



Study of Electronic or Digital Link Disclosure

A Third-Party Evaluation of Challenges Impacting Access to Bioengineered Food Disclosure

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Contents

| | |
|--|----|
| Executive Summary | 04 |
| Understanding the Law | 06 |
| The Study | 08 |
| Current Landscape | 10 |
| Methodology: Human-Centered Design & Crowdsourcing | 22 |
| The Reality: Understanding Digital Engagement with Consumers | 34 |
| Looking Ahead: Implementing the Law | 64 |
| Conclusion | 70 |
| References | 72 |

► Blue arrows throughout this report indicate factors outlined in the Law that this study must consider in its assessment of consumer access to the bioengineering disclosure through electronic or digital links.



Executive Summary

In compliance with the National Bioengineered Food Disclosure Standard (“the Law”), this study identifies potential challenges associated with accessing a bioengineering disclosure through an electronic or digital link. This study analyzes data from over 150 observations or in-depth discussions and nearly 1,000 crowdsourced participants across the country. All participants in this study were interested in accessing information on bioengineered food.

Across the country, 53 percent of adults say they care about the issue of bioengineered food, and a third of that group cares a great deal.¹ In addition, half of all shoppers would likely be sensitive to labeling changes, as evidenced by increased consumer desire for food information in recent years.² These behaviors are pervasive across region, age, income, and gender.^{1,2}

Overall, 62 percent of study respondents did not voice challenges that might impact their access to information in a digital link. However, in direct observations of consumers who are interested in accessing the disclosure, researchers observed key technological challenges that prevented nearly all participants from obtaining the information through electronic or digital disclosure methods. Despite this

finding, these challenges can be overcome through appropriate implementation of the Law.

The following are technological challenges that may impact consumer access to a bioengineering disclosure through electronic or digital links:

- **Digital links are not inherently associated with additional food information, and consumers often assume they are for marketing and industry use.**

Of 40 in-depth conversations with consumers, all 40 either did not recognize the on-package digital link or did not associate it with food information. Retailers were also unfamiliar with digital links and thus were unable to assist consumers.

- **Consumers may not have equipment capable of scanning digital links on their own, and in most cases there is not a viable alternative provided by retailers.**

Twelve percent of interested consumers faced challenges accessing equipment capable of scanning digital links such as smartphones. Of 42 retailers visited across the country, none provided scanners capable of accessing information in a digital link. Moreover, research demonstrates that

landlines do not currently provide an equivalent means of accessing the disclosure.

- **There are hundreds of scanning apps available in the market, many of which are not intuitive to use, causing consumer confusion and difficulty opening link results.**

In direct observations, 85 percent of consumers struggled with complicated mobile software applications (“apps”), regardless of their comfort using technology. This is partly due to wide variability in apps available. In addition, most apps contain advertisements that confuse consumers and run counter to how the Law requires disclosure when regulations are finalized and implemented.

- **Consumers may be unable to connect to broadband, or connect at a speed that is so slow that they cannot load information.**

Sixteen percent of consumers in crowdsourced discussions voiced challenges related to availability or quality of data or WiFi networks. While food retail stores are increasingly installing WiFi networks, 20 percent of retail stores do not currently have in-store WiFi, including 63 percent of small retailers.³



In addition to potential technological challenges, a number of contributing factors may challenge consumers who are uncomfortable using technology or do not fully understand the complexity of bioengineering disclosures. This includes a lack of familiarity with scanning a link, limited technical knowledge on how to download or use a scanner app, and confusion around voluntary bioengineering disclosure language currently in use.

As outlined in the Law, this study considers whether consumer access to the bioengineering disclosure through electronic or digital disclosure methods is affected by the following factors:

- ▶ **The availability of wireless Internet or cellular networks.** Increasing availability of broadband networks will expand access, particularly, although not exclusively, in rural regions of the country.
- ▶ **The availability of landline telephones in stores.** Landlines are universally available in store. However, they do not provide a viable means of accessing the digital disclosure due to limited availability of such phones for consumer use and restricted manufacturer call center hours.

▶ **Challenges facing small retailers and rural retailers.** Rural retailers are less likely to have broadband access, and small retailers will struggle to make costly investments in WiFi networks. As a result, consumers who shop at these stores will face difficulties accessing digital disclosures.

