NORTH

Date: August 26, 2019
To: Stephen Lake, CEO
From: Christina Headley, Communications Manager
Subject: White Paper: North Focals Smart Glasses

Executive Summary: The North Focals Opportunity

Background: North Focals and the Future of Wearable Technology [1]

The start-up company North Inc. was founded in 2012 by three graduates of the University of Waterloo engineering mechatronics program [2]. Their first product, the Myo armband, was an innovative wearable device that used gesture control to operate presentation software. When North co-founders tested Google Glass, they were determined to create a better pair of smart glasses—one that people would want to wear and want to use [3].

North has received funding from the Canadian government, Intel, and the Amazon Alexa Fund. The company has grown to several hundred employees as it prepares to make the first pair of everyday smart glasses.

Summary: North Focals and the Future of Wearable Technology

Opportunity Analysis: Limitations of the Current Wearables Market

Wearable devices are relatively new, and unfortunately the design and features of these products can sometimes reflect that. Although wearables have the potential to change the way we interact with the world, consumers are slow to embrace them. We may see a wearable as simply a fitness device. We may have concerns about privacy and high prices. And we may not want to carry around an extra device when our smartphones have better features and get charged first. After all, weren't smartphones the reason we could stop wearing watches?

We love how many features our smartphone offers, and haven't found a wearable that compares. And we don't want to spend all our money to wear something that makes people look at us sideways.

Opportunity Fulfillment: An Overview of North Focals Smart Glasses

Focals are an eyewear-first approach to wearables that will change the way you look at technology. They look like ordinary glasses, but hidden electronic components provide personalized and discrete visual notifications that float in front of you. You can stay connected to your information, stay connected to the world around you, and leave your phone in your pocket.

Just like that feeling of awe you got from your first Blackberry or iPhone, Focals feel revolutionary, letting you do things you hadn't imagined before. With dozens of impressive and customizable features, you'll feel like you've seeing the future, while recalling a past where you could use your hands for something besides holding your phone.

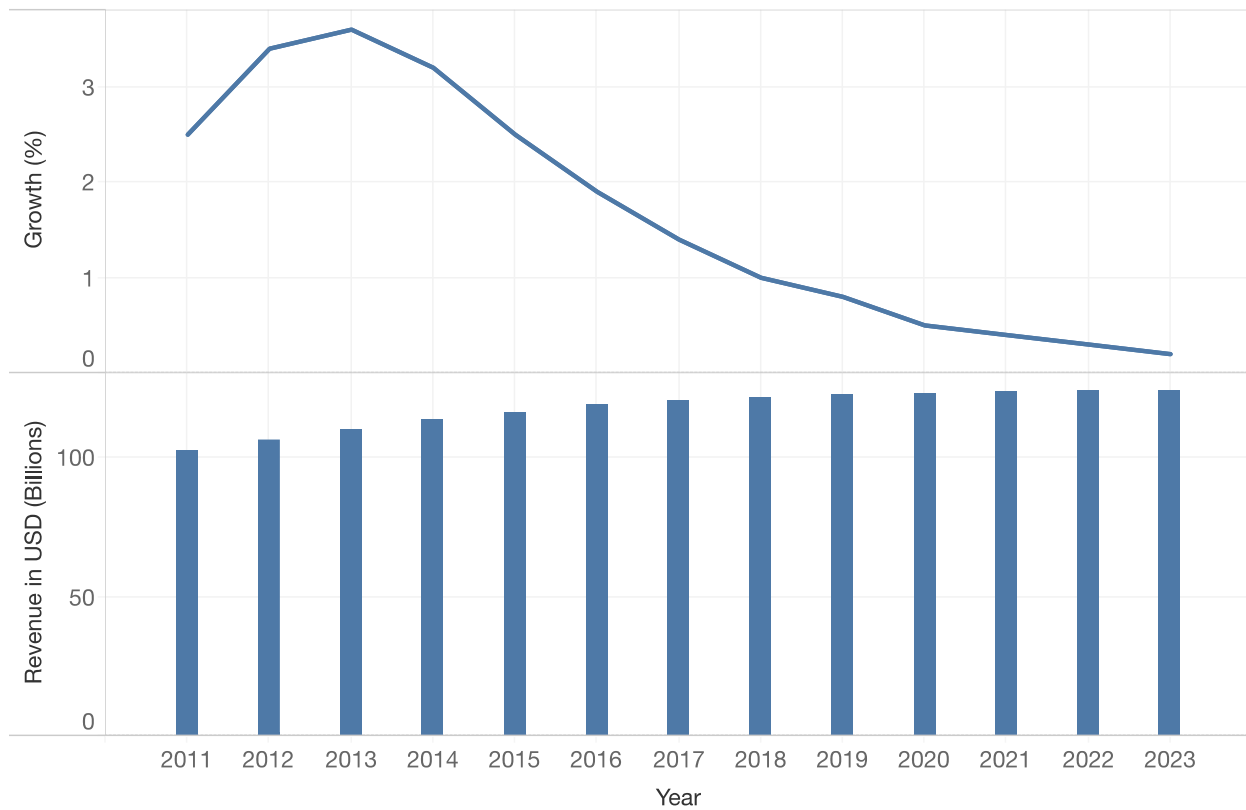## Consumer Electronics Industry Overview

Industry Description

The consumer electronics (CE) industry includes electronic equipment purchased by individuals that is not for resale [4]. These electronics are "specifically designed for entertainment, communication, or information purposes [5]." Items included in this industry change over time, and currently include mobile phones, televisions, computers, audio and video equipment, and wearable devices such as smartwatches and fitness bands [6]. The CE industry has manufacturing and retail components, including ecommerce. Equipment rentals and household appliances are not included in this category.

