Chapter 7
Business Strategies and Disruption in Vision Care

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1 Introduction

Disruptive innovations have occurred in many industries, including health care. For example, Apple's music product (iTunes), disrupted the music industry, record stores, and payments to musicians when it allowed individuals to purchase songs and save them as electronic files. These innovations usually leverage new technology to provide services to potential customers that were neglected by the incumbent firms. These innovations can challenge both incumbent firms and regulators to adapt quickly while ensuring that consumer protections are sufficient to protect those with an information disadvantage. While this innovation poses challenges, it also provides an opportunity for those who are ready to take advantage of the change, and who understand the strategies used by stakeholders to protect their interests.

Health care providers, including psychologists working in integrated care, are affected by an ongoing stream of health care innovations, sparked by concerns about continued increases in health care expenditures, technological innovations, or unmet needs of individuals who are under-served or over-served by the current health care system. Innovations affecting psychologists include telehealth, substitution of social workers, substitution of masters-degree psychologists for PhD psychologists, and a plethora of online and cell-phone apps designed to help patients manage mental health conditions and behaviors contributing to chronic medical conditions. Additional pressures for change specific to the Veterans Health Administration include declining numbers of veterans and shifts in the locations of veterans. Finally, innovations, such as telehealth services and retail clinics offering convenient and relatively inexpensive treatments for minor illnesses and injuries, could weaken relationships between primary care practices and their patients. This could affect

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psychologists working in integrated care, to the extent that this delivery model presupposes strong ties between primary care physicians and their patients. The ongoing stream of innovations includes two types of innovations: those that strengthen the ability of the industry to function in the traditional manner, and those that disrupt the traditional industry. The degree to which psychologists are affected by disruptive innovations will depend on their strategic responses to the innovations.

This chapter provides a conceptual framework for understanding the types of innovations, the potentially positive impacts of disruptive innovations on some groups of consumers or patients, implications of these innovations for consumer protection, and the mix of positive and negative potential impacts of these innovations on health care professionals. The chapter begins by defining disruptive innovations and discussing a few examples in Sect. II. Section III focuses on a case study of a disruptive innovation that occurred within the health care industry but does not involve psychologists. This allows psychologists to focus on the business aspects of the challenges posed by the innovation and possible professional responses. The first part of Section III describes the innovation. The second part of Section III outlines a series of steps professionals can use to analyze a potentially disruptive innovation, and it illustrates the steps by analyzing the innovation highlighted in the case study. To facilitate comparisons between innovations in the health care industry and innovations in other industries, we use the words "products," "goods," and "services" interchangeably.

2 Disruptive Innovation

Two types of innovation drive growth in an economy (Schumpeter, 1942). The first type of innovation is a form of learning by doing. As a firm grows, it may innovate to reduce cost and displace rival companies. For example, aircraft manufacturers continually upgrade engine designs, creating engines that are more reliable and less expensive. The large size of firms that manufacture aircraft and their investments in innovation create a virtuous cycle: the firms improve steadily as they grow (Rosenberg, 1982). The challenge for successful incumbent firms is that the incentive to do this type of innovation is muted by the fact that the company is already successful. In this situation, change is risky.

The second type of innovation described by Schumpeter is creative destruction. In this model, innovators from outside the industry combine existing technologies, develop new technologies, or they use a combination of the two strategies to disrupt the incumbent firms. While an incumbent may have access to industry-specific technologies that are not widely available, there are other technologies that are well known and can be used across industries. Innovators may apply technology developed in one industry to disrupt a second industry. For example, Uber leveraged smartphone technology to disrupt the taxi industry.

The term "disruptive innovation" describes a specific type of industry disruption (Christenson et al., 2015). In a mature industry, incumbent firms tend to focus their

efforts on supporting their most profitable customers. (Christensen et al., 2015) This focus on the most profitable customers usually means that some customers are under-served by incumbent firms, while others are over-served. Under-served customers may not buy any product from the industry because they would prefer to buy a streamlined product with a low price, but the industry does not offer this option. Over-served customers are currently buying products, but they would switch to an inexpensive streamlined product if it were available. In disruptive innovation, an outside group redesigns the production of a good to fulfill the demand of the under-served group for an inexpensive streamlined product. Initially, this innovator does not compete with the incumbent firms for its existing customers. The innovator will begin to compete with these firms, however, if existing customers begin switching to the inexpensive streamlined product or if the innovator begins to improve its product to appeal to existing customers, and eventually disrupt the incumbent's position.

This framework is helpful for thinking about innovation and the likely impacts of disruption. Analyzing how this dynamic plays out in other industries can also give some insight into the challenges psychologists could face in the future in their practice. First, it is important to understand what disruptive innovation is not. It is not innovation that serves the mainstream customers of the incumbent firms. Instead, disruptive innovations begin by targeting under-served customers and then improve the product to appeal to mainstream customers, eventually disrupting the mainstream market. While Uber did spark significant changes in the market for "rides for hire," it was not a disruptive innovation as it targeted the mainstream taxi customer from the beginning. Amazon was a disruptive innovator in the mid-1990s, as it targeted an under-served market of readers who wanted a wider selection than could be found in brick-and-mortar stores like Barnes and Noble. This is clear from the title of the first book sold on Amazon.com: "Fluid Concepts and Creative Analogies: Computer Models of the Fundamental Mechanisms of Thought" (Garber, 2012).

2.1 Examples of Disruptive Innovation

Amazon.com did more than just disrupt the businesses of large chain bookstores. Over time, it disrupted the businesses of book distributors, authors, and publishers. It then leveraged their business processes to take on big box retail in general. The impact of disruption extends to all members of the supply chain for a good or service, in some cases in very negative ways. For example, one book retailer, Borders Books, was eventually forced to declare bankruptcy in the face of the disruption brought by Amazon.com. However, Amazon.com also facilitated the success of authors and independent entrepreneurs through the launch of Kindle publishing and Fulfillment by Amazon. While the disruption brought by Amazon hurt some firms, it was leveraged by others to create new businesses and serve new customers. Disruptive innovation can either hurt or harm those involved in a mature industry, depending on how each stakeholder reacts to the disruption.