▶ **The efforts that retailers and other entities have taken to address potential technology and infrastructure challenges.** Retailer efforts to expand WiFi networks will significantly impact consumer ability to access the bioengineering disclosure for consumers with personal devices capable of scanning. However, in-store scanners needed to access digital disclosure links are not widely available for consumer use.

▶ **The costs and benefits of installing in retail stores electronic or digital link scanners or other evolving technology that provide bioengineering disclosure information.** While scanners are modest in cost, in most cases they must link to WiFi, requiring installation of networks in stores. This may prove cost prohibitive, particularly for small and rural retailers. In addition, there are limited benefits due to limited consumer knowledge around digital disclosure today.

This study identifies meaningful steps that government and interested parties can take to improve access for consumers facing challenges:

1. Education for consumers and retailers around electronic and digital disclosure links and bioengineered foods will improve access and understanding.
2. Offline options, such as those that provide the bioengineering disclosure through phone or text message, will increase access for consumers who lack smartphones or broadband access.
3. Developing or endorsing user-friendly scanner apps will ease the consumer experience.

Electronic and digital link technology will continue to change and evolve, resulting in shifting retailer and consumer adoption. Thoughtful action can help to make sure that consumers are able to use such methods to effectively access food information.



Understanding the Law

The National Bioengineered Food Disclosure Standard mandates that food manufacturers disclose if food is bioengineered

The National Bioengineered Food Disclosure Standard was signed into law on July 29, 2016

The Law requires that the United States Department of Agriculture (USDA) establish a national mandatory bioengineered food disclosure standard for any bioengineered food and any food that may be bioengineered, and set requirements and procedures to carry out the standard by July 29, 2018. The Law preempts any state or local requirement relating to the labeling of whether a food or seed is genetically engineered or was developed or produced using genetic engineering.

The Law allows for three disclosure options

Food manufacturers may select whether the bioengineering disclosure is in text, a symbol, or an electronic or digital link. Internet URLs that are not embedded in the link are not a valid option of electronic or digital disclosure, except for small food manufacturers.

The Law mandates a study be conducted on challenges using electronic or digital links

Within a year of enactment, a study must be conducted to identify potential technological challenges that may impact whether consumers would have access to the bioengineering disclosure through electronic or digital disclosure methods. If the Secretary determines in this study that consumers will not have sufficient access, he shall provide additional disclosure options in consultation with retailers.

This document complies with the mandate.

The Law applies to bioengineered foods

A bioengineered food disclosure is only required for food intended for human consumption. Meat, poultry, and egg products only require a disclosure under limited scenarios. Bioengineered food refers to food that contains genetic material that has been modified through in vitro recombinant DNA

techniques to engineer organisms for desired traits for which the modification could not otherwise be obtained through conventional breeding or found in nature.

USDA is required to determine the amount of a bioengineered substance that may be present in order for the food to be considered bioengineered. USDA must also establish a process for requesting an agency determination regarding the additional factors and conditions under which foods would be considered bioengineered.

When discussing bioengineered foods, researchers, scientists, and the general public commonly use the terms genetically modified organisms (GMOs), genetically modified (GM) foods, or genetically engineered (GE) foods interchangeably, though these terms may refer to different breeding processes.



The Law grants exclusions to disclosure

Certain foods will not be subject to the bioengineered food disclosure standard.

- Foods derived from animals will not be considered bioengineered solely because the animal consumed bioengineered feed
- Foods served in restaurants or other similar retail food establishments are excluded
- Foods sold by very small manufacturers — a term to be defined by USDA — are excluded

Bioengineered foods are neither more nor less safe than non-bioengineered alternatives

The Senate Agriculture Committee says that, “The comprehensive federal regulatory review process has determined that foods produced using bioengineering are safe and not materially different in any way from those made using other methods.”

Additional disclosure options exist for small food packages and small food manufacturers

The Law requires USDA to provide alternative reasonable disclosure options for food contained in small or very small packages. For small food manufacturers, the Law stipulates that USDA must provide additional on-package disclosure options that can be selected by the manufacturer, including:

- A telephone number with language indicating that it provides access to additional information
- An Internet URL maintained by the manufacturer

This implementation date will not be earlier than one year after implementation of the regulations.