Industry Performance: Current and Historical

The CE industry is mature and generally experiences low and steady positive growth. The market experienced a recent growth high of 3.5% in 2013 [7] as smartphone ownership became widespread. Since 2013, growth has been steadily declining but remains positive. Global CE revenue was $997 billion (USD) in 2018, with a compound annual growth rate (CAGR) of +2.6 (2012-2023) [8]. As seen in figure 1, US revenue in the CE industry totaled $128 billion (USD) in 2018.

US Consumer Electronics Growth and Revenue

2019-2023 data are forecasted

FIGURE 1: US CONSUMER ELECTRONICS GROWTH AND REVENUE 2011-2023 [7]

Some segments, such as CE manufacturing, have higher growth than the industry as a whole, while other segments, such as US brick-and-mortar retail stores, are experiencing negative growth [4]. The CE market is saturated [4]; however, new enterprises continually launch as technological advances lead to new markets. For example, while revenue from brick-and-mortar stores is decreasing, ecommerce retail revenue is increasing.

Industry Outlook and Forecast

The global CE industry includes many established and emerging companies. Analysts predict future growth will be positive and slow, at 1% or less. As shown in figure 1 above, US revenue in the CE industry is predicted to grow slowly to $137.2 billion (USD) in 2023, with a predicted CAGR of +1.2 from 2012-2023 [7]."

While the CE industry is long-standing, its product offerings change with the introduction of new technology. Mobile phones are an example of a strong market created from technological innovations. The technology revolution, the Internet of Things (where everyday objects are embedded with an internet connection), and ecommerce opportunities

contribute to the changing industry landscape. "Competition in this industry is high and the trend is steady [9]." Newer markets, such as wearables and the Internet of Things, expect higher growth rates than the industry as a whole. Both new and existing CE enterprises need to adapt to recent technology developments and meet consumers' expectations for innovative and useful products. Increased competition and lower manufacturing costs mean that prices and profit margins are expected to fall.

Industry Segmentation

We can place the consumer electronics industry into four main components: telephony; computing; TV, radio, and multimedia [8]; and wearable devices.

TELEPHONY

The telephony segment includes landlines and mobile devices. Smartphones account for the majority of telephony revenue. Of the $997 billion (USD) in 2018 global CE revenue, 48% ($474 billion USD), was from the telephony segment [8]. This segment experienced dynamic growth in the last twenty years as more and more people purchased a smart phone for the first time. Slow growth is expected in the near future. Almost all sales are replacements with few first-time purchases.

COMPUTING

The computing industry segment includes computers and all related equipment, such as mice and printers. It accounts for 28% of the market, with 2018 global CE revenue equaling $276 billion (USD) [8]. Over 90% of US households own at least one computer [10], so sales include few first-time purchases. Market penetration will continue to rise while computer prices fall.

TV, RADIO, AND MULTIMEDIA

This segment, which accounts for 24% of the market [8], was the core of the industry throughout the twentieth century. It includes items like televisions, gaming consoles, cameras, and speakers. This segment also includes newer products such as smart speakers and peripheral TV devices. Smart TVs, OLED displays, and rolling screens are TV products with predicted growth [11].

WEARABLE TECHNOLOGY
The newest and smallest segment comprises just 3% of the global CE industry [12]. Global revenue in 2018 was $26 billion (USD) [13]. This segment may experience great growth and

volatility in the coming years. Common items in this category include the Apple smartwatch and Fitbit activity trackers.

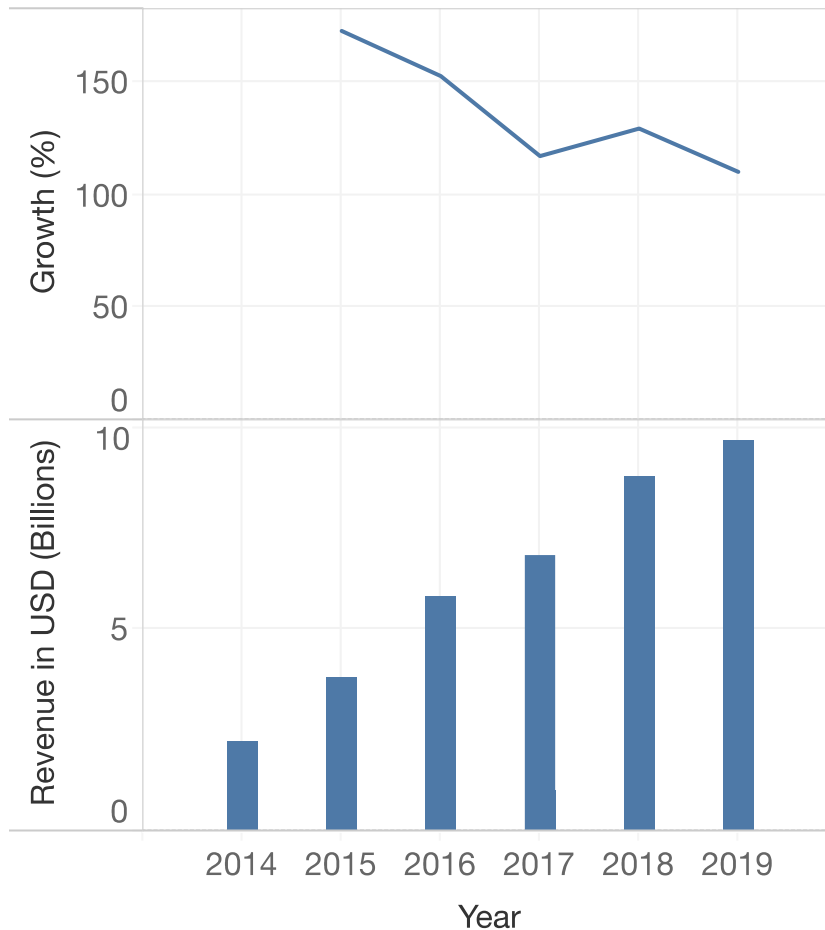# Target Market Analysis: Wearable Technology

Market Description

The wearable technology market began growing around 2013, when Fitbit introduced its first wristband activity tracker. Wearables have remained a growth market and new submarkets keep it growing.