Retail health clinics provide an example of a potentially disruptive innovation in the health care industry. When the first retail clinic opened inside a retail store, the clinic offered a streamlined set of primary care services and did not have a system for billing insurance (Kaissi, 2016). Nurse practitioners or physician assistants provided a streamlined set of services; prices for specific services were posted and they were lower than prices charged by physician practices; services were offered during extended hours on weekends as well as weekdays on a drop-in basis only; and the clinics worked to ensure that wait-times did not exceed 15 min. The clinics were expected to appeal to uninsured individuals, who were under-served by physicians offering a broad array of traditional health care services in a physician office. As the retail clinic business grew, however, insured people also used the clinics, and the retail clinics acquired systems for billing insurance. Surveys indicated that insured individuals obtained care at retail clinics for minor illnesses and injuries because they preferred the convenience and low price offered by retail clinics (Cassel, 2018). Studies indicated that the quality of care provided by retail clinics was comparable to physician-provided care, for the types of services offered in retail clinics (Cassel, 2018). This innovation was potentially disruptive, but it did not generate major impacts on other components of the health care system, such as the volume of patients arriving at hospital emergency departments or urgent care facilities (Kaissi, 2016). One explanation focuses on the fact that some hospitals partnered with retail clinics, and they developed business strategies to utilize the clinics in ways that supported the hospital's business model (Kaissi, 2016). An additional explanation highlighted the fact that the substantial growth of retail clinics occurred as passage of the 2010 Patient Protection and Affordable Care Act (PPACA, 2010) triggered increased demand for primary care services (Kaissi, 2016). To the extent that patients who switched to retail clinics had been over-served by primary care physicians (because they were relatively healthy adults with only minor illnesses or injuries), the increase in retail clinic utilization helped primary care physicians focus on treating patients with more complex conditions.

2.2 Impacts of Disruption on Skilled Individuals Working in the Incumbent Firms

People who oppose innovations that automate production processes are known as "Luddites," after a textile worker named Ned Ludd who smashed a piece of textile equipment prior to the well-known Luddite incident. The Luddite incident is often framed as a revolt of unskilled labor against automation: however, the events that triggered the revolt were actually more complicated. Those who participated in the Luddite demonstrations were skilled members of the weaver's guild, a professional group which was similar to a modern labor union. In 1811, a group of English workers, the Luddites, assembled outside Nottingham, England and began to break automated weaving machines (known as "frames") (Beckett, 2012).

Why did the protests happen and why were skilled laborers being displaced at that time? At the beginning of the industrial revolution the primary constraint in the

textile process was spinning cotton, wool, or other materials into thread. Through most of human history, this process was highly labor-intensive compared to weaving, and there were frequent shortages of thread supplied to weavers in eighteenth century England. In 1768, Richard Arkwright removed constraints to thread production when he perfected an automated spinning process to produce reliable supplies of thread that was both stronger and less expensive than thread produced with the previous methods (Postrel, 2020).

Within a few years, materials for creating textiles were plentiful, the textile industry grew rapidly, and shortages of skilled weavers became the chief constraint faced by producers of cloth. These weavers enjoyed several decades of high wages, until a second innovation (which was partly motivated by these high wages) reduced demand for them as well (Postrel, 2020).

The availability of stronger thread made it possible to automate parts of the weaving process (Postrel, 2020). The new automated weaving machines were initially used to produce relatively low-quality textiles. Thus, the innovation focused on changing production methods to serve a previously under-served customer base that preferred to buy inexpensive low-quality cloth. While skilled weavers were still needed to produce higher-quality textiles, use of the new machines reduced the immediate demand for weavers, and the Luddites correctly perceived that more affluent customers would eventually switch from buying hand-woven textiles to buying textiles woven with automated processes. One can imagine the distress this automation would cause, after skilled workers spent long years in apprenticeships to obtain high-paying employment, only to see technology make the occupation obsolete (Postrel, 2020).

This sequence of events recurs frequently throughout history, and accelerated sharply with the start of the industrial revolution:

1. Firms produced a popular product and sold it to consumers. Some individuals involved in the production process were able to earn high wages.
2. People completed extensive training to qualify for employment in these high-wage occupations.
3. Other people noted the high wages and high prices, and they began working to develop new methods of production to offer new types of goods to consumers at lower prices.
4. The new production methods (or the new products) reduced demand for the highly skilled workers who had been enjoying high wages.

2.3 Regulatory Issues Raised by Disruptive Innovations

In contrast to the impact of innovation on skilled workers, the impact of innovation on consumers is generally positive. During his Nobel Lecture, Paul Romer (2018) argued that most of the increase in living standards over the last 200 years can be attributed to the development of new technologies, new processes, and new scientific knowledge. However, while the benefits to society may be positive

overall, subsets of people involved in a disrupted industry are negatively impacted by these changes. These groups use an array of strategies to try to mitigate damage. In particular, skilled labor may lobby for increased regulations, such as licensing laws, to minimize the risk that their jobs will be threatened by the new type of competition.

Consumer protection regulations, such as licensure requirements, play a particularly important role in the health care industry. Patients (customers) cannot usually judge the quality of care up front. Generally, this problem is mitigated by licensing and regulation. Therefore, innovators must address regulatory restrictions in addition to the task of creating a service that is valued by people who were under-served by incumbent providers. Regulators may have concerns about developing new types of consumer protection regulation to accommodate disruptive innovation. They have a primary responsibility to protect consumers. When the existing regulatory system was designed, lawmakers and regulators conceptualized "consumer preferences" and "consumer protection" in the context of the traditional health care system. When a disruptive innovation occurs, it typically offers new types of quality and convenience that were not provided by the incumbent providers. Protecting consumers in the evolving industry may require new definitions of "consumer protection" and new strategies for achieving that goal. It may also require weighing trade-offs between subsets of consumers because the innovation may allow some previously under-served individuals to gain access to the market, while the change in quality characteristics may pose a new risk for other consumers. In addition, regulatory agencies have typically worked with provider organizations for many years and may be reluctant to adjust regulations in ways that are likely to facilitate rapid disruption of the incumbent providers.

