The SpaceX Starlink Satellite Project: Business Strategies and Perspectives

Article *in* Corporate and Business Strategy Review · January 2024

DOI: 10.22495/cbsrv5i1art3

2 authors:

Yarnaphat Shaengchart
Rangsit University
19 PUBLICATIONS **59** CITATIONS
SEE PROFILE

Tanpat Kraiwanit
Rangsit University
104 PUBLICATIONS **473** CITATIONS
SEE PROFILE

THE SPACEX STARLINK SATELLITE PROJECT: BUSINESS STRATEGIES AND PERSPECTIVES

Yarnaphat Shaengchart *, Tanpat Kraiwanit **

* Faculty of Economics, Rangsit University, Pathum Thani, Thailand
** *Corresponding author*, Faculty of Economics, Rangsit University, Pathum Thani, Thailand
Contact details: Faculty of Economics, Rangsit University, 52/347 Phahon Yothin Road, Muang Eke, Pathum Thani 12000, Thailand

How to cite this paper: Shaengchart, Y., & Kraiwanit, T. (2024). The SpaceX Starlink Satellite Project: Business strategies and perspectives. *Corporate & Business Strategy Review, 5*(1), 30–37.
https://doi.org/10.22495/cbsrv5i1art3

ISSN Online: 2708-4965
ISSN Print: 2708-9924

Received: 10.02.2023
Accepted: 04.01.2024

JEL Classification: A10, O21, O33, O50
DOI: 10.22495/cbsrv5i1art3

Abstract

Starlink will transform the world by providing Internet access to people in remote areas where ground infrastructure cannot be built (Jessica, 2022a). This study aims to explain the impact of the SpaceX Starlink Satellite Project on global and local Internet providers. The study employed a qualitative methodology, including in-depth interviews with ten selected key informants, chosen using purposive sampling. The collected data underwent thorough content analysis using the NVivo software. The findings revealed that Starlink, a satellite Internet constellation operated by Space Exploration Technologies Corporation (SpaceX), may have an effect on both global and local Internet providers. The Starlink Internet service has already proven its worth in Ukraine and Tonga. In Thailand, it may provide one of the best Internet connections in the world. Fibre Internet coverage is already available in major areas due to fierce competition among Thai service providers, and Internet service fees in Thailand are relatively low compared to Starlink's service fee. Hence, Starlink's Thai customers appear to be a subset of the population living outside the high-speed Internet service area with some financial resources. Starlink should devise an effective marketing strategy to entice users in countries where fibre Internet is more affordable and convenient to migrate to a satellite Internet service.

Keywords: Starlink, Satellite, Fibre, Internet Provider

Authors' individual contribution: Conceptualization — Y.S. and T.K.; Methodology — Y.S. and T.K.; Software — Y.S. and T.K.; Validation — Y.S. and T.K.; Investigation — Y.S. and T.K.; Resources — Y.S. and T.K.; Writing — Original Draft — Y.S. and T.K.; Writing — Review & Editing — Y.S. and T.K.; Supervision — T.K.

Declaration of conflicting interests: The Authors declare that there is no conflict of interest.

1. INTRODUCTION

In a rapidly evolving world, the dimensions of our lives — be they social, political, or professional — are intricately interwoven with connectivity. This synergy has led to an explosive proliferation of innovative devices. With the impending advent of 5G and the Internet of Things (IoT), seismic transformations loom ahead. Societies are poised to thrive within smart cities, wearable technology will empower individuals to take charge of their health, and the domains of intelligent agriculture and fishing promise a safer environment. In the ceaseless race for technological supremacy, the US Federal Communications Commission (FCC) partnered with Space Exploration Technologies Corporation (SpaceX) to birth a grand project named "Starlink", entailing the deployment of a constellation comprising 12,000 low Earth orbit (LEO) communication satellites. Utilising phased array antennas for up- and downlinks, Starlink endeavours to bestow the global populace with low-latency, high-bandwidth coverage (Fourtané, 2018; Kokez, 2020).

However, since SpaceX's inaugural launch of Starlink constellation satellites in May 2019, the astronomical community has voiced apprehensions regarding the potential ramifications for astronomical observations. Presently, the Starlink constellation encompasses 1667 LEO satellites, as of November 9, 2021, with 124 satellites having either reentered Earth's atmosphere due to malfunctions or been deliberately retired. These satellites are launched in clusters of up to 60 per launch, with 14 such batches deployed in 2020 and an additional 17 launched in 2021.

Amid concerns that extensive LEO satellite constellations could adversely impact astronomy and render certain orbits perilous, the potential drawbacks may be deemed acceptable if these constellations yield substantial advantages. The prevailing rationale often centres around the acute global demand for accessible and affordable Internet connectivity. This undeniable need has prompted SpaceX to extend free beta Starlink Internet to underserved communities, including emergency responders and the Hoh Tribe in Washington. Nevertheless, it's crucial to note that furnishing free Internet access to marginalised communities is not the primary objective of Starlink, nor is it a sustainable business model (Rawls et al., 2020).

