



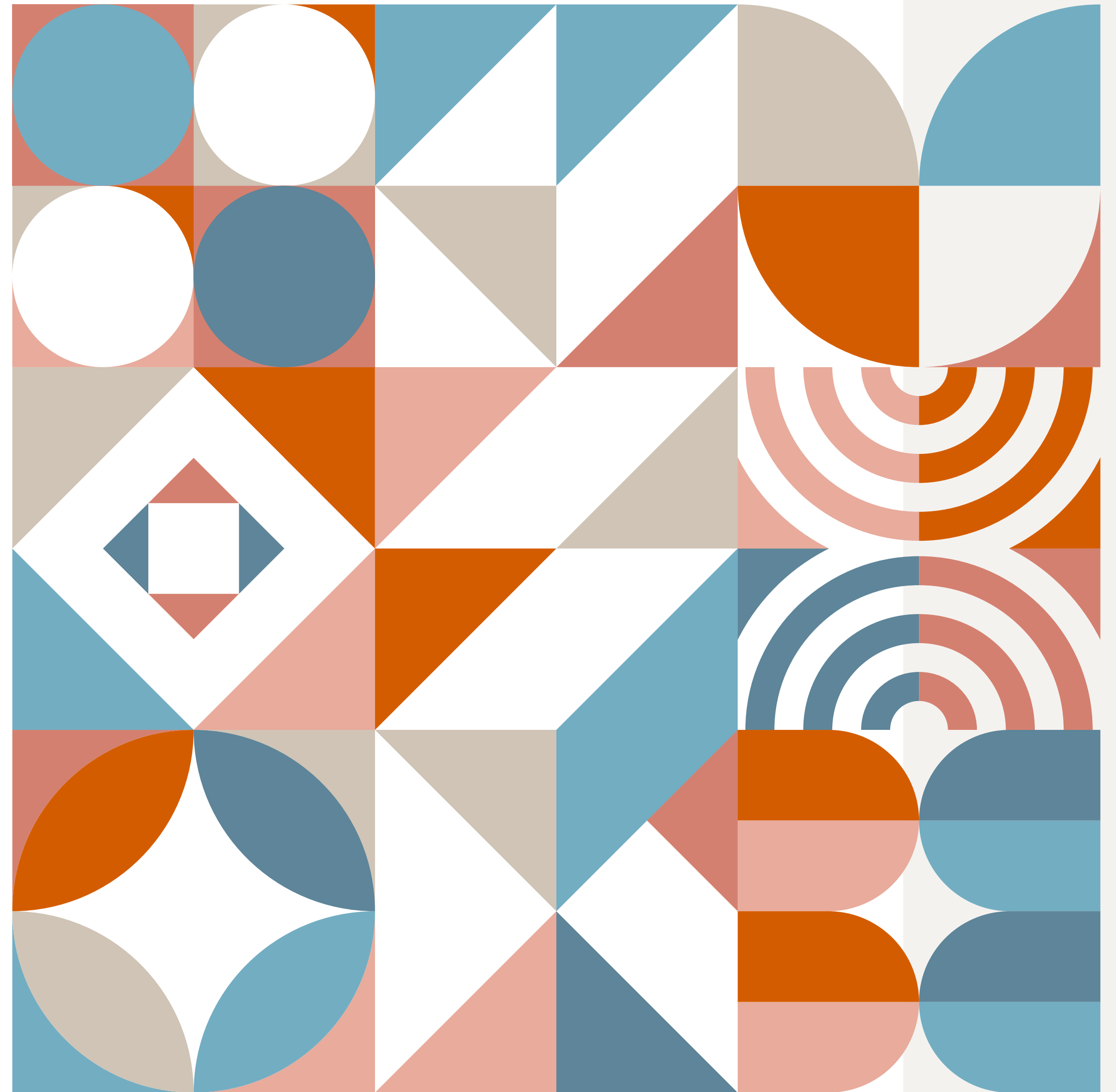
The graduate school
of global affairs
at Tufts University



IDEA 2030
IMAGINING A DIGITAL ECONOMY FOR ALL

BEYOND ACCESS: FOSTERING SUSTAINABLE AND INCLUSIVE CLIMATE SOLUTIONS THROUGH DIGITAL TECHNOLOGIES

IDEA 2030 is supported by
the Mastercard Center for Inclusive Growth



ABOUT

Digital Planet

Digital Planet, an interdisciplinary research initiative of The Fletcher School's Institute for Business in the Global Context, is dedicated to understanding the impact of digital innovations on the world and providing actionable insights for policymakers, businesses, investors, and innovators.

Institute for Business in the Global Context

The Institute for Business in the Global Context (IBGC) connects the world of business to the world. It is the hub for international business at The Fletcher School, the oldest graduate school of international affairs in the United States. The Institute takes an interdisciplinary approach, preparing global leaders who can cross borders of many kinds and integrate business skills with an understanding of the geopolitical, legal, financial, security, macroeconomic, humanitarian, and environmental impacts on business. The Institute is organized around four core activity areas: education, research, dialogue, and a lab. Our degree programs—Master of International Business (MIB) and Master of Global Business Administration (GBA)—and leadership development programs are at the heart of our educational mission. These offerings, coupled with original research in multiple areas—inclusive growth, digitalization, innovation and economic development at scale, sovereign wealth, and global capital flows, among others—facilitate a vibrant

dialogue on contemporary global issues through conferences, symposia, and speaker events. The lab creates opportunities for student teams to take knowledge into the field, affecting change through entrepreneurial startups and consulting projects. The Institute also houses the Council on Emerging Market Enterprises, a think tank comprising distinguished practitioner-scholar experts who collaborate with the Institute and The Fletcher School on a variety of initiatives, such as research programs, symposia, and conferences.

The Fletcher School at Tufts University

The Fletcher School of Law and Diplomacy at Tufts University is the oldest graduate school of international affairs in the United States, working to solve the world's most pressing problems through a collaborative, cross-disciplinary approach to research and education. Since 1933, The Fletcher School has prepared the world's leaders to become innovative problem solvers in government, business, and non-governmental organizations with strategic cross-sector networks. Through our ongoing and rigorous commitment to advancing world knowledge through research and scholarship, The Fletcher School continues to shape meaningful solutions to urgent global issues.



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CONTENTS



Center for
Inclusive Growth

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Executive Summary

Framework

Case Studies

Appendices

Endnotes



EXECUTIVE SUMMARY

The needs of the global sustainable development agenda are both broad and urgent, and innovation models are central to addressing them in a timely, efficient, and scalable manner, from promoting inclusive growth to ensuring the longevity of natural resources to addressing issues across the state of the human condition.

Inclusive businesses—including large multinational corporations (MNCs), social enterprises, and impact investors—recognize that the private sector will increasingly play a lead role in solving problems and closing global sustainability gaps. Such endeavors can cost USD 3-5 trillion annually, according to some estimates,¹ although the value that businesses can unlock while in the process is estimated to be in the range of USD 12-15 trillion per year.² Ideally, thus, this suggests a macro-level business case for trying to do good while doing well.

While the macro-level business case provides a tremendous amount of evidence on the private sector's role in addressing sustainable development challenges, a bottom-up perspective is also crucial to understanding how much technology can be a force for inclusion, or against it. To this end, researchers at Digital Planet placed a group of private enterprises that leverage digital technology to solve sustainable development challenges under a microscope, building a case study for each of them from a bottom-up perspective.

Through this case study approach, we hope to allow our audience to immerse themselves in an enterprise's journey, answering the question of how companies in different parts of the world are taking on sustainable development challenges and closing inclusion gaps. In addition, in each case study, we employ "*The Nine A's Framework*" to analyze an enterprise's business model. This original framework is designed to provide an outside-in evaluation of a given company's strengths and weaknesses, as well as to highlight the opportunities and challenges it faced at the time of the writing. Lastly, this compendium allows for a comparison of the enterprises' business models, revealing several common themes and learnings that business leaders and entrepreneurs should consider for future actions.

In this third edition of the Beyond Access case compendium series, we cover three companies working to achieve a more sustainable future. These companies are working to help address the following United Nations Sustainable Development Goals (SDGs): SDG 1, no poverty; SDG 3, good health and wellbeing; SDG 4, quality education; SDG 6, clean water and sanitation; SDG 7, affordable and clean energy; SDG 8, decent work and economic growth; SDG 9, industry, innovation, and infrastructure; SDG 10, reduced inequalities; SDG 11, sustainable cities and communities; SDG 12, responsible consumption and production; and SDG 13, climate action.

Below is an overview of the three enterprises in the compendium:

Husk Power Systems is an energy provider established in 2008 to serve rural communities across India and Africa. The company's mission is to provide decentralized, reliable electricity by installing mini-grids that utilize a mix of sustainable energy sources.

Nexsis seeks to alleviate global poverty by providing access to potable water, hot sanitation water, electricity, and financial institutions to those who need it via its solar-powered Smart Panel technology. Through partnerships with governments, NGOs, and other businesses, Nexsis aims to distribute its Smart Panels to communities around the globe, with operations currently in Cambodia, Morocco, Singapore, Australia, and early stages in India and Brazil. The innovative Smart Panels allow Nexsis to offer a multi-pronged digital solution to customers with an affordable pay-as-you-go pricing model whilst providing verifiable carbon credits.

ThredUp is a US-based secondhand e-commerce consignment business that facilitates the sale of high-quality clothing by providing the digital platform and logistical expertise to eliminate friction and maximize convenience for both buyers and sellers. Sustainable values are deeply rooted within the company's DNA and are visible in ThredUp's environmental impact, as ThredUp creates a circular economy, limiting carbon emissions as well as energy and water waste.



EXECUTIVE SUMMARY

Emerging Insights and Implications for Action

Looking across the three cases, some insights and learnings which emerged are:

1) Pay-as-you-go pricing makes dramatic quality-of-life improvements accessible to all, while encouraging sustainability

Pay-as-you-go pricing is a game changer for low-income households. It allows people to only spend resources on the items they need, helping consumers save money. By not locking consumers into contracts, it also helps people avoid burdensome debt. Pay-as-you-go models encourage responsible use of resources, which can reduce waste and increase conservation. This style of pricing can promote economic development by making it easier for people to start businesses and access markets. For instance, in the cases of Husk and Nexsis, offering access to power and clean water not only helps households but can lay the foundations for microenterprises in rural and underserved regions. Finally, as seen with Nexsis, and with the right partners, introducing pay-as-you-go pricing along with the product can lead to increased financial inclusion.

2) Digital technologies are a force multiplier for climate-conscious businesses

Digital technologies can act as a force multiplier for businesses focusing on sustainability. They accomplish this

in several ways. First, through resource efficiency. Digital technologies enable businesses to monitor and manage their resources more efficiently. For instance, smart sensors and automation systems can optimize energy consumption in buildings and industrial processes. In the case of ThredUp, digital technologies bring order to an otherwise chaotic secondhand apparel market, extending the lifetime of clothing. Second, those same monitoring capabilities can be harnessed to track metrics in real-time on environmental impact, bring transparency to supply chains, and be used as a benchmarking tool for companies. Third, digital technologies can be harnessed to create circular economies, by facilitating the reuse and recycling of materials, as seen by the use of rice husks and solar by Husk Power Systems.

3) Regenerative technologies have the potential to address longstanding gender gaps

Women bear the brunt of energy and resource poverty. They are more likely to be responsible for collecting firewood and water. By removing some of this drudgery, women have more free time to study or engage in paid work.³ Regenerative technologies, like Nexsis' solar-powered Smart Panel, offer clean water and improved sanitation, improving the well-being of women and girls. Cleaner fuel sources also can improve the health of the entire household,⁴ with outsized impacts on women.⁵ At the same time, many sustainable energy projects fail to deliver the intended benefits to women, as women still lack decision-making

power in households.⁶ Companies seeking to improve women's lives, must think beyond simply delivering power and water. For example, Husk offers village women training and job opportunities (making incense sticks out of the rice husk char), empowering them economically. Clean power and water are a necessary, but not sufficient condition for both sustainable development and closing gender gaps.

4) Government collaboration is key to ensuring the success of renewable energy startups

Investors in the renewable energy sector are concerned about the long-term friendliness of governments towards the industry. Governments that lack national plans for rural electrification and renewable energy policies may discourage private companies like Husk and Nexsis from entering the market, hindering the electrification of rural dwellers. To create a healthy market foundation, governments are collaborating with the renewable energy sector to understand what is most conducive to its growth. Some key elements include:

- **Prioritizing Sustainability:** Many governments have set renewable energy targets, but few have articulated policies that facilitate the implementation of such energy by private actors. Recognizing the role that the private sector can play in meeting energy targets can foster quicker, sustainable electrification for rural households.



EXECUTIVE SUMMARY

- **Main-grid Arrival:** The arrival of the centralized grid to off-grid communities is a looming threat to the long-term profitability of mini-grids. Governments should outline how electricity distribution rights will be apportioned if such a scenario arises to ease mini-grid investors' minds and promote rural electrification. Despite the importance of this assurance, around half of governments surveyed by Climatescope do not have any specific guidelines concerning grid arrival to a rural community.⁷
- **Government Subsidies:** Governments can invest in the renewable energy industry through results-based funding (RBF), which rewards mini-grid companies' projects upon verification of a legitimate electric connection to a pre-established number of households. RBF is a low-risk option for governments interested in investing in rural electrification without blindly committing money to external entities.
- **Tariff Setting and Taxation:** Governments need clear guidelines around acceptable tariff practices. Accepting alternatives to fixed-rate tariffs, such as Husk's algorithm-based pricing model, can promote electricity use and increase demand for services.

To ensure the successful implementation of electrification programs in emerging economies, governments should establish stable and transparent policies and regulations

that promote investment and ensure a level playing field for all stakeholders. Clear licensing rules, streamlined solicitation procedures, environmental and social impact assessments, and guidelines that regulate, and foster market growth are crucial for sustainable electrification.⁸

5) Creating and maintaining consumer demand is necessary for the long-term viability of sustainable businesses

Increasing affinity for large-scale sustainable solutions to human consumption is a victory for environmentally conscious businesses. As the interest in climate consciousness increases, sustainable businesses need to establish a plan to cement demand for their products and maintain their popularity in mainstream consumption.⁹

A principal challenge faced by the renewable energy sector when penetrating rural, un-electrified markets is the lack of demand for electricity. To entice and retain customers, companies in the renewable energy sector must think of innovative ways to create demand for their products and services.

Nexsis' CEO, Robert Pyman emphasizes the importance of 'consumer product waterfalls,' where electricity suppliers provide energy and electric appliances simultaneously to generate both the demand and supply of their own products.¹⁰ Hybrid-grid industry players, like Husk, employ

KeyMaker economic models to create demand for their service. This involves enlarging the local economy by buying local raw products and using their own energy to process and package them, and then selling them in areas with higher demand.¹¹ Such an approach increases demand for electricity, enhances the local economy, and diversifies the community's income by hiring local employees.

Lastly, ThredUp's demand has incrementally increased as the online retailer continues to gain popularity. To maintain its relevance, ThredUp has penetrated the traditional retail market and contracted in-vogue celebrities to represent the ThredUp brand. These efforts have reframed secondhand clothing, making it contemporary, imbued with meaning, and environmentally conscious.

THE INCLUSIVE INNOVATION MODEL AND THE NINE A'S FRAMEWORK

We define the Inclusive Innovation Model as a series of viable and scalable activities that bolster a firm's competitiveness and further its strategic objectives. Such innovations can come in various forms, including but not limited to products, services, designs, processes, and business models. Inclusive innovators tend to integrate a combination of these elements and secure competitive advantage by:

- Targeting low-income or other traditionally disadvantaged communities (e.g., women, unskilled youth, minority groups) and including them in the company's value chain as consumers and as producers, entrepreneurs, or employees
- Developing approaches that sustain natural resources
- Filling institutional, contextual, and human capital gaps

The Nine A's Framework: Innovating to Squeeze Value Out of the Business Model

For each case study, we use "*The Nine A's Framework*" to help us analyze each enterprise's business model, providing an outside-in evaluation of the company's strengths and weaknesses. The framework evaluates the four core components—the value proposition, the process, resources, and profit formula of an enterprise's business model through the following nine aspects.

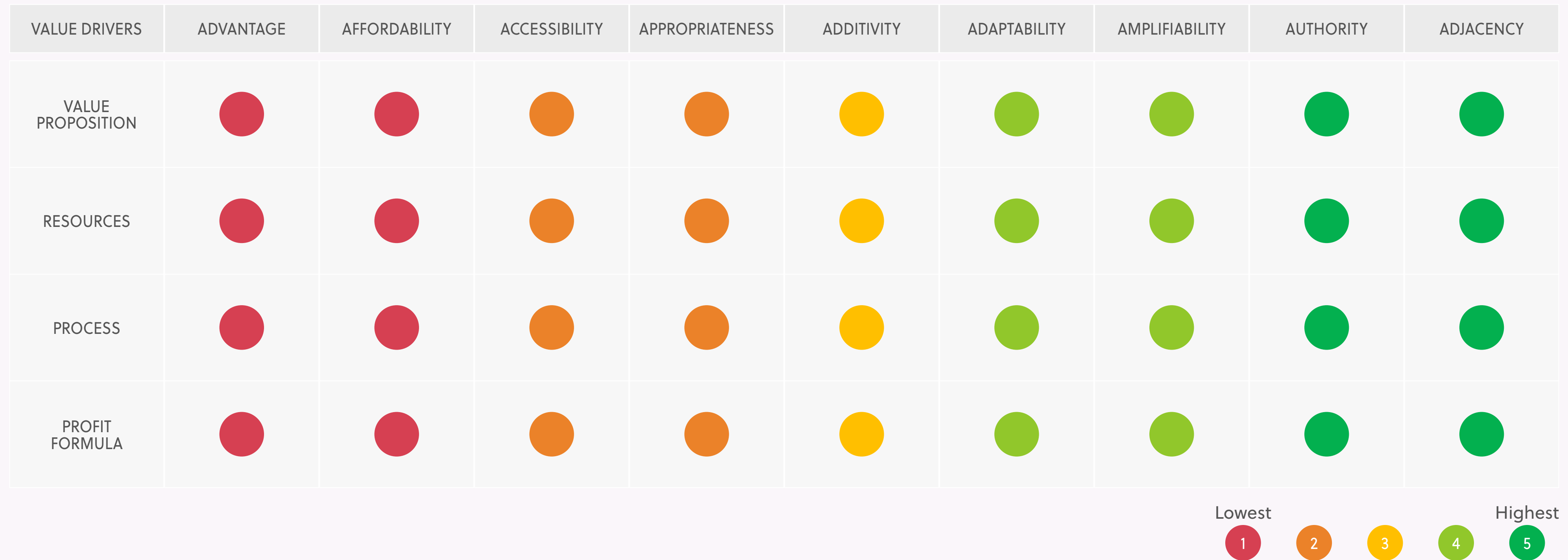
For each of these nine criteria, we designate a value from five to one, where five is excellent, and one means that it needs attention, as Figure 1 demonstrates below. Using this simple formula, we can quantify and visualize a company's strengths and weaknesses for each of the business model components across the nine aspects, which in turn help summarize the opportunities and challenges a company faces at the time of the writing.

- **Advantage:** How well a company ensures that it is compelling, differentiated, and sustainable.
- **Affordability:** Increasing demand through low prices.
- **Accessibility:** Increasing the size of the addressable market while keeping costs low.

- **Appropriateness:** Increasing demand through superior customer-centric differentiation, such as design thinking, freemium pricing, and experiential products, etc.
- **Additivity:** Closing key gaps in the value chain, such as connecting unmet and unused resources, correcting information asymmetry, or completing supply chain gaps by vertically integrating, and more.
- **Adaptability:** Building in learning and pivoting to increase adoption and utilize the right resources for the right jobs.
- **Amplifiability:** Can the company look for leverage points at all stages in the decision process: Scaling up and looking for leverage points to enhance sales at all stages in the buyers' decision-making process.
- **Authority:** Whether the company has the power to change the landscape and convince other companies to conform to its practices.
- **Adjacency:** Whether the enterprise can solve an adjacent problem, a similar problem, such as using resources generated from one business to unlock value propositions in other areas.

THE INCLUSIVE INNOVATION MODEL AND THE NINE A'S FRAMEWORK

Figure 1: [The Nine A's Framework Matrix](#)



CASE STUDIES



INDIA AND AFRICA
Husk



GLOBAL
Nexsis



UNITED STATES
ThredUp

Husk

Innovative business
electrifies rural areas
in the developing world

Case
Studies

Husk

Introduction

Business
Model

Strengths and
Weaknesses

Opportunities
and Challenges



INTRODUCTION

HUSK.

Husk Power Systems is an energy provider established in 2008 to serve rural communities across India and Africa. The company's mission is to provide decentralized, reliable electricity by installing mini grids that utilize a mix of sustainable energy sources.

Access to reliable and affordable electricity is a critical determinant of socioeconomic development. Energy provision enables households to use appliances, communication devices, water pumps, and other equipment conducive to human welfare. Families with access to adequate lighting, for example, benefit from more safety at night and more flexibility when scheduling household activities such as cleaning, cooking, studying, and working.¹² At the community level, grid connectivity is fundamental to the delivery of education, healthcare, and other public services.¹³ It fosters the growth of small- and medium-sized enterprises by enabling them to operate longer, facilitate adequate storage practices, and employ safer production techniques.

