration. Yet, although minimal, there was still an obvious variation in the findings, with rural students having less computer ownership levels and yet spending more each month on average with phone and data costs.

Rural/Urban	Average Monthly Spending on Phone & Data Costs (SLL)	Average Monthly Spending Converted to GDP	Percentage of Students that <i>do</i> have a Computer at home Connected to the Internet	Percentage of Students that <i>do not</i> have a Computer at home Connected to the Internet
Urban	151,476 SLL	£10.60	26.37%	68.66%
Rural	154,036 SLL	£10.78	23.71%	73.20%

There are many possible factors that could conclude these results. One obvious reason could relate to the institutional background of a private university in a developing setting. The rural students could account to the wealthier citizens situated in that geographical area. In addition, the fact that they pay more monthly for phone and data costs could account to the weaker signal strength in those areas.

Although this does not paint a picture of a rural-urban DD as existing work suggests, it does identify possible limitations that could be encountered in education through COVID-19. This, relating back to a weak signal strength in rural areas, could be evident, where students could potentially miss out on any important information or online lectures.

5.2 Qualitative Survey Results & Analysis

This qualitative survey examined the social implications preventing students from accessing the Internet and utilising digital abilities. In ensuring the data was analysed and the research questions and objectives were investigated, common themes and patterns were evaluated and portrayed from the data results. Accordingly, the following themes and patterns within this section highlight these common digital disparities found through the data collection:

Economic DD in Education

Data revealed that the most prominent barrier for students in accessing the Internet and engaging in online learning was the cost of digital components with 76% of the students stating that data is too expensive. These costs referred to as data costs could include all different types of digital appliances and networks like phone and computer costs.

Furthermore, it was interesting to evaluate that there was no correlation to the students who said these disparities and to what educational department they were in. Consequently, both students that statistically had more internet accessible rates already and those who did not complained about the data costs. Indicating the need to reduce these costs for the benefit of student's education as well as bridging the DD.

Fundamentally, the results highlighted an economic burden across the DD in education where the economically inferiors are deprived of their access and digital ability. The COVID-19 pandemic has exacerbated this economic DD worsening the already existent divide but also the existing DD inequalities have grown during the pandemic where the economically less fortunate have less chance to access adequate education and the rich have more entitlement and an unfair advantage. Emerging literature also shares with this view. Ingram (2021) explores the digital civilisation in developing countries and suggests that the pandemic is widening the divide, as those with computer skills and internet access are able to continue learning and those who don't fall behind. Consequently, there is an urgent need to bridge this gap.

Moreover, to further support this point, the pandemic has further widened the economic DD and given less chance to the least fortunate as exploitive prices has seen the Internet become even more unaffordable. One of the many consequences of the COVID-19 pandemic is the disruption to supply chains. The disruption from the pandemic globally has led to difficulties in the production and distribution of a number of essential products, leading to supply shortages and increased prices (Kumar et al., 2020). This has been apparent in one of the most dependant markets during the pandemic of digital infrastructure. These productive shortages, along with increased demand has led to exploitive pricing (OECD, 2020). Moreover, the lack of competition for digital access in consolidated markets explicitly in Sierra Leone and Africa has led to an exploitation of costs.

In addition, the increase in internet traffic has led to an acceleration of internet expenditure related to an expansion of capacity that has been developed to keep up with the digital development through the pandemic. However, spending not related to an increase in general digital capacity (internet modernisation) is being postponed (Katz, 2020). This can have concluding effects on the DD and overall digital developing in developing countries where the pandemic has slowed down its progress in internet modernisation and a digital catch up with the rest of the world.

Internet Connectivity and the Priority of Mobile Broadband

A second interrelated barrier to internet access and digital skills was the actual internet connectivity speed and quality of connection. Likewise to the data costs, this result had no association to the different departments with both low and high access faculty students indicating the slow speeds. Furthermore, the results also showed how students pressed for the need of a better internet connection to improve their educational livelihoods.