3 Case Study: EyeQue

New technology for providing vision care and prescription glasses illustrates issues posed by disruptive innovations and possible strategic responses. There are elements of vision care that require significant skill and judgement on the part of a medical professional, while other elements of vision case are more straightforward. Innovations like EyeQue allow providers to separate the two types of care, devoting more resources to the more complex cases, while possibly providing oversight and review on the more straightforward services needed by patients. If psychologists keep this mental model in mind as they approach their own care, they may identify strategies for leveraging the new technology to strengthen patient care while avoiding the pitfalls for providers that disruptive innovation can cause. In short, disruptive innovation in health care can offer benefits to providers who understand the dynamics of these changes and explore strategies for leveraging them to improve care or reduce health care expenditures.

3.1 The EyeQue Innovation

In 2015, two researchers at MIT, Tibor Laczay and John Serri, patented technology that would allow an individual with a smartphone and an inexpensive attachment to obtain the measurements required for eye glass prescriptions.[1] This technology was initially developed to serve adults without insurance or vision care plans. The researchers formed the company, EyeQue, to sell kits based on this technology to consumers (EyeQue, 2021a). In July 2021, the newest model could be purchased online for $69, and shared with friends and family members. Each user must open an online account; however, there is no charge for these accounts as of July 2021. In contrast, a visit to a medical provider for vision care was estimated to cost $171–$200 dollars for one individual.[2] These fees do not include the cost of frames and lenses, potentially several hundred dollars, which are often sold by the optometrist as well. David Gewirtz, writing for Zdnet.com during 2021, describes his experience using the EyeQue tool and procuring frames and lenses outside of the traditional path. He spent the $45 for the EyeQue kit in 2020, and then spent $21.95 to buy frames and prescription lenses from an online provider called EyeBuyDirect (Gewirtz, 2021).

EyeQue is attempting to disrupt part of the vision care market by allowing people to update or obtain the equivalent of an eyeglass prescription by using the technology it licensed from MIT. How does the process work? First, a customer buys an attachment for her smart phone from a retailer. As of this writing, the attachment was on sale at several retailers, includingAmazon.com. When the customer receives the attachment, she opens an account with EyeQue and downloads the app. The app requires the user to take the test three times and then generates what EyeQue refers to as "EyeGlass Numbers." These are the same measurements generated for a prescription, but EyeQue cannot legally refer to them using that term due to the fact that they are not generated by a licensed optometrist or ophthalmologist.

For example, under Nevada law, the following activities are included in the list of "acts constituting practice in optometry," which can only be conducted by licensed optometrists or under the supervision of an optometrist (NRS, 2021). These activities include measuring refractive errors. Similar activities are also described under the practice of ophthalmology. These activities include measuring refractive error, and they specify that eyeglass lenses and frames can only be dispensed when the patient has a valid prescription written by an optometrist or physician.

NRS 636.025: Acts constituting practice in optometry

> (b) Adapting, or prescribing or dispensing, without prescription by a practitioner of optometry or medicine licensed in this State, any ophthalmic lens, frame or mounting, or any part thereof, for correction, relief or remedy of any abnormal condition or insufficiency of the eye or any appendage or visual process.

[1] The attachment uses the smartphone's computer capabilities to perform a refraction test at home.

[2] This estimate was prepared by Fair Health, a nonprofit organization that aggregates payment data from health care claims (Nvisioncenters.com, 2021).

> (c) The examination, evaluation, diagnosis and treatment of the human eye and its appendages, the measurement of the powers or range of human vision by any means, including, without limitation, the use of an autorefractor or other automated testing device, unless performed under the direct responsibility of a licensed optometrist as authorized in NRS 636.346, the determination of the accommodative and refractive states of the eye or the scope of its function in general, … .

Generating the eyeglass numbers is only part of the information you need to buy a pair of glasses. Another key element is getting an accurate measure of pupillary distance, the distance between your pupils. This measurement is important as it determines where the lenses/frames need to sit to place the focal point of a corrective lens in the correct spot. The EyeQue kit includes a pair of white plastic frames with several markings on it to aid in accurately measuring this distance. A customer can put the frames on and take a picture of herself wearing the glasses. The EyeQue app uses the photo to capture the pupillary distance and frame measurements required to make a pair of glasses that fits, with the lens focus centered correctly over the pupil.[3] These are all steps that are traditionally carried out by a technician or an optometrist in the traditional vision care model.

While smartphone technology is able to detect vision problems, calculate the needed lens power for correction, and measure facial features was necessary for a disruptor like EyeQue, it is not sufficient for their business model to be successful. There are also stacks of other technologies and business processes that are required for a business model like this to work. The EyeQue business model also depends on the availability of online eyeglass retailers to address state laws requiring valid prescriptions prior to in-state sales of eyeglasses.

The EyeQue business model is only viable because customers can now purchase prescription glasses online from companies such as Zenni Optical, Glasses USA, and EyeBuy Direct. This is possible because businesses outside the health care industry have developed processes to support online sales over the last 20 years.

EyeQue and companies like it can provide a cheaper way to get the measurements for a corrective lens because other technologies and business processes enabled by the Internet support this business model. However, the EyeQue business model raises two important concerns. First, an eye exam generally entails more than just determining the appropriate corrective lenses for a patient. An eye exam also screens for other conditions such as macular degeneration, cataracts, and glaucoma. Patients who want to buy eyeglasses from brick-and-mortar stores must still obtain prescriptions from optometrist and ophthalmologists. One argument for maintaining this requirement focuses on the value of bundling the service that is often salient to individuals (eyeglasses) with the screenings that may be important for maintaining eye health, but are less salient to patients. The combination of benefits and harms generated by the EyeQue business model generates an important question: Does the benefit of increased access to corrective eyeglasses (generated by the low

[3] EyeGlass Numbers can be used, along with the measure of pupillary distance, to purchase eyeglasses, but they cannot be used to purchase contact lenses. The EyeQue system is not calibrated to provide the necessary information for purchasing contact lenses (EyeQue Support, 2021a, b, c).

cost of using EyeQue to obtain a vision test) offset the potential harm that could be caused if fewer people obtain annual eye exams screening for eye health issues? Second, regulators considering modifying the current consumer protection regulatory strategy could also be concerned about the quality of the eye glass numbers versus a prescription written by a trained optometrist. Some doctors have expressed these concerns. An optometrist, Dr. Heiting, summarized the two concerns (GeWirtz, 2020):