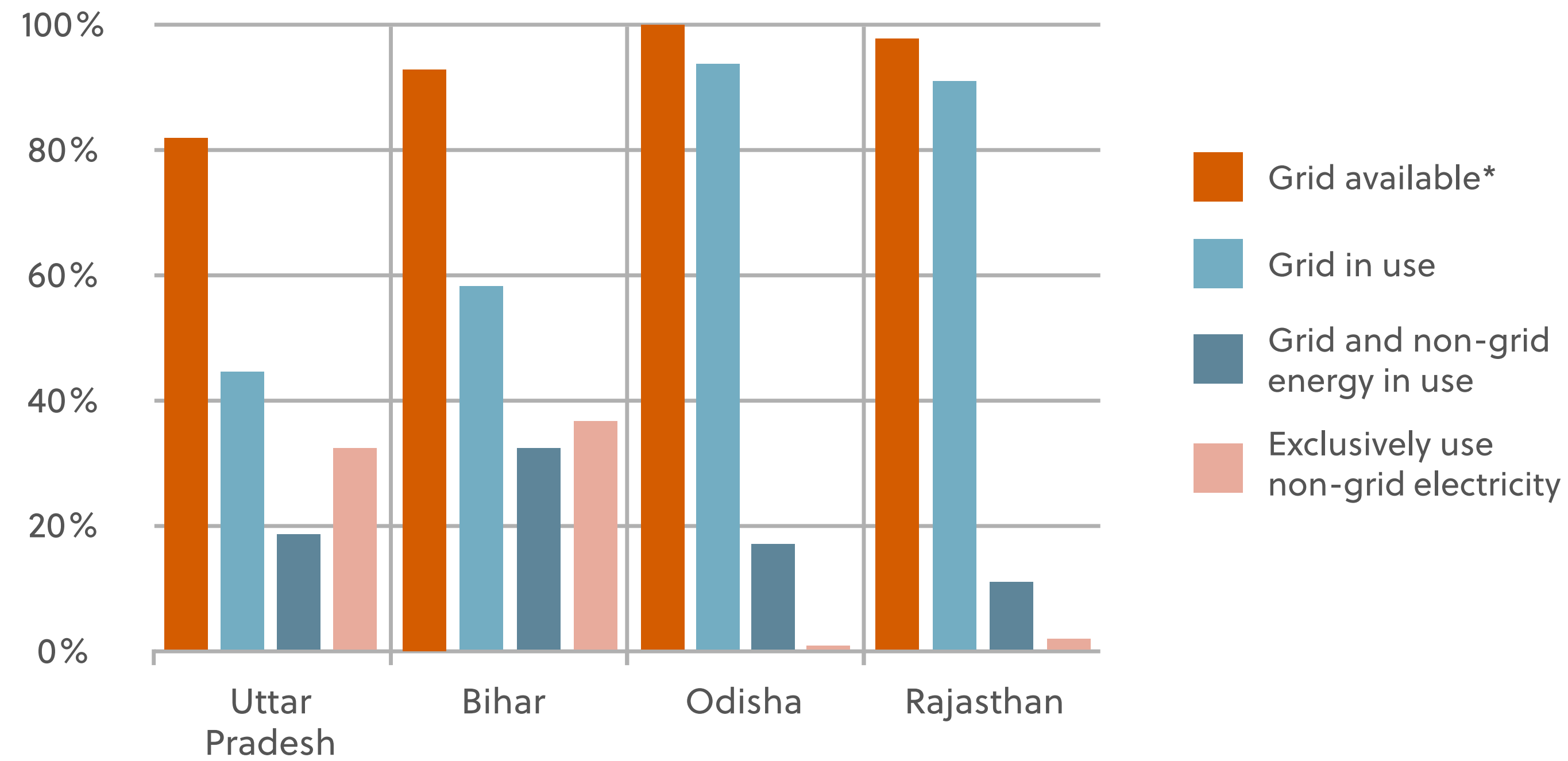
Despite significant progress made in recent years, approximately 10% of the global population, or around 770 million people, do not have access to electricity.¹⁴ This gap is concentrated among low-income countries in sub-Saharan Africa and South Asia, where over half of the population remains unconnected.¹⁵ Lack of access to electricity is therefore an extremely pressing matter. The confluence of problems that lead to and result from unconnected communities can be traced all along the supply chain and are summarized in the following points.

1) Supplier Challenges When Pursuing Rural Electrification

Developing countries often struggle with the challenge of providing reliable electricity to remote and low-density population areas due to high infrastructure costs. In countries such as Nigeria and India, where rural agriculture-based states are common, extending electric poles and lines to individual households is often not cost-effective, as doing so may yield a low return on capital investment since few people would benefit from individual line extensions.¹⁶ The high cost of extending electricity infrastructure to remote areas is further compounded by other challenges such as difficult terrain, insufficient financial resources, and weak governance. This makes the task of providing electricity access to rural communities in developing countries an intricate and challenging process. Furthermore, isolated communities that are electrified by the state-owned central grid have only intermittent access to electricity. Despite India's 2019 claim of achieving 100% nationwide electrification, studies show that most people in rural communities living within 50 meters of an electricity pole are not connected.¹⁷ The Rockefeller Foundation estimated that, in 2018, 304 million Indians still lacked access to electricity, despite residing in areas that are classified as "electrified" by government standards.¹⁸ Businesses and households in weak-grid areas are therefore resorting to alternate energy sources that present their own set of problems, as seen in the image below.

INTRODUCTION

Figure 2: Available Electricity Options Among Small Rural Enterprises in India



*Measured as having an electricity pole within 50 meters. Source: State of the Global Mini-grids Market Report¹⁹

INTRODUCTION

2) Consumer Challenges When Meeting Electricity Demand

Communities that have developed a demand for electricity but reside in weak-grid or off-grid areas often resort to expensive, unsustainable, and dangerous substances to meet their energy needs. Around one third of global energy consumers rely on highly pollutive substances such as charcoal, crop waste, dung, and kerosene for cooking and heating.²⁰ In Nigeria, a liter of kerosene, a dangerous and inefficient yet popular energy source,²¹ costs more than twice the global average price.²² In addition to exorbitant prices, kerosene poses a serious health risk when used indoors; it has been linked to decreased lung function, serious acute diseases like tuberculosis, and countless injuries resulting from hazardous use.²³ Furthermore, other conventional sources such as dung and crop waste are known to release carbon monoxide, nitrogen oxide, and other dangerous chemical byproducts which can cause chronic diseases such as asthma and cancer.²⁴ The IEA estimates that use of these alternatives causes 2.5 million premature deaths annually.²⁵ Access to safe energy sources can mitigate health risks for disadvantaged rural communities, while remaining conscious of their economic limitations.

3) The Environmental Impact of (Non)Electrification

Though centralized grid connectivity is currently the conventional global approach to electrifying rural communities, most countries fail to consider the environmental impact of such methods. Firstly, reaching isolated communities requires the disruption of ecosystems and the displacement of flora and fauna in order to extend lines from the central generator to the peripheries. Once this process is complete, the central grid's reliance on pollutive fossil fuels exacerbates electrification's environmental impact. Around 80% of India's electricity is derived from fossil fuels;²⁶ the same goes for Nigeria, which currently uses unsustainable energy sources to produce about 75% of its electricity.²⁷ Furthermore, weak-grid and off-grid communities that resort to diesel generators,²⁸ kerosene canisters,²⁹ and dangerous biomasses³⁰ contribute to greenhouse gas emissions that are harmful to the environment both locally and globally. Thus, solutions to this electrification problem must consider the perspectives of both the consumer and the government, while also minimizing environmental repercussions.

Husk was formed to address these three issues. The company advocates for a decentralized mini-grid system that both eases the government's economic burden of electrifying rural areas and ensures that these communities have access to all the benefits of on-demand electricity. Husk employs sustainable energy sources that can cater to a given population's needs while ensuring user safety by eradicating the need for dangerous and polluting energy sources.

HUSK'S BUSINESS MODEL

Value Proposition

In 2008, the co-founders of Husk Power Systems saw the convergence of these supply-demand problems and transformed it into an opportunity for inclusive, sustainable business.

Husk's mission originally revolved around aggregating local demand for electricity to provide energy-as-a-service (EaaS) through a locally installed biomass gasification system—an electricity generator that produces energy out of rice husks.³¹ At the time, this product was far ahead of its renewable energy competitors; Husk's machine produced five times as much energy as solar panels for the same price.³² Producing energy from rice husks, a biomaterial that is abundant in unlit rural areas due to high production concentration, was not only a resourceful solution both to the dearth of electricity and the surplus of biowaste, but also an accessible option for clients with limited economic resources.

By 2014, advances in solar panel technology had driven down costs in electricity production to the point where, in 2019, solar power was equal to or even cheaper than biomass gasification.³³ Rather than proceeding with an increasingly antiquated business model, Husk pivoted its mission to fill an even wider gap in the market and address its own

shortcomings. Husk's systems employ photovoltaic (PV) solar panels, a widely studied technology that produces energy by absorbing sun radiation that reacts with the PV cell's electrical field.³⁴

Husk executives quickly realized that advocating for one power solution was not enough. Though both biomass and solar energy fulfilled the mission of bringing electricity to rural areas, they presented certain limitations. Solar energy was cheap during daylight hours, but very costly to maintain at night. Biomass gasifier tech was no longer cheaper than solar and required more maintenance. Using only one type of sustainable energy source translated to shortages in power generation and limitations on power generation.

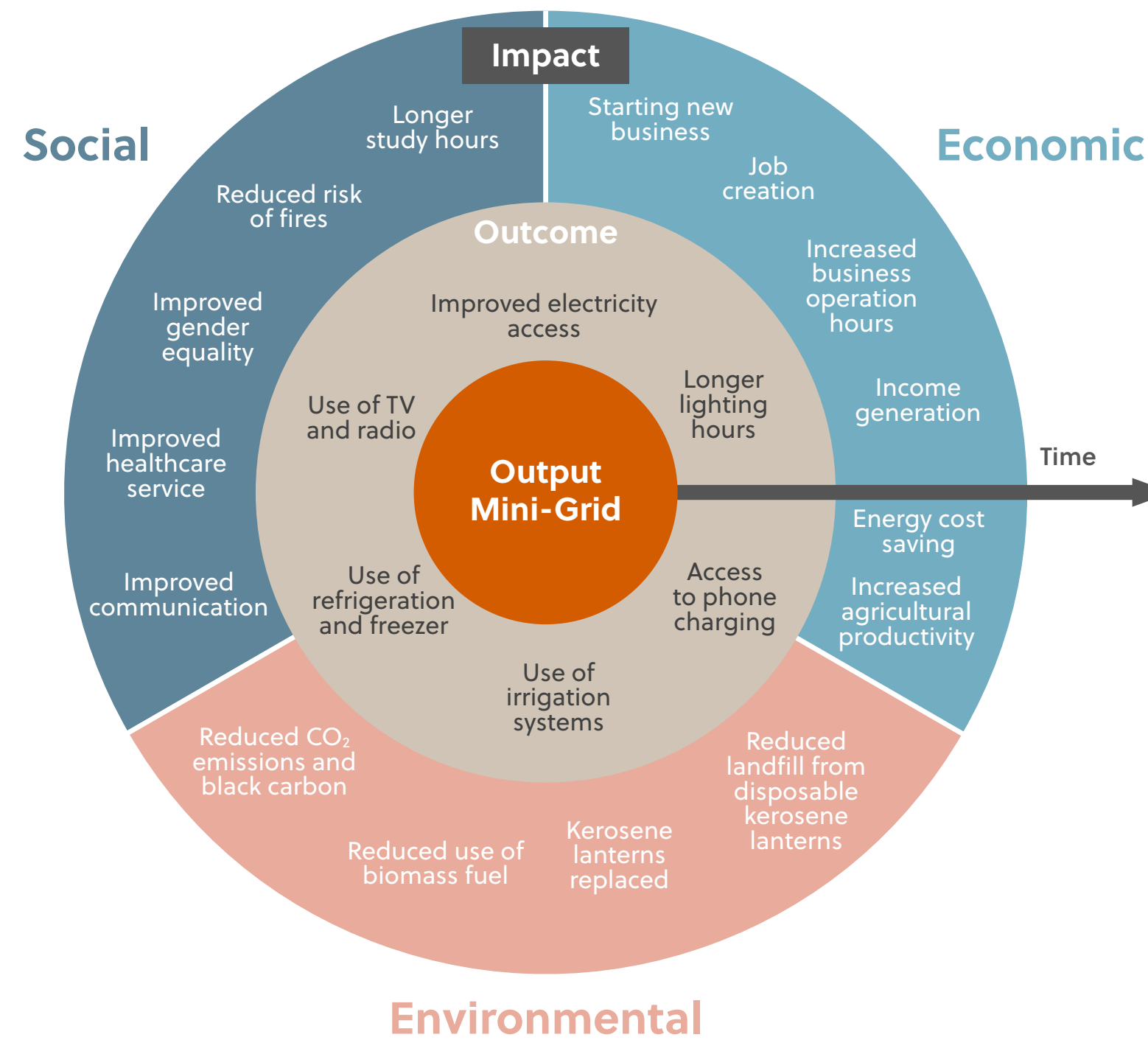
Their solution was to combine the best components of the two by advocating for both products and creating what the company coined as a decentralized, hybrid mini-grid system. This system, which pulls energy from both sustainable machines and a battery that stores excess energy, affords clients the ability to access electricity on demand, regardless of the time of day.

Husk was one of the first to put the sustainable mini-grid concept into practice. In 2014, only about 30% of mini-grids in the market were using solar PV, and even less were generating 100% renewable energy. Now, PV solar panels are part of over half of all mini-grids installed in sub-Saharan Africa and Asia.³⁵ The advent of this concept placed Husk in the unique position of offering uninterrupted access to sustainable electricity in weak-grid and off-grid communities. With Husk's 99% uptime and 24/7 troubleshooting,³⁶ subscribers can expect access to renewable electricity at all times of day, radically changing the way energy can be used and its implications for wealth, leisure, and safety.

Today, Husk boasts over 200 mini-grid systems spanning two continents. Their success in scaling is proof that sustainable, inclusive businesses can be both socially conscious and profitable.³⁷ Mini-grids have the potential to propel positive change at the social, economic, and environmental levels, as seen in the figure below.

HUSK'S BUSINESS MODEL

Figure 3: Output, Outcome, and Impacts of a Mini-Grid Project



Sources: Visualization pulled from State of the Global Mini-grids Market Report. Information from BloombergNEF; GOGLA; Lighting Global; World Bank Group

HUSK'S BUSINESS MODEL

Table 1: Key Facts

Name of Enterprise	Husk Power Systems Private Limited
Headquarters	United States of America
Country Footprint	India, Nigeria, Tanzania
Year Established	2007
Name of Founders	Manoj Sinha, Amarnath Chakradeo, Bhavana Mayur, Chip Ransler, Gyanesh Pandey, Mahesh Agashiwala, Ratnesh Kumar, and Suresh Sharma ³⁸
Size of the Company	475 ³⁹
Product/Service	Renewable Energy-as-a-Service
Market Segment	Weak-grid and off-grid rural communities
Use of Digital Technology	IoT-enabled, pay-as-you go payment system and algorithm-based pricing model; artificial intelligence

Sources: Dun & Bradstreet, Inc. 2021; Zippia⁴⁰

Products and Services

Husk’s business model revolves around the hybrid mini-grid, which consists of solar, biomass, and battery energy that is cost-effective and available 24/7. Once a Husk system is installed in a nearby off-grid or weak-grid community, the electricity generated is sold as a service to nearby clients through a pay-as-you-go scheme.

Product: A Look at the Science

Since the organization’s pivot in late 2014, the mini-grid has employed solar energy during the day, biomass energy during the evening, and battery energy at night.⁴¹ Once the sun begins to wane, the system automatically switches to Husk’s biomass gasification system. This machine produces electricity by decomposing biomaterial such as rice husks and using methane, carbon dioxide, and other gas byproducts to create energy.⁴² During the night, anyone who needs energy will draw from the grid’s lead-acid battery, which houses all excess energy produced during the day.⁴³

In addition to the technology used to produce energy, Husk mini-grids are Internet of Things (IoT) devices equipped with features that facilitate remote surveillance. The pay-as-you-go scheme is enabled by the grid’s internet connection to the

payment system and pricing algorithm. Furthermore, because most common troubleshooting can be done from afar thanks to the mini-grid’s internet connectivity and self-diagnostic features, the system requires minimal maintenance.⁴⁴

Energy-as-a-Service

Once a mini-grid is installed in a suitable location, Husk’s central promise is to provide “high reliability, easy to connect, good quality power.”⁴⁵ The use of more than one energy source increases the mini-grid’s resilience whenever unexpected complications arise. A cloudy day might inhibit solar energy but would not impact the production of biomass electricity. Conversely, lack of biomass due to supply chain complications would not be an issue, given that solar power can be stored in the battery for later use. Users who are connected to the Indian national grid, for example, often encounter energy shortages, infrastructural issues, and unpredictable outages due to the national grid’s lack of maintenance and inadequate architecture.⁴⁶ When compared to the national grid in India, the service Husk offers boasts much higher reliability due to its independence and subsistence on renewable energy.⁴⁷

Additionally, barriers to entry are very low. Users who are interested in plugging into the grid do not have to pay a premium, reducing friction and therefore encouraging households and businesses to opt in with little to lose.⁴⁸

HUSK'S BUSINESS MODEL

Furthermore, the IoT pay-as-you-go feature allows customers to top up their energy from the convenience of their homes. Husk has partnered with companies such as Vodafone to make the payment process as easy as possible through the IoT infrastructure.⁴⁹

Lastly, Husk's services include 24-hour customer support for anyone experiencing trouble with their energy supply. Clients can call a toll-free number or use the Husk app to file a complaint. Husk promises to resolve the issue within 4 hours of the complaint being filed.⁵⁰

These components are crucial for Husk's services to be appealing to clients and competitive to other entrenched energy players, such as the diesel and kerosene industries, the national grid, and other less sustainable sources of energy.



Source: Husk

Process

One of Husk's most appealing components is its ability to provide energy as a service rather than through a product. Some competing companies are looking to focus on electrifying rural areas by selling products designed to illuminate households at the individual level. This approach, however, shifts the burden of financing, operating, and maintaining the technology to the consumer, which could dissuade them from partaking in such an endeavor. Husk's approach removes this burden by aggregating localized demand for electricity and satiating it by offering EaaS rather than an energy-producing product.

Unlike other renewable energy competitors, Husk takes care of the entire process—from designing, building, and installing the grid to operating and maintaining it. Clients only need to plug into the grid and connect to the metered payment system to get electricity. This approach provides a maximum level of comfort to the customer. It also enables Husk to reach more households with less technology.

This business model provides Husk with a great advantage in the market, but it also requires the organization to be present in many remote areas. It currently operates over 200 grids in 2

HUSK'S BUSINESS MODEL

continents, meaning that the company needs to adhere to a strict procedure when choosing a new site in order to ensure its financial viability in the long term.⁵¹

Designing, Building, Owning, Operating⁵²

When choosing which areas to operate in, Husk takes several factors into consideration. Firstly, Husk assesses which countries have the most concentrated markets. Its projects are mostly concentrated in India and Nigeria, where over 250 million⁵³ and 85 million people⁵⁴ do not have access to electricity, respectively. This means that installing mini-grids throughout the country maximizes their reach by impacting the largest amount of people while maintaining minimal physical distance between sites.

Once the largest markets are identified, Husk proceeds to study the country's regulatory environment and whether it could pose any challenges to its long-term operation. Governments with clearly outlined rules and regulations empower Husk to invest in infrastructure without concern for legislative barriers. The Uttar Pradesh and Bihar states in India, for example, were two of the first entities to enact comprehensive micro-grid policies for their underserved populations.⁵⁵ In light of this openness, Husk has been gradually expanding its operations therein; it is currently in the process of building 140 additional micro-grids in these two Indian states.⁵⁶ The drafting of these groundbreaking

policies in India led to their adoption in other places around the world. Within six months, the Nigerian government was implementing a strategy to regulate and promote the installation of hybrid mini-grids, which created an incentive for Husk to set up operations in the country.⁵⁷

Analyzing political and economic risk is also key to understanding whether the market is suitable for Husk's products. Though Husk is already in operation in Nigeria, currency fluctuations were a central concern to investors; inflation has been shifting between 8% and 20% since 2014,⁵⁸ and its latest 2023 forecast shows no signs of amelioration.⁵⁹ Without the security of local financial stability, many risk-averse investors, banks, and debt lenders perceive mini-grids as a high-risk investment.⁶⁰ This economic instability is only one of the many risks Husk needs to evaluate before committing to a country. Another component is civil unrest—though Husk views markets such as Myanmar as particularly well suited for their service, it has been unable to penetrate due to the country's volatile political state.⁶¹

Once Husk finds satisfactory social, political, and economic conditions, it proceeds to identify communities that are ideally suited for Husk's offerings. In order to maximize their impact and maintain realistic ambitions, Husk looks for communities that are not as big and densely populated as a town, but not smaller than 300 clients within a 2-kilometer radius.⁶² Additionally, since the company's profit comes from

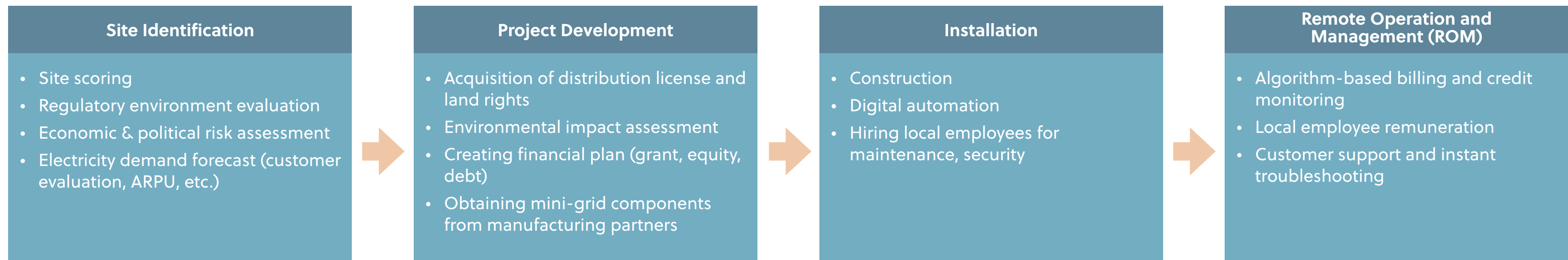
a mixture of clients, there should be an adequate proportion between serviceable households and businesses in order for Husk to balance average revenue per user (ARPU) with quantity of users in a given community.

Lastly, the availability of a talent pool is crucial to Husk's operations.⁶³ Though their IoT features enable them to troubleshoot from afar, many regular maintenance issues require specialized personnel on site to address them in a timely fashion. Additionally, Husk's promise to rectify issues within 4 hours of notification requires people on the ground to ensure everything runs smoothly. Lack of talent at the community level is therefore a significant factor when choosing which communities are viable to service.