Market Performance: Current and Historical

Capturing less than 2% of the US consumer electronics industry in 2014, the wearable technology market does not have a long history to track historical performance. In the few years we can track sales, we see significant market gains. Market revenue nearly doubled in 2014 and 2015 with the introduction of the Fitbit wristband and the Apple Watch, respectively. As seen in Figure 2 below, US wearables market revenue quadrupled from $2.2 billion (USD) in 2014 to $9.7 billion (USD) in 2019 [14].

Currently, wearable technology is used by 56.7 million US adults (about a quarter of the population) and over half of those use smartwatches [15]. Global market penetration is high. China currently leads market penetration, with 66% of Chinese adults owning a smartwatch or activity tracker [15].

US Wearables Growth and Revenue

2016-2019 data are forecasted

FIGURE 2: US CONSUMER WEARABLE REVENUE 2014-2019 [14]

Market Outlook and Forecast

The wearable technology market is expected to remain in a growth stage. Analysts predict a promising future, with CAGR predicted between +16% (2016-2022) [16] and +19% (2019-2024) [17].

The acceptance and ownership of wearables is multiplying quickly [18]. Market penetration for US wearable users is expected to reach 67 million adults in 2022 [14], an 18% increase from 2018 [14]. Global wearables revenue is predicted to quadruple from $16 billion (USD) to over $73 billion (USD) in 2022.

Although double-digit growth is predicted, the future of any new market is not as predictable as the outlook for a mature market. Previous revenue predictions for wearable devices have been higher than actual earnings. Consumers haven't welcomed items such as Google Glass or virtual reality headsets as quickly as expected. However, analysts anticipate that consumer behavior is changing as technological advances in wearables become more exciting and beneficial to people's lives, and as the construction of items becomes more stylish. An example of this is the hybrid watch trend, a growing market of traditional-looking watches with the features of a smartwatch.

Fluctuation is high in wearable submarkets. Activity trackers were nearly the whole market in 2014, but their market share steadily decreased while smartwatches overtook them and also grew the market [19]. Other submarkets, such as hearables, will grow and increase total market revenue.

Market Segmentation

SMARTWATCHES

Smartwatches, like the Apple Watch, dominate the current wearable device market, making up about half of market revenue [14], [20]. Hybrid watches, which look like traditional watches but act like smartwatches, are new to the market and quickly selling to consumers who appreciate wearing a watch with a traditional watch face instead of a screen.

ACTIVITY TRACKERS

Activity trackers, or fitness trackers, are often known by the popular brand name Fitbit. They are typically bands worn around the wrist, but may clips or pieces of jewelry. They track individual user statistics, such as distance walked, flights climbed, and heart rate. Some fitness trackers operate independently while others make use of app and smartphone integration. Activity trackers have more total shipments than other wearables, but sales are declining as users replace them with more advanced wearables, or simply use the activity tracking features built-in to their smartphones.

SMART HEADPHONES (HEARABLES)

Hearables are expected to be the biggest growth segment of the wearable technology market [14]. Technology companies such as Samsung, Google, and Apple as well as audio equipment companies such as Bose and Sony have products in this category. Most hearables play music, take calls, and include integration with a digital assistant. Some offer specialized hearing assistance or translation services. There is some crossover with the hearing aid market.

Virtual Reality (VR) and Augmented Reality (AR)

Virtual reality and augmented reality devices include headsets or glasses that alter the wearer's view either completely or partially. They may also be called head-mounted displays. The appearance of these devices varies widely, from standard-looking glasses to helmets. VR devices have a variety of price points, while AR devices tend to be several hundred dollars or more.
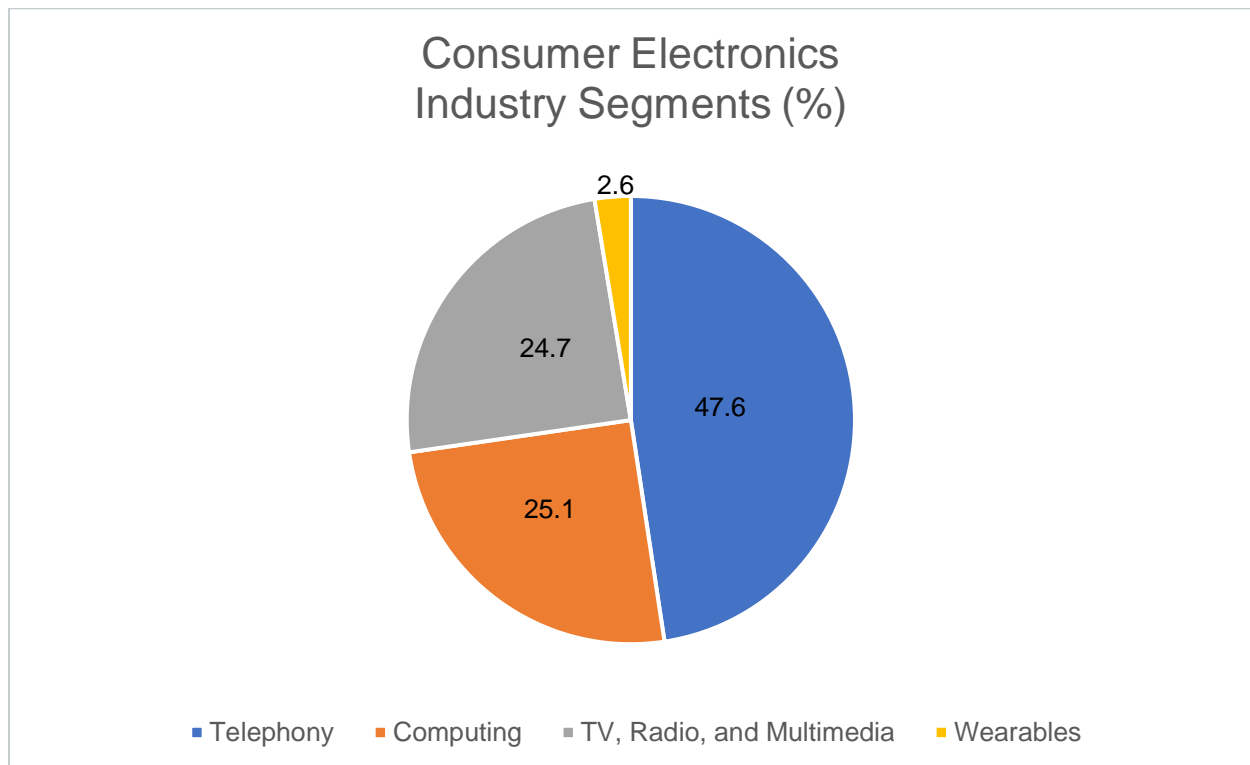