> I took a quick peek at the promo video for the device. It looks like it could work to determine a glasses prescription for single vision lenses (including astigmatism correction), but not a prescription for progressive lenses for someone with presbyopia.
>
> …
>
> Finally, consumers should be made aware that this is not a substitute for a comprehensive eye exam, as it does not evaluate the health of the eyes or test eye pressure to rule out glaucoma. *https://www.zdnet.com/article/eye-exams-at-home-a-safe-way-to-update-your-eyeglass-rx-in-the-age-of-covid/*

Later, in the same article, Dr. Mesheca Bunyan, an opthalmologist in Maryland, said the following:

> I do think that technology such as EyeQue can work. The technology appears to be innovative and has the ability to offer a clear prescription if someone is unable to see their eye doctor.
>
> My thought is that it still can't replace a comprehensive eye exam which includes the refraction, the portion of the test that gives the eyeglass prescription.
>
> Optometrists have the ability to fine tune the prescription in ways that a piece of technology cannot. For example, there are instances in which a patient's prescription may be high in astigmatism and we might decrease it based on what the patient might be able to tolerate. Technology can't determine this. *https://www.zdnet.com/article/eye-exams-at-home-a-safe-way-to-update-your-eyeglass-rx-in-the-age-of-covid/*

These concerns could have important implications when we think about the impact of the EyeQue product on existing players in the vision care market. The fact that appointments with ophthalmologists and optometrists are still needed to check for other conditions impacts the effective cost for a consumer choosing between getting an eyeglass prescription while at their annual or biannual visit to their eye doctor or using EyeQue. This is particularly true for consumers who are willing to request their prescription at the end of an appointment and then use the same online eyeglass retailers that consumers using EyeQue use. For these consumers, there is the additional cost of EyeQue plus the added time and inconvenience of purchasing eyeglasses separately. This is an important thing to keep in mind as we review the potential impacts of the EyeQue product on the eyeglass market. Even if EyeQue provides a less expensive option for obtaining the information needed to purchase eyeglasses, customers might prefer to visit an optometrist because the optometrist can package several services at potentially a lower total cost, especially for consumers planning to purchase inexpensive eyeglasses online. Additionally, there is a risk factor with online sales: the glasses might not fit the customer's face correctly. If the glasses are purchased at a brick-and-mortar location, a technician fits the frames to the customer's face at the point of purchase.

3.2 Steps to Analyze Potential Impacts of a Disruptive Innovation (Illustrated for the EyeQue Case)

When professionals notice potentially disruptive innovations, they may assess the viability of the new firm and consider strategic responses. In this subsection, we use four steps to assess EyeQue's potential to disrupt optometry and ophthalmology services and to consider strategic responses. In the first step, we gather baseline information about the components of the vision care industry. In the second step, we examine payment structures that are likely to affect relationships among those components. In the third step, we consider the regulatory environment that could help – or hinder – the innovator's efforts. In the final step, we consider possible strategic responses to the innovation.

3.2.1 Components of the Vision Care Industry and Relationships Among Those Components

The US vision care industry has four major components: professionals offering diagnostic services and writing eyeglass prescriptions, firms manufacturing eyeglasses, firms distributing and selling eyeglasses, and vision care plans that form networks of optometrists and ophthalmologists and negotiate discounted prices for their services. Each component of this sequence of entities that create vision care for consumers has characteristics that can elevate prices paid by consumers. An innovator that can bypass points of inefficiency can potentially disrupt the industry. However, regulations designed to protect consumers and current guidelines for maintaining eye health pose challenges for potential disrupters.

Vision Care

The demand for vision care in the United States is high. Refractive errors that can usually be corrected with glasses or contact lenses impact approximately 30% of people over age 40 (Kempen et al., 2004). These services are traditionally provided by either optometrists or ophthalmologists, both highly trained professionals. An ophthalmologist is a medical doctor who can provide eye exams as well as perform surgery or treat conditions like glaucoma. As a medical doctor, she has completed medical school, residency, and an internship. An optometrist completes a four-year professional program after her undergraduate training. She can also provide eye exams, monitor certain medical conditions, and prescribe eyeglasses and contacts. She does not perform surgery.

Both professions were organized early in the twentieth century. In 1898, the Association of Opticians was formed (now known as the American Optometric Association), and by 1910, formal classes for the study of optometry were being offered at Columbia University (Bryan, 1981). The practice rapidly

professionalized and the first Doctor of Optometry degrees were issued by the Pennsylvania College of Optometry in 1923. By 1928, the first state regulation limiting licensing to those with Doctor of Optometry degrees was established in New York. Similar developments occurred in professional training for ophthalmologists. The first ophthalmology specialty board exams were administered in 1916. Roles of the two professions continue to evolve. In 1986, Ronald Reagan signed a Medicare parity law that expanded the ability for optometrists to be reimbursed for vision care (Garland, 1987).

These professional organizations continue to provide leadership for eye-health providers and for consumers aiming to maintain eye health. A December 2020 letter written by the President of the American Optometric Association, which is posted on the organization website (Reynolds, 2020), states the organization's position on the EyeQue innovation:

> With regard to your question–whether the EyeQue Vision Monitoring kit is a good substitute for a trained professional, we can confidently say that, from a patient health and safety perspective, there is simply no replacement for an in-person comprehensive eye exam.
>
> https://www.aoa.org/about-the-aoa/press-room/statements/aoa-response-to-cnet-eyeque-review?sso=y

The position of the American Academy of Ophthalmology is more nuanced (see Box 7.1). This organization posted a list of mobile apps that might be useful for patients, along with a statement of disclaimer (Mukamal, 2021). EyeQue is one of the apps included in this list. The statement indicates that EyeQue does not replace an eye exam, but it can be used to obtain the information needed to buy eyeglasses.

Once licensed, some optometrists have attempted to maximize revenue by encouraging patients to purchase their glasses at the optometrist's office. These optometrists may withhold the written copy of the prescription until the patient specifically requests it or refuse to provide a written copy even when it is requested (Rottenberg, 1962).

Box 7.1: The American Academy of Ophthalmology on Eye Health Apps
Eye Health Screening Apps May Signal Need for Eye Exam

Reena Mukamal, Feb. 17, 2021.