Once all these components have been considered, Husk then proceeds to design, install, and connect the mini-grid system depending on the community's specific energy needs and climactic conditions. The mini-grid is delivered to the community configured and pre-wired for easy and quick installation; once up and running, the distribution network is connected to the grid and energy is supplied to the community almost immediately.⁶⁴

HUSK'S BUSINESS MODEL

Figure 4: Husk's Value Chain



Source: Husk; State of the Global Mini-grids Market Report⁶⁷

This multi-step process, though meticulous and seemingly time consuming, has not slowed down Husk’s installation rate. The company’s efficiency concerning “site scoring and selection, land leasing and permitting, supply chain management, logistics and warehousing, construction and digital automation”⁶⁵ are what have enabled them to not only minimize back-end operations and maximize effectivity, but also to build up to 16 grids a month.⁶⁶ This is an indication of how little friction there is from beginning to end thanks to their lean operation process.

HUSK'S BUSINESS MODEL

Resources

Partners

Husk benefits from strategic partnerships in every facet of the grid-making process. Firstly, concerning regulatory partnerships, its work with the Indian and Nigerian governments has facilitated the implementation of mini-grid-friendly policies.⁶⁸ These policy partnerships are also present at the IGO level, given that Husk has helped forge the best practices recommended by organizations such as the World Bank when it comes to sustainable energy implementation.⁶⁹ Additionally, Husk's commitment to the environment is further legitimized by forging partnerships in the global climate change sphere and publicly announcing its carbon-offsetting goals. In 2022, Husk signed the United Nation's Energy Compact, promising to install 5,000 micro-grids in partner countries by 2030, further guaranteeing its legitimacy in the climate consciousness debate by strengthening and formalizing its relationship with global organizations.⁷⁰

On its production front, Husk outsources manufacturing to industry leaders capable of ensuring high-quality energy

generators. Three partners essential to Husk's operations are First Solar, Cummins, and HAVOS which are tasked with supplying the organization with PV solar panels and the other technology necessary to run a mini-grid.⁷¹

Lastly, partnerships on the ground allow Husk to run its operations in the smoothest, most cost-effective manner. Its connection with telecommunication companies like Vodafone enable Husk to implement the pay-as-you-go model, which requires a constant connection to bill as consumption occurs rather than retroactively.⁷² Other partnerships on the ground include electricians, mini-grid operators, and security personnel who monitor the premises and respond when problems arise.

Investors

Currently, Husk and other members of the mini-grid industry are still burgeoning enterprises that lack the scale necessary to be economically self-sustainable. The industry remains too nascent to rely on commercial financing, which means that investments from private equity, venture capital, development finance agencies (DFIs), and governments are particularly important to Husk while it achieves economic viability.⁷³

Since 2008, Husk has raised over USD 160 million,⁷⁴ with USD 40 million received in the last 4 years.⁷⁵ Cisco Investments, DFJ Element, and Acumen were the first investors to support Husk's financials, investing around USD 600,000 before the company's first funding round.⁷⁶ Throughout the years, Husk's Series A through C funding rounds have yielded increasing quantities, culminating with USD 20 million invested in 2018 by Shell Ventures.⁷⁷ Since then, Husk has raised USD 55 million and was attempting to secure an additional USD 100 million from private investors as of September 2022.⁷⁸

Thanks to its investors, the company has grown 10-fold in the last 15 years.⁷⁹ It plans to double its total grid count from 200 to 400 by the end of 2023, meaning that its growth projection is exponential in an industry largely believed to be unscalable. As it continues to grow, the company has transitioned to acquiring low-cost, long-term debt as a prominent source of financing.⁸⁰ This implies that the company has finally reached a business stage where it is beginning to be profitable.

Its debt-sourced financing comes from major regional players. In February 2022, Husk announced a financing deal reached with the India Renewable Energy Development Agency Ltd. (IREDA) for USD 4.2 million to construct 140

HUSK'S BUSINESS MODEL

micro-grids in Uttar Pradesh and Bihar.⁸¹ An additional debt of USD 6 million was granted to Husk by the Electrification Financing Initiative (ElectriFI) to construct 80 more mini-grids in India.⁸² In early 2023, Husk secured USD 750,000 from the Herman Investment Corporation (DEG) to, among other things, construct 8 new mini-grids in Nigeria.⁸³ This DEG financing marks the first time Husk uses debt to fund projects outside of India, further cementing their ability to self-fund, move away from relying exclusively on non-commercial grants or equity investments, and prove to other risk-averse investors that Husk employs a sustainable business model.

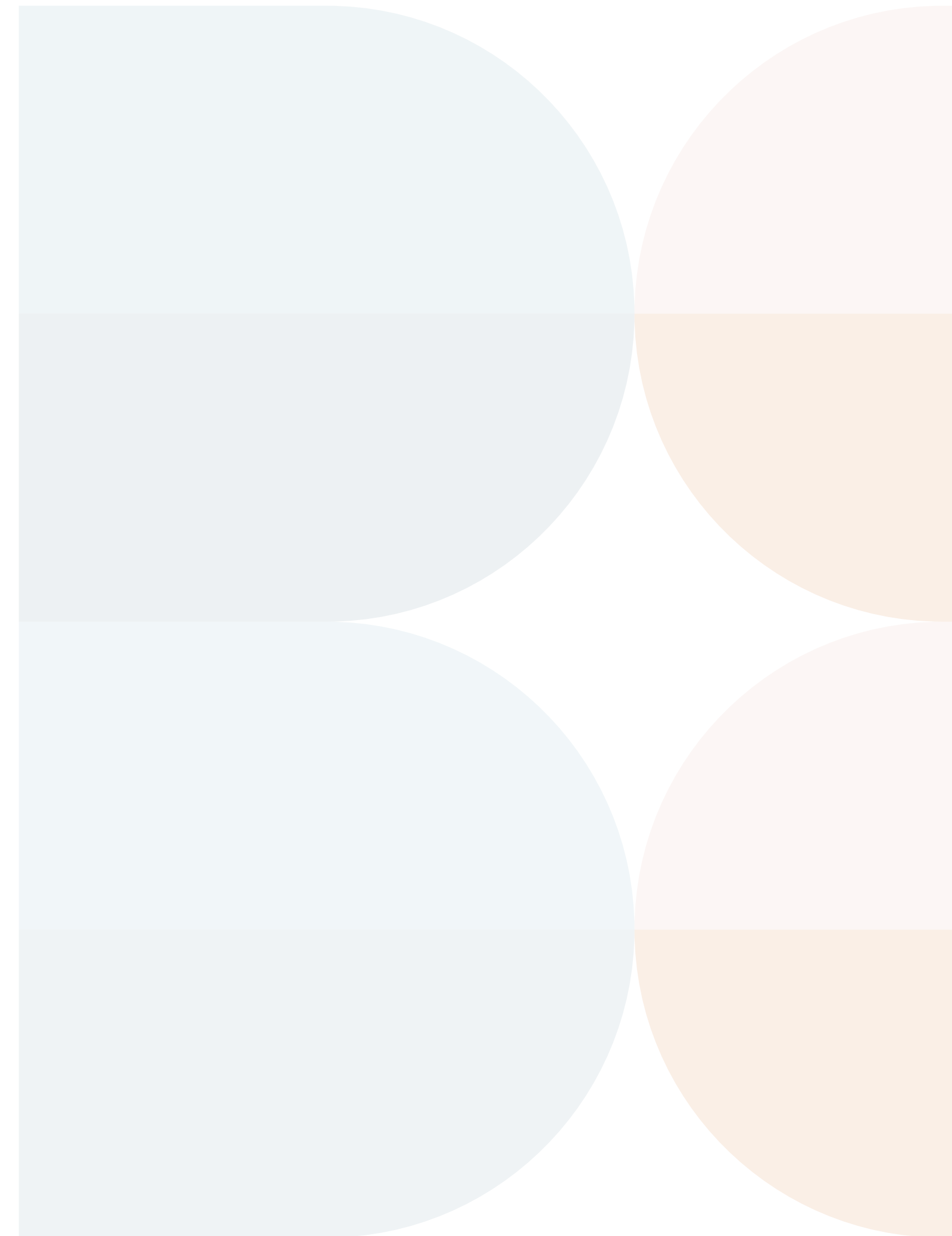
Profit Formula

Customer Base

As a company offering energy-as-a-service (EaaS), Husk's profitability relies exclusively on energy consumption. They equip each community with the necessary instruments so that no client needs to bear the financial and logistical burden of owning, operating, and maintaining a power source. This EaaS requires Husk to go directly to the community, and it, therefore, does not gain profit from B2B or B2G transactions. The company's income is therefore proportional to the amount of energy consumed in its network. The more energy

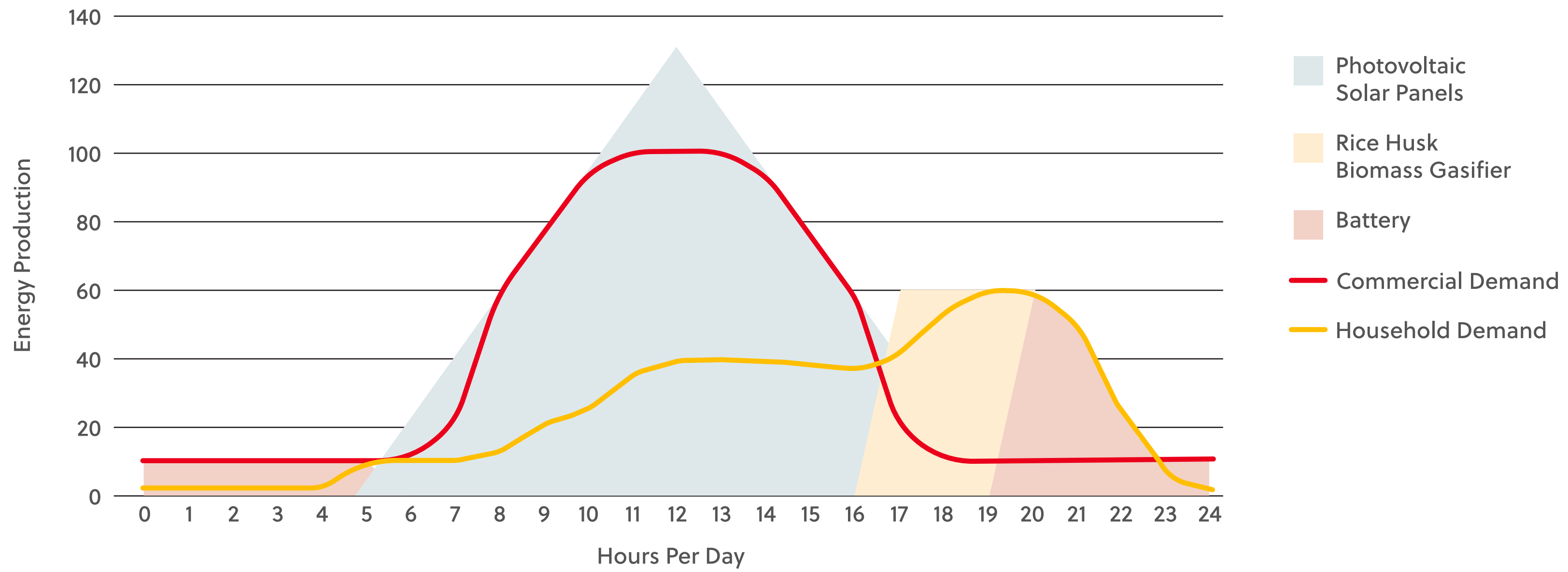
consumed in the less amount of space, the better their prospects for making money.

When Husk first launched, their principal target was residential households, which made up 90% of its clients. However, they eventually realized that targeting productive-use customers, such as micro, small, and medium-sized enterprises (MSME) could drastically increase their average revenue per user (ARPU), given that businesses consume electricity more reliably and at more convenient times.⁸⁴ Since electricity generation is cheapest during the daytime thanks to solar PV panels, it behooves Husk to target customers that are more prone to diurnal grid utilization because it presents the least amount of marginal cost to the company.⁸⁵ Household consumers, who tend to use energy for cooking and other personal uses, cannot fit their schedules into the mini-grid's optimum energy-production schedule. The image below demonstrates how productive-use customers can consume more and cheaper electricity than household clients, demonstrating why Husk's ARPU increases when focusing on commercial electrification.



HUSK'S BUSINESS MODEL

Figure 5: Example of Husk Energy Production on a Typical Day



HUSK'S BUSINESS MODEL

This is now factored into Husk's community selection process. Currently, their customer base has been inverted; Husk's clients are now 80% commercial and 20% residential to increase overall efficient energy use and consequently increase revenue.⁸⁶

Algorithm-Based Pricing Method

Husk uses a prepaid meter to minimize delinquencies and ensure constant revenue streams. This means that all electricity is prepaid and can be easily refilled through a mobile phone.⁸⁷ Once a client consumes all their credit, energy is cut off until the account is refilled.

An algorithm is used to determine the price of electricity. In essence, Husk employs a hybrid between 'block rate' and 'time-of-use' tariffs.⁸⁸ Pricing is based on how many kilowatt hours are consumed. The cost of each kilowatt, however, varies depending on what method is used to generate energy, at what time of day the energy is used, how much of it is used, and what type of client is using it.

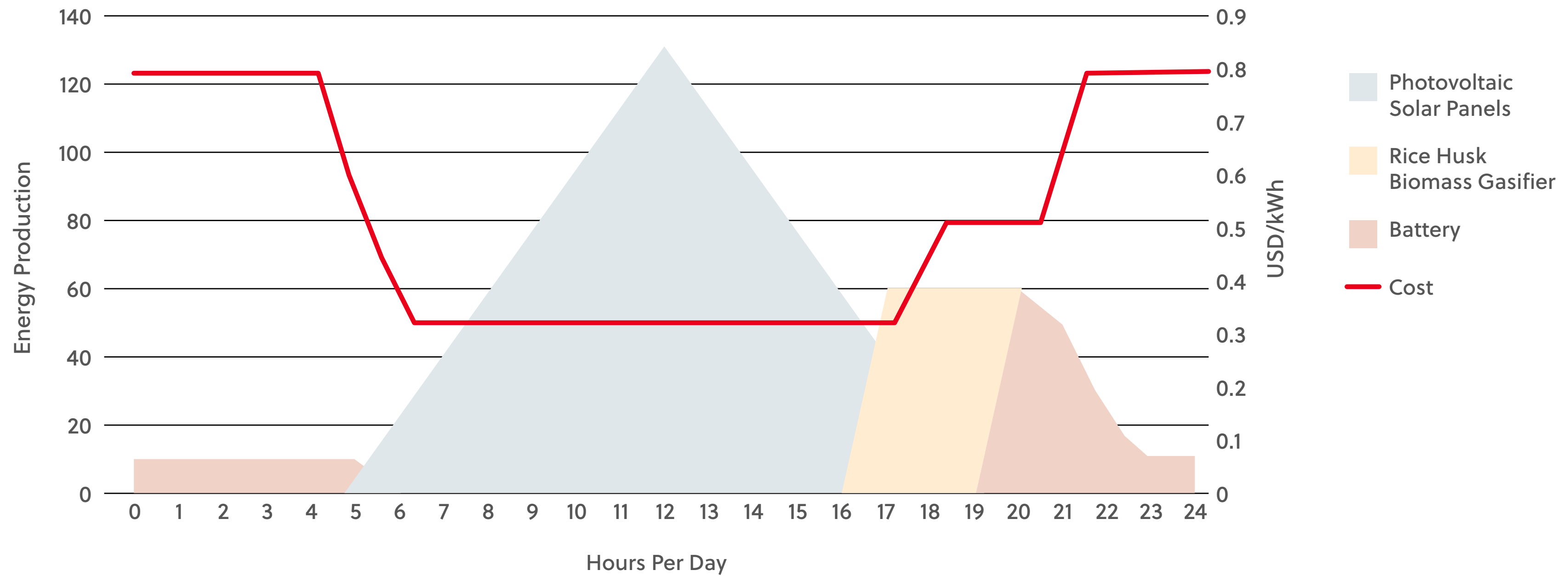
Consumption that occurs during the day, between 7 am and 5 pm, for example, will be the cheapest, given that clients are consuming energy produced by the solar PV panels—the most cost-efficient form of energy available in the mini-grid. During these hours, clients can expect a discount on the regular electricity rate; this discount is case-specific, meaning

it will vary by country, season, and, essentially, anything that impedes solar panels from operating at full potential.

Consumption becomes more expensive as solar panel productivity decreases and the grid must resort to more expensive methods of energy production. Energy usage during the late afternoon, once the sun's strength wanes, is derived from biomass gasification, and is normally accompanied by a slight cost increase to offset the efficiency difference between solar and biomass, as seen in Figure 6. Any consumption occurring at night will be the most expensive, given that energy is pulled from the battery reserve, which is very costly to maintain. Surge pricing will often occur late at night to offset the costs of battery usage and dissuade customers from using energy at unconventional hours.⁸⁹ An example of the theoretical pricing structure can be seen in the figure below.

HUSK'S BUSINESS MODEL

Figure 6: Example of Cost Variegation Based on Energy Source Used



HUSK'S BUSINESS MODEL

Lastly, the cost of electricity decreases as usage increases; users who consume more than 200 kilowatt hours per month will benefit from a discount. Husk does this to promote productive uses, particularly for commercial businesses which make up the majority of Husk's clientele and offer Husk a higher ARPU.⁹⁰

This cost variegation is one of the reasons Husk is not price competitive with government grids. The appeal in Husk's service, however, has more to do with the high uptime percentage, the 24-hour accessibility, and the 24-hour customer service.⁹¹ Additionally, such competition is rarely a problem given that Husk's target demographic is precisely found in off-grid areas outside of the government's reach. When compared to complete lack of electricity at night, Husk offers a solution that, although expensive, can lead to increases in productivity, safety, and wellbeing.⁹²

Creating Consumer Demand for Electricity

Apart from Husk's hybrid mini-grid service, the company also sells energy-efficient electrical appliances such as televisions, freezers, and individual sustainable power generators.⁹³ The rest of the company's profit formula is therefore dependent on the hybrid mini-grid system: by giving their clients electricity, they manage to create demand for their own electrical products in areas where such products were previously unviable.

STRENGTHS AND WEAKNESSES

Using The Nine A's Framework and the analysis presented above, we now evaluate the core components of Husk's business model in the matrix below. For each of these Nine A's elements, we designate a value from one to five, with one meaning that it needs attention and five suggesting that it is currently in an excellent stage. Using this simple formula, we quantify and visualize Husk's strengths and weaknesses in each of these categories.



STRENGTHS AND WEAKNESSES

Figure 7: Husk's Nine A's Evaluation

VALUE DRIVERS	ADVANTAGE	AFFORDABILITY	ACCESSIBILITY	APPROPRIATENESS	ADDITIVITY	ADAPTABILITY	AMPLIFIABILITY	AUTHORITY	ADJACENCY
VALUE PROPOSITION	●	●	●	●	●	●	●	●	●
RESOURCES	●	●	●	●	●	●	●	●	●
PROCESS	●	●	●	●	●	●	●	●	●
PROFIT FORMULA	●	●	●	●	●	●	●	●	●



STRENGTHS AND WEAKNESSES

On our **Advantage** metric, Husk earns an average of 4 points. Its Value Proposition and Process excel in this category; the company successfully balances the importance of using innovative, sustainable energy production with its mission to bring reliable electricity to off-grid populations. Furthermore, Husk's willingness to adapt to modern technology is further proof that the leadership is actively interested in reaping the benefits of ever-changing, evolving technology, even if it means drastically changing its mission and business plan. Slightly lower scores were given to Husk's Resources and Profit Formula. Concerning financial resources, Husk has raised enough money to operate over 200 grids globally thanks to its investors, which enabled it to scale at a rate faster than its competitors. Though steps have been taken to venture into debt financing in India and Nigeria, it still has a long way to go if it wants to make its resource advantage permanent. Furthermore, its partnership with First Solar and Cummins assures that they are supplying rural communities with high-quality technology from world-renowned production experts. Concerning their Profit Formula, Husk earns high marks because of their advanced use of technology for pricing and charging; compared to other players in the market, Husk successfully manages to achieve no energy theft.

Husk's **Affordability** assessment earns a 3— the lowest score of all its Nine A's evaluations. Its trajectory demonstrates how renewable energy technologies can be much cheaper

than entrenched alternatives, but this comparison is not particularly relevant when talking about Husk's target demographic, which often considers electricity an elastic commodity.⁹⁴ Determining whether renewable energy is worth the cost has more to do with an individual client's objective financial realities rather than renewable energy's cost vis à vis other players. For Husk's cost to be acceptable to its target demographic, it would have to lower its prices by over 40%, meaning that it still has a long way to go to become subjectively affordable.⁹⁵ Furthermore, its use of variable tariffs (block rate and time-of-use) make it lose points for affordability. The use of an algorithm to determine price means that users never know how much they are paying every time they employ electricity, which can not only dissuade customers from buying in, but it can also inhibit them from planning monthly expenses ahead of time.

Husk's founding mission is anchored around **Accessibility**, which makes it score quite high in this category, earning 5 in all components except for Process. Strong points include Husk's Profit Formula, which uses a pay-as-you-go credit structure that enables families to not fall behind on bills and debt. Concerning resources, one particular point of concern is that biomass gasification's efficiency is contingent on the availability of rice husks. Husk's strict community scoring and selection process ensures that it only chooses communities capable of supplying rice husks due to it being a byproduct of local agricultural production. However, seeing that mini-grids

are lifelong investments, shifts in economic activity where rice is phased out of agriculture (or agriculture is phased out entirely) could impact the amount of biomass available for energy production. Regardless, Husk scores a 5 in Resources because supply chain constraints occur in all energy supplies, which are often more deeply impacted than local supplies, as seen in coal and natural resource shortages during the COVID-19 pandemic. Further, Husk scores a 3 in Process because of its very strict parameters when choosing a host community. Their guidelines ensure their project's success and longevity but can also inadvertently exclude communities most in need of electricity. Many of these communities that fall short of Husk's guidelines often suffer interconnected disadvantages that further perpetuate their disqualification for Husk's services. Husk should make efforts to create a wider definition of qualifiable communities in order to include the most disadvantaged.

Husk's Value Proposition is quite unique, scoring it a 5 across all **Appropriateness** categories. It offers a socially relevant service that is low maintenance, uses an anti-theft design, and has very low downtime. It uses an anti-theft design to ensure that anyone unauthorized cannot tamper with it or steal electricity. Their Profit Formula stands out in this category as well, given that their use of an algorithm to determine price allows Husk to cater electricity costs to each family's lifestyle. Those who do not wish to pay the additional cost of using electricity at night, for example, can alter

STRENGTHS AND WEAKNESSES

schedules accordingly to decrease costs in a way that works for them.