Starlink, an innovative satellite Internet service developed under the aegis of SpaceX, a company helmed by Elon Musk, has fundamentally altered the Internet landscape. The mechanics of Starlink's functionality involve the transmission of data signals between a multitude of LEO satellites positioned overhead and ground-based gateway stations. In the United States, Starlink has rapidly ascended to become the third-largest satellite Internet provider. The impressive reach of Starlink's satellite service encompasses the entire expanse of the United States, making it potentially accessible to a substantial portion of the population. On a global scale, Starlink's impact is even more substantial, boasting over one million active subscribers across 54 countries. The evolving coverage map of Starlink visually underscores its expanding footprint of Internet accessibility. With 3,580 LEO satellites in orbit as of February 2023, SpaceX Starlink has succeeded in blanketing various regions with Internet connectivity.

Presently, Starlink extends its services to 36 countries, primarily targeting areas with limited coverage. Notably, its commitment extends to bridging the digital divide within the United States, with plans to offer coverage to the entire continental nation by the culmination of 2023. Evidencing its prowess, Starlink has delivered remarkable Internet speeds, with Lithuania experiencing a median download speed of 160 Mbps during Q1 2022. Similarly, commendable speeds have been recorded in other regions: 91 Mbps in the United States, 97 Mbps in Canada, and 124 Mbps in Australia. Notably, in Mexico, Starlink stands out as the North American region's swiftest satellite Internet provider, boasting a median download speed of 105.91 Mbps (Cooper, 2023).

Jessica's (2022b) research underscores the transformative potential of Starlink, a constellation of LEO satellites orchestrated by SpaceX to democratise broadband Internet access, transcending geographical barriers. In remote locales where conventional ground-based infrastructure proves unfeasible, Starlink emerges as a harbinger of change, offering the prospect of universal Internet access. The prominence and intrigue surrounding the SpaceX Starlink Satellite Project stem from its audacious objective of establishing global broadband coverage through an intricate satellite constellation.

While the project is relatively new and ongoing, there have been few studies and assessments conducted on its potential impact on global and local Internet providers. Therefore, this study aimed to determine such impact of the SpaceX Starlink Satellite Project, using a qualitative method. Purposive sampling was deployed to conduct in-depth interviews with ten key informants. The data was analysed using NVivo and content analysis. In Ukraine and Tonga, the Starlink Internet service has already proven to be valuable. It has one of the best Internet connections in the world in Thailand. As a result of fierce competition among Thai service providers, fibre Internet coverage is already available in major areas, and Internet service fees in Thailand are relatively low when compared to Starlink's service fee. Therefore, Starlink's Thai customers appear to be a subset of the population who live outside of the high-speed Internet service area and have some financial means. Starlink should develop an effective marketing strategy to entice users to migrate to a satellite Internet service in countries where fibre Internet is more affordable and convenient.

Thus, the research question can be formulated as follows:

RQ1: What is the impact of the SpaceX Starlink Satellite Project on global and local Internet providers?

The structure of this paper is as follows: Section 2 reviews the relevant literature, Section 3 analyses the methodology, Section 4 gives the study result, Section 5 discusses the finding of the work and Section 6 concludes the research work.

2. LITERATURE REVIEW

Elon Musk and SpaceX have gained global recognition, as highlighted by Walker and Elliott (2021), for their persistent endeavours to usher in a new epoch of space exploration. The inception of the SpaceX Dragon initiative marked a watershed moment in 2012, as it was the pioneer project to ferry cargo to and from the International Space Station (ISS). In 2015, they made headlines anew with the triumphant reentry and landing of their Falcon 9 rocket within the Earth's atmosphere. Building on this achievement, SpaceX achieved yet another feat in 2016 by successfully landing Falcon 9 autonomously on a barge at sea. Subsequent refinements have elevated the technology to a point where Falcon 9 rockets can now be reclaimed and reused after both launch and landing. Elon Musk, in 2015, set his visionary gaze on a fresh aspiration under the banner of Starlink: a comprehensive overhaul of the broadband Internet landscape. In Musk's perspective, the Starlink initiative is tantamount to "rebuilding the Internet in space". The central mission of Starlink revolves around furnishing "high-speed, low-latency broadband Internet" to attain nearly global coverage. These

ambitious aims, however, are not bereft of a strategic blueprint. Starlink's ambition of achieving worldwide coverage hinges on a mega-constellation comprising thousands of diminutive satellites. While the US FCC initially sanctioned 12,000 satellites in LEO, a subsequent application submitted in late 2019 seeks to augment this number by an additional 30,000 units. Each satellite weighs approximately 500 pounds and maintains an orbit at an altitude of nearly 350 miles above Earth's surface. Notably, traditional satellite Internet relies on significantly larger spacecraft positioned in orbits exceeding 22,000 miles above the planet's surface, historically resulting in subpar connection quality. Upon fruition, the substantial assembly of satellites and their relatively shallow orbits will facilitate high-speed Internet accessibility for users spanning virtually every corner of the world. A salient virtue of this initiative lies in its ability to serve rural and remote locales that have traditionally been marginalised due to the absence of conventional broadband infrastructure. However, it's noteworthy that the expansion of Starlink could inadvertently contribute to the escalating issue of space debris (Henry, 2019; Pultarova & Howell, 2023).