Special regulations exist for manufacturers who choose to use electronic or digital links

If the food manufacturer chooses the electronic or digital link option for disclosure, that link must:

- Include on-package language stating only ‘Scan here for more food information,’ or equivalent language reflecting changes in the technology
- Provide access to the disclosure located in a consistent and conspicuous manner on the first product information page that appears, which shall exclude marketing and promotional information
- Not collect, analyze, or sell personally identifiable information about consumers or their devices unless necessary to carry out the Law, in which case it should be deleted immediately after use and not used for other purposes
- Include a telephone number that provides access to the disclosure
- Be of sufficient size to be easily and effectively scanned or read by a digital device

The Study

This study is focused on understanding if consumers can access the bioengineering disclosure through the electronic or digital link option

This study explores potential challenges that may impact implementation

The National Bioengineered Food Disclosure Standard requires that manufacturers inform consumers if a food is bioengineered. The disclosure must provide consumers information that informs them whether a food is produced with bioengineering. This study is one portion of that Law.

This study is focused on understanding whether consumers who are interested in accessing information on the bioengineered status of their food can, in fact, access that information when it is provided only through an electronic or digital link. This study identifies the potential technological challenges that may impact access.

This study considers five specific factors

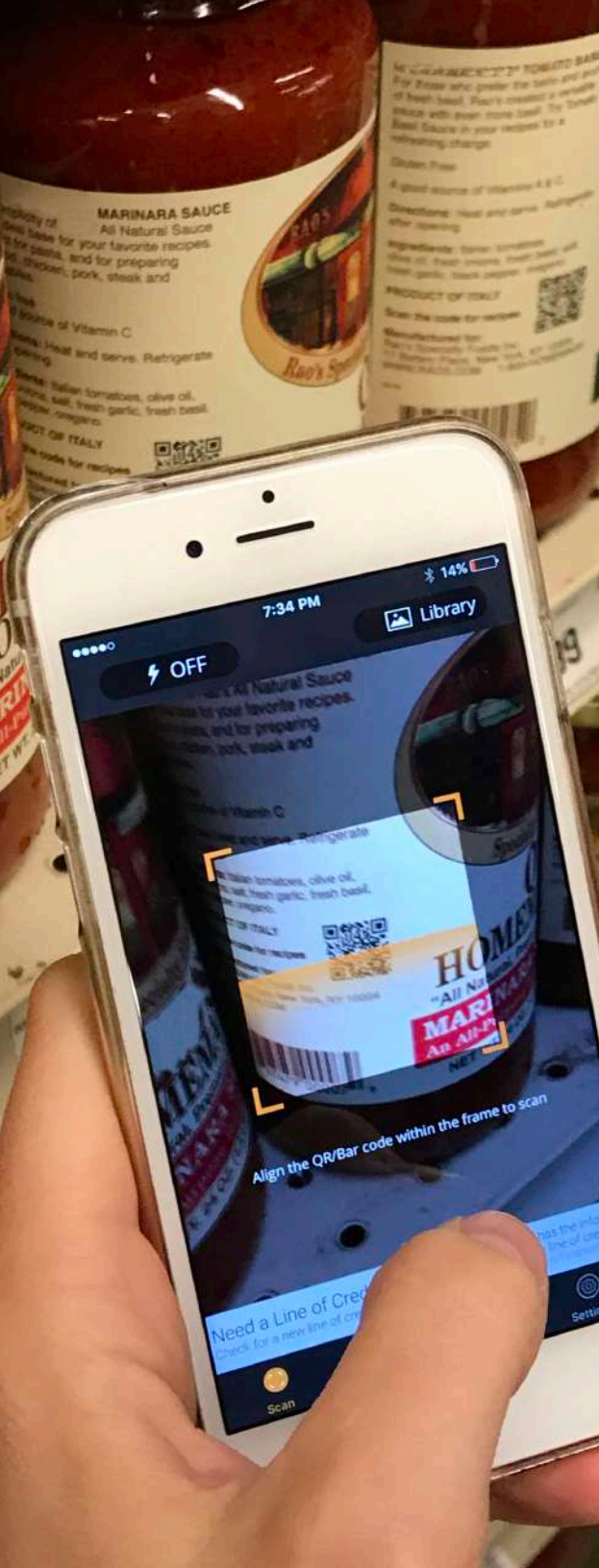
The Law identifies the following five factors that this study must address as it identifies challenges:

- The availability of wireless Internet or cellular networks
- The availability of landline telephones in stores
- Challenges facing small and rural retailers
- The efforts that retailers and other entities have taken to address potential technology and infrastructure challenges
- The costs and benefits of installing in retail stores electronic or digital link scanners, or other evolving technology that provide bioengineering disclosure information

What is an electronic or digital link?