Husk scores 5 points for **Additivity** in all relevant sections. By bringing previously disconnected communities into the grid system, it is introducing them to a plethora of new markets and opportunities. Its utilization of an unused resource (rice husks and sun) to resolve an unmet need (electricity generation) makes this company a valuable, innovative addition to the energy market.

The company's business model ranges in its **Adaptability** across all sectors, earning a 4 overall. On the one hand, their pivot in Value Proposition across the years has ensured that they remained relevant in their field and that they take advantage of how the latest technology can close the gap on energy needs. However, these pivots in business model are most feasible at the beginning of their trajectory; as they continue to install mini-grids across the world, they will be forced to make a commitment with technological resources that could be outdated relatively quickly. Thus, as they continue to expand and cement their presence across Africa and South Asia, they will become less adaptable in the grids they operate because of the heavy level of decentralization

and the time it takes to regain the initial money invested in each mini-grid. Husk's Profit Formula receives a perfect score because of the differences in price rates that enable families to avoid paying more money to offset the cost of the battery, for example.

Husk scores a 4 in **Amplifiability**. Though its Value Proposition suggests a big addressable market, the logistics of reaching it is one of Husk's, and the entire industry's, biggest barriers. Industry experts believe that Husk's business model is not easily scalable because it relies on a market that is massively spread out and that requires such a high level of initial investment. Their ability to scale has been impressive, given these challenges, and as of early 2023 they reached profitability. The fact that their operation is decentralized mixed with a target audience that has limited means to pay requires them to have exceptionally high financial reserves to cover the initial investment that funds equipment, installation, and administrative overhead. On one hand, their raw energy sources are quite amplifiable because rice husks and adequate sun levels are found in many qualifying communities across Africa and Asia. On the other hand, diversification of the biomass source used to power the gasification system could enable Husk to serve even more

communities by monetizing different types of biomass waste. Other popular biomass electricity sources that are widely available include wood chips, sugarcane bagasse, and nut shells.

Husk cemented its **Authority** in the sustainable business industry by consistently meeting its growth targets, attracting large funding from reputable firms, and forging ties with important actors in the renewable energy field. It earns a 5 across all categories, with the Process and Resource scores standing out. The meticulous process of scoring a community to determine suitability prioritizes the community's long-term wellbeing and ensures that the company's profit acquisition is sustainable in the long term. This perceptive, holistic process indicates that Husk remains true to its fundamental mission, even as it changes its approach to achieving said mission. Furthermore, in early 2022, the company expanded its partnership resources by becoming the first of its kind to sign a UN Energy Compact, where it stated that it would install 5,000 grids worldwide by 2030. These types of commitments further reinforce the company's authority in the renewable energy field, as well as its commitment to becoming an economically sustainable business.

STRENGTHS AND WEAKNESSES

Husk's ability to indirectly solve problems gives it a 4 overall for **Adjacency**. Giving off-grid communities access to electricity enables them to address adjacent issues—such as health care, education, food security, and safety—by using energy as an initial building block to increase socioeconomic prosperity. Electricity-dependent products that increase the quality of life, such as light bulbs and fridges, can now be considered by households with newfound access to electricity. Husk capitalizes on this by offering this technology to its clients at a reduced price or through a pay-as-you-go pricing structure, further spreading its impact past electricity acquisition in its client communities.

OPPORTUNITIES AND CHALLENGES

1) Lack of Cost Competitiveness and Prohibitive Costs Remain the Biggest Hurdle

Though renewable energy production has become unprecedentedly cheap,⁹⁶ its application is still not cost-competitive. In on-grid places, centralized energy systems tend to be heavily subsidized regardless of whether they are public or private. These large-grid managers are therefore not primarily concerned with profit,⁹⁷ while organizations like Husk need to be conscious of not only the cost of energy production but also ensuring enough funding for operational expenses and sufficient returns on investment.⁹⁸ In weak-grid and off-grid areas, entrenched players who sell diesel, kerosene, and other pollutive substances offset more expensive energy production by already having well-established distribution and production infrastructures in place—something that renewable energy organizations still do not have.

Regardless of cost competition, Husk's particular target audience requires exceptionally low electricity costs. Currently, the industry average cost is USD 0.33 kWh.⁹⁹ Estimates suggest, however, that in order for Husk's target audience to be able to consistently afford services, it needs to reduce this price by at least 40%.¹⁰⁰ Technological advances can only do so much, and although the only viable long-term option would be to lower costs, Husk must navigate creative short-term alternatives to justify its

price to potential consumers. Not doing so could lead to a lack of customer retention and Husk becoming vulnerable to clients' irregular income streams.¹⁰¹

Further diversifying its client and partner portfolio to increase its appeal could be a viable alternative to lowering costs. Certain markets have been unable to penetrate rural areas because of a lack of electricity. Those who have been able to penetrate these areas, like the telecommunications industry, currently have excessively high operational expenses due to their reliance on diesel when operating in off-grid areas.¹⁰² Fulfilling the needs of adjacent industries in energy-less communities could provide an opportunity for Husk to bring additional services by partnering with companies that offer crucial services for which electricity is key for operation. Husk could partner with this type of productive-use customer to both increase its ARPU and ensure that its household customers gain reliable access to, for example, telecoms on top of their energy connectivity, potentially offering connectivity packages that bundle phone plans with electricity to further promote demand creation.

2) Lack of Demand for Electricity

The target audience's demand for electricity is very elastic. Studies show that potential users are not willing to bear the brunt of a particularly high electric bill because their day-

to-day functions are currently not energy dependent.¹⁰³ As time exposed to electricity increases, so does the service's inelasticity—this is because clients eventually acquire fridges, stoves, lighting, and other daily use instruments that rely on access to electricity.

This reality presents a challenge and an opportunity for Husk. On the one hand, creating demand for electricity, and specifically sustainable electricity, can be challenging for Husk given the energy cost and logistical complexity of installing a hybrid power system in a community that treats it as a commodity rather than a necessity. On the other, it provides an opportunity for Husk to create demand for its own products—fridges, televisions, light sources—and create two different streams of income, the second of which is dependent on the first. Creating this demand, however, presents the clients with an even bigger economic burden—interested customers would initially have to pay for both the electricity and the appliances in a short time span. This could be a prohibitive cost for Husk's target audience.

Husk does a good job of diminishing this initial shock by applying the same pay-as-you-go structure it uses for its electricity service to its appliances. Clients interested in acquiring electrical appliances can do so without having to pay the full cost upfront. While this qualifies more people to buy appliances from Husk, the company needs to think

OPPORTUNITIES AND CHALLENGES

of a way to deal with delinquencies and missed payments for appliances, just as it has done when dealing with the electrical service. Furthermore, as previously mentioned, Husk should consider partnering with local players to bundle products with their electricity subscription to increase demand, like telecommunication connectivity.

3) Prohibitive Scoring Rubric

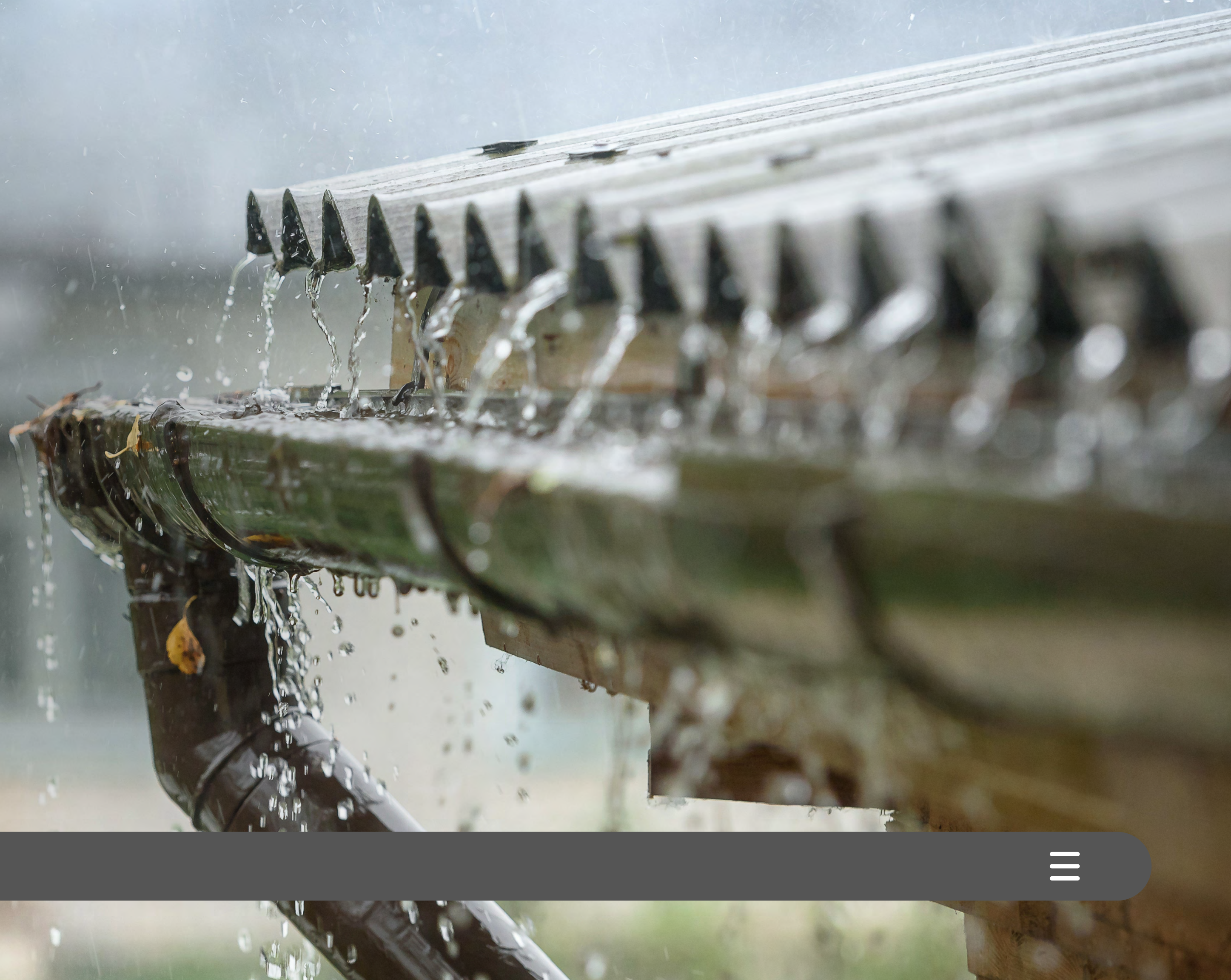
As discussed in the Process section, Husk employs a very strict procedure to choose which communities to operate in. Their scoring rubric, which takes into consideration the number of clients, business-to-household ratio, and technical expertise, ensures that their service caters perfectly to the target audience. This procedure, however, can at times be very exclusive, and even end up rejecting communities that suffer interconnecting disadvantages. These communities, which are most likely experiencing a shortage of talent because of a shortage of electricity, for example, could be the ones that stand to benefit the most from Husk mini-grids. Widening Husk's client net would

not only increase its addressable market and potential for profit but also ensure that Husk's benefits reach the most underserved communities.

To widen its market and penetrate into even more underserved areas, Husk might consider expanding its definition of eligible client communities. This can be done by, for example, offering a community training program to develop local Husk-specific technical expertise to troubleshoot the mini-grids. Thus, instead of only targeting communities that already possess this expertise, Husk can widen its reach and impact communities that do not have access to this type of skillset.

Nexsis

Innovative startup offers a multi-pronged solution to those lacking access to clean water, electricity, and financial services



INTRODUCTION



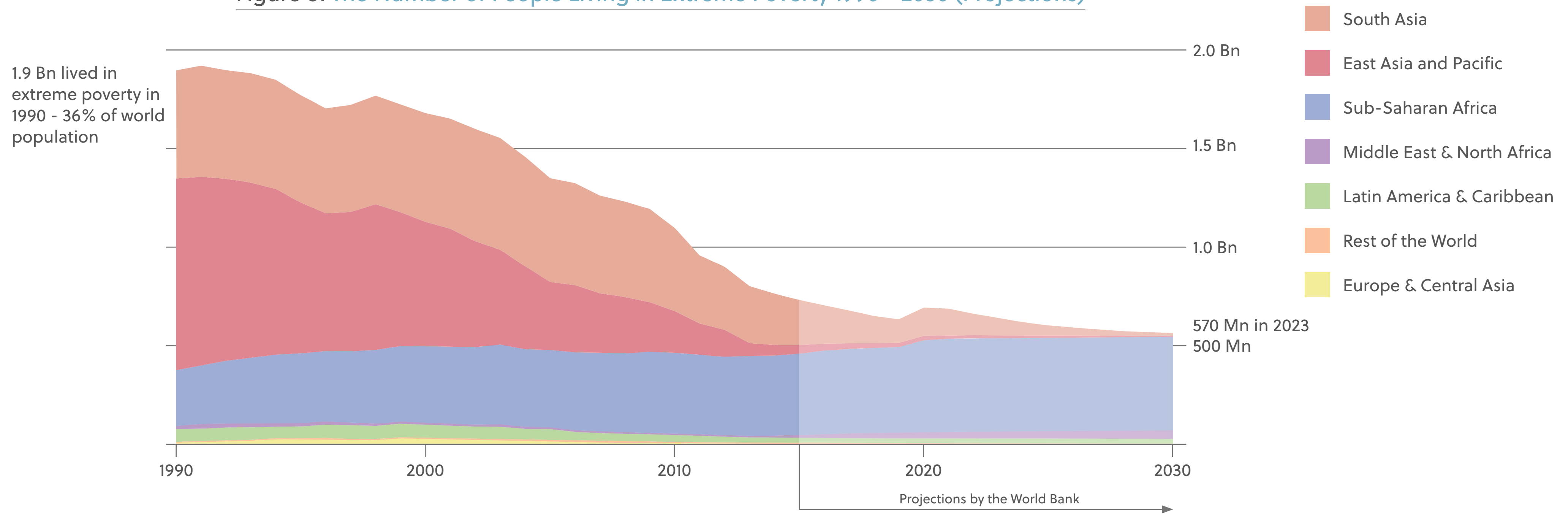
Nexsis seeks to alleviate global poverty by providing access to potable water, hot sanitation water, electricity, and financial institutions to those who need it. Through partnerships with NGOs and other businesses, Nexsis aims to distribute its Smart Panels to communities throughout the world, with operations currently in Cambodia, Morocco, Singapore, and Australia (with early-stage development in Brazil and India). The Smart Panels, an innovative solar-powered technology patented under the global Patent Cooperation Treaty, allow Nexsis to offer a multi-pronged digital solution to customers with an affordable pay-as-you-go pricing model.

A careful analysis of Nexsis' business model shows that the company has the potential to secure meaningful profits while maintaining sustainable business practices.

According to the World Bank Group, half of the world's population lives on less than USD 6.85 a day.¹⁰⁴ Of these, over 700 million people, almost 10% of the world's population, live in extreme poverty, on less than USD 2.15 a day.¹⁰⁵ In the decades preceding the COVID-19 pandemic, the number of people in extreme poverty fell from nearly 1.9 billion in 1990 to about 650 million in 2018. Poverty declined during the last generation in part because the majority of the poorest people on the planet lived in countries with strong economic growth (see Figure 8). This impressive growth, however, is no longer the case.¹⁰⁶

INTRODUCTION

Figure 8: The Number of People Living in Extreme Poverty 1990 - 2030 (Projections)



This data is adjusted for inflation and differences in the cost of living between countries. Extreme poverty is defined as living below the international poverty line of \$1.90 per day (in 2011 prices).

Source: Our World in Data¹⁰⁷

INTRODUCTION

Even without strong economic growth within an economy, access to certain resources can provide people with the tools to end a cycle of poverty. Key among these resources are potable water, electricity, and access to financial tools.

1) Lack of Access to Clean Water

In countries with the lowest GDP per capita, less than one third of the population has access to safe water.¹⁰⁸ Lack of access to water disproportionately affects women and children. Children are more vulnerable to diseases caused by unsafe water sources, which account for 6% of deaths in low-income countries. Further, reports show that, globally, over 800 children under five die every day from diarrhea linked to contaminated water.¹⁰⁹ Additionally, women bear the brunt of the labor involved in obtaining water from whatever source necessary: the average woman in rural Africa walks 6 kilometers every day to haul 40 pounds of water, and cumulatively women and girls spend 200 million hours per day gathering water.¹¹⁰ Direct access to clean water would prevent many unnecessary deaths and significantly increase the amount of time available to women and girls, allowing them to place a greater focus on education or other activities.

2) Lack of Electricity

Electricity is also vital for escaping poverty, as it increases the number of hours in a day that can be used for productive activity, such as work or study. But globally, roughly 940 million people do not have access to electricity. Nearly two-thirds of people not connected to the electric grid live in sub-Saharan Africa, indicating that this is a localized problem that disproportionately affects low-income countries.^{111, 112} Lack of access to electricity presents a myriad of challenges. Households without electricity must resort to using inefficient and toxic energy sources such as solid fuels and kerosene, both of which emit toxic gasses that lead to dangerous levels of indoor air pollution, and kill more people than tuberculosis, malaria, and HIV annually.^{113, 114} Kerosene is not only particularly dangerous, but also very expensive; users pay roughly USD 100 per kilowatt hour (kWh)— 100 times the cost in higher-income countries.¹¹⁵

3) Financial Insecurity

Roughly 1.4 billion people in the world remain unbanked or otherwise underserved by financial institutions.^{116, 117} Lack of access to a bank account reinforces poverty by “preventing individuals from building credit histories, accessing loans, securing their families against accidents and other risks, and accumulating the assets necessary to invest in education, small businesses, and other life-improving measures.”¹¹⁸ Furthermore, carrying or storing cash results in constant insecurity, and the acquisition of cash for unbanked people oftentimes results in exorbitant fees from payday lending or check cashing.¹¹⁹

NEXSIS' BUSINESS MODEL

Founding Mission & Value Proposition

Former professional football player and coach in Australia, Robert Pyman, in his capacity as the CEO and Founder of Glendalough Estate Wines, had the opportunity to travel to many countries throughout the Global South. He commented:

“The more I traveled, the more I saw there was an issue associated with water. I took it for granted that, in Australia, we can get clean water... [and so] I started developing technology that could potentially provide drinking water [to those at the bottom of the pyramid].”¹²⁰

Robert Pyman, CEO and Founder, Glendalough Estate Wines

Table 2: [Key Facts](#)

Name of Enterprise	Nexsis
Headquarters	Singapore
Country Footprint	Cambodia, Morocco, Singapore, Australia (early stages in Brazil and India)
Year Established	2013
Name of Founders	Robert Pyman
Size of the Company	22 employees, more at JV level
Product/Service	Smart Panels providing access to potable water and electricity, and offering a payment model that encourages financial inclusion
Market Segment	Off-grid households lacking access to essential resources (electricity, potable water, hot sanitation water, and financial services)
Use of Digital Technology	Smart solar panels with integrated IoT for periodical digital payments

NEXSIS' BUSINESS MODEL

Founded in 2013 by Robert Pyman, Nexsis' mission is to unlock global potential by giving more people access to the basic necessities of life. The company hopes to improve productivity and incomes, and ultimately "drive an expanding middle class and ensure that prosperity reaches everyone."¹²¹ In pursuit of this goal, Nexsis has partnered with influential NGOs and corporations with extensive networks in local markets to improve the company's prospects for reaching underserved populations. Furthermore, while many companies seek to offer such communities access to either electricity or clean water in addition to financial inclusion, there are few companies offering all three in a single product, putting Nexsis in a uniquely competitive position.¹²²

Over five years of research by "some of the leading minds in renewables and cleantech" have resulted in the Nexsis Smart Panel.¹²³ The business remains in its pre-revenue stage, though acceptance into Mastercard's Start Path accelerator program in 2018 and more recent partnerships demonstrate Nexsis' promise.

According to Nexsis, a family that installs the solar-powered Smart Panel in their home will receive up to 10 standard water bottles—the equivalent of five liters of pure clean

water, 50 liters of UV-treated hot sanitation water, and 35-80 watts of electricity (enough to power LED lights for about 15 hours) per day.^{124, 125} Ready access to clean water would mean that women will no longer have to make time-consuming journeys to obtain water from local sources that are often contaminated, and children will be at significantly lower risk of contracting waterborne illnesses. Over 50% of hospital beds in the developing world are occupied due to waterborne diseases.¹²⁶ Access to electricity can help increase productivity and leisure time for families and will limit the need to resort to kerosene and other pollutive fossil fuels as the sole source of electricity. Finally, financial inclusion through credit building will open new opportunities for families to finance new projects.

Families in remote communities generally spend 30-50% of their income on necessities.¹²⁷ The Nexsis Smart Panel is an investment that will save families both time and money over an 18-24-month payment period. The pay-as-you-go financial model ensures that even those with limited income are included and acts as a gateway to banking.¹²⁸ As an added benefit, Nexsis aims to monetize its data by tracking payments over time, providing financial institutions with data to promote financial inclusion.¹²⁹



NEXSIS' BUSINESS MODEL

Product

The solar-powered Nexsis Smart Panel is modular in design, which makes it easy to self-install. The product works in both single-domestic and large-scale commercial applications, and its intuitive, hassle-free design requires minimum maintenance, making it well-suited to all types of customers. One panel is generally sufficient for a household, and it can be mounted on either the ground or the roof. Its 10-year lifespan ensures that customers can rely on Nexsis solutions long after they have been purchased.

The Smart Panel accepts any source of water—ponds, rivers, oceans, piped or even contaminated groundwater. A feed pipe and integrated solar pump extract the water from the source into the panel through a process of biomimicry, the panel's "best-in-class integrated solar photovoltaic cells." The result is "clean drinking water ... [free of] arsenic, sediment, bacteria, and viruses...that exceeds...robust international standards,"¹³⁰ hot sanitation water, and electricity suitable for any household need. The panel's storage compartment can hold up to 10 liters of readily available water. To ensure continued water purity, the feed pipe needs to be rinsed monthly. The energy produced by the Smart Panel is stored in a rechargeable battery pack to be used by the consumer at will.

Nexsis' digital features connect to the internet, which supports the implementation of a pay-as-you-go structure and the financial inclusion component. The digital connection allows Nexsis to (1) install a payment regimen for users, (2) create a credit history for customers by collecting data on monthly payment practices, and (3) provide verifiable carbon credits (the Smart Panels displace fossil fuels used for energy production and boiling of water for purification).