As reported by Cooper (2023), Starlink distinguishes itself through its transparent and straightforward approach to Internet deals and pricing, devoid of hidden fees. The service offers a quartet of plan options, detailed in Table 1. Within these options, customers encounter the *Starlink Residential* Internet plan, which entails a monthly fee of $110, and *Starlink RV* Internet plan, priced at $135 per month. These plans deliver download speeds reaching up to 200 Mbps, coupled with a hardware fee of $599 that encompasses the dish, router, and associated cables. The *Starlink Business* Internet plan contrasts this with a monthly charge of $500, supplemented by a one-time hardware cost of $2,500. On the maritime front, the *Starlink Maritime* Internet plan is available at a monthly cost of $5,000, encompassing an initial investment of $10,000 for two high-performance Starlink dish terminals. Both the *Starlink Business* and *Starlink Maritime* plans provide access to download speeds of up to 350 Mbps. Diverging from customary satellite companies, Starlink maintains a policy against permitting subscribers to lease their equipment. It's vital to acknowledge that service availability may vary depending on your geographical location. Should service be unavailable, a $99 deposit (or $500 for the *Starlink Business* plan) can be made towards the acquisition of a Starlink Internet Satellite Dish Kit, offering an alternative pathway.

Table 1. Starlink's Internet deals and pricing

Plan name	*Download speed*	*Starting price*	*Data cap*
Starlink Residential Satellite	Up to 200 Mbps	$110 per month	Unlimited data
Starlink RV Satellite	Up to 200 Mbps	$135 per month	Unlimited data
Starlink Business Satellite	Up to 350 Mbps	$500 per month	Unlimited data
Starlink Maritime Satellite	Up to 350 Mbps	$5,000 per month	Unlimited data

Sourse: Cooper (2023).

According to Malik (2022) and Cooper (2023), SpaceX is working to fulfil pre-orders. Delays in service activation are primarily caused by capacity and silicon. Despite the fact that 4,638 Starlink satellites orbit the Earth in a predetermined pattern, certain areas of the planet are less visited than others, limiting Starlink's ability to accept new subscribers. Starlink has successfully completed 70 satellite launches since its operations began in 2019, and the company intends to continue launching at an aggressive pace to increase capacity and fulfil future orders. Silicon supply has become a major topic for Starlink and every other tech company attempting to supply customers with high-tech gadgetry.

Cooper (2023) also stated that Starlink satellite connections currently offer download speeds of up to 350 Mbps. In the future, Elon Musk's SpaceX plans to increase the maximum speed to 10 Gbps. These speeds will necessitate specialised laser technology, which SpaceX is still developing and expanding. Moreover, this technology would enable future LEO satellites to communicate directly with one another via laser while in orbit. Because transmissions of this type travel exponentially faster in space than on Earth, 10 Gbps download speeds may become a distinct reality. Until then, Starlink LEO satellites communicate with gateway base stations on Earth to send data transmissions to their destinations.

Frąckiewicz (2023a) indicated that in recent years, Starlink's low-latency, high-speed Internet service has significantly impacted traditional Internet service providers (ISPs). Customers are increasingly turning to Starlink for its reliable and fast Internet access, creating heightened competition for traditional ISPs. To remain competitive, ISPs are expanding their coverage areas, offering more reliable services, and exploring additional features such as cloud storage and streaming services. However, the long-term viability of traditional ISPs in the face of Starlink's service remains uncertain. Starlink's low-cost Internet service is also disrupting the telecommunications industry, with providers likely to experience reduced profits and market share as customers are enticed by Starlink's affordable plans. This shift is particularly significant in rural and underserved areas, where Starlink's low-cost plans may become the only viable option for high-speed Internet access. As a result, providers may need to adjust their pricing structures to remain competitive. Overall, Starlink's entrance into the market is expected to have a lasting impact, reshaping the industry and leading to lower prices and improved Internet accessibility for consumers. Additionally, Starlink's constellation of satellites has the potential to redefine the telecommunications industry, providing high-speed Internet access to even the most remote parts of the world and fostering innovation in services and technologies. This development can potentially bridge the digital divide and unlock new economic opportunities for rural areas. Initial studies indicate that Starlink's Internet service is delivering reliable and high-speed connectivity to rural customers, effectively expanding network coverage and improving accessibility. Further research is needed to fully understand the extent of Starlink's impact on network coverage and accessibility in rural areas, but the early findings suggest a transformative potential for bridging the digital divide.