Consequently, this slow and poor quality of connection can only have widened the gap of the DD in developing countries where the dependency of internet use cannot be trusted. This attribute and an actual lack of overall digital infrastructure has been a prevalent component

attributing to a DD in developing countries for some time. Landlocked countries within Africa are even more unfortunate with their internet connectivity as data throughout Africa is mostly spread by submarine cables (Carter, 2010). Moreover, parts of Africa that are connected are more internet dependant and affluent than the landlocked countries that receive no fibre-optic connection. This lack of infrastructure has influenced the slower digital development in less affluent developing countries and continents. Sierra Leone only has one submarine cable so fibre-optic internet and connection within the country is scarce. This was supported in the research findings with only one student having a fixed broadband connection. Malecki & Wei (2009) expose this view and indicate how submarine cables have not only led to a poor internet connection across the developing world but have also led to new sources of vulnerability. Concluding that the country exposure to submarine cables and the population distance from its landing stations found to reduce internet and mobile penetration rates and increased other forms of internet connection like mobile-cellular tariffs. Overall, the expenditure of the infrastructure outweighed any benefits. Ultimately, the instalment of submarine cables could be an effective means to bridge the DD, yet these challenges persist with regards to the cost of infrastructure as well as the sociocultural vulnerabilities it can generate.

Alternatively, the results also outlined the other means of online infrastructure of a mobile broadband connection to be the most prominent means of getting online for the students. The university seemed to utilise this fairly new concept of connection when education was online through group meetings made on WhatsApp and other mobile communication apps (Author of this research, 2021). Significantly, mobile broadband connection is a modern concept that seems to be the most ubiquitous and crucial component that will bridge the DD in developing communities (Quaglione et al., 2020). They have already strengthened the availability rates and weakened the DD for general access in the last few years. Yet, mobile use does not lead to a digital inclusion as it is currently constituted as lower levels of skills in comparison to those who have a computer (Correa et al., 2020).

Conclusively, mobile broadband connection is the most feasible method that constitutes students to internet access. Even though currently this can generate a DD in education where students cannot fully access all materials online, an improvement in accessibility and strength of satellite connection could potentially bridge the divide for the future in the most practical way.

Lack of Digital Skills

As already expressed, recent theoretical discourse on the DD highlights the significance of measuring an individual's digital skills as a component of their digital capability. With scholars outlining unequal online skills (Hargittai, 2002; Zillien & Hargittai, 2009). The core perception of this phenomenon was that having physical access was useless without the requisite skills, knowledge and support for effective use and that the DD was not just technological but also social, economic and cultural problem. This usage gap has been ever-present during the COVID-19 pandemic particularly in education through the induction of e-learning as well as the dependency to acknowledge online teaching. Ultimately, digital literacy constitutes to the basis of citizenship in order for the effectiveness of a modern society.

This has been an obvious component that has inevitably widened the DD. Moreover, the data within these results highlighted that many students felt like they were missing necessary digital skills when completing online work or accessing digital appliances. Further, many students indicated they were knew the basics of controlling the Internet and digital software but found it crucial to learn more for their education. Subsequently, the existing DD has inevitably increased among digital learners where the more advanced users have had updated experience in the digital epoch and the ones with lower digital skills have missed out on information and knowledge. Furthermore, the dependency on these set of skills and competences integrating digital literacy are expected to be guaranteed in tertiary education. This associates not only to student's digital skills but also to the teachers and their education of online delivery. The importance of digital literacy is substantial in students having the capabilities for an effective education (Zulkernain et al., 2020).

Studies highlight this ineffectiveness in higher education, with (Tejador et al., 2020) concluding there needs to be a rethink amongst higher education learning and to reinforce main issues for this transformation, mainly: communication, teaching and digital competences. Otherwise, digital literacy is not guaranteed and higher education is not accomplishing its main objectives.

Conclusively, to bridge the skill divide in the post COVID-19 era, there has to be improvements in digital learning in both formal and adult education. Van Dijk (2020, p. 138) identifies the need for an educational perspective when increasing these digital skill divides,

outlining four main ways of achieving this bridge: The integration of digital literacy in all forms of education to students but also teachers, promoting digital adult education in public places (aimed specifically at the older generation), job training should include it where applicable and stimulating Internet users to learn skills on their own.