Between visits to the eye doctor, some patients are turning to eye health apps. These apps don't replace a comprehensive eye exam by an ophthalmologist. But they may help you manage ongoing eye conditions and alert you when a doctor's input is needed.

Disclaimer: *These apps and technologies are presented for your information only. They are not the only such tools, but are merely representative of the types of tools that are available. These apps are not endorsed by the Academy, as the Academy never endorses products, companies or organizations. Ask your eye care team, including your ophthalmologist, to help identify apps and technologies that might best address your needs.*

VisionCheck 2 (EyeQue, $65 for the device and two-year subscription to the app)

This at-home vision test bundle includes a device that works in conjunction with your smartphone and an app. The device tests your vision, one eye at a time. You can measure the lens power needed to correct your nearsightedness, farsightedness, and astigmatism as well as any near-vision additional power you might need. The app generates eyeglass numbers that can be used to order glasses online. This bundle does not replace routine eye exams and does not screen for conditions like glaucoma, cataracts, and macular degeneration.

Source: Mukamal, R. (2021). Eye Health Screening Apps May Signal Need for Eye Exam. American Academy of Ophthalmology. https://www.aao.org/eye-health/tips-prevention/eye-health-app-covid-coronavirus-home-exam

The Federal Trade Commission responded to concerns about these strategies with the " Eyeglass Rule" in 1978. Under this rule, optometrists are required to provide a written prescription to each patient at the end of each appointment for no additional cost, whether the patient requests the prescription or not. In addition, optometrists may not condition an examination on a commitment to purchase any goods from the optometrist (FTC, 2020). This rule has been updated several times since 1978, and the FTC issued warning letters as recently as 2020 for violations of the EyeGlass rule (FTC, 2020).

Health care regulations are primarily controlled at the state level. Some of these regulations have been utilized to restrict competition among optometrists. State-level regulations on optometry have restricted the employment of optometrists by larger chain businesses, as well as the location and number of optometry offices in an area. Some of these restrictions made it unlawful for an optometrist to work for a non-optometrist or restrict the use of offices that are not dedicated entirely to optometry[4] (Haas-Wilson, 1986). This second restriction could increase the costs to entry for new optometrists, thereby limiting supply. Both of these restrictions are consistent with the hypothesis that regulation is often sought by an industry for its own benefit, particularly when one considers that state optometry boards are typically appointed by the governor from a list of optometrists who have practiced in that state for a minimum number of years (Haas-Wilson, 1986; Stigler, 1971).

[4] For an additional example, see L. Benham (1972) The Effect of Advertising on the Price of Eyeglasses, 15 J. L. & Econ. 337, and Kobayashi, B. and T. Muris (2013) I Can See Clearly Now: Lee Benham, Eyeglasses, and The Empirical Analysis Of Advertising And The Effects Of Professional Regulation, Competition Policy International, Vol. 9, No. 1, pp. 156–162, Spring 2013 George Mason University Law and Economics Research Paper Series.

Eyeglass Manufacturers and Distributors

The second and third components of the vision care industry are the eyeglasses manufacturers and distributors. The cost of manufacturing eyeglasses decreases as a firm produces a larger number of glasses. When this cost structure exists, large firms can charge lower prices than smaller firms. In this situation, the industry is likely to be dominated by a small number of large firms. The dominant position of the large firms can persist for many years, until a technological disruption occurs that allows new competitors to enter the market by using new production methods or offering new types of products.

In 1961, Leonardo Del Vecchio established Luxottica, an eyeglasses design and manufacturing firm (Luxotticaa, 2021). By 1974, it began wholesale distribution in Italy, and by the early 1980s, had expanded internationally. The firm continued to expand rapidly and today it manufactures 80% of the eyeglasses in the United States and 30% of eyeglasses worldwide. Today Luxottica manufactures prescription glasses and sunglasses, runs a vision benefits company with 52 million US members, provides optometrist services through Doctors at Luxottica, and owns retail outlets such as Sunglass Hut and the prescription eyeglass retailer LensCrafters. In 2017, Luxottica merged with the $49 billion French eyeglass firm Essilor, further consolidating the industry (Luxottica, 2021).

Payment Structures*: Vision Care Plan and Health Savings Accounts*

The fourth component of the industry includes entities and systems that help consumers pay for eye exams and glasses. Many health care insurers do not include eye exams and eyeglasses as covered benefits. These services are not covered by traditional Medicare, Medigap plans, (MedicareInteractive.org, 2021; Worstell, 2020), and adult vision care is not one of the essential benefits that must be covered in plans offered on the Health Insurance Exchanges (healthcare.gov, 2021). Instead, some employers offer managed vision care plans. The first of these, California Vision Services, was founded in 1955 by a group of optometrists in Oakland, California. By the mid-1970s, the practice had grown and changed its name to Vision Service Plan (VSP). Today, Davis Vision, EyeMed (owned by Luxottica), and VSP are some of the largest providers (IbisWorld, 2019). The typical vision care plan functions as a prepaid service. Customers purchase a plan with an annual premium. The vision care plan contracts with a network of licensed providers and negotiates price reductions for its members. By reducing consumer incentives to utilize price-saving strategies for obtaining the information needed to buy eyeglasses, however, vision care plans pose a challenge for EyeQue's efforts to disrupt the industry.

Contracts between vision care plans and the in-network optometrists may also contain a requirement that raises regulatory concerns. These contracts typically include clauses known as "Most Favored Nation" clauses. These clauses specify that the optometrist must offer her "best price" to the vision care plan. If the

optometrist provides a service to any customer for a price below the negotiated price with the vision care plan, she must offer the same low price to the vision care plan. This requirement sounds good at first glance: this policy mandates that price discounts offered to a small set of individuals must be shared with all individuals covered by vision care plans. However, these clauses create a strong disincentive for an optometrist to offer price discounts to members of other vision care plans or individuals who are not covered by a vision care plan. For example, a provider could offer discounts to customers who are willing to be flexible on timing, and fill-in when a provider has a gap in her schedule. These discounts could be similar to discounts offered by airlines to "stand by" passengers. This would benefit the provider in that she utilizes otherwise-lost capacity, and a customer with scheduling flexibility who receives a price reduction for accepting a last-minute appointment. If the provider must also provide this reduced pricing to all members of a care plan, she may decide to accept the lost capacity. In this case, both the provider and the customer with some flexibility in time are worse off. This logic could also discourage an ophthalmologist from offering a discounted price to low-income individuals who are not covered by vision care plans.