Frąckiewicz (2023b) reported that Starlink is transforming access to telecommunications and infrastructure in rural areas by providing reliable and high-speed Internet connections. It eliminates the need for traditional infrastructure, allowing residents in remote areas to connect with family and friends, access educational and economic opportunities, and obtain vital information and resources. Starlink has particularly benefited farmers, ranchers, and small business owners, enabling them to make informed decisions and reach new customers. Furthermore, Starlink is bridging the digital divide and empowering rural residents to access the same opportunities and services as urban areas. In the context of developing nations, Starlink has the potential to bridge the global Internet access gap and facilitate economic development, education, and healthcare. This revolutionary technology has also had a significant impact on traditional telecommunications providers, forcing them to adapt pricing, services, and technologies to remain competitive. Overall, Starlink's satellite-based Internet service has revolutionised connectivity by providing high-speed, low-latency, and affordable access to underserved areas worldwide, potentially transforming the way we live and work.

The Starlink Satellite Project aims to provide high-speed, low-latency broadband Internet to remote and rural areas globally. A study by Shaengchart and Kraiwanit (2023) investigated its impact on ISPs in emerging economies. Satellite Internet has significantly expanded professional development opportunities for people in underserved regions, granting access to specialised resources previously unavailable. It has also enabled career advancement possibilities for those living in remote areas, bridging the digital divide and promoting socio-economic growth. In addition, Shaengchart et al. (2023) delved into the repercussions of the Starlink project on the Internet service provider market in Thailand. The researchers emphasised the significance of businesses crafting proficient strategies to cater to their customer's demands and aspirations. Notably, organisations equipped with Internet access can harness the potential of data collection to create innovative products, granting them a valuable edge in the competitive landscape. To ensure a fair and beneficial market, it is essential to maintain a competitive environment that discourages artificial suppression of collection rates or the establishment of exorbitant prices through collusion or implicit pricing agreements. By safeguarding competition and encouraging a level playing field, consumers can reap the benefits of diverse choices, improved services, and reasonable pricing, thereby fostering a healthier and more prosperous Internet service provider market in Thailand.

3. RESEARCH METHODOLOGY

The research strategy employed in this study centred around a qualitative approach, with a focus on conducting in-depth interviews. The qualitative research methodology comprises four key phases: 1) research design, 2) data collection, 3) data analysis, and 4) report composition. The fundamental objective of qualitative research lies in comprehending the contexts within which individuals or groups make decisions and take actions, while also providing insight into the reasons underlying the occurrence of a specific phenomenon in a particular manner (Limna & Kraiwanit, 2022). Notably, in-depth interviews serve as a potent tool to glean detailed insights into a designated subject, thereby yielding precise information aligned with the research objectives (Moore, 2004; Queirós et al., 2017).

The research methodology entailed the examination of secondary data to identify pertinent key survey questions, subsequently guiding the in-depth interviews (see Appendix). These interviews were facilitated using the documentary method to amass primary data results. The questions employed in the interviews were meticulously formulated to solicit comprehensive and insightful viewpoints and a pilot test was executed to enhance their clarity. To uphold ethical standards, participants' informed consent was obtained before the interviews commenced. The interview sessions took place within comfortable settings, accommodating the preferences of the participants. Detailed notes or recordings were taken, contingent on the participants' consent, and post-interview, the recorded conversations were transcribed for subsequent analysis.

Purposive sampling stands as a qualitative research methodology wherein researchers employ their expertise to judiciously select a sample that best serves their objectives. Its core aim is to comprehensively explore a specific phenomenon or population. In this vein, purposeful sampling was the chosen method for participant selection. In accordance with a recent qualitative study by Jangjarat et al. (2023), it is recommended that a minimum of six interviews be conducted to attain data saturation in qualitative research. Consistent with this, the current study engaged a cohort of ten participants, all of whom were experts, academics, or educators within the realm of the Internet. Of paramount significance, each participant possessed knowledge or familiarity with the SpaceX Starlink Satellite Project. The participant criteria encompassed the following: 1) familiarity with or knowledge of the SpaceX Starlink Satellite Project, 2) status as an Internet provider, expert, or academic in Thailand, and 3) attainment of a minimum age of 18 years. The data collection process hinged on conducting in-depth interviews with these ten chosen participants.

Content analysis serves as a qualitative methodology aimed at systematically and objectively delineating and quantifying specific phenomena. This is achieved by drawing valid inferences from verbal, visual, or written data. Within this approach, text often stands as the initial point of focus. The ultimate objective is to distil a substantial volume of text into a succinct and well-structured summary of pivotal findings. This process entails a systematic transformation of extensive text into a meticulously organised and compact representation of key insights.