Process

A new product is a challenging sell to those accustomed to a certain way of life. One key to getting potential users on board is local partnerships. Partnerships—agreements on service provision, technology licenses, and distribution agreements—are important to Nexsis because they help the company overcome many challenges inherent to businesses targeting underserved communities. Nexsis operates largely on a business-to-business-to-consumer (B2B2C) and business-to-business-to-government (B2B2G) basis. Under this B2B2C/B2B2G model, Nexsis supplies the panels to partners who are better equipped to supply customers with the desired product. Nexsis' partner entities are therefore

specialized in the specific region of operation and can advise or execute best practices in service provision, distribution, etc.

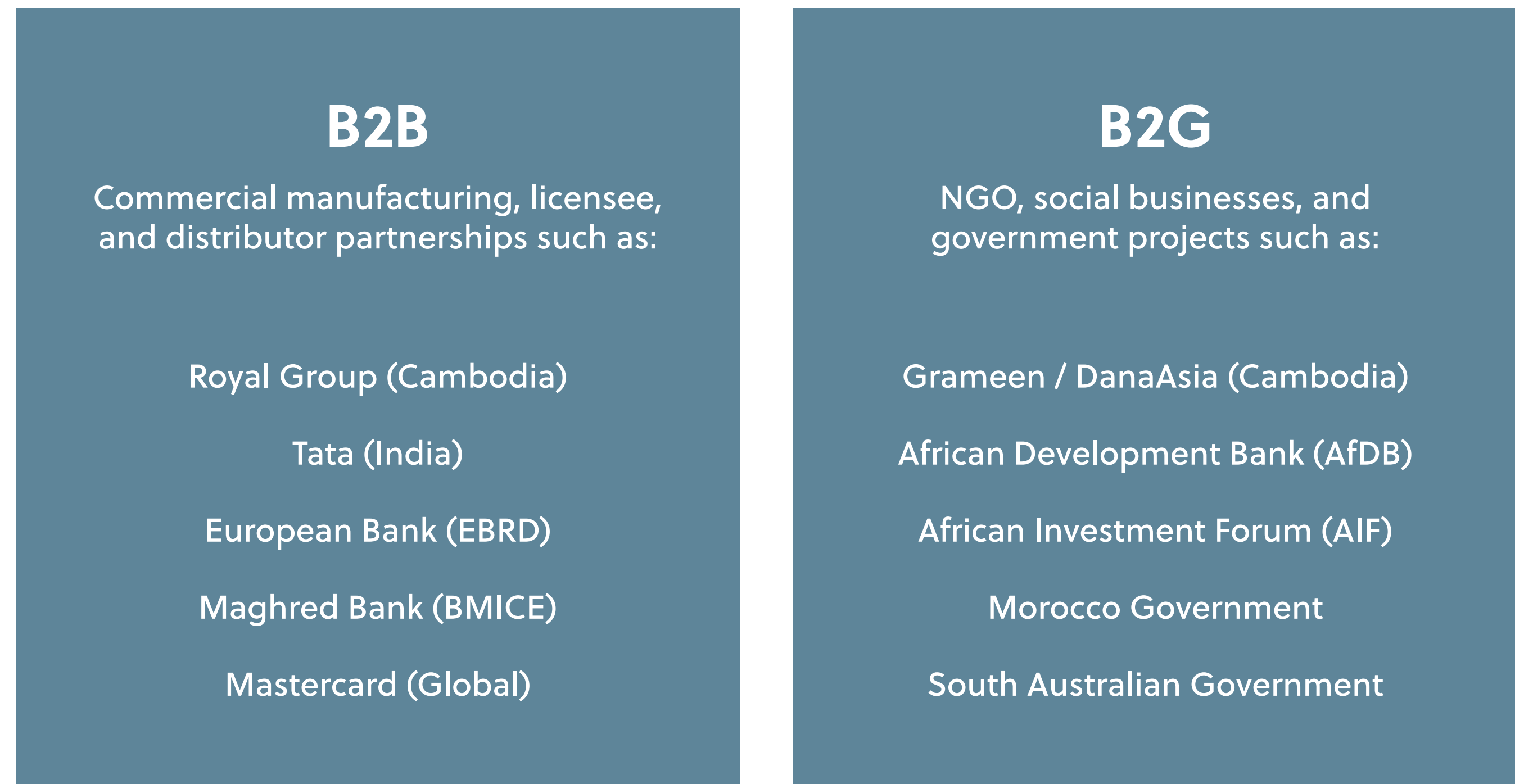
For example, by forming partnerships or joint ventures (JV), Nexsis gains access to off-grid markets with new potential customers. By utilizing partners' market knowledge, infrastructure, and distribution networks, Nexsis has been able to improve its market penetration, overcome distribution challenges, and successfully promote demand for its services worldwide.

More specifically, Nexsis maintains numerous local partnerships that equip it with market-specific knowledge on how to best increase outreach. For example, Nexsis has engaged in multiple partnerships across Asia. In Cambodia, Nexsis has formed a JV with Royal Group, partnering to build a USD 21 million manufacturing and distribution facility.¹³¹ To begin production, Nexsis issued a purchase order for 250,000 Smart Panels as a part of a nationwide food security project. Additionally, Tata, already the largest water provider in rural India, has asked Nexsis for an exclusive technology partnership. Representatives of Tata leadership believe that they can leverage Nexsis' technology to provide water, energy, and connectivity to an additional 500 million people.¹³²

NEXSIS' BUSINESS MODEL

Nexsis has determined over the past several years, especially amid the COVID-19 pandemic, that it is more effective to render services through government channels because of the supply chain and local employment. In Australia, Nexsis has engaged the government and indigenous communities in discussions regarding access to water and electricity for all. These partnerships are vital to Nexsis' business model both in terms of increasing engagement in the local community and limiting backlash from entrenched players.

Figure 9: Nexsis' Immediate Focus Customers



Source: Nexsis¹³³

NEXSIS' BUSINESS MODEL

Resources and Partnerships

Staff

As a pre-revenue company serving the bottom of the pyramid, it is vital that Nexsis limits its expenses and maintains a lean business model. Both in keeping with this necessity and promoting local employment, Nexsis has only 22 employees and relies on joint ventures and partnerships for much of its staffing requirements. Nexsis' executive team comprises professionals with technical as well as business backgrounds.

Partnerships

Nexsis CEO Robert Pyman believes that the right partnerships are vital to reaching the total addressable market affordably.¹³⁴ In addition to previously mentioned practical partnerships in manufacturing, service, and distribution, financial partnerships are central to Nexsis' business viability.

For example, Nexsis' success in the Mastercard Start Path accelerator program has been key to establishing the company's credibility as it seeks brand awareness and access to financial partnerships. After an intense application process passed by only 2% of applicants, Nexsis was accepted into Mastercard's 2018 cohort of Start Path companies, becoming the fifth Australian company ever to gain acceptance to the program. Start Path is an accelerator program through which Mastercard supports and advises startups with significant potential.

Pyman states that Mastercard Start Path has "given [Nexsis] access to a global network and organization, and also access to experienced mentors, particularly in the finance and tech world." Pyman's presentation in front of 500 potential investors and partners at the Global Start Path Summit in Miami in 2018 provides an example of the boost to Nexsis' visibility and credibility that Mastercard

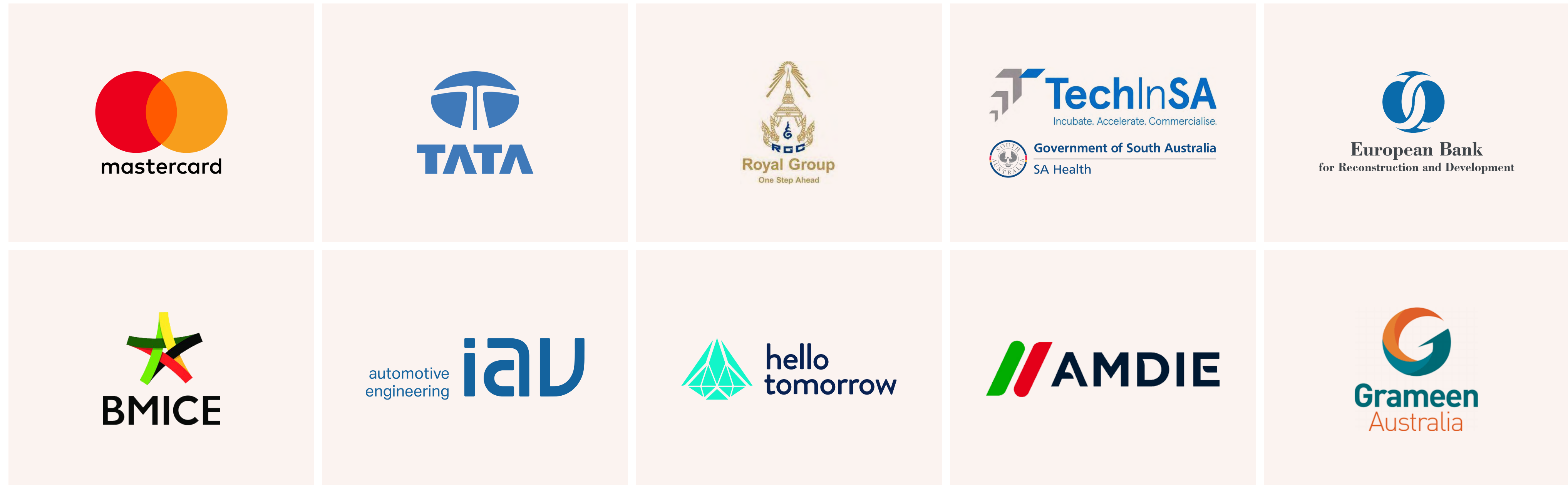
offers. While Nexsis was making headway in establishing partnerships before joining Start Path, the accelerator program certainly expanded its reach; Nexsis now boasts a nearly 100% response rate with partnerships they pursue, and the company now liaises with partners in many regions as it transitions to a post-revenue company (see Figure 10).

Now, to help generate funding for a USD 35 million manufacturing and distribution facility in Africa, Nexsis forged partnerships with the World Bank, the African Development Bank, the Bank of Africa, the European Bank for Reconstruction and Development, and the Morocco Government. Thus, partnerships empower Nexsis with the institutional legitimacy necessary to convince investors and secure crucial funding for the company to mass launch its product and transition into the post-revenue stage.

NEXSIS' BUSINESS MODEL

Figure 10: Nexsis Partnerships

Nexsis has partnered with leading companies, governments and NGOs around the world



Source: Nexsis¹³⁵

NEXSIS' BUSINESS MODEL

Patented Technology

Patents for the Smart Panel technology have been granted in Australia and numerous other countries filed under the Global Patent Cooperation Treaty (Global PCT). Nexsis has been exercising caution until a second submitted patent is granted to further protect against intellectual property theft. Once granted, the company will have the opportunity to expand its public image and more openly advertise its technological prowess. However, Global PCT patents are just one part of Nexsis' IP protection strategy, as the organization is constantly looking for ways to strengthen its security measures.

Profit Formula

Nexsis' financial opportunities in each market will be determined by the structure in place and local market peculiarity. The company's initial go-to-market approach is to sell panels wholesale to businesses that will be distribution partners. These partners sell panels at retail prices or offer them to customers under a pay-as-you-go financial model.

Product Cost

In the absence of a detailed financial breakdown of Nexsis' panel costs, this case substitutes comparable business models to approximate production costs. As Nexsis' CEO said that customers pay less than USD 1 per day, we estimate that amount to be USD 0.45 per day with a repayment period of two years. We know that M-KOPA, a leading SHS provider in Kenya, has a pay-as-you-go model with an initial deposit of 17.5% (or USD 35) of the total product price of USD 200,

Table 3: Calculation Conducted by Digital Planet Research Team

Nexsis Panel Cost Estimation	
Estimated Daily Expense	USD 0.45
Repayment Period	2 years
Estimated Initial Deposit	17.5%
Estimated Nexsis Panel Cost	USD 400

followed by a daily payment over a year.¹³⁶ Applying this payment structure to a two-year payment period, we can estimate that Nexsis' product could be sold for approximately USD 400 (USD 0.45 x 365 x 2) / (1-17.5%).¹³⁷

Pay-as-you-go Pricing

Though Nexsis offers a simple solution to three major global quality-of-life issues, its cost can be prohibitive for some members of the company's target audience. To reach millions of customers at a cost-effective rate, Pyman hopes to maintain lean manufacturing practices and reasonable profit margins across the value chain. Understanding that maintaining healthy profit margins at the bottom of the pyramid can be a challenge, Pyman asserts: "Instead of building a Rolls Royce, we are building a Toyota."¹³⁸

To incorporate as many people as possible from the bottom of the pyramid, Pyman plans to offer a pay-as-you-go financial model with a small deposit defined by a given country's taxes, duties, and other fees, followed by daily payments for water and electricity of less than USD 1 per day.

Payments can be made on any phone as well as through local shops for those without access to a phone. Failure to make payments will result in the panel being shut off until payment is received. Most Nexsis users should be able to pay off the panel within 18-24 months, at which point customers

NEXSIS' BUSINESS MODEL

are given an opportunity to buy further products, in what Pyman refers to as a "consumer product waterfall."¹³⁹ Pyman foresees that in the future, increased battery power will allow users to utilize more energy-intensive equipment, such as fans or even refrigerators. In some instances, access to Nexsis products can unlock new micro-entrepreneurship opportunities. For instance, small-scale water and energy farms could potentially sell their services to local consumers.¹⁴⁰

Nexsis is currently in its pre-revenue stage, however, the startup plans to rely on eight revenue streams to secure profits, as shown in Figure 11.

Additional Revenue Streams

Sales revenue will make up a large percentage of Nexsis' earnings in its initial stages. However, as the company continues to scale up, it plans to focus on additional revenue streams. Pyman believes that profit margins will only widen as manufacturing costs come down over time.¹⁴¹

Figure 11: Nexsis Revenue Streams



Source: Nexsis¹⁴²

STRENGTHS AND WEAKNESSES

Using *The Nine A's Framework* and the analysis presented above, we can now evaluate Nexsis' core components within the business model in the matrix below. For each of these *Nine A's* elements, we designate a value from one to five, with one meaning that it needs attention and five suggesting that it is excellent. Using this simple formula, we can quantify and visualize Nexsis' strengths and weaknesses in each of these categories.



STRENGTHS AND WEAKNESSES

Figure 12: Nexsis' Nine A's Evaluation

VALUE DRIVERS	ADVANTAGE	AFFORDABILITY	ACCESSIBILITY	APPROPRIATENESS	ADDITIVITY	ADAPTABILITY	AMPLIFIABILITY	AUTHORITY	ADJACENCY
VALUE PROPOSITION	4	5	Unavailable	5	4	4	5	5	5
RESOURCES	4	5	5	4	Unavailable	5	3	3	4
PROCESS	3	5	3	5	4	3	4	4	4
PROFIT FORMULA	2	4	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	4



STRENGTHS AND WEAKNESSES

In terms of **Advantage**, Nexsis earns a score of 3. The company's multi-pronged solution sets it apart from competitors, but while others in the market may not offer the overarching solution that Nexsis does, many are more advanced in their market penetration and, in some cases, they can offer more technologically-advanced products. Pyman asserts that Nexsis' multi-pronged approach is rare in the market and makes its solution more valuable than that of competitors: "We don't see too many players offering water and energy solutions all in one." Still, Nexsis must compete against clean water and solar energy players already active in its target markets.

While Pyman believes that no water competitor can produce water "as cheap and green" as that of Nexsis and that those using "membrane or dehumidification technology" will not be as cost-effective in the long term, multiple players in the water sector have already established strong positions and proven their viability in sub-Saharan Africa.^{143, 144}

In terms of electricity, sub-Saharan Africa and Southeast Asia have seen a boom in solar power over the past decade as prices have come down and entrepreneurs have come to believe that "just as cell phones bypassed the network of telephone lines, solar panels will enable many rural consumers to bypass the electric grid."¹⁴⁵ As such, there are many established players in the market, and while Nexsis states that no solar-electric competitor has a "complete

micro-grid solution," companies such as M-KOPA and Solar Sister already serve more than one million customers each and offer more advanced products to consumers such as fans, televisions, and refrigerators. Over time, with support from its partners, Nexsis has the potential to overcome these competitive advantages. Currently, however, there remain challenges to overcome.

Nexsis earns a 5 for its **Affordability**. The company offers a solution that is intended to include even those at the lowest rungs of the global socioeconomic ladder. Nexsis' pay-as-you-go structure offers purchasing power to those with limited wages without the need for sizable upfront investments, which often serves as a major deterrent. According to Xavier Helgesen, the American co-founder and CEO of Off-Grid Electric: "[For those at the bottom of the pyramid,] a bad decision... can mean your kids don't eat or go to school, which is why people tend to be conservative. And which is why kerosene was winning. There was no risk. You could buy it a tiny bit at a time."¹⁴⁶ With a pay-as-you-go structure, Nexsis' Smart Panel is more affordable, more time-efficient, and cleaner than procuring water from other sources. Furthermore, with Nexsis, customers receive clean water and electricity for roughly the cost of only one of the two, suggesting that the solution can be price-competitive with other solar companies while providing clean water as a bonus.¹⁴⁷ Finally, while it is easiest to pay through the use of a phone, customers without access to a phone have the option

to make daily payments at a local shop, further ensuring that as few people as possible are excluded from Nexsis' solution.

Nexsis scores a 4 on the **Accessibility** metric for its ability to get its product to the communities that needs it. Nexsis' partnerships will be instrumental in this task. As noted previously, partnerships help Nexsis overcome distribution challenges and improve its penetration in areas where profitability potential is high. Still, in countries with lower political stability, Nexsis may face challenges in attempting to reach potential customers due to threats posed to the manufacturing, distribution, and installation processes.

In terms of **Appropriateness**, Nexsis earns 5 points for the suitability of the Nexsis Smart Panel to the problems it seeks to solve. As discussed in the introduction, those living at or below the extreme poverty line often endure interconnected disadvantages. In other words, those who lack access to water most likely also lack access to electricity and financial services. When Nexsis provides those necessities, it also provides people with a springboard to escaping poverty by giving them more time to study and work, and boosting their financial profile.

In terms of **Additivity**, Nexsis earns a score of 4. As a nascent startup, Nexsis is providing a multi-pronged solution, and adding to other parts of the value chain by providing an avenue for financial inclusion for those at the bottom of the pyramid.

STRENGTHS AND WEAKNESSES

Given the simple modular design of the Smart Panel and the cost-efficiency of its implementation in all markets, Nexsis can effectively expand its global market reach. For these reasons, the company scores a 4 on **Adaptability**. In addition, the panels can treat all water sources, which means that the product can be successfully integrated into various geographic environments.

Nexsis scores a 4 on the **Amplifiability** metric based on the breadth of the problem the company is seeking to solve and the universal nature of the solution. Lack of clean water and electricity are common across the Global South, and Nexsis offers a solution to both problems that transcends culture. Panels can be installed on the ground or a roof, and as long as there is sunlight and a water source, they will provide households with adequate clean water and electricity. Still, partnerships with local businesses or governments are key to the success of the Nexsis solution; without such joint ventures, Nexsis is not equipped to serve populations in need. Failing to form partnerships in current or new countries could be a challenge for Nexsis to amplify its solution to the people within that country.

Nexsis earns 4 points for **Authority**. A startup will almost always struggle with this metric because young companies rarely have the power to change the commercial landscape and convince other companies to conform to their practices. Despite this, Nexsis remains committed to alleviating poverty

against the backdrop of an increasing global focus on climate-friendly water and energy solutions. Beyond that, having been a Mastercard Start Path cohort member, Nexsis wields significant legitimacy and resources. For these reasons, Nexsis boasts a greater level of authority than many startups.

In terms of **Adjacency**, Nexsis earns 5 points. The company was built on the idea of offering a holistic solution to those facing adjacent challenges. As mentioned previously, the Nexsis Smart Panel gives those at the bottom of the pyramid access to clean water and electricity and, in doing so, it improves sanitation, limits waterborne disease, promotes gender equality, increases the number of hours families can spend working or studying, and opens an avenue for financial inclusion.

OPPORTUNITIES AND CHALLENGES

Capturing the market at the bottom of the pyramid offers an attractive profit potential. According to the Harvard Business Review, “the 4 billion people living in poverty represent USD 5 trillion worth of purchasing power.”¹⁴⁸ But, delivering the basic necessities to the people at the bottom of the pyramid comes with many challenges.