Most Favored Nation clauses are widely used in business contracts; however, economists and regulators are concerned that these agreements can result in reduced price competition (Gurkaynak et al., 2015). Most Favored Nations clauses are not necessarily anticompetitive, but they can raise antitrust concerns in some circumstances. The federal Department of Justice filed an antitrust lawsuit against VSP in 1994, alleging that the Most Favored Nation clauses in its contracts with optometrists would discourage optometrists from offering discounts. The suit was settled by an agreement that prevented VSP from using this clause for five years (U.S. Department of Justice, 2020). Additionally, VSP was prohibited from taking any action that would discourage any doctor from participating in any other vision care plan's programs or charging lower fees than what she had contracted with the VSP to any other clients (U.S. Department of Justice, 1996). Since that time, the Justice Department has filed a handful of similar suits against dental plans and other health care plans (U.S. Department of Justice, 2020).

For individuals not covered by vision care plans, the EyeQue website notes that an individual with a Health Savings Account (HSA) may be able to use funds in that account to purchase the EyeQue kit. This is an advantageous purchasing strategy because some employers contribute funds to HSA accounts and money deposited in an HSA is not subject to federal income tax. The number of HSA accounts has grown from $6.3 million in 2011 to $30.2 million at the end of 2020 (Devenir Research, 2021). Compared with traditional insurance coverage, HSAs create incentives for individuals to be price-conscious when utilizing health care services. Under IRS regulations, funds in HSA accounts can also be used to pay for comprehensive eye exams and eyeglasses (Evans, 2021).

3.2.2 Regulatory Environment for Consumer Protection

Licensing laws protect consumers from improperly trained or incompetent providers (Rottenberg, 1962). Most consumers cannot assess the competence of a vision care provider on their own; hence these requirements are imposed to enforce a minimum level of training and knowledge (Haas-Wilson, 1986). In general, the regulatory system is created by a state legislature and then administered by a licensure board comprising members of the professional group being regulated. The legislature mandates that services may only be provided by licensed individuals, and the boards specify requirements for training and professionalism.

Health care licensing regulations address the asymmetry between information available to patients about the quality of care offered by individual health care providers, and information known to the providers themselves. An individual optometrist may know how skilled she is and the quality of service she provides. Her peers in an area may also know her skill level. However, there is limited opportunity for any individual patient to gain this knowledge. In the absence of any countervailing force to address this uncertainty, providers (with low skills or low scruples) could sell low-quality care at a low cost driving their competitors out of business. These countervailing forces vary by industry, from brand names, to retail chains, to third-party rating groups (Akerlof, 1970). In industries like law, health care, and vision care, these countervailing forces are generally licensing and educational requirements. In health care, licensing regulations play a central role in consumer protection.

While the arguments for licensing typically focus on protecting consumers; however, it is notable that the arguments for strong licensing requirements are also made by practitioners themselves. These arguments may be motivated by concern for standards; however, practitioners may also try to use stringent licensure requirements as a strategy to limit the number of new practitioners entering the field. If these efforts are successful, the existing practitioners may be able to charge higher prices (Rottenberg, 1962).

State licensure laws can also be used to block disruptive innovators such as EyeQue.

The position that licensure requirements are important is not controversial; however, there is ongoing controversy about the stringency of those requirements. If an industry successfully uses licensing to cap the number of entrants into a profession, consumers may be harmed by higher prices and inadequate access. In addition, individuals who have the skill and work ethic to enter the profession may be blocked by the costs of becoming licensed, including fees, training time, and/or tuition costs for training.[5] When a potentially disruptive innovation is introduced, lawmakers and regulators will be asked to weigh costs and benefits of specific licensure

[5] Adam Smith (1776) discussed this issue in The Wealth of Nations arguing that it is unjust to prevent a capable person from engaging in any field she wishes as long as she harms no one. "The patrimony of a poor man lies in the strength and dexterity of his hands; and to hinder him from employing this strength and dexterity in what manner he thinks proper without injury to his neighbor is a plain violation of this most sacred property."

requirements, and they will be asked to balance the need for quality against the harm caused by inadequate access and high prices.

3.2.3 Strategic Responses by the Incumbent Providers

How would we expect an optometry business to respond to the EyeQue innovation? We begin this analysis by considering an optometrist who produces two services: (i) vision exam that could generate a prescription for eyeglasses, and (ii) exams that screen for conditions such as glaucoma, macular degeneration, or cataracts. Ophthalmologists also produce these two services, along with an array of additional medical services.

One strategy an eye health professional could adopt is to refocus her time and efforts on providing services that require higher levels of skill. Pursuing this strategy could allow her to maintain her revenues even in the face of technological disruption, if there is sufficient demand for the higher-skill services. The US Bureau of Labor Statistics (BLS) projects continued growth of demand for optometrists' services through 2019, which will be partly spurred by the aging baby boomer generation (BLS, 2021). One analysis of the supply of optometrists' services reports a current surplus of optometrists that is decreasing as demand grows. This analysis also reports that sales of eyeglasses constitute a decreasing share of optometrists' income due to competition from retail chains and online retailers (VM, 2017).

The current oversupply of optometrists, along with the limited range of medical services offered by optometrists, suggests that these professionals will have difficulty maintaining current levels of revenue if substantial numbers of consumers switch to obtaining eyeglass prescription information from innovators such as EyeQue. In contrast, ophthalmologists provide a wider array of services beyond eyeglass prescriptions. They are more likely to be able to implement the strategy of shifting their time and efforts to produce services that require higher levels of skill. The difference in the market positions of these two professions is consistent with the difference in the public statements about EyeQue made by the two professional organizations (and noted above).