As posited by Mortelmans (2019), the utilisation of NVivo emerges as an invaluable tool for augmenting and delving deeper into the analysis process. A notable feature of NVivo is its capacity to generate word clouds, facilitating

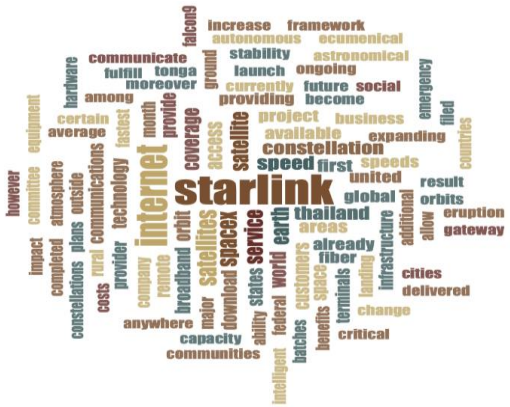
the visualisation of word frequency (Feng & Behar-Horenstein, 2019; Elliott-Mainwaring, 2021; Kraiwanit et al., 2023; Limna, 2023). Thus, in the analysis of the qualitative data garnered from the in-depth interviews, the content analysis technique was harnessed in tandem with the NVivo software program.

4. RESULTS

A cohort of ten participants was engaged in the interview process to glean insights into the impact of the SpaceX Starlink Satellite Project on global and local Internet providers. This sample encompassed experts, academics, and educators well-versed in the realm of the Internet, each possessing familiarity or knowledge of the SpaceX Starlink Satellite Project. The participants were evenly divided by gender, with five males and five females, and their ages spanned from 34 to 49 years.

The amassed responses underwent scrutiny, with the goal of identifying two overarching themes: the perspectives of global Internet providers and those of local Internet providers in Thailand. To execute this analysis, a combination of content analysis and the NVivo software was employed. Within this framework, a word frequency query was instrumental in enhancing the clarity of the findings. Notably, a word cloud (depicted in Figure 2) was generated to visually present the frequently utilised words by respondents throughout the interview process.

Figure 2. Word frequency query (Word cloud)



Source: Authors' elaboration.

4.1. Perspectives of a global Internet provider

For global Internet providers, Starlink's entry into the market introduces a new player that can potentially disrupt the industry. The project's satellite-based Internet service has the advantage of being able to reach areas that are challenging for terrestrial providers to serve. This could lead to increased competition and compel existing providers to improve their infrastructure and services to remain competitive.

The Starlink satellite constellation system has a primary objective of establishing comprehensive global Internet coverage. This technology proves especially advantageous for rural and geographically isolated regions where conventional Internet access is either unreliable or entirely absent. The accessibility to Starlink Internet can be swiftly realised within remote areas, requiring only a few minutes for setup with the appropriate equipment, rendering it a valuable asset during emergencies. An intrinsic benefit of Starlink lies in its agility — without the limitations imposed by conventional ground infrastructure, it can be deployed promptly, within minutes, to provide vital support to emergency responders during disaster scenarios.

4.2. Perspectives of a local Internet provider in Thailand

On a local level, the impact of Starlink can vary depending on the region and the existing state of the Internet infrastructure. In areas where fibre Internet coverage is already extensive and affordable, the impact of Starlink may be more limited. However, in regions with limited or inadequate Internet access, Starlink can offer a viable alternative. It has the potential to improve Internet speeds, reduce latency, and provide reliable connectivity in remote areas, benefiting individuals, businesses, and communities.

Starlink is now available for general users to reserve in advance. Customers in Thailand who are interested in the service can pre-order it, and will be allotted on a first-come, first-served basis. In areas where fibre Internet service is available, it is instantly clear that Thailand's fibre Internet service is superior because of its high speed and stability, ranking first in the country and with the fastest average home Internet in the world in the ranking of OOKLA, the Global Broadband Speed Test, with an average speed of 308.35 Mbps, already surpassing Singapore and Hong Kong. Although Starlink is a new technology that can transmit a wider range of signals, its distance from the rest of the world may cause signal interference. As a result, speed and stability are still insufficient to compete with Internet access via fibre cable. The majority of the earliest users in the United States are customers who live outside the fibre Internet usage area. This service's response, both in terms of speed and stability, makes it possible to use high-quality Internet, including in remote and rural areas outside Thailand's major cities. Thailand's Internet already ranks among the best in the world. Because of the fierce competition among service providers in Thailand, fibre Internet coverage is already available in major areas, such as Bangkok, and the Internet service fee in Thailand is relatively low when compared to Starlink's service fee. As a result, Starlink's customers in Thailand appear to be a group located outside the high-speed Internet service area and they must also have some level of financial resources.

5. DISCUSSION

This study delved into the profound implications of the SpaceX Starlink Satellite Project on both global and local ISPs. The findings underscored the anticipated substantial impact of this project on these providers. Through the deployment of an expansive array of satellites, Starlink endeavours to usher high-speed Internet accessibility into remote and underserved regions across the globe.