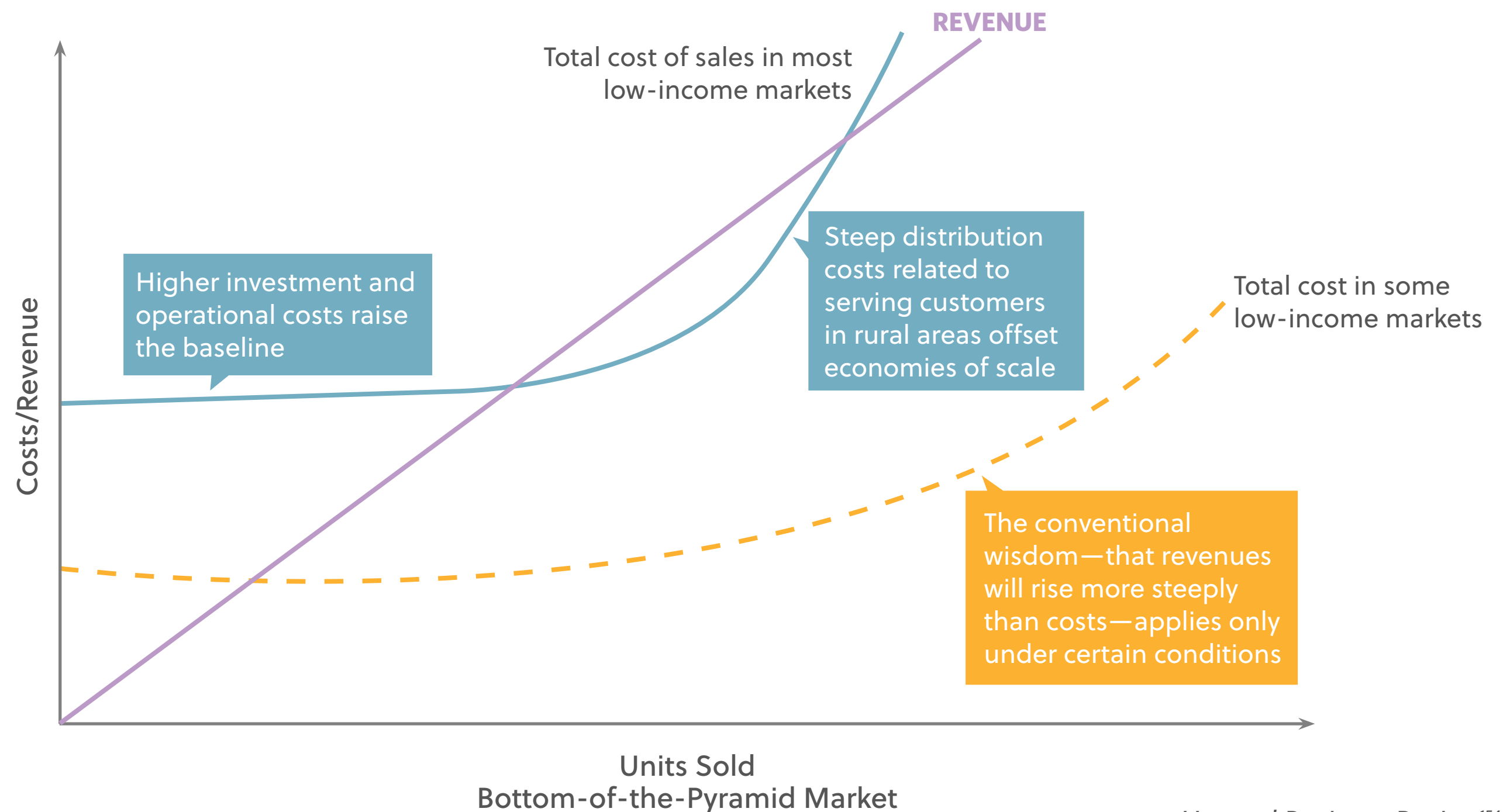
1) The Importance of Achieving a High Penetration Rate

The low-price, low-margin, high-volume strategy for serving those at the bottom of the pyramid, proven viable by Unilever’s success in India, requires impressive penetration rates to capture significant profits. Erik Simanis argued in the Harvard Business Review in 2012 that “well-meaning commercial ventures that couldn’t make sustainable profits are all too common in low-income markets [because success] inevitably requires an impractical penetration rate of the target market—often 30% or more of all consumers in an area.”¹⁴⁹ See Figure 13.¹⁵⁰

The Volume Game: A Losing Proposition

Experience in most bottom-of-the-pyramid markets contradicts the conventional wisdom that very-low-priced consumer products can be profitable at high volumes.

Figure 13: The Challenge of Profitability Even at High Volumes



Source: Harvard Business Review¹⁵⁴

OPPORTUNITIES AND CHALLENGES

2) Difficulty Penetrating Markets in Rural Areas

The high penetration rate required for profitability is quite difficult to achieve. Although potential consumers are numerous, they are often rural and scattered.¹⁵¹ Compared to developed markets, operational expenses such as distribution are frequently much higher in rural areas, where critical infrastructure is often lacking. Expansion is challenging as “marginal costs rise rapidly and efficiency drops [as] a company tries to expand beyond a village or a small cluster of villages.”¹⁵² Every replication of the business requires an increase in operational costs, like recruitment and training of new employees, which can be time-consuming and expensive. Furthermore, traction in one rural area does not guarantee popularity in another as localized messaging and adoption is crucial to each potential expansion.

3) Surviving Significant Upfront Costs Before a Pay-Off

To make products affordable, the Nexsis pay-as-you-go strategy offers a way to sell comparatively expensive goods to those at the bottom of the pyramid. Such strategies incorporate more people and increase the penetration rate, but they can also widen the gap between initial investment and final payoff. Companies that adopt this strategy must have the capital to sustain the business without significant revenues for an extended period.

Companies best suited to serving those at the bottom of the pyramid are those that, according to experts, pursue a strategy of “creating private and public value while aiming for scale.”¹⁵³ If the community thrives when the business does, a successful company will allow people in the community to grow more affluent, thus further increasing their consumption and creating a positive feedback loop. Such a strategy can be implemented through the effective use of digital technology while profitably tackling problems. Digital technology allows businesses (1) to address thousands and even millions of consumers facing the same challenges with cost-effective and environmentally-friendly solutions, (2) to better understand the needs of consumers on a daily basis, (3) to efficiently collect money for the services they offer without having to hire thousands of employees, (4) to offer timely maintenance when services are not functioning as they should, and, most relevant in this case, (5) to unite challenges under a common solution.

ThredUp

Online consignment and thrift store offers top brands, compelling deals, and partial solution to fashion waste

Case Studies

ThredUp

Introduction

Business Model

Strengths and Weaknesses

Opportunities and Challenges



INTRODUCTION

THREDUP

ThredUp is a US-based secondhand e-commerce consignment business that facilitates the sale of high-quality women's and children's clothing by providing the digital platform and logistical expertise to eliminate friction and maximize convenience for both buyers and sellers. ThredUp offers over 35,000 brands at an affordable average price-per-item (USD 17) that caters to a wide customer base and expands the resale market in the United States. Sustainable values are deeply rooted within the company's DNA and are visible in ThredUp's environmental impact, as ThredUp creates a circular economy, limiting carbon emissions as well as energy and water waste. A careful analysis of ThredUp's business model shows that the company offers a clear example of a business with the potential to do well while doing good.

Fashion is one of the most pollutive industries in the world. At present, the textile system operates in an almost entirely linear manner, with large amounts of non-renewable resources extracted to produce clothes that are used for a short time and then discarded in a landfill or incinerated (see Figure 14).¹⁵⁵ By some estimates, the fashion industry produces 10% of all of humanity's carbon emissions, ranking behind only the fuel industry and the agriculture industry in terms of its negative environmental impact.^{156, 157} The industry's impact stretches beyond carbon emissions, contributing substantially to water waste and pollution, plastic production, and the expansion of landfills.¹⁵⁸

While the pollution caused by the fashion industry is a global problem, the United States bears the most responsibility per capita of any country. The United States is responsible for the highest demand for apparel fibers (37.6kg per capita) and, consequently, the highest carbon emissions per capita (1,450kg of CO₂ eq in 2016).¹⁵⁹ Each year, 32 billion garments are produced for the US market, and 64% of them end up in a landfill.^{160, 161} Moreover, American consumers are wearing their purchases 75% less often compared to the global average.¹⁶²

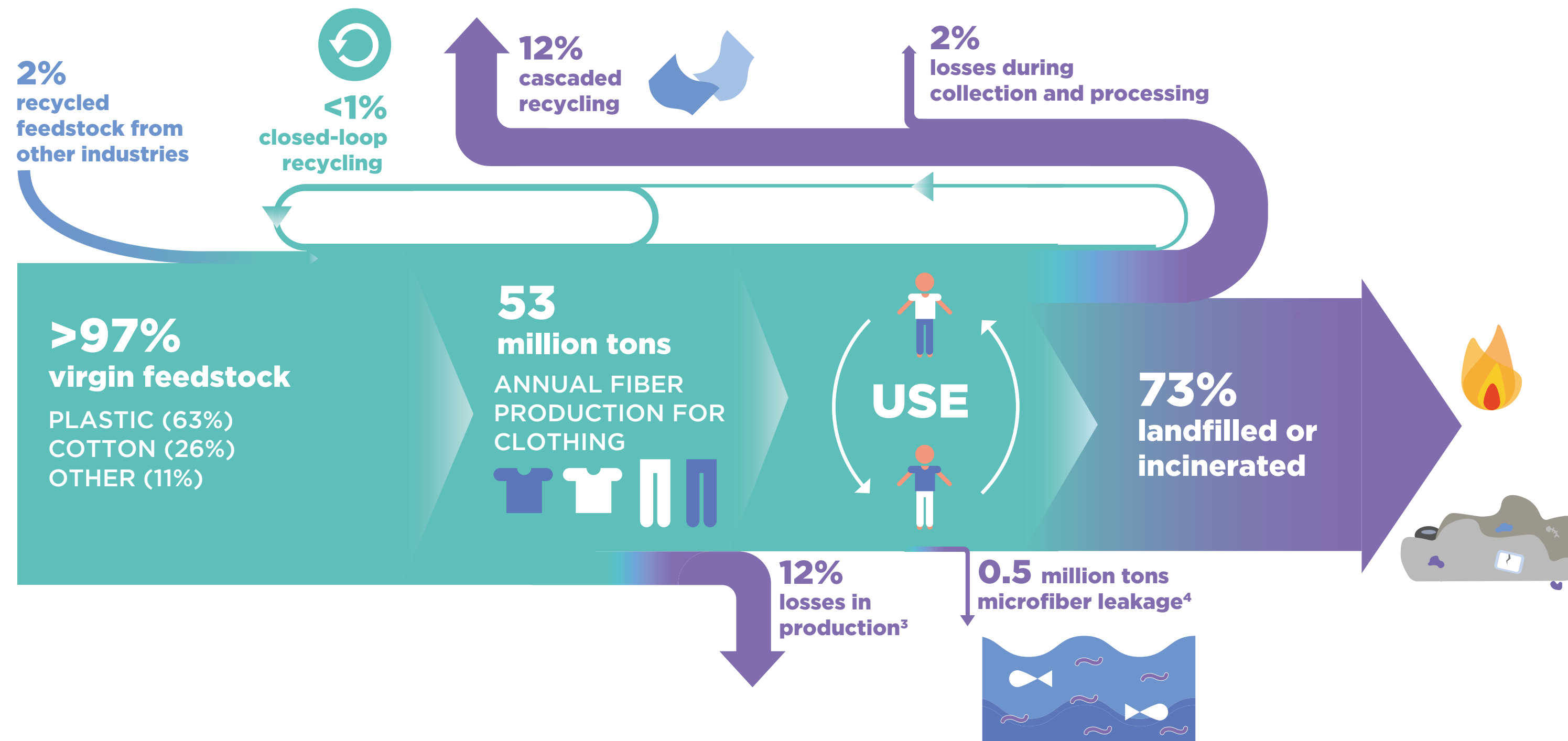
To address this growing problem, ThredUp, a for-profit company, was founded in early 2009 to offer an innovative and sustainable alternative to wasteful fast fashion. The company has evolved over the years by consistently

capitalizing both on the strength of the United States' digital economy and the rising appetite for secondhand clothing. To make secondhand clothing sales as easy and seamless as traditional retail, ThredUp has devised a logistics network and online platform that incorporates buyers and sellers into the circular fashion economy in a hassle-free manner. They operationalize this managed marketplace by:

- 1) Providing sellers with a free "clean out kit," which they fill up with quality used clothing and send back to ThredUp where the company handles processing and listing items;
- 2) Using proprietary technology to determine which items can be accepted and then photographing, categorizing, and arranging said items on the site;
- 3) Pricing and marketing items using sophisticated algorithms and personalized advertising; and
- 4) Shipping products to buyers and compensating sellers accordingly.

INTRODUCTION

Figure 14: Global Material Flows for Clothing in 2015



Source: A New Textiles Economy: Redesigning Fashion's Future ¹⁶³

INTRODUCTION

Some of the key challenges facing the U.S. fashion retail sector that ThredUp aims to solve include:

1) Adverse environmental impact due to increased production and growth in fast fashion

The push toward fast fashion, a business model that focuses on getting the newest styles to consumers as cheaply, quickly, and as often as possible, has exacerbated fashion waste. Clothing production has doubled in the past 15 years.¹⁶⁴ Western fashion companies went from offering two collections per year in 2000 to five in 2011, with companies like H&M showing 16 and Zara 24.¹⁶⁵ This increase in collections led consumers to buy 60% more clothing in 2014 compared to 2000 and to keep each garment for only half as long.¹⁶⁶ This vicious cycle results in significant waste generation, as “the equivalent of one garbage truck full of clothes is burned or dumped in a landfill every second.”¹⁶⁷ According to the Environmental Protection Agency (EPA), “Americans generate 16 million tons of textile waste a year, equaling just over 6% of total municipal waste.”¹⁶⁸

2) Lack of appropriate waste disposal and underutilization of existing clothing in circulation

The process of recycling clothing is “labor intensive, slow and requires a skilled workforce.”^{169, 170, 171} There remains substantial room for improvement in terms of recycling materials in clothing once they have been discarded: less than 1% of the material used to produce clothing is recycled into new clothing and less than 15% of the material used to produce clothing is recycled at all. A less capital- and technology-intensive option in fashion disposal sees the lives of clothing extended through reuse and harnessing the value of unused and barely-used clothing. Since more clothing is in production and circulation than ever before, most clothes fall into this category.

More than USD 500 billion of value is lost every year due to clothing underutilization, and according to experts, “increasing the average number of times clothes are worn is the most direct lever to capture the value and eliminate waste in the textiles system.”¹⁷² On the other hand, consumers are becoming increasingly comfortable with selling and buying clothes secondhand for both environmental and economic reasons. The percentage of women over 18 who have bought or are willing to buy secondhand fashion in the future has risen from 45% in 2016 to 87% in 2020. Sellers have recognized this shift in consumer behavior and are readily cleaning out their closets to make a profit.¹⁷³

3) Unorganized second-hand market and investment in logistical infrastructure

Environmentally friendly options such as secondhand and rental clothing remain less than 10% of the overall market.¹⁷⁴ Off-price & value chains comprise 30% of the market while fast fashion and other mid-price specialty retailers comprise another 30%. Recent shifts in consumer behavior and priorities indicate that ThredUp’s mission represents the future of the retail market: in 2022, 53% of shoppers had bought a secondhand item in the last 12 months, almost double the amount that had done so in 2020.¹⁷⁵ In 2023, 75% of consumers say they are open to shopping or have shopped for secondhand apparel.¹⁷⁶ These shopping trends are reflected in the size of secondhand clothing’s market share: in 2022, the resale market grew “five times as much as the broader retail clothing sector.”¹⁷⁷

Fast fashion caters to the most basic consumer need of trendy, affordable clothes procured in a hassle-free manner. Thrifting, on the other hand, can be both time-consuming and arduous, often requiring hours spent visiting secondhand stores and sifting through piles of clothes. Even competing digital marketplaces such as eBay, Poshmark, and Depop are simply online platforms connecting buyers and sellers, leaving much of the logistics of the shopping experience to users. These barriers to entry deter many would-be buyers and sellers from entering the market, leaving them to resort to fast fashion and bad fashion disposal methods.

THREDUP'S BUSINESS MODEL

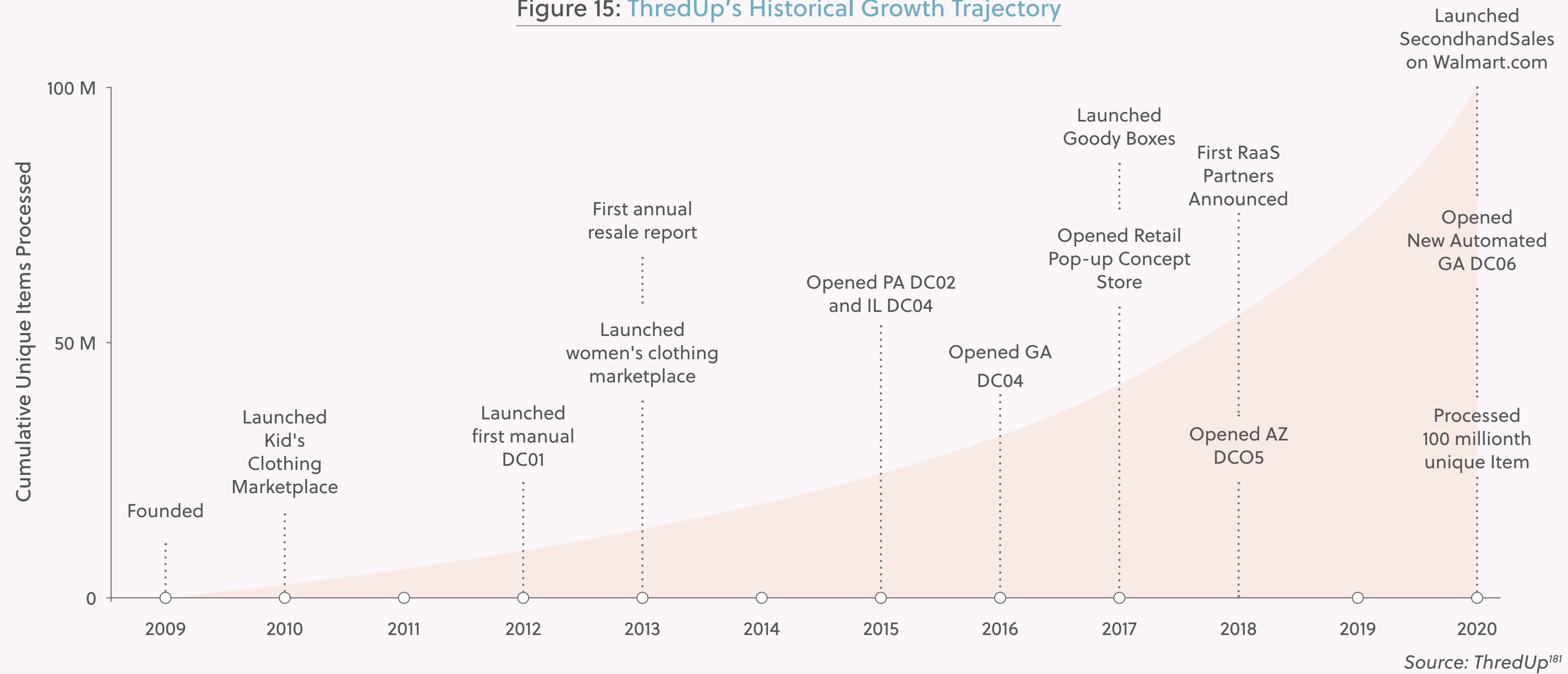
Value Proposition

Frustrated with the mountain of slightly used clothes piling up in his closet, James Reinhart had the business idea for ThredUp as a Harvard Business School student in 2009.¹⁷⁸ What began as a peer-to-peer service to swap men's dress shirts quickly shifted to children's clothing, enabling families to save time and money when replacing outgrown clothes for their kids. To grow its user base beyond the 30,000 parents that used the platform, ThredUp pivoted once again, transforming into an online kids' consignment service in 2012.¹⁷⁹ In January 2013, the company expanded into juniors, and a month later into women's apparel (see Figure 15).¹⁸⁰



THREDUP'S BUSINESS MODEL

Figure 15: ThredUp's Historical Growth Trajectory



THREDUP'S BUSINESS MODEL

Through its marketplace, ThredUp seeks to enable buyers to effortlessly find high-quality secondhand items from popular brands at competitive prices while allowing sellers to clean out their closets and earn a payout for items they no longer wear. ThredUp also makes it possible for brands and retailers to increase their consumer base by partnering with them through Resale-as-a-Service (RaaS).

For buyers, ThredUp's value proposition rests on its ability to provide premium and luxury brands at up to 90% off estimated retail value.¹⁸² The ever-changing assortment of clothing is appealing, with more than 35,000 brands across 100 categories (see Figure 16).¹⁸³ Additionally, ThredUp provides an enjoyable shopping experience designed to reduce the stigma of secondhand shopping. The company focuses on sustainability through a "feel-good" positioning about buying secondhand to enable waste reduction.

ThredUp utilizes its data science capabilities to give consumers a personalized shopping experience, customized based on the buyer's location, preferred brands, and the time of year. This personalization allows for faster delivery, lower prices, and decreased environmental impact. ThredUp also ensures the quality of the clothing received from sellers through a rigorous 12-point quality inspection; it lists only about 50% of items received from sellers after curation and processing.¹⁸⁴

Figure 16: ThredUp's Value Proposition for Buyers



Source: ThredUp¹⁸⁵

THREDUP'S BUSINESS MODEL

For sellers, the company's value lies not only in its convenience but also in enabling them to reduce clutter, support an environmental cause, and make money off clothing they rarely wear. ThredUp makes it easy for sellers to clean out their closets by supplying prepaid bags and labels to send in clothing. ThredUp handles the rest by providing no-hassle sale management, end-to-end resale services, item pricing management, merchandising, fulfillment, payments, and customer service.

For a seller deciding between a peer-to-peer service like Poshmark and a B2C service like ThredUp, the question is "whether the resale value of an item is worth the time and energy required to wash, photograph, describe, [price, manage the sale,] package, and send."¹⁸⁶ While some autonomy is lost in the selling process, ThredUp offers a compelling solution for a vast number of sellers that would like to make a profit off of their unused clothing, without going through the trouble of all of these steps.

Twelve years since its founding, ThredUp continues to grow and expand into one of the world's largest consignment stores. It operates distribution centers in three locations, including one in Atlanta that is the size of three football fields. These warehouses can hold 5.5 million items, and the company processes more than 100,000 products daily, listing selected items on the brand's website.¹⁸⁷

Table 4: Key Facts About ThredUp: Company Overview as of May 2022

Name of Enterprise	ThredUp Inc.
Headquarters	Oakland, California, USA
Country Footprint	Canada and USA
Year Established	2009
Name of Founders	James Reinhart, Oliver Lubin, and Chris Homer
Size of the Company	2,416 employees ¹⁸⁸
Product/Service	Online fashion consignment marketplace and resale-as-a-service (RaaS) platform for secondhand clothing, shoes, and accessories for women and children
Market Segment	Secondhand apparel resale market
Use of Digital Technology	Digital platform, which includes proprietary software and systems, machine learning and AI, data-driven decision-making, and automated distribution centers

THREDUP'S BUSINESS MODEL

Products and Services

ThredUp has built the backbone of resale on the internet, applying cutting-edge technology and proprietary software to build their online digital platform complemented by a robust distribution system, warehousing, and logistics. The platform is both web- and smartphone-compatible with its own dedicated mobile app.