FIGURE 3: SEGMENTS OF CONSUMER ELECTRONICS INDUSTRY (BY %) [8]

Market Characteristics

Wearable technology is a fragmented, growing, and evolving market. Consumer reluctance or acceptance determines market growth. Global device sales and market penetration are expected to increase exponentially in the next few years [21].

Features

Fragmented market concentration. The wearable technology market is somewhat fragmented, as shown below in Figure 4. Smartwatch maker Apple and activity tracker maker Fitbit are two of the market's largest companies. The fragmented nature of the

industry makes it easier for new enterprises to find footing in the market. Once an innovative brand is established in a fragmented market, it can be sold or operated.

Changing submarkets. The wearables market was built on activity trackers, but that submarket is declining, and major revenue now comes from the smartwatch submarket. The composition of the market will continue changing as fitness tracker sales continue to decline and other submarkets emerge and grow. Hearables, TV peripheral devices, AR, VR, smart clothing, and the Internet of Things are all markets expecting significant growth in the near future [22].

Market Concentration

Consolidated– Market dominated by 1-5 major players

Smart Wearable Market

Fragmented – Highly competitive market without dominant players

Source: Mordor Intelligence

FIGURE 4: MARKET CONCENTRATION LEVEL OF WEARABLE TECHNOLOGY MARKET [17]

TRENDS

Even though customers will adopt new technology, they have requirements about these items. Price, innovation, looks, and functionality play significant roles in a product's success.

Young consumers. Wearable technology is most popular with adults age 34 and younger [14]. They also consume more media than other age groups. Because of young consumers' acceptance of wearable devices, analysts expect to see carryover as these consumers age up into the next bracket.

Innovative Technology. Consumers are looking for easy-to-use items that allow them to connect to their information. They are looking for technology that is "naturally smart, intuitive, and unobtrusive [8]." New devices and new models of existing items need significant advancements or new features to attract consumers. For example, advances in voice assistance technology mean that hearable device makers are able to add new features and attract more customers [17].

One device to replace the smartphone. Consumers are adapting an "everything now" mentality, expecting easy access to everything all at once [23]. Because their smartphones do so many things, consumers expect items to be practical and to perform multiple functions. They are willing to use wearable devices that do it all in place of their smartphones [14], although most wearable devices don't have this functionality yet.

Style. Companies are focusing on the aesthetics and design of their devices as a way to attract customers [17]. Most consumers don't want their wearable to make them look strange or like a cyborg. VR headsets and Google Glass are critiqued by consumers for their odd looks. Whereas industry leader Apple is famous for focusing on the design and aesthetic appeal of their products.

Market Catalysts

5G. The updated speed and connectivity of 5G networks will provide greater reliability and functionality for wearable devices. It will also allow users to connect more devices at the same time than ever before [24]. 5G is a very recent release, and it will help shape technology markets for years to come. New submarkets or competing markets may emerge, as 5G networks "usher in the next era of innovation, delighting consumers and driving our economy [25]."

The Internet of Things. As the Internet of Things grows, market penetration and consumer acceptance of new products also increases. Consumers see neighbors with video doorbells and hear about advances in self-driving cars. Repeated exposure to smart products leads to familiarity and acceptance.

Involvement of US Government. Increased tariffs on Chinese products and electronic components could drive prices up, thereby affecting consumer interest in wearables. Tariffs in Chinese products could affect prices directly or indirectly, as items are shipped through an intermediary location or production is moved to a different country. Trade bans on Chinese manufacturers, such as smartphone and wearable device company Xiaomi, severely limit their opportunities in the US market.

Hearables. Hearables have the biggest growth potential in the wearables market. Samsung, Google, Apple, Bose, and Sony are all large companies selling hearable devices that also invest in R&D to keep their products innovative and competitive. The best-known hearable might be Apple EarPods, which are a smart device because they are integrated with the digital assistant Siri.

Competitive Landscape

Key Players

Key players in the wearables market include Apple, Huawei, Xiaomi, Garmin, Fossil, and Fitbit. Many of these enterprises sell wearables as well as other consumer electronics. Almost all of the wearable devices these companies sell are smartwatches or activity trackers [26], [27], [28], [29], [30], [31], [32], [33].