This approach holds immense potential for bridging the digital divide and fostering connectivity among countless individuals previously devoid of reliable Internet access. The efficacy of Starlink's Internet service has already been vividly demonstrated in regions such as Ukraine and Tonga.

Amid the ongoing Russian invasion, SpaceX's monumental and continually expanding broadband constellation, Starlink, has emerged as a crucial asset within Ukraine's communication infrastructure. Another compelling instance took place in February 2022 when Tonga, reeling from a devastating volcanic eruption and ensuing tsunami, received over 50 Starlink terminals. The objective here was to provide the island's populace, particularly those in remote settlements, with free Internet access. This technological intervention was pivotal in maintaining communication within the areas most profoundly impacted by the natural catastrophe, as reported by Needham (2022) in Reuters.

Contrastingly, Thailand stands out as a nation already boasting robust Internet services that are considered among the best globally. Intense competition among Thai service providers has led to widespread fibre Internet coverage, and Internet service fees within the country remain relatively economical compared to Starlink's charges. Consequently, the demographic of Starlink's Thai clientele seems to comprise those situated beyond the realm of high-speed Internet access while still maintaining financial means. This study not only highlights the far-reaching effects of the SpaceX Starlink Satellite Project but also accentuates the intricate interplay between technological innovation, local dynamics, and global connectivity.

Frąckiewicz (2023a) found that the emergence of Starlink's low-latency, high-speed Internet service has had a notable effect on traditional ISPs. Starlink's satellite-based service has garnered acclaim for its minimal latency, enabling users to access the Internet without significant delays. Consequently, this has directly influenced traditional ISPs as an increasing number of customers are opting for Starlink as their preferred Internet provider. According to a report by Orenstein (2021), Starlink's technology shows promise in connecting underserved rural areas in Minnesota where the establishment of high-speed Internet infrastructure is costly and challenging. However, the service has also sparked considerable debate and frustration among public officials. Crist and Paul (2023) reported that Starlink is ideal for areas of the world where connectivity has traditionally been difficult. Starlink now provides service in dozens of countries on all seven continents, though the nascent broadband provider is still dealing with a backlog of prospective customers waiting to receive equipment and begin service. This list includes Ukraine, where SpaceX has shipped tens of thousands of receivers and worked to protect local signals from Russian military interference while the invasion is still ongoing.

Walker and Elliott (2021) concluded that the emerging Starlink constellation is being influenced by societal factors. The conflict between the relevant social groups involved with Starlink and their ongoing discourse allows direct observation of the closure process under the Social Construction of Technology framework. The combination of the Starlink analysis and the technical project provides important insights into the challenges that spacefaring vessels will face in the twenty-first century and beyond. The Spacecraft Design Capstone team hopes to finish the course with a detailed framework for a CubeSat constellation that can meet the needs of as many stakeholders as possible while also being mindful of its potential impact on the night sky. As stated by Yadav et al. (2022), high-speed Internet is now a requirement for people all over the world. In this day and age of online work and commerce, it is imperative that everyone in India, for example, has access to high-speed Internet for the smooth operation of their businesses. As a solution, India will require satellite-based Internet that is received from the sky and can meet all of the country's needs. When it comes to Internet speed, the introduction of a satellite-based high-speed Internet connection like Starlink can be a game changer. Although satellite technology is much more efficient in the current crisis, where it is difficult to find a secure, stable job and deal with price increases, implementing it is difficult. India has a sensitive economy, and launching technology that costs $99 to $499 could be a barrier. Thus, sky-based Internet technology is a solution to one of today's problems, but establishing it in India requires careful consideration of the market situation.

Overall, the impact of the SpaceX Starlink Satellite Project on global and local Internet providers is expected to be transformative. It has the potential to extend Internet access to underserved areas, increase competition in the industry, and drive improvements in Internet infrastructure and services.

6. CONCLUSION

The findings of this research study provide important insights into the impact of the SpaceX Starlink Satellite Project on global and local Internet providers. SpaceX's Starlink satellite Internet constellation will have an impact on both global and local Internet providers. For instance, in Ukraine and Tonga, the Starlink Internet service has already proven its worth. It offers one of the best Internet connections in the world. Furthermore, because of fierce competition among Thai service providers, fibre Internet coverage is already available in major areas, and Internet service fees in Thailand are relatively low when compared to Starlink's service fee. As a result, Starlink's Thai customers appear to be a subset of the population who live outside of the high-speed Internet service area and have some financial means. Despite the fact that the strength of Internet access from anywhere in the world is a strength and point of interest when applying for Starlink's service, there are still disadvantages or other limitations that may influence the decision to use the service. For instance, when compared to fibre Internet, the monthly service fees and equipment costs are relatively high. Each member may only use one service position. If a user wants to use it in other locations or install Starlink devices in the car for road trips, there will be an additional charge of 900 Thai Baht per month. Hence, Starlink should develop an effective marketing strategy to

attract users in countries where fibre Internet is more affordable and convenient in order to entice them to use a satellite Internet service.