ThredUp makes it easy for anyone to sell their used clothes responsibly and for anyone to buy quality secondhand apparel at an affordable price. The company invests heavily in technology, artificial intelligence, and machine learning to optimize pricing, seller payouts, item acceptance, merchandising and sell-through, customer acquisition, and continued customer engagement.¹⁸⁹

Process

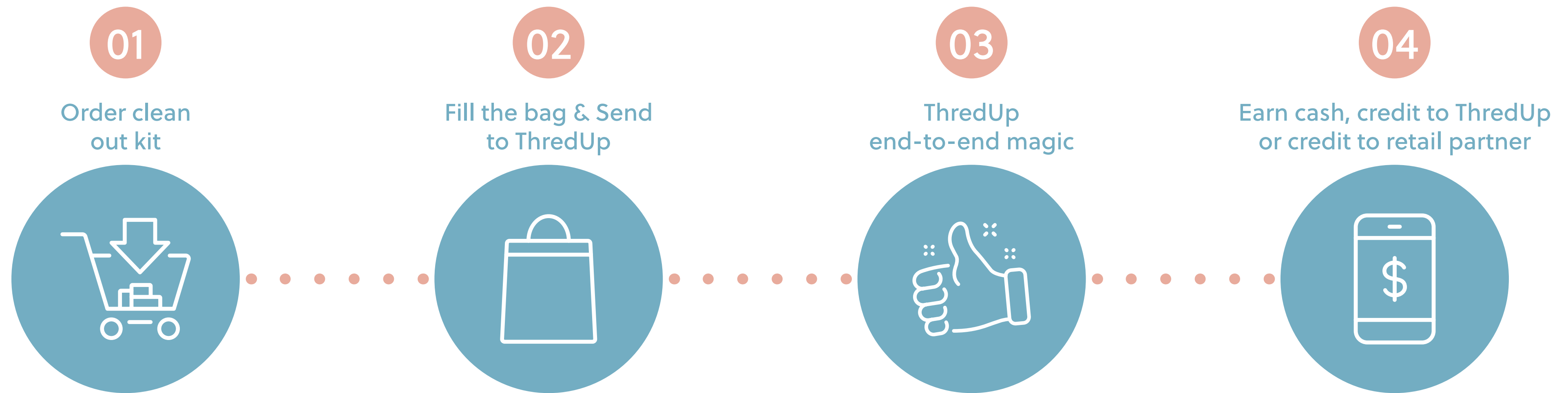
End-to-End Process

Unlike other online resale platforms such as Poshmark or eBay, ThredUp handles all the logistics between sellers and buyers, as well as the entire selling process. Originally, the company encouraged consumers to mail in their unwanted clothes for cash or ThredUp credit, and subsequently resold the items on its website. However, to optimize for gross profit dollar growth, the company shifted to a consignment sale model in 2019.

With its consignment structure, shown in Figure 17, ThredUp sends a prepaid "clean out bag" (charging a flat shipping rate of USD 5.99) in which customers can pack their unwanted clothes and send them to one of ThredUp's distribution centers. If the items sell, sellers get a payout within a 14-day window, which they can receive in cash or in shopping credit.

THREDUP'S BUSINESS MODEL

Figure 17: ThredUp's Product End-to-End Process¹⁹⁰



THREDUP'S BUSINESS MODEL

The Pricing

ThredUp generates revenue from items that are sold to buyers on their website and mobile app as well as through RaaS partners and their retail stores. ThredUp has been phasing out direct product sales and shifting toward a primarily consignment sales model, meaning that it doesn't pay sellers for inventory until it has successfully been sold and the two-week return window has passed. Since making the shift to consignment, sales went from 30% of revenues in 2018, to 60% in 2019,¹⁹¹ to 76% for the last twelve months (LTM) ending March 31, 2021.¹⁹²

The company manages the entire sales process, from logistics to product presentation. The price of goods sold on the platform ranges from as low as USD 5 to as high as USD 300; the average price per item is USD 17.¹⁹³ Part of ThredUp's massive appeal is the quality of products sold at low prices—the platform often offers discounts more substantial than other off-price offerings. Premium and luxury brands like Valentino and Louis Vuitton, whose retail prices often fall between USD 400 and USD 2,000, can be found on ThredUp's website at up to 70%-90% off retail price.¹⁹⁴

Generally, sellers can earn between 5% and 80% of the anticipated selling price—the percentage received by the seller depends on the value of the item. ThredUp's commission ranges from 20% to 95% of the selling price—the greater the item's selling price, the lower the commission.¹⁹⁵ In FY 2020, the average seller payout was 19% of the item sale price and the average seller payout per bag was USD 51.70.¹⁹⁶

ThredUp's pricing algorithm processes millions of data points daily to determine the optimal pricing structure for retail price and seller payout.

Resale-as-a-Service (RaaS)

Through its RaaS platform, ThredUp is attempting to incorporate retail stores into its solution, partly as another channel for high-margin revenue and partly to limit backlash from established retailers. Having recognized changing consumer trends, both retail and off-price stores are exploring ways to engage in resale business models (see Figures 18 and 19). Many are testing pilot programs and initiatives that keep the main business separate but allow the company to have lighthouse projects where they implement a resale model. For instance, both H&M and

Zalando have introduced independent platforms for selling quality-controlled pre-owned fashion—H&M's Sellpy and Zalando's Zirkle.^{197, 198} ThredUp views this experimentation as an opportunity to encourage partnerships. As James Reinhart stated in an earnings call: "None of the brands are really at the point where they're taking the channel seriously from a scale perspective... We feel really confident that they will come to the conclusion that working with a company like ThredUp, who are experts in all of this, is the right move to scale."¹⁹⁹ By encouraging RaaS partnerships in this way, ThredUp hopes to bring companies that might be threatened by ThredUp into ThredUp's ecosystem.

ThredUp helps to deliver tailored resale experiences to the customers of big retailers like Walmart or Macy's by allowing them to add pre-owned ThredUp products to their stores or websites; in this way, retailers gain access to numerous premium brands and ThredUp gains "exposure to the [retailer's] audience."²⁰⁰ Essentially, by listing each item on both the retailer's and ThredUp's websites, the customer pool and the frequency of inventory turnover for both partners increase.

THREDUP'S BUSINESS MODEL

Through its diverse array of RaaS partnerships, ThredUp utilizes its leading technology and logistics platform to help clothing retailers develop a resale channel. While Reinhart notes that the RaaS segment of the business is still in its "early days," he "envisions hundreds, even thousands of brands having resale strategies powered by ThredUp."²⁰¹ ThredUp has RaaS partnerships with both retailers and brands.

In addition, such partnerships make it possible for ThredUp's customers to return their purchases to a nearby Walmart or Macy's store, therefore eliminating shipment costs.²⁰²

In terms of ThredUp's partnerships with brands, ThredUp offers its logistical and resale expertise to help its RaaS partners drive incremental revenue, build brand awareness, and access new customers from large resale communities of thrifters. As shoppers, particularly those of younger generations,²⁰³ are expected to shift more spending toward secondhand than any other sector in the next five years, a partnership with ThredUp offers an intriguing opportunity for retailers to capture a portion of the growing market.²⁰⁴ See a selection of ThredUp's RaaS partners in Figure 20.

Figure 18: Retailers' Accelerating Adoption of Resale

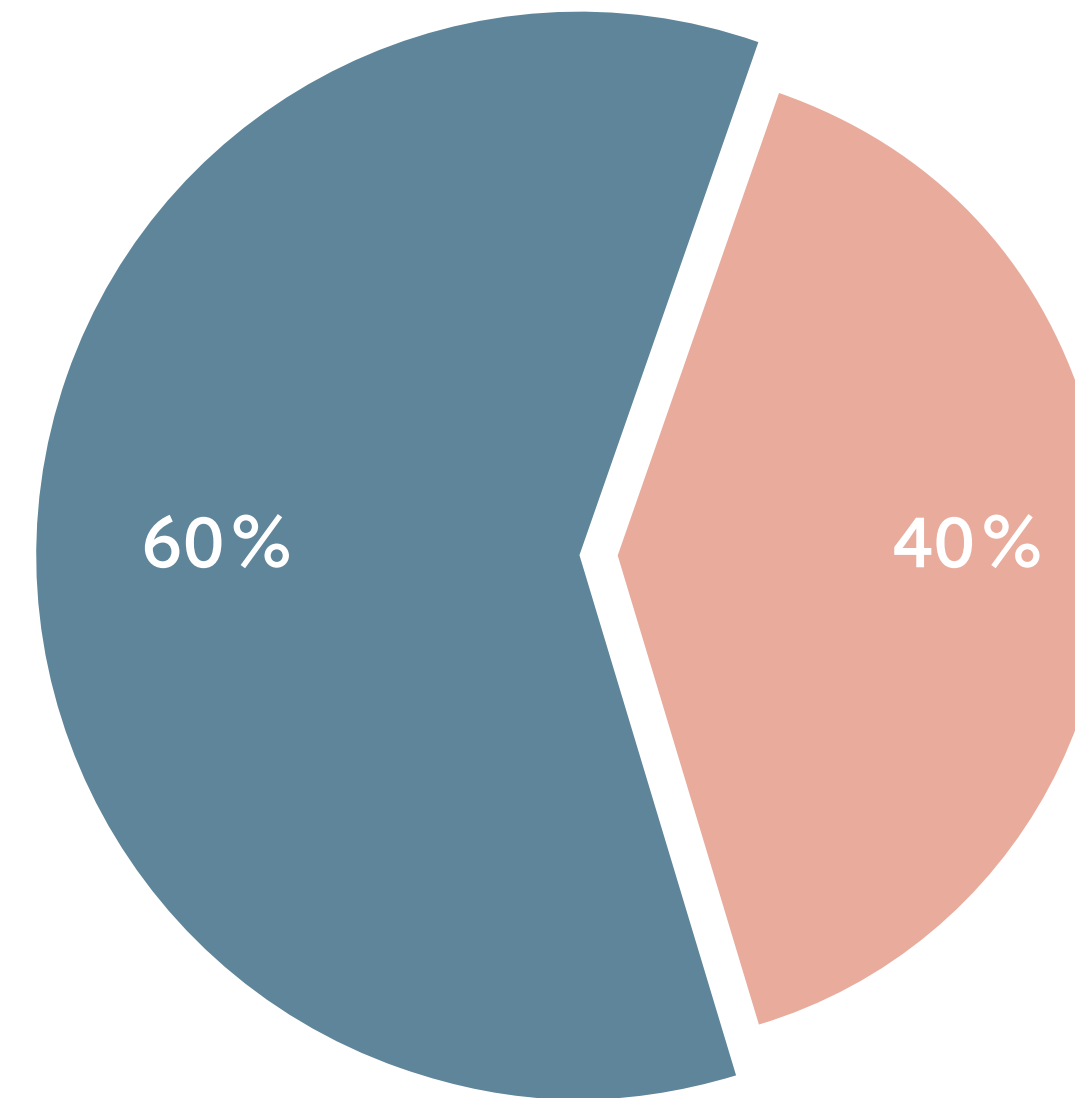
60%

of retailers have or are open to offering secondhand to their customers.

That is

23.8K

retailers interested in offering secondhand.

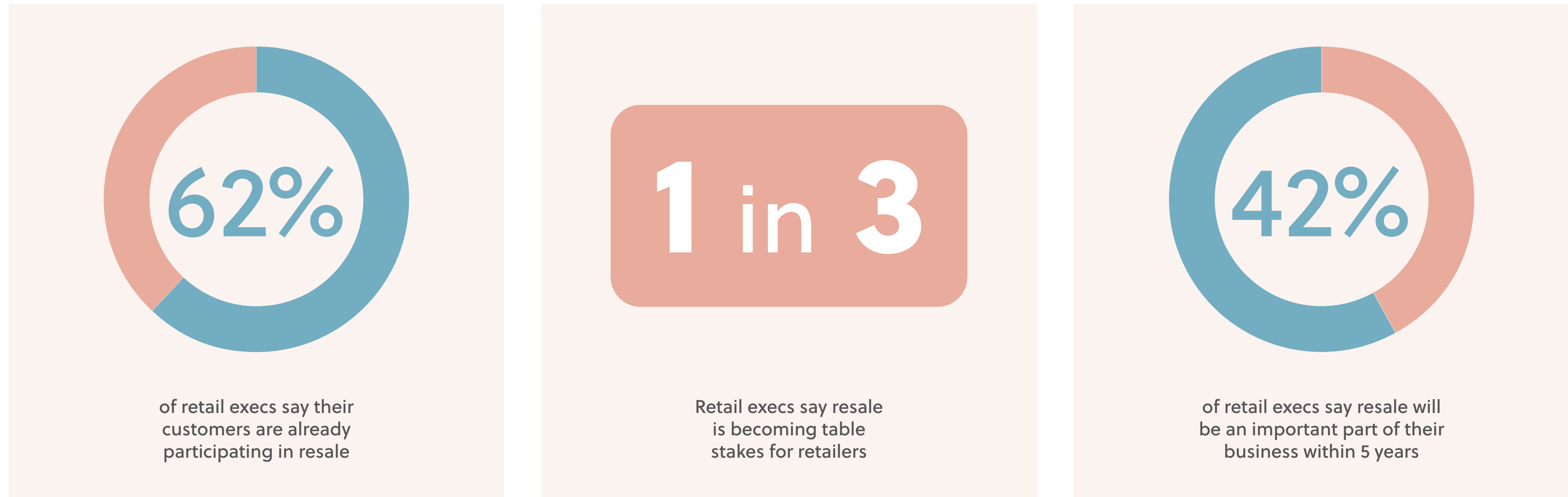


Percent of retail executives who say their company has or is open to offering resale options

Source: ThredUp²⁰⁵

THREDUP'S BUSINESS MODEL

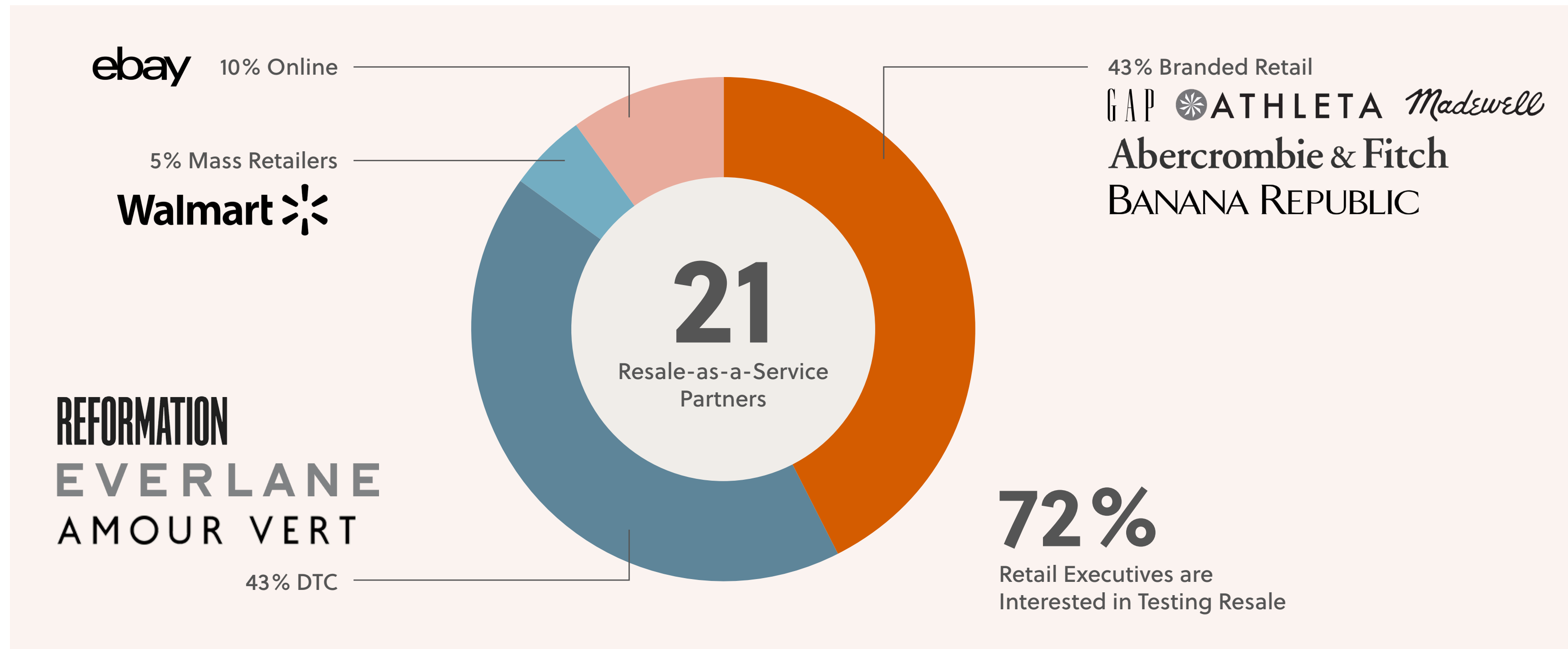
Figure 19: Resale as an Emerging Growth Engine for Retail



Source: ThredUp²⁰⁶

THREDUP'S BUSINESS MODEL

Figure 20: ThredUp's RaaS Partners



Source: ThredUp²⁰⁷

THREDUP'S BUSINESS MODEL

Resources

Technology

ThredUp incorporates technology into every part of its operation, and its proprietary software enables the company to streamline the buying, processing, and selling stages of online resale, as well as to determine optimal pricing for products sold.

Firstly, when clothing items are received in one of the three ThredUp distribution centers, it is uniquely tracked by a stock keeping unit (SKU) that labels and registers the type of item in the company's database. ThredUp then deploys machine learning and AI for visual recognition, inspection, and storage of items received, as well as automated photography software that selects the optimal photo to place online for an item to drive buyer engagement. It uses location-based assortment optimization to match buyers with the closest distribution center's inventory to lower the price and reduce shipping time.²⁰⁸ This enables the company to process up to 100,000 items of clothing per day and keep up to 5.5 million items in stock across all warehouses.²⁰⁹

ThredUp has effectively leveraged automation to lower labor costs, maximize effective space usage, increase consistency, decrease processing time, and maximize profits.²¹⁰

The company also uses machine learning and AI to maximize purchases as well as determine the economic impact of sales and company decisions. The company employs proprietary software and systems, with multi-layered algorithms that have the ability to determine whether an item should be accepted or rejected, to predict demand and pricing for an item, and to decide the optimal payout rate to the seller.²¹¹ It deploys data analysis to enhance the shopping experience by providing personalized, curated offers, and an effective data pipeline to identify optimal marketing and advertising strategies and spend to maximize customer acquisition.²¹² Its database consists of information on "over 100 million unique secondhand items processed across 35,000 brands and 100 categories."²¹³

Finally, ThredUp also uses technology to streamline its interactions with buyers. Aside from their RaaS, all their audience interaction is strictly online. Since ThredUp lacks a physical storefront, its mission and purpose need to be reflected exclusively through the user interface provided on its website and mobile app. As part of its mission to mainstream secondhand purchases, ThredUp's website offers

users a modern experience that pushes away the notion of a thrift store and emulates the websites of big, modern clothes retailers. This ties in with ThredUp's mission to destigmatize secondhand clothing and ensure the company's viability.

Partnerships

The company's principal partnerships are part of its RaaS business, including national retail stores such as Walmart, Macy's, JCPenney, premium women's fashion brands such as Burberry, Chloé, Jimmy Choo, and e-commerce websites and marketing places such as eBay.²¹⁴

Staff

ThredUp has grown its staff exponentially; it currently has 2,416 employees, over twice as much as it had in 2016.²¹⁵ These employees are split between the corporate office in Oakland, CA and warehouses in Mechanicsburg, Pennsylvania; Suwanee, Georgia; and Phoenix, Arizona. The management team has ten members, many of whom previously served as executives at major companies such as Netflix. ThredUp promotes an "aspirational as well as inspirational" culture, with employees encouraged to "speak up, think big, [and] influence outcomes."²¹⁶

THREDUP'S BUSINESS MODEL

Investors

ThredUp was initially funded by family and friends, with a starting investment of USD 250,000.²¹⁷ In its first fundraising journey, ThredUp's investor pitch was rejected 27 times until Trinity Ventures, which offers tech-focused venture capital, saw ThredUp's potential and invested in the company's seed round.²¹⁸ Since then, ThredUp raised a total of USD 337.84 million in funding over 8 rounds, from Series A in 2010 to Series F in 2019, before its initial public offering in March 2021.^{219, 220} ThredUp went public in March 2021, opening 30% above the listing price, raising USD 168 million at a valuation of USD 1.3 billion.²²¹ As of early May 2023, ThredUp's market cap was USD 256 million.²²²

Profit Formula

ThredUp's growth strategy to scale its business includes:

- 1) expanding its automated distribution centers and processing facilities;
- 2) improving its proprietary software and data capabilities;
- 3) increasing its selection of high-quality items by furthering RaaS partnerships and by attracting new sellers through referral programs and targeted marketing; and
- 4) ultimately attracting more buyers through a positive feedback loop.

Since ThredUp has "never spent a single dollar acquiring sellers," ThredUp's growth strategy is largely based on the attraction and retention of buyers.²²³

To attract buyers, ThredUp leverages its broad supply of desirable brands with an exciting and user-friendly interface, as well as data analytics to target potential buyers through online search networks, social media, influencers, TV, and the press. To retain those buyers, it further uses data analysis to improve personalization and increase conversion, and fosters

trust through timely and reliable fulfillment of orders and responsive customer service.

For the year ended December 31, 2020, repeat buyers accounted for 80% of orders on ThredUp. Orders from new buyers grew by 18% and orders from repeat buyers grew by 29%, demonstrating the stability of the marketplace.²²⁴

Though attracting sellers has never been a problem, ThredUp still needs to work to retain them. In 2020, 77% of the Clean Out Kits processed were from repeat sellers. ThredUp views this as a demonstration of the "consistent and compelling value proposition that [it] provide[s]," and the company would like to maintain similar rates into the future.²²⁵ ThredUp retains sellers by maintaining brand reputation through quick service, consistent and transparent acceptance of items, and time-saving payout and return processes and policies for secondhand items supplied. Additionally, as more buyers join the platform, the sellers' utility and profit potential increases through network effects.

The company executes operational efficiencies by optimizing shipping time and cost with buyers and sellers. Distribution centers cater to specific regions, and ThredUp continues to seek efficiency improvements by utilizing proprietary technology, automation, and AI. The switch to a consignment model has allowed ThredUp to drive stronger margins, and they are hopeful this trend will be lasting.

STRENGTHS AND WEAKNESSES

Value Drivers Evaluation Using the Nine A's Framework

Using "The Nine A's Framework" and the analysis presented above, we now evaluate the core components of ThredUp's business model in the matrix below. For each of these 'Nine A' elements, we designate a value from one to five, where one means that it is in need of attention and five that it is excellent. Using this simple formula, we quantify and visualize ThredUp's strengths and weaknesses in each category. See Figure 21 for a visual representation.