Optometrists and ophthalmologists pursing this "shifting" strategy may also look for new types of bundling opportunities. If individuals begin using devices like the EyeQue attachment to obtain the information needed to buy eyeglasses, the current practice of bundling the vision test with eye care screening tests could become obsolete. Eye care professionals might begin thinking about alternate bundling strategies. For example, an optometrist could potentially co-locate his office adjacent to a primary care practice. The two practices could contract with insurers to bundle the eye care screening with annual wellness visits or annual checkups.

The alternate strategy is to leverage the technology provided by EyeQue to increase patient engagement and to reduce the cost (to patients) of obtaining the information needed to buy eyeglasses. The EyeQue website suggests areas in which the EyeQue technology could be applied to strengthen the patient-doctor relationship (EyeQue, 2021c):

> Expand your practice and improve your relationship with patients by embracing leading-edge technology.
>
> - Attract more patients and create loyalty by being the coolest doc on the block.
> - Transform the annual visit to an ongoing conversation with regular at-home monitoring, alerts, and notifications.
> - Improve patient outcomes and monitor prescription stability in at-risk patients. https://www.eyeque.com/partner/

Eye Netra is a separate company offering "refraction testing powered by a cell phone.". This company's business model focuses on the concept that the device is a tool optometrists and ophthalmologists can use to (i) provide vision testing in a variety of settings (the battery can support 2 days of testing), and (2) strengthen the customer experience (Eye Netra, 2021):

> A provider using EyeNetra mobile tools empowers his or her patients to take a more active role in their eye care; fostering trust in the patient-provider relationship and vastly improving the customer experience. https://eyenetra.com/product-netra.html

3.2.4 EyeQue Market Experience

If EyeQue is able to supplant the traditional eye exam and eye prescription process for eyeglasses, purchases of "prescription" eyeglasses are expected to increase, as customers who currently rely on reading glasses would switch to "prescription" eyeglasses that correct vision errors in more detail. Further, the number of prescriptions provided by optometrists will decrease, and optometrists will shift more of their production to higher skilled services. Do we see these shifts, and if not, why?

The total size of the eyewear market can be difficult to estimate. However, according to Statista.com (2021), between 33% and 36% of Americans over 18 purchased glasses from a doctor's office in 2018. Additionally, Statista estimates that Luxottica had approximately $2.5 billion in sales in 2018 in the United States alone. We can also assume that some of those who cannot afford prescription eyeglasses buy reading glasses instead. That market was approximately $14 billion per year in 2018 (Insight, 2020). EyeQue began offering its devices to consumers in 2015, and its revenue is estimated at $6–$8 million per year (Owler.com, 2021). After 6 years of operation, EyeQue does not appear to be disrupting the vision care market. What could explain this lack of traction?

EyeQue may have difficulty disrupting the vision care market due to three challenges. First, optometrist and ophthalmologist traditionally bundled vision tests with other eye health services, and by regulatory issues. The fact consumers can obtain vision tests during recommended annual eye health exams suggests that the primary customer base for EyeQue will be individuals who do not have vision insurance. Second, individuals with vision insurance may not have strong incentives to seek low prices for vision tests and eyeglasses. Third, one company (Luxottica) provides optometry services and also manufactures and distributes eyeglasses. This company has market power in the manufacturing and distribution components of the vision care industry. Hypothetically, this company could work to thwart

EyeQue's effort to disrupt the market. Alternately, Luxottica could design its own disruptive innovation or it could acquire or partner with EyeQue.

Fourth, state regulations mandating that in-state eyeglass sales must be accompanied by prescriptions written by medical professionals may lead to raise questions in consumers' minds about the credibility of the EyeQue technology. The FDA does not require an approval process for this type of device. Without approval or certification from a reputable organization, products like EyeQue face the problem of asymmetric information: the company has access to data about the product's quality, but consumers cannot easily verify the product's quality for themselves. In this situation, the initial growth rate of a new product may be slow as the product gains a reputation for quality and reliability.

4 Other Examples of Disruptive Innovation in Health Care

A cardiologist, Eric Topol, has been speaking of the potential benefits of numerous low-cost smartphone-enabled testing devices, for both health care providers and their patients (Versel, 2013). For example, the FDA approved a device that allows consumers to perform electrocardiograms (ECG) at home (ACC, 2019). These systems allow inexpensive and frequent testing for patients and generate new types of data to inform interactions between patients and health care providers. Consumers can purchase the device at Walmart or through Amazon.com. The ECG device allows individuals to monitor heart conditions and provide the results to their physicians.

In a second example, Congress created a new category of over-the-counter (OTC) hearing aids in 2017 for use by adults with mild to moderate hearing loss. Traditionally, hearing aids could only be purchased with a prescription written by a licensed medical professional. Hearing aids are costly, and they are not typically covered by insurance. While many people over age 65 have some degree of hearing loss, most of these people do not purchase hearing aids. Consumers will be able to purchase the new OTC without prescriptions (NIDCD, 2021).

Congress mandated that the Federal Trade Commission (FTC) and Federal Drug Administration (FDA) will write consumer protection regulations to govern the new market. The logic of the new hearing aid category focuses on the fact that the majority of adults with mild to moderate hearing loss (such that they have difficulty hearing conversations in noisy places) need sound amplification and noise cancellation. Consumer electronics companies, such as Samsung and Bose, argued that they have expertise and experience producing headphone that provide these two services. Further, retail prices for these headphones are substantially lower than prices of hearing aids.

The market will open when the new regulations are complete. Writing these regulations required conceptualizing new types of consumer protection issues. Traditionally, consumer protection regulations focused on ensuring that consumers obtained health care from licensed professionals, and low-quality products were not

available for sale. The new OTC headphones raise new issues such as: (i) Will headphone manufacturers be required to submit test results before advertising that the devices will help adults with age-related hearing loss; (ii) How will individuals know (before buying headphones) whether they would benefit from prescription hearing aids instead of the OTC devices? (iii) During audiologist visits, for hearing tests, individuals also received screenings for hearing-related medical conditions. If people can buy OTC devices to help them hear conversations in restaurants, will they experience adverse impacts from reductions in visits to audiologists?