Although these recommendations occur before the pandemic was relevant, these points are even more substantial in achieving a fairer digital society as the pandemic has exacerbated the divide exposing these inequalities. Consequently, digital skills should be a necessity to training in education especially within this modern world. These components also attribute to the concept of the Internet as a basic human right. The pandemic has definitely strengthened this argument where students and life in general will lose out on social and cultural development if they have no digital literacy.

5.3 Solutions to Mitigate the DD

The results have exposed the DD in education and has called for a reassessment of policy perspectives and ICT4D initiatives aiming to bridge this gap. Although the phenomenon as a whole is too complicated to be approached with a single or limited strategy, there are multiple perspectives that can be outlined (Van Dijk, 2020).

One standpoint that can be met is a technological perspective, with the goal of distributing digital technology in society. In simplistic terms, this ideally looks at internet infrastructure and access, aiming to connect the unconnected. This is apparent due to the exposure of the first level divide the pandemic has generated, where general access to the Internet has been significantly more important. As expressed in previous sections, one main way of connecting the most vulnerable to digital society could be from the influx of satellite connection. The findings already addressed the basic skills that these provide, but there needs to be an improvement on satellite connection making it even more available and stronger. Wireless technology in general is fast becoming a necessity to a modern society, therefore it is crucial to meet these requirements and bridge the gap.

Secondly, is an educational perspective. This study emphasises the importance and significance of digital skills in a general society and explicitly in education. It stresses the importance of digital education in a formal and general setting. This adoption is just as important as technological infrastructure but one cannot work without the other.

Technological adoption has to be met with an education of digital skills (Davies & Eynon, 2018). Additionally, these perspectives bring the point on to the third perspective that needs addressing, the social inclusion. Although an inclusion is a perceived result of an educational and technological standpoint, a social perception focusses more on social and political digital acceptability. In order to bridge the DD, governments and organisations need to acknowledge the importance of internet access and ability and include it as a component in general life.

These perspectives offer a viewpoint of the components policy initiatives and global digital financial platforms will have to focus on to bridge this divide.

6. Conclusions

This dissertation aimed to investigate the internet access rates and digital capabilities in education in Sierra Leone and to explore the digital inequalities and implications that make up the DD in a developing country. It further questioned whether the COVID-19 pandemic has impacted this divide. It revealed multiple barriers for students in their access to the Internet, with unaffordable data prices, a weak internet signal and ineffective digital skills all contributing to a technological imbalance among students when education was online. Moreover, these components and constraints also revealed another significant finding that the COVID-19 pandemic has exacerbated this divide and exposed the inequalities of students with low internet access rates and digital skills. In addition, the interpretation of the data through the pandemic has called for the re-evaluation of the DD concept especially referring to the first and second level divides. It has echoed the significance of general access to the Internet as well as digital skills.

In consideration of these differing components of an increased DD under the pandemic, this essay also analysed the data indicating several means for future recommendations to bridging the gap. Moreover, it stressed the importance of evaluating three different perspectives when looking at solution to bridge the DD: a technological, educational and social perspectives. A technological perspective is inevitable but substantial to achieving these objectives, with it being crucial to address the issue of technological infrastructure and capital. However, this would be beneficial without the second perspective with the notion of education. It is imperative that digital education is also addressed to overcome the digital literacy divide. In amalgamation, these perspectives create a binary focus that lays the foundations to achieving a social perspective where digital inclusion is inherited into society, politics and the economy. Fundamentally, the notion of the Internet being provided for everyone possibly as a basic human right needs to be accepted for this social perspective to be fully completed.

These conclusions should not be viewed in isolations of the methodological limitations of the research. Although the sample size for the first survey was substantial, the sample size in the second qualitative survey was relatively small. Also, the research was grounded only to one university representing a mass amount of other students. Therefore, these generalisations should be made extremely cautious when evaluating this data. As a result, it is key that future research can make these comparisons across multiple institutions and educational

establishments. It would be beneficial to potentially compare this data with the same digital variables to other universities in Sierra Leone but also the rest of Africa and the world.

Future academics should definitely further question the Internet as a significant component of sustainable development. We are living in a digital civilisation where not having digital skills and access to the Internet is preventing social, cultural and economic development. Future academics can build on these foundations, enabling the transition of the Internet being a luxury to a crucial necessity.

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