The study identifies a subset of customers in Thailand who reside outside the high-speed Internet service area and have the financial resources to opt for Starlink's satellite Internet. This insight suggests that Starlink could be a viable option for individuals in similar circumstances worldwide. The recommendation for Starlink to devise an effective marketing strategy in countries where fibre Internet is more affordable and convenient further contributes practical guidance for the implementation and expansion of the project. From an academic perspective, this study contributes to the understanding of the transformative potential of the SpaceX Starlink Satellite Project. By employing a qualitative approach with in-depth interviews and content analysis, it offers valuable insights into the impact on global and local Internet providers. The research methodology provides a foundation for future studies to explore this topic further.

Limitations of this study on the impact of the SpaceX Starlink Satellite Project on global and local Internet providers include the small sample size of only ten key informants, which may limit the generalizability of the findings. Additionally, the study's reliance on a qualitative approach and content analysis could benefit from complementing quantitative data to capture broader trends and patterns. Future research should consider broadening the geographic scope to include a wider range of countries and regions, employing larger sample sizes, and incorporating quantitative analysis to provide a more comprehensive understanding of the project's impact. Comparative studies with other satellite and terrestrial providers, as well as longitudinal research to track changes over time, would enhance the assessment. Furthermore, exploring user experiences and satisfaction levels, along with targeted marketing strategies, could provide insights into the potential migration from traditional fibre Internet to satellite services in countries where affordability and convenience play a significant role. By addressing these limitations and pursuing these recommendations, future studies can offer a more comprehensive understanding of the impact of the SpaceX Starlink Satellite Project on global and local Internet providers.

REFERENCES

1. Cooper, T. (2023, June 21). *Starlink Internet.* BroadbandNow. https://broadbandnow.com/starlink#
2. Crist, R., & Paul, T. (2023, June 20). Starlink explained: What you need to know about Elon Musk's satellite Internet service. *CNET*. https://www.cnet.com/home/Internet/starlink-satellite-Internet-explained/
3. Elliott-Mainwaring, H. (2021). Exploring using NVivo software to facilitate inductive coding for thematic narrative synthesis. *British Journal of Midwifery, 29*(11), 628–632. https://doi.org/10.12968/bjom.2021.29.11.628
4. Feng, X., & Behar-Horenstein, L. (2019). Maximizing NVivo utilities to analyze open-ended responses. *The Qualitative Report, 24*(3), 563–572. https://doi.org/10.46743/2160-3715/2019.3692
5. Fourtané, S. (2018, October 7). IoT and smart agriculture are building our future cities today. *Interesting Engineering.* https://interestingengineering.com/innovation/iot-and-smart-agriculture-are-building-our-future-cities-today
6. Frąckiewicz, M. (2023a, March 10). *Examining the impact of Starlink's Internet on traditional Internet providers and the telecommunications industry.* TS2 Space. https://ts2.space/en/examining-the-impact-of-starlinks-Internet-on-traditional-Internet-providers-and-the-telecommunications-industry/
7. Frąckiewicz, M. (2023b, March 18). *Starlink's impact on the future of telecommunications and infrastructure.* TS2 Space. https://ts2.space/en/starlinks-impact-on-the-future-of-telecommunications-and-infrastructure/
8. Henry, C. (2019, October 15). SpaceX submits paperwork for 30,000 more Starlink satellites. *SpaceNews.* https://spacenews.com/spacex-submits-paperwork-for-30000-more-starlink-satellites/
9. Jangjarat, K., Kraiwanit, T., Limna, P., & Sonsuphap, R. (2023). Public perceptions towards ChatGPT as the robo-assistant. *Online Journal of Communication and Media Technologies, 13*(3), Article e202337. https://doi.org/10.30935/ojcmt/13366
10. Jessica. (2022a, October 27). *How Starlink will change the world.* OpenWorldLearning. https://www.openworldlearning.org/how-starlink-will-change-the-world/
11. Jessica. (2022b, November 3). *SpaceX's Starlink: The future of Internet access.* OpenWorldLearning. https://www.openworldlearning.org/spacexs-starlink-the-future-of-Internet-access/
12. Kokez, H. A.-D. F. (2020). On terrestrial and satellite communications for telecommunication future. In *2020 2nd Annual International Conference on Information and Sciences (AiCIS) Proceedings* (pp. 58–67). IEEE. https://ieeexplore.ieee.org/abstract/document/9408249
13. Kraiwanit, T., Limna, P., & Siripipatthanakul, S. (2023). NVivo for social sciences and management studies: A systematic review. *Advance Knowledge for Executives, 2*(3), 1–11. https://ssrn.com/abstract=4523829
14. Limna, P. (2023). The impact of NVivo in qualitative research: Perspectives from graduate students. *Journal of Applied Learning & Teaching, 6*(2), 1–12. https://doi.org/10.37074/jalt.2023.6.2.17
15. Limna, P., & Kraiwanit, T. (2022). Service quality and its effect on customer satisfaction and customer loyalty: A qualitative study of Muang Thai insurance company in Krabi, Thailand. *Journal for Strategy and Enterprise Competitiveness, 1*(2), 1–16. https://so07.tci-thaijo.org/index.php/STECOJournal/article/view/912
16. Malik, T. (2022, October 5). *SpaceX delays launch of Starlink satellites to make way for crew-5 astronaut flight.* Space.com. https://www.space.com/spacex-delays-starlink-launch-crew-5-astronaut-mission
17. Moore, B. L. (2014). In-depth interviewing. In J. Soeters, P. M. Shields, & S. Rietjens (Eds.), *Routledge handbook of research methods in military studies* (1st ed., pp. 136–148). Routledge. https://tinyurl.com/v8pzptzr
18. Mortelmans, D. (2019). Analyzing qualitative data using NVivo. In H. Van den Bulck, M. Puppis, K. Donders, & L. Van Audenhove (Eds.), *The Palgrave handbook of methods for media policy research* (pp. 435–450). Palgrave Macmillan. https://doi.org/10.1007/978-3-030-16065-4_25
19. Mróz, P., Otarola, A., Prince, T. A., Dekany, R., Duev, D. A., Graham, M. J., Groom, S. L., Masci, F. J., & Medford, M. S. (2022). Impact of the Spacex Starlink satellites on the Zwicky transient facility survey observations. *The Astrophysical Journal Letters, 924*(2), Article L30. https://doi.org/10.3847/2041-8213/ac470a