TABLE 1: WEARABLES MARKET COMPANY COMPARISON BY EXPERTISE, STRENGTHS, WEAKNESSES, AND REVENUE

Company	Areas of Expertise	Strengths	Weaknesses	Annual Revenue* (Billions)
Apple	- Computers - Smartphones - Smartwatches	- High R&D investment - Industry leader - Loyal user base - Luxury branding Profitable	- High price point - Incompatibility with other brands	$265.6
Huawei	- Activity bands - Computers - Enterprise networking - Smartphones - Smartwatches	- Profitable - Quick growth - Wide variety of product offerings	- Lack of capital - US trade ban	$107.4
Xiaomi	- Activity bands - Artificial Intelligence of Things - Audio equipment - Smartphones	- Competitive prices - Focus on creating and updating products - Large product catalog - Worldwide distribution	- Brand differentiation - Service	$26.1

Company	Areas of Expertise	Strengths	Weaknesses	Annual Revenue* (Billions)
Garmin	- GPS devices - GPS-enabled: - Activity trackers - Hybrid watches - Smartwatches - Watches	- In-house manufacturing - Quality	- Lacks integration with 3rd-party services - Limited to GPS-centered devices	$3.3
Fossil	- Watches: - Hybrid watches - Smartwatches - Traditional - Accessories: - Bags - Jewelry	- Global brand recognition and distribution - Leader in hybrid watch market - Style - Successful expansions	- Declining revenue for the last five years - High inventory levels	$2.5
Fitbit	Activity trackers	- Brand is synonymous with fitness bands - Market trailblazer	- Declining submarket - High price point	$1.5

*Annual revenue is for 2018 and in USD

In 2018, 172.2 million wearable devices shipped worldwide. The key players' market share by unit shipments is shown in Figure 5 below.

2018 Vendor Market Share (%) by Global Unit Shipments
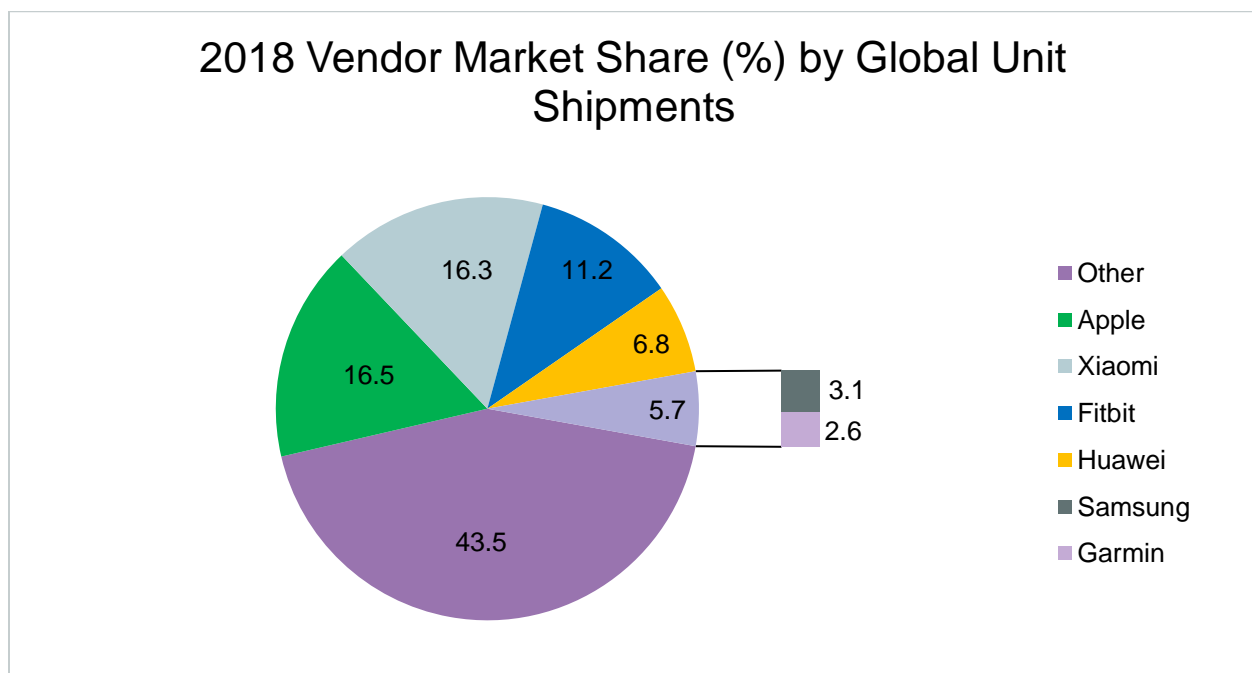
North's Competitive Advantage

Start-up company North Inc. plans to change the wearable device market by introducing the first pair of main-stream smart eyeglasses for consumers.

Must-have technology. North smart glasses provide a futuristic user experience. Users see their information floating in front of them without blocking their view. Once freed from staring at their phones, users will be able to stay connected to their data without disconnecting from their world. They also combine many features in one easy-to-use device, such as texting, maps, music, and the digital assistant Alexa.

Aesthetics. Consumers want items to look a certain way, and will reject items that don't meet their expectations. North Focals are simple, plastic-framed, and resemble Warby Parker glasses [35]. Most of the technology is housed in the companion ring, which keeps the glasses light and prevents users from continually tapping or reaching for their glasses.