The OTC hearing aids raise questions that parallel the questions raised by the EyeQue example. In both cases, licensed professionals bundled hearing or vision testing with routine screenings for related medical conditions. This system is useful for individuals who can afford the visits, but it may exclude others from obtaining the hearing aids or eyeglasses, because they cannot afford to obtain prescriptions written by these professionals under the current system. Bundling two goods, such as vision tests and eye-health screenings can provide convenience for consumers when it is covered by insurance, but it also raises the price of obtaining prescriptions for hearing aids or eyeglasses. Bundling can also raise antitrust concerns if it is mandatory.

5 Conclusions

Psychologists face an ongoing stream of innovations that are likely to affect their practices. These innovations include telemedicine, mental health apps, willingness of payers to substitute master's degree psychologists and social workers for PhD psychologists, consumers obtaining primary care in retail clinics (separate from primary care offices offering integrated care), teledoc services offered to enrollees by insurance companies (which could also weaken ties between patients and primary care providers), and the pressures for change faced by the Veterans Health Administration.

Clinicians considering potential impacts of innovations can:

1. Identify frameworks that help organize general information.
2. Identify a useful sequence of steps to structure detailed analyses.
3. Look at similar challenges faced by other professionals to conceptualize possible strategic responses.

In this chapter, we use the case of EyeQue to illustrate these steps. The EyeQue case is useful for psychologists for two reasons. Because this innovation occurred in vision care, rather than psychology, it may be easier for psychologists to focus on the strategic business issues rather than the content of the innovation itself. Second, many of the issues faced by vision care providers are similar to issues that psychologists are likely to face.

The dynamic illustrated by the EyeQue case is described by Christensen (1997) in his book "The Innovator's Dilemma." Christensen describes innovations that

originate outside an industry and start by serving customers that were overlooked by the incumbent firms. For example, when Japanese firms entered the car market, they initially competed by selling low-end compact cars that were more fuel efficient than cars previously available in the market. Later, when Toyota had become a more established car brand, it began producing cars that appealed to higher-end customers and Korean car companies like Kia began to disrupt the low-end car market. This leads to a challenging situation for an established company as it is incentivized to compete for the higher end customers. However, this strategy leaves the door open for disruption from new competitors.[6]

In the health care space, this dynamic is more complicated. There are established eyeglass manufacturers and vision care providers that have incentives to continue competing at the higher end of the market. Regulators have the challenge of protecting consumers while expanding lower-cost treatments to individuals with straightforward conditions. Insurance plans blunt incentives for customers to shop for low prices, while asymmetric information makes it difficult for consumers to assess quality. External innovators will try to gain a foothold by offering products and services that are designed to appeal to individuals who are not currently served by the existing market. These innovators are likely to improve their product over time, to appeal to mainstream customers. Medical providers will face a dilemma: should they compete with these innovations, or shift their focus to providing services that require higher levels of skill?

Managing these dynamics will be a significant challenge for stakeholders in the vision care space over the next several years. Forward-looking vision care providers can explore strategies for leveraging this disruptive technology to provide better care to more patients. In fact, a company EyeNetra that uses the same technology as EyeQue is pursuing this path, focusing on partnering with optometrists to use these lower cost tools to improve the health care partnership between clinician and patient.

Regulators could work with providers to establish criteria for identifying patients that present straightforward vision issues that can be treated using the new low-cost technology, and make that technology more widely available to those patients. At the same time, regulators and health care providers will evaluate processes to identify those with more complicated problems that need more specialized treatments offered by licensed providers. At the national level, regulators and professional organizations may consider guidelines and tools to review or certify apps and related devices to help resolve the asymmetric information problem as it applies to innovative new apps.

Well-designed regulatory frameworks and app assessment guidelines could facilitate the development of affordable care for low-risk people, while allowing licensed health care providers to focus on people with complex health issues. Alternately, health care providers might use the new tools to strengthen patient relationships and patient engagement.

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[6] Clay Christensen, Jerome Grossman, and Jason Hwang applied these ideas to the health care industry in a subsequent book: The Innovator's Prescription: A Disruptive Solution for Health Care. McGraw Hill. 2009.

Disruptive innovation and tools like EyeQue can provide a framework for health care providers in other fields to not only avoid the negative impacts of disruptive innovation on their practice, but also to leverage these innovations as a tool in.

their own practices. There are several lessons to learn both from the economic theory, and the example of EyeQue. First, disruptive innovation is likely to occur in the areas that are not served by current provider practices. Second, this type of disruptive innovation often focuses on areas where repeatable/algorithm-type decision-making occurs. Third, forward-looking health care providers can likely leverage this disruption to improve their own services, increase their resource allocation to higher-skilled tasks, and improve availability for their patients. In short, a forward-looking psychologist does not need to fear disruptive innovation. Instead, she can leverage it to improve her own practice and her service to the community.

Evaluating your clients can give you some insight into both who your practice is optimized to support and who are likely to be under-served potential customers. Perhaps customers without certain types of insurance coverage or other constraints on their life (work schedules, childcare, etc.) are under-served by your practice. Disruptive innovation is likely to target these groups in an effort to bring them affordable care. There may be a temptation to ignore these groups and focus on your primary client base. This can be risky though as disruptive innovators will leverage what they learn serving those groups to eventually disrupt your core business.

Second, it is important to review what types of services you provide and which services require higher-level decision-making versus more routine decision-making. Perhaps certain services you provide to your patients are fairly routine and some of them could be automated or sent to a lower skilled provider (for example a nutritionist). Where lower skilled, more rote decision-making overlaps with under-served populations there is risk for disruptive innovation.

Finally, if you can find areas in your practice where there are under-served patients and the potential to automate some of the simpler decision-making, you likely have also found an opportunity to expand your own practice. Reducing the resources allocated to these tasks can allow you to serve more patients at lower cost. Identifying such areas, that are ripe for disruptive innovation, can open doors to innovation within your own practice, to improve patient outcomes and potentially increase the number of clients you can serve. To protect the interests of patients, it may be necessary to work with licensing and regulatory bodies. Evaluation of necessary supportive technologies is also important. For example, the extent to which potential benefits of the innovation can be realized is conditioned on connectivity, computer literacy, and sufficient hardware support. Consider, for example, a veteran experiencing depression while living in a rural area that does not have Internet service. This individual would face substantive barriers blocking access to many of the online sites offering services to help manage depression. Clinicians may need carefully assess the fit between potentially useful innovations and each patient's capacity to use the innovation.

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