20. Needham, K. (2022, February 23). Musk's Starlink connects remote Tonga villages still cut off after tsunami. *Reuters*. https://tinyurl.com/mppr6965
21. Orenstein, W. (2021, October 29). 'Starlink,' SpaceX's Internet service, is growing in Minnesota. What that could mean for the future of rural broadband. *MINNPost*. https://www.minnpost.com/greater-minnesota/2021/10/starlink-spacexs-internet-service-is-growing-in-minnesota-what-that-could-mean-for-the-future-of-rural-broadband/
22. Pultarova, T., & Howell, E. (2023, August 2). Starlink satellites: Everything you need to know about the controversial Internet megaconstellation. *Space.com.* https://www.space.com/spacex-starlink-satellites.html
23. Queirós, A., Faria, D., & Almeida, F. (2017). Strengths and limitations of qualitative and quantitative research methods. *European Journal of Education Studies, 3*(9), 369–387. https://oapub.org/edu/index.php/ejes/article/view/1017
24. Rawls, M. L., Thiemann, H. B., Chemin, V., Walkowicz, L., Peel, M. W., & Grange, Y. G. (2020). Satellite constellation Internet affordability and need. *Research Notes of the AAS, 4*(10), Article 189. https://doi.org/10.3847/2515-5172/abc48e
25. Shaengchart, Y., & Kraiwanit, T. (2023). Starlink Satellite Project impact on the Internet provider service in emerging economies. *Research in Globalization, 6*, Article 100132. https://doi.org/10.1016/j.resglo.2023.100132
26. Shaengchart, Y., Kraiwanit, T., & Butcharoen, S. (2023). Factors influencing the effects of the Starlink Satellite Project on the Internet service provider market in Thailand. *Technology in Society, 74,* Article 102279. https://doi.org/10.1016/j.techsoc.2023.102279
27. Walker, A., & Elliott, S. T. (2021). *Starlink: Societal factors affecting SpaceX's satellite Internet constellation.* (Research Paper, University of Virginia). https://libraetd.lib.virginia.edu/downloads/m326m255z?filename=Walker_Avery_STS_Research_Paper.pdf
28. Yadav, A., Agarwal, M., Agarwal, S., & Verma, S. (2022). Internet from space anywhere and anytime — Starlink. In *Proceedings of the Advancement in Electronics & Communication Engineering 2022*. https://doi.org/10.2139/ssrn.4160260

APPENDIX. QUESTIONNAIRE

Interviewed questions:

1. How has Starlink's satellite Internet affected your company's business, especially in terms of competition?

2. Do you see Starlink reaching remote areas as a challenge or opportunity for your global Internet services?

3. Can you tell us about specific places where Starlink has influenced your operations, and what have you done in response?

4. How has Starlink's ability to provide fast Internet during emergencies impacted your disaster plans?

5. How has Starlink's availability for pre-order affected your local Internet services?

6. Thailand's Internet is known for its speed. How does Starlink compare, and how does it affect your services?

7. What steps have you taken to deal with signal interference from Starlink in Thailand?

8. What kinds of customers are using Starlink in Thailand, and how does this affect your business locally?