Potential market leader. North has the opportunity to become a market leader and brand name in an emerging market. The best-known items in this arena are Oculus VR headsets for gaming and Google Glass, an augmented reality headset which originally failed because of aesthetics, user safety concerns, and privacy issues arising from the video recording feature [36].

Price. Most augmented reality wearables cost $1,000 or more. North's Focals smart glasses start at $599. The competitive price point matters in a market where "54% of consumers say price has limited their interest in purchasing a wearable device [23]." The low price point will attract wearable seekers as well as other consumers.

Opportunity Analysis: North Focals Smart Glasses

Limitations in Wearable Technology

The wearable technology market is in its infancy. Technological innovations and consumer behavior will continually move the market forward until wearable devices rival the ease and functionality of smartphones.

Overview of Wearable Technology

Wearable devices are a nice-to-have product, owned by the young, the affluent [36], the fitness-motivated, or the tech-savvy [37]. Most work only in conjunction with a smartphone or an app. Less than a quarter of US consumers own a wearable device today [11], with Fitbit activity trackers, the Apple smartwatch, and digital assistant-enable headphones among the most common. Up to 78% of Internet-using adults are interested in wearable devices [36], but high prices and lack of features prevent most from purchasing one. Instead, consumers buy and rely on their smartphones.

Limitations of Current Wearable Devices

Customers want an attractive, affordable device that does it all and works well.

Activity trackers. Ten years ago, activity trackers spurred the creation of the wearable device market and accounted for the bulk of sales. As the name implies, activity trackers keep track of a user's activity levels and other fitness metrics such as heart rate. Some offer additional functions like displaying the time or playing music. However, their scope is limited. For example, you cannot use one to write an email or order an Uber. Some activity trackers are self-contained, allowing users to go for a jog without carrying their smartphone, but they don't offer as many features as a smartphone does. Although consumer interest in fitness tracking is still high, the activity tracker as a stand-alone device is going the way of the iPod or the VCR, and is being replaced by smartphones or full-featured wearables.

Smartwatches. Smartwatches have much more functionality than an activity tracker, and have replaced the activity tracker as the market leader. Most smartwatches are an extension of the user's smartphone and need to be configured with an app. They can pass along notifications from your smartphone and do the same things an activity tracker can, but they cannot replace a smartphone. Not everyone finds watches comfortable to wear. And someone who constantly glances at their watch may seem uninterested or bored with their company. Over 50% of consumers say they are too expensive to even consider purchasing [36].

Hearables. Hearable devices are simply earphones or ear buds that can access a digital assistant or the internet. Their portability and lower price points are attractive to consumers, who use them to place calls or listen to music. While some hearables can track activity such as heart rate, they lack the functionality of a smartwatch or a smartphone. Since hearables have no screen or keyboard, they rely on a digital assistant to make them smart. While your digital assistant might be able to read you an email, more advanced functions like writing and editing emails are best left to devices like smartphones.

VR and AR devices. AR and VR devices typically look very strange and bulky. They tend to be worn indoors and are used in business or gaming. Many people don't understand the features offered by these devices [38]. Also, AR devices are very expensive, costing several hundreds or thousands of dollars. At this time, VR and AR devices are "niche products" [39]. However, consumer interest is growing, and AR should reach "its full market potential" [40] in ten years.

High prices. The high price of wearable devices prevents many consumers from considering them and purchasing them. Most devices are sold to young or affluent consumers. And even though US discretionary spending and consumer interest are rising, [37], there are still large portions of the population who cannot or do not want to spend hundreds of dollars on a wearable device.

Battery life. Battery life hasn't kept up with other technological innovations. Touchscreens and bright displays can consume battery life very quickly, and many devices have a battery life of one or two days [36]. Standalone devices have a longer battery life, perhaps 5 days, and batteries in screenless hybrid watches can last over a year. At this point, long battery life and multiple features do not usually exist in the same device, and battery life is often a trade-off for features and functionality. Analysts predict higher acceptance of AR glasses in the next five years if battery life can be improved [39].

Style. Style is an important concern for consumers, but many wearables take a technology-first approach. Many people thought Google Glass backfired because of its looks [41], and VR headset and smartwatches "can be bulky and awkward" [36] to wear.

Features. Few consumers are interested in wearables with limited functionality. Fitness tracker sales have fallen because they don't compare to full-featured smartphones. However, "consumers are very interested in wearable devices that can handle many of the multitasking features common to cell phones, including texting and calling, in addition to tracking fitness and playing music [36]."

TABLE 2: COMPARISON OF POPULAR WEARABLE DEVICES

Item	Features	Limitations	Battery Life	Price
Fitbit Charge 3 activity tracker [41]	• Backlit touchscreen • Fitness and sleep tracking • Smartphone notifications • Waterproof	• Utilitarian style	Up to 7 days	$149.95
Apple Watch 4 [42]	• Proactive health monitor, including electrocardiogram • Multiple notifications, sensors, and trackers • Cellular version can be used without iPhone • Pressure-sensitive touchscreen • Waterproof	• Can only pair to iPhones • Staring at your watch may be socially unacceptable	Up to 18 hours	$399.00 and up
Apple AirPods [43]	• True wireless • Siri digital assistant • H1 chip for fast and stable pairing • Fast charging	• Unusual look • Not secure for use while exercising • Average sound quality	5 hours (24 hours with charging case)	$159.00
Oculus Quest VR headset [44], [45]	• Self-contained • Wireless • Room-scale VR • Responsive touch controllers • Crisp graphics	• Limited apps • Download process	2.5 hours	$399.00 and up
Vuzix Blade AR Smart Glasses [46]	• Alexa digital assistant • Touchpad • HD camera • Motion trackers • Smartphone notifications • Companion app • Location aware	• Bulky, style resembles safety glasses • Heavy • Complicated touch gestures • No speakers	Up to 8 hours	$999.00

Significance of Limitations on Stakeholders

Consumers are limited in their adoption of wearable technology because of lack of interest, lack of availability technology, and lack of affordable options.