STRENGTHS AND WEAKNESSES

Figure 21: ThredUp's Nine A's Evaluation

VALUE DRIVERS	ADVANTAGE	AFFORDABILITY	ACCESSIBILITY	APPROPRIATENESS	ADDITIVITY	ADAPTABILITY	AMPLIFIABILITY	AUTHORITY	ADJACENCY
VALUE PROPOSITION	4	5	Unavailable	5	3	4	5	5	5
RESOURCES	5	1	4	3	3	3	2	3	4
PROCESS	3	1	4	5	3	4	2	4	4
PROFIT FORMULA	2	4	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	4



STRENGTHS AND WEAKNESSES

On our **Advantage** metric, ThredUp scored 4 points. ThredUp competes against both traditional retailers and other resale platforms, and scores well against both.

Compared to traditional retailers, ThredUp has lower costs, access to limitless supply, and the weight of moving consumer trends, but it comes up against challenges related to its status as a newcomer with limited revenues and its ability to procure trendy items. By selling garments that have been produced through the supply chain of other fashion companies, ThredUp formally has almost no production costs. This is a helpful advantage over traditional fashion companies as it allows ThredUp to have low fixed costs regarding product creation. Another advantage is that secondhand garments are available in abundance. Furthermore, as noted above, the resale market is growing rapidly, and is predicted to outpace fast-fashion within the coming decade. One of ThredUp's main disadvantages stems from the fact that the fashion industry overall is a highly trend-based industry which means that a significant portion of clothes for sale may be outdated and therefore be less likely to sell. On top of that, as a newcomer to fashion, ThredUp has fewer resources to utilize as compared to major retailers.

Compared to other resale platforms, ThredUp has a significantly greater footprint, which can be seen as an advantage in some contexts and a disadvantage in others. ThredUp handles logistics for buyers and sellers while

Poshmark, one of ThredUp's main competitors, sells similar items but purely follows a platform business model in which the sellers are responsible for uploading and selling their products. ThredUp offers sellers simplicity while removing some of their agency in the sale and may limit their potential profits, whereas Poshmark forces sellers to take greater ownership over the sale. What is unclear so far is whether sellers prefer ThredUp over Poshmark because of the convenience created by the services. While both models showed early signs of viability, a comparison of both companies' first ever quarterly earnings reports after their respective IPOs early in 2021 shows that Poshmark was posting superior numbers in terms of revenues (USD 81 million for Poshmark versus USD 57 million for ThredUp) and adjusted EBITDA (USD 4.2 million for Poshmark versus a USD 9.1 million loss for ThredUp).^{226, 227} As of Q3 2022, ThredUp's EBITDA was USD 11 million,²²⁸ and Poshmark's was USD 8 million.²²⁹

In terms of **Affordability**, ThredUp has an average selling price of USD 17 per item. Though prices remain low compared to new clothing (the average price point for apparel at H&M is USD 32.28, and at Zara it is USD 54.13),²³⁰ it is important to note that the company has a long delivery time of 3-8 business days and requires a high delivery fare of USD 5.99, thereby making the customer pay for high fixed costs, a result of the extensive logistical system that benefits sellers. When buying basic items for USD 6, the price for the consumer

doubles, which makes shopping at ThredUp only worth it if the customer buys several items. As this may not always be a customer's intention, ThredUp loses customers by going against the economic standard of free deliveries. And even though fewer deliveries are better for the environment as a whole, we decided that for **Affordability** overall, ThredUp only scores 3 out of 5.

In terms of **Accessibility**, ThredUp received 4 points. On top of the fact that products are affordable, it is safe to say that by setting up an online shop that is open 24/7, it certainly is accessible to everyone who has an internet connection on an electronic device. Moreover, adding filters makes it much easier for customers to find items of desire. In traditional secondhand shops, that would not be the case. The accessibility for sellers is also high (further details can be found in the section above, under "advantage"). The company did not score a perfect 5, due to the fact that there are still those in the US without access to the internet and 3-8 business days for the delivery makes the online shopping experience less appealing for US consumers who are accustomed to fast delivery times.

In **Appropriateness**, ThredUp scores well with 4 points. The company's goal is to contribute to Sustainable Development Goal 12 regarding "Responsible Production and Consumption" by utilizing the circular economy through an active promotion of reusing clothes. This turns ThredUp's

STRENGTHS AND WEAKNESSES

mission into a social movement in which reusing/thrifting becomes a lifestyle that addresses not only people with a low budget, but also wealthier communities. ThredUp's impact is visible in its limitation of carbon emissions as well as energy and water waste.

Regarding **Additivity**, ThredUp only received 3 out of 5 points. ThredUp does not have its own production which explains why they do not actively contribute to the infrastructure or value chain of apparel production in the US. While they do have an infrastructure of warehouses and logistics systems, the Additivity-metric does apply in all cases to ThredUp.

Over the course of its history, ThredUp has proven that **Adaptability** is one of its strengths; it scores 4 points. The company was built during the 2008-2009 Financial Crisis, as Reinhart saw the economic downturn as a good opportunity to create resale services that would be compelling to millions of American families who had recently lost their jobs. Since then, ThredUp has changed its business model and value proposition four times based on the opportunities and changing trends around consumer preferences, all of which shows the company's ability to adapt to the constantly evolving resale industry. Furthermore, early in the company's history, ThredUp invested in its platform, ensuring that it could gather a lot of data and offering the possibility for

trend analysis to better understand customers' desires. Using that knowledge, ThredUp can adapt its offerings and limit items that the system describes as "less likely to be sold."

ThredUp scores in our **Amplifiability** metric 3 out of 5 points, as the sustainable mission that the company follows, as well as the sale of reused clothes is replicable in other communities or countries. Since the garments are sold from people within the same community, common tastes can be addressed easily. The main concern, which also resulted in reducing one score point, is the extensive investment needed when setting up the infrastructure for collecting and preparing visuals in other countries. A competitor like Poshmark in comparison, would receive the full score as selling and shipping costs are delegated to the individual seller rather than the company.

In terms of **Authority**, ThredUp scored 3 out of 5 points. While ThredUp does not necessarily have the power to change the landscape and convince other companies to conform to their practices, they have become a part of the movement toward a circular economy, which appears to be only growing in popularity. As ThredUp is still a young growing business without its own production or a substantial supply chain, it has less power to influence others in the industry or set standards, but through its RaaS partnerships, it has shown

early signs of its ability to be an authoritative voice for the circular economy in fashion.

On **Adjacency**, ThredUp scored 4 points as well. While the business model currently focuses on clothes, especially for women and children, there is a potential to expand into offering all kinds of reused items, thereby becoming a big e-commerce company for reusable things. ThredUp has also successfully supported other companies breaking into the resale space through its RaaS partnerships and has the ability to expand into new categories and offerings that can leverage its conveyor and item on-hanger systems.

OPPORTUNITIES AND CHALLENGES

Despite the boom and positive economic outlook the resale industry presents, a few key challenges remain:

1) Competing Against Trendy Fast Fashion

Fashion is a trend-based industry, and some consumers enjoy keeping up with the latest trends in order to remain fashionable. Fast fashion has shortened fashion cycles, meaning that articles of clothing are “in style” for a shorter period of time. This puts companies in the resale market at a distinct disadvantage because once an item reaches a resale company, it may already be out of style. In addition to that, resale companies are not in control of their inventory and are vulnerable to periodic fluctuations in the types, brands, and quality of clothing available.²³¹ Companies in the resale market need to find ways to maintain their supply of quality, stylish clothing.

2) Competing Against Cheap Fast Fashion

One of the main reasons consumers turn to thrifting is the reasonable pricing. Yet, fast fashion also often comes with an affordable price tag. The average price point for apparel at H&M is USD 32.28, and at Zara, it is USD 54.13;²³² promotional pricing can further limit resale’s economic advantage. Companies in the resale market need to keep prices as low as possible while increasing profit margins.

3) Maintaining Customer Base in a Vibrant Economic Climate

The resale market saw a boost during the pandemic due in part to the struggling economy. About 80% of people say they have or are open to shopping secondhand “when money gets tight.”²³³ Companies in the resale market will need to ensure that their offerings remain attractive to consumers even when they have more cash in their pockets.

4) Creating Opportunities for Growth by Capitalizing on the Increasingly Digitalized Economy

While the US is a major contributor to the environmental degradation caused by the overproduction and overconsumption of fashion, the strength of its digital economy provides American companies like ThredUp with a springboard to offering innovative solutions. Digital Planet’s Digital Intelligence Index classifies the US as a “Stand Out” in the state of its digital evolution, ranking behind only Singapore in its advancement (89.82/100).²³⁴ As a Stand Out country, the US is characterized by its ability to function as a leader in driving innovation and providing

a seamless online experience that inspires its population to exhibit particularly engaged online behavior. The US ranks well above many advanced economies in consumer spending, the use of digital money, and its fulfillment and transaction infrastructure. Such fluidity facilitates the growth of ThredUp, allowing the company to confront the environmental ills of the fashion industry while pushing toward profitability.

OPPORTUNITIES AND CHALLENGES

Still, ThredUp will encounter significant challenges as it grows and seeks financial sustainability. The Value Drivers matrix and analysis of ThredUp's business model provide insights into the implications for ThredUp's future action:

1) Invest Heavily in Technology to Optimize Cost Structure

ThredUp is unique among its competitors in its footprint and logistical network. While companies like Poshmark operate a managed marketplace that allows sellers to sell directly to buyers, ThredUp takes more ownership over the process and assumes a greater logistical burden, simplifying the transaction for all parties, but eliminating the seller's freedom to manipulate the price. This model has proven itself to be viable, despite the substantial investment required by ThredUp to facilitate each transaction. The model will only become more profitable as ThredUp accumulates data and further builds out its logistics network. ThredUp should reinforce its logistical advantage by investing heavily into its technology and warehouses; if done successfully, it will increase its gross margin, further optimize its cost structure, and make ThredUp even more appealing to potential RaaS partners. Improved logistics will also allow ThredUp to speed up delivery times and limit shipping fees, which will make the consumer experience more similar to that of a traditional online shopping outlet.

2) Consider Branching into Solving Adjacent Problems

ThredUp's logistical prowess provides it with the potential to expand into other categories. The company should consider the advantages of expanding its offerings to include more secondhand goods, which might include things like toys, tools, or decor. While its warehouses may be better suited to some items than others, ThredUp's logistical model and reputation for sustainability through secondhand provides an opportunity for the company to solve adjacent problems. A simple way to start along this path might be to offer rentals of ThredUp clothing, perhaps for dresses for more formal occasions that people are unlikely to wear more than once.

3) Improve ThredUp's Brand Recognition

ThredUp has successfully partnered with a series of celebrities in order to make secondhand fashionable. This has enabled ThredUp to challenge fast fashion's dominance of style and trendiness by making its mission mainstream. Beyond that, Reinhart has bemoaned the fact that while traditional fashion companies produce clothing that advertises their logo, there is no way to tell whether someone has purchased an item secondhand. As consumer trends increasingly push toward secondhand, ThredUp should consider embroidering a line of clothing items with a small ThredUp logo to spread brand recognition and highlight the fact that secondhand can be as in-vogue as fast fashion.

OPPORTUNITIES AND CHALLENGES

4) Consider Expansion to Foreign Markets

While ThredUp is still working to ensure its financial sustainability in the US, it should begin to make plans for international expansion into Western Europe. Appetite for secondhand clothing is high in that region, which is partially attributable to concerns over environmental sustainability. The top 10 countries in Yale's Environmental Performance Index are all located in Western Europe,²³⁵ and the secondhand clothing market is booming with companies like the Lithuanian secondhand clothing marketplace Vinted being valued at over a billion dollars (making it Lithuania's first billion-dollar company).²³⁶ The market will likely become more crowded over time, and may justify purchasing a secondhand startup as opposed to ThredUp moving into the market itself, but in either case ThredUp can leverage its clothing supply and logistical expertise from its American market to attain viability in a new climate and potentially double its TAM.²³⁷

5) Explore Alternative Revenue Streams by Leveraging its Technology and Expertise

Over the years, ThredUp has invested significant resources into its technology and innovation, and they have become experts in operating efficiency. These strengths are transferable to other markets. ThredUp could explore the possibility of selling its proprietary software and systems as white-label products to other companies to help them optimize their operating efficiency. For instance, ThredUp has developed software that automatically selects the optimum photo to drive buyers' engagement. Such specialized photo selection capability enables ThredUp to produce hundreds of thousands of photos a day without the need to hire and pay for a professional photographer, which is one of the largest expenses when putting a product online for sale.²³⁸ Similar software could be used by electronics companies such as Best Buy or consumer goods companies like Unilever—all of whom seek to efficiently brand their products and services online.

APPENDICES

Appendix 1: Market Value Potential for Husk

Total Addressable Market

Studies such as the ESMAP Market Outlook estimate that proper investment in the mini-grid industry can create a worldwide addressable market of 490 million people.²³⁹ Global Market Insights values the mini-grid market at over USD 11 billion.²⁴⁰ To calculate Husk's total addressable market (TAM) in India, Nigeria, and Tanzania, we analyze the population of rural households without access to electricity, who have the ability to afford it.²⁴¹

Table 5: [Husk TAM Calculations](#)

Country	Addressable Audience	Yearly Projected Electrical Consumption per Person	TAM
India	12.3 million	98 kWh	USD 397 million
Nigeria	52.5 million	147 kWh ²⁴⁶	USD 2.5 billion
Tanzania	17.5 million	128 kWh ²⁴⁷	USD 739.3 million
Total	82.3 million	8.7 million	USD 3.7 billion



Our definition of affordability is benchmarked to work by the Rocky Mountain Institute, which estimates that non-cooking energy costs should be less than 10% of daily household expenditures.²⁴² Thus, we use a conservative cutoff of people making USD 2.15 a day or more to determine who could afford Husk's services; this poverty headcount ratio is provided by the World Bank.²⁴³

We determine our addressable audience by multiplying each country's rural population by the percentage without access to electricity, and then multiplying that by the percentage able to pay for Husk power. This gives us an addressable population of 82.3 million people in these three countries alone. This number is then multiplied by the average yearly electrical consumption per person for each country. The estimation for India's electrical consumption is derived from a study conducted by Smart Power India that discusses average

consumption in rural households²⁴⁴ which we converted to average consumption per person using UN data.²⁴⁵ We use this rural average consumption study instead of national average consumption because it is a more realistic projection of the target audience's electricity expenditures. Expected electrical consumption is then multiplied by the addressable audience to determine hypothetical yearly demand for electricity. We deduced that Husk's rate is roughly USD 0.33 per kWh, which, when applied to the total yearly demand for electricity, yields a total addressable market of USD 3.7 billion in the three countries where Husk is operating.

This is likely a conservative estimation of mini-grid's addressable market, given that demand for Husk's services can increase through government partnerships, increased energy consumption, and technological advancements.

APPENDICES

Appendix 2: Market Value Potential for Nexsis

Total Addressable Market

Global

Nexsis' services are directed toward three populations: those without access to clean water (~771 million²⁴⁸), those without electricity (~940 million²⁴⁹), and the unbanked or financially underserved (~1.4 billion²⁵⁰). Over the course of his research, Pyman has found that these groups have a significant overlap: "If you're in one of those groups, you are probably in another as well. There are many common traits associated with those groups."²⁵¹ This overlap is relevant in calculating the total addressable market.

Assumptions:

- Those who have access to water and electricity but are unbanked are unlikely to view Nexsis as a necessary route to achieving financial inclusion.
- Those who have access to clean water but lack electricity may be more interested in an energy solution that is more built-out and includes ready access to fans, televisions, or refrigerators.

- There is limited data capturing the exact amount of overlap between those without access to clean water and those without access to electricity, but we will assume that nearly all those that lack access to clean water also lack electricity and that the duality of Nexsis' solution is therefore particularly appealing.

Under these assumptions, there are roughly 771 million people in Nexsis' global target market.

Countries Where Nexsis Operates

We can deduce the TAM by applying the same assumptions listed above to the countries where Nexsis is operating. Nexsis is currently operating in five countries that are yet to achieve at least basic access to drinking water: Australia, Brazil, Cambodia, India, and Morocco. In order to calculate the TAM available in these five countries, we found the amount of people who do not have access to at least basic drinking water and who have the economic means to pay for a Nexsis Smart Panel. We then divided this number by the average household size in each country. This is because each panel is designed to power a family unit rather than individual people. Once we found the total number of households within the target audience, we multiplied this number by the estimated cost of a Nexsis panel, which we deduced to be about USD 400 in the case study Profit Formula section.



APPENDICES

The total addressable market resulting from this calculation is a quantity of USD 3.5 billion, which would impact 41.2 million people in 8.7 million households. As governments continue to center their development agendas around sustainability, it is possible that this TAM continues to grow. With the assistance of government subsidies, for example, this addressable market could expand to include households living under USD 6.85 a day, making Nexsis Smart Panels more accessible to those who could most benefit from it.

Table 6: Nexsis TAM Calculations

Country	Population lacking access to water with economic means ^{252,253}	Addressable Households ²⁵⁴	TAM
Australia	7,750	3,100	USD 1.2 million
Brazil	1 million	317,500	USD 127 million
Cambodia	3.4 million ²⁵⁵	747,300	USD 299 million
India	36.1 million	7.5 million	USD 3 billion
Morocco	570,000	123,800	USD 49.5 million
Total	41.2 million	8.7 million	USD 3.5 billion

APPENDICES

Appendix 3: Market Value Potential for ThredUp

Total Addressable Market

We project that the total addressable resale apparel market for women and children is between USD 11.6 billion and USD 15.5 billion. We attained this range using two different methods, the first giving us our upper bound of the estimate and the second giving us our lower bound.

Our first method consisted of determining the number of women in the US that are open to shopping secondhand or have already done so (GlobalData estimates 87% leading to a total of 94 million women) and multiplying this figure by “Average Spend,” the average amount that an active buyer spent on ThredUp over the last three years (~USD 164). This serves as a proxy for the amount that a woman open to shopping secondhand might spend on women’s or children’s secondhand apparel in a given year.^{256, 257} Using this method, we calculated a total addressable market (TAM) value of ~USD 15.5 billion.

Limitations of this method: This alternative does not give us a way to account for the fact that people might shop for

secondhand clothing through other stores, so the “Average Spend” figure may not include all secondhand spending. At the same time, first-time secondhand shoppers might be less willing to spend as much money as regular purchasers, meaning that the “Average Spend” could balance out between the two.

Our second method, which gives us the lower bound estimate, consisted of finding what percentage of money spent on clothing every year would be used in purchasing secondhand apparel. To do this, we found multiple sources estimating the amount that the typical target customer (women and children) spends on clothing yearly. We concluded that consumers spend on average about USD 620 on clothing every year. We then considered estimates on the percentage of the average American’s closet that is made up of secondhand clothing and how that is expected to change in the coming years. We concluded that around 12% of their clothing budget is spent on secondhand clothing. We then multiplied the average expected spending by the percentage of expected secondhand clothing spending and multiplied that figure by the number of women and children in the US to bring us to a TAM of approximately USD 11.6 billion.

Limitations of this method: There is a wide range of figures on the amount that an American consumer spends on clothing in a given year, and this is particularly difficult to find for children.

Table 7: [ThredUp TAM Calculations](#)

Upper Bound Estimation: ThredUp Market Value Potential	Amount
Number of women interested in shopping secondhand	94 million
Average spend	USD 164
Total Addressable Market (TAM)	USD 15.5 billion

Lower Bound Estimation: ThredUp Market Value Potential	Amount
Yearly clothing budget—women and children	USD 620
Percentage of budget spent on secondhand clothing	12%
Number of women and children (USA)	156 million
Total Addressable Market (TAM)	USD 11.6 billion



APPENDICES

Environmental Impact Evaluation

As previously noted in the Introduction, fashion is one of the most pollutive industries on the planet, accounting for roughly 10% of all of humanity’s carbon emissions, 20% of industrial water pollution, and substantial energy waste. The footprint of a new versus a used item of clothing in terms of carbon emitted, energy expended, and water used can be summed up as follows in Figure 22.

Thus, each secondhand clothing item that is purchased in lieu of a new one saves 17.4 pounds of CO₂ emissions, 34 kWh of energy, and 77.3 gallons of water.

In this case study, we assume that each item purchased on ThredUp is an item that would otherwise have been purchased new. While consumers certainly make impulse purchases on ThredUp, there is no reason to believe that they would make more impulse purchases on ThredUp than they would from other stores. In fact, it is reasonable to assume that shoppers on ThredUp are more conscious of their environmental impact and are therefore less likely to make impulse purchases.

ThredUp sold about 11 million items of clothing in 2020. This suggests that in 2020 ThredUp saved:

- 191.4 million lbs. of CO₂ emissions, equivalent to taking 12,800 cars off the road for a year (191,400,000 / 15,000);²⁵⁸
- 378.4 million kWh of energy, the equivalent of 89,700 Americans’ electricity consumption for a year (378,400,000 / (10,632 / 2.52));^{259, 260} and
- 850.3 million gallons of water, enough water for over 175,000 people for drinking, washing, and cooking for a year (based on the UN goal of at least 50 liters per person per day).²⁶¹

ThredUp’s impact stretches beyond CO₂ reduction, energy savings, and water retention. The textile industry is also guilty of expanding landfills and creating conditions for human exploitation.²⁶² Though ThredUp’s impact in these areas is more difficult to calculate, it remains clear that the reuse of clothing as opposed to the production of new clothing in countries that are vulnerable to labor exploitation is beneficial to the planet and those living on it, and ThredUp has played a meaningful role in increasing the appeal and reach of resale.

Table 8: ThredUp's Environmental Impact

Environmental Impact Metrics	Amount Saved
Clothing sold (separate items)	11 million
CO ₂ emissions	191.4 million lbs
Energy	378.4 million kWh
Water	850.3 million gallons



APPENDICES

Figure 22: Environmental Footprint of a New vs. Used Item of Clothing



BUYING USED INSTEAD OF NEW DISPLACES THE CO₂e EMITTED FROM HARMFUL NEW CLOTHING PRODUCTION

An item purchased used vs. new displaces

17.4

lbs. of CO₂ emissions.

Reducing its carbon footprint by

82%

*Assumes 30% of lifetime is complete when reused to calculate relative savings.
**Assumes used item is bought on ThredUp via data from GreenStory Inc.,
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Source: ThredUp²⁶³



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