Impact on consumers. Consumers think of wearables as either meant for fitness tracking or as entertainment. They aren't aware of how wearables might benefit them and can't envision not being tethered to their smartphones. Or they are left with devices that don't meet their expectations. They would like a single device that is affordable, works well, and is full of features that make their lives easier. At this point, the device that best meets those criteria is the smartphone.

Impact on North. North needs to understand the limitations of current wearables and what consumers want when considering which products to develop. If they don't offer products that improve on the status quo, consumers will keep looking until they find the innovation they seek. Therefore, North would miss out on revenue-generating products in their own industry. As a start-up with extremely limited product offerings, it is important that North only release products that capture enough market share for them to operate and grow the company.

Significance for North

North can take advantage of a fragmented and growing market to provide smart glass technology that is largely unavailable in the consumer market.

Fill a gap in the wearables market. Consumers are interested in wearables, and 31% would consider purchasing AR glasses [36]. With no market leader, North has the opportunity to fill this gap, but creating a product that delivers on what customers want is critical. Acceptance of AR has been slower than expected. Issues such as privacy, features, battery life, and price need to be addressed before most consumers will consider AR. Because of high customer expectations and a capital-intensive market [40], North will need up to $200 million (USD) in investment and R&D capital. Since "North America is the largest market for smart wearables [40]," North's location is ideal for reaching its target market.

Unique product offering. North focuses on development of one unique product at a time. Since "product uniqueness is the significant factor that is currently providing a competitive advantage" [40] to vendors, North should capitalize on that advantage and create a ground-breaking product. The company could become a well-known brand

name in the wearable market, and create other wearable products in the future. Or it could be acquired by a larger company such as Apple or Facebook, where wearable technology would continue to be created and improved.

Opportunity Fulfillment: North Focals Smart Glasses

North Focals Device Architecture [47]

Smart glasses are eyeglasses with computer technology that display images for the user to see. They are worn on the face like traditional glasses. Focals resemble traditional glasses in many aspects, including their plastic frame and optional prescription lenses. A companion ring called the Loop and a charging case are included. The glasses and ring are paired via Bluetooth to a smartphone and the Focals application.

FIGURE 6: FOCALS SMART GLASSES WITH CHARGING CASE, CHARGING CORD, AND THE LOOP RING. [48]

Materials

The Focals are made of Swiss Grilamid plastic frames and lightweight die-cast aluminum [49] with stainless steel spring-loaded hinges and copper accents. The lenses, which have several

protective coatings, are curved to fit either non-prescription or prescription lenses. An invisible holographic film is molded to the right lens, which works with a tiny light-emitting projector to create the images. Customers can choose from two styles and three colors. Sunglass clips, which come in two colors, are included with every pair. Focals are water resistant with an IP55 rating.

Display

A small projector inside the right arm of the glasses sends out light, which reflects off the holographic coating applied to the right lens. This coating acts like a mirror and reflects light onto the fovea, the part of the eye where your vision is best [50]. This process is called laser beam scanning [51]. The resulting image is clear, colorful, and appears to float in the air at arm's length. The images are see-through and fade away after a few seconds. By freeing the display from a screen, we're no longer limited to a solid, opaque background. Brightness, volume, and notification settings are adjustable.

FIGURE 7: FOCALS SMART GLASSES DISPLAY (LEFT) [52] AND WITH PROJECTOR BUILT-IN TO RIGHT ARM (RIGHT) [50]

Hardware

Focals contain an advanced Qualcomm APQ8009w processor and a 700 mAh battery, which lasts up to 18 hours. The right arm of the glasses also contains a speaker to provide notifications and a microphone to contact the digital assistant Alexa. Focals contain several sensors, including a motion-tracking sensor, an ambient light sensor, and a proximity sensor.

Loop Companion Ring

The Loop is a polycarbonate ring that operates Focals smart glasses. By pressing or moving the tiny joystick component in one of four directions, you can scroll through apps or reply to text messages. By placing hardware in the Loop, the glasses remain lightweight and can be operated discretely.

App Integration

Focals smart glasses and the Loop ring both connect to smartphones via Bluetooth. Access through the app allows the user to access a variety of features, including digital assistant Alexa, texts, email, walking directions (driving with AR glasses is illegal), Spotify music, Uber ridesharing, calendar, weather, voice-to-text, Google Fit activity tracking, screen time tracking, Google Slides, Slack, Microsoft OneNote, reminders, to-do lists, language flashcards, Evernote, travel updates, and more.
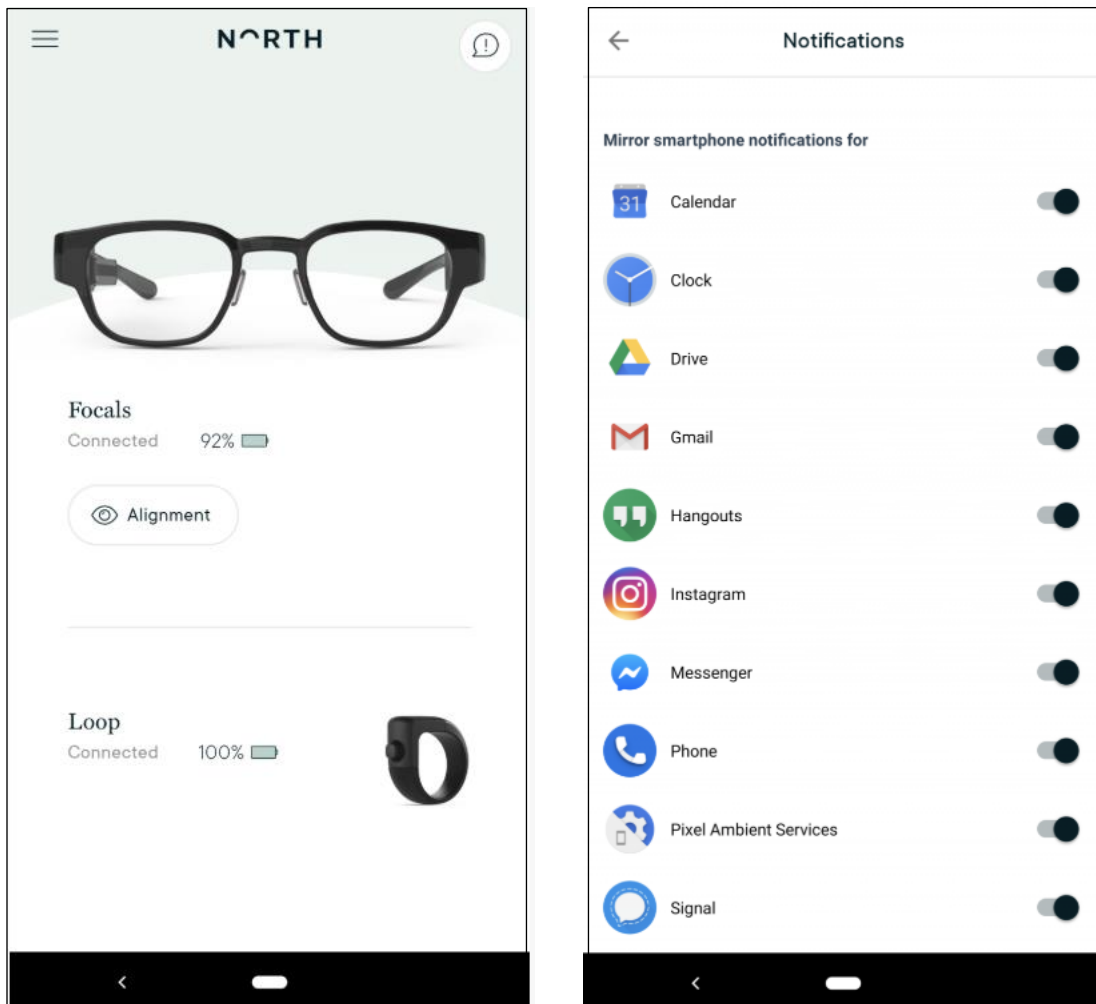
FIGURE 8: FOCALS APP SCREENSHOTS [50]

Features and Functionality

Focals smart glasses are a one-of-a-kind wearable technology that provide the best of both worlds.

Feature	Functionality
Materials	› Focals use materials common to traditional eyeglasses, resulting in a socially acceptable product. › Premium accents are needed for a higher-priced product.
Display	› Users sees crisp and colorful images that are pleasurable to look at. › See-through display offers safe and unobstructed view, and gives users freedom and the ability to move around. › Only the user can see images, so information remains private.
Hardware	› A smartphone-level processor improves product speed.
Bluetooth	› Bluetooth connectivity reduces latency and allows for easy pairing with smartphones.
Loop Ring	› Allows user to operate glasses discretely. › Prevents users from awkwardly reaching for face all the time and throwing off alignment. › Keeps glasses lightweight and stylish.
App Integration	› Allows users to leave their cell phones in their pocket and stay connected to their world. › Multiple apps provide consumer with satisfying user experience and increase perceived value. › Digital assistant provides voice-to-text, so that users don't need a keyboard.

Benefits of North Focals Smart Glasses

Benefits for Customers

North Focals provide several benefits to customers that other wearables do not.

TABLE 4: LIMITATIONS OF CURRENT WEARABLES, AND SOLUTIONS AND BENEFITS OF FOCALS

Limitations of Current Wearable Devices	Focals Solution	Benefits Provided
Need a screen to look at information	› Information floats in your view without needing a screen. › Remain in your world instead of disconnected from it.	› Hands-free use. › A new way of interacting with digital data. › Not stuck behind a screen or looking down.

Limitations of Current Wearable Devices	Focals Solution	Benefits Provided
	› No need to touch glasses.	› Stay engaged in life. › Reduced smartphone use.
Battery life	› 18 hours use on one charge. › Carrying case that doubles as a charging case.	› Easy to charge while sleeping. › Lasts all day.
Lack of multiple features	› Offers dozens of apps and features, such as GPS, music, texting, shopping lists, and fitness tracking.	› Customers get a multi-functional device. › Device is exciting to use. › Provides enough features to compete with smartphones.
Style	› Focus on creating traditional-looking eyewear. › Focals can replace the prescription glasses you already wear.	› User doesn't feel awkward wearing Focals. › Socially acceptable › Don't need to carry an extra item.

Benefits for North

TABLE 5: NORTH'S BENEFITS FOR DEVELOPING FOCALS

Benefit	Description
Create revenue	› As a start-up, North can be flexible and quick to launch products. › No well-known smart glass makers as competition.
Create jobs	› Development, product release, and in-house manufacturing result in the creation of hundreds of jobs.
Receive investments	› Generated investments of $170 million (USD) from Amazon Alexa Fund, Intel, Canadian government, and others [51].
Become a key player in an emerging market	› Creator of first pair of everyday smart glasses. › Increase brand recognition. › Be seen as a market leader. › Be known for cutting-edge technology.
Hold valuable patents	› Created several patents for smart glasses. › Acquired related patents from Intel [52].

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