Electronic or digital links are codes that consumers can scan to access more information. Currently, those links require the use of a laser scanner or smartphone camera. If the content is stored on an external site, the scanning tool would require broadband access to connect to information.

The most common electronic or digital links are one and two dimensional codes, such as barcodes and Quick Response (QR) codes. However, as technology evolves, other types of codes or links are likely to gain traction. Already, companies are experimenting with other technologies, and rules concerning disclosure standards will need to remain relevant.



This study identifies potential challenges that may impact whether consumers can access the bioengineered food disclosure through electronic or digital links.



Current Landscape

This section provides an overview of the open-sourced information related to electronic or digital links, including the key trends impacting this type of disclosure. This research was used to assess the state of the industry and technology, identify geographic targets for ethnographic research, and uncover issues that may impact the feasibility of using an electronic or digital link.

IN THIS SECTION

- A. Consumer Interest in Bioengineered Food
- B. Electronic or Digital Link Technology Trends
- C. Smartphone Ownership Among the US Population
- D. Measuring Broadband Access
- E. Retailer Infrastructure and Challenges

Key Takeaways

- ✓ 53% of US adults say they care about the issue of bioengineered food
- ✓ 77% of Americans own a smartphone and ownership rates are trending upward
- ✓ 93.6% of Americans live in areas with sufficient broadband access to load a bioengineering disclosure through an electronic or digital link
- ✓ Broadband access is currently lowest in rural areas and the Secretary of Agriculture has identified expansion of broadband networks in these regions as a priority
- ✓ 97% of regional chain stores and 100% of national chain stores provide WiFi in store, but only 37% of small retailers provide WiFi to consumers in store

An increasing number of consumers express an interest in the issue of bioengineered foods and information access

53%

of US adults say they care about the issue of bioengineered foods, with a third of this group caring a great deal¹

26%

of consumers look for a non-GMO label on the front of a food package²

Though many consumers care about the issue of bioengineered food, there is limited understanding of the issue

According to the Pew Research Center, more than half of US adults care about the issue of bioengineered foods, with 16 percent saying they care a great deal and 37 percent saying they care some about the issue. At the same time, there is limited familiarity among the American public on bioengineered food. Overall, 71 percent have heard little to nothing about the issue.¹

This limited familiarity may result in soft opinions that are more likely to change over time and be sensitive to question wording. With implementation of the Law, consumer attitudes may shift as information about bioengineered food becomes more readily available.

A number of indicators point to consumer interest in bioengineered foods

Limited familiarity and soft opinions make it difficult to measure consumer interest in the issue of bioengineered foods. However, there are some behaviors that may indicate greater interest.

First, frequent consumers of organic foods care a great deal about the issue of bioengineered foods, with 31 percent saying they care a great deal compared to just 6 percent of those who eat little organic foods. Second, those who are vegan or vegetarian are more likely to care about bioengineered foods, as 39 percent care a great deal compared to 14 percent of those who are not. Third, those with food allergies are slightly more inclined to care about bioengineered foods, as 22 percent care a great deal compared with 14 percent of those with no allergies or food intolerances.¹

Factors influencing consumer purchasing behaviors are shifting

A Deloitte study conducted in association with the Grocery Manufacturers Association and the Food Marketing Institute found recent shifts in consumer preferences and behaviors.² Historically, customer purchasing patterns were influenced by price, taste, and convenience. While these are still important considerations for grocery shoppers, about half of all consumers now consider health and wellness, safety, social impact, experience, and transparency in their purchasing decisions. These shifts are pervasive across region, age, income, and gender.² While bioengineered foods are not more or less healthy or safe than any other food, a disclosure of such information relates directly to consumers' desire for greater transparency.

This study focused on consumers who expressed an interest in knowing whether their food is bioengineered.



A number of electronic and digital links currently exist that will enable and challenge access in different ways

Electronic or digital links enable consumers to access information through the use of a laser scanner or smartphone with a scanning app and functioning camera. Currently, the most common electronic or digital links are one- and two-dimensional codes, which may contain a limited amount of information themselves. There are several emerging technologies that may impact future means of disclosure. The variety of digital links may make it difficult for retailers to keep up with evolving scanning technologies due to the investment required.

Existing technology used by consumers in the market



ONE-DIMENSIONAL CODES (E.G., BARCODE)⁴

These early forms of laser technology were used to transfer product information to cash registers. Now, Universal Product Code (UPC) barcodes can be used with a handheld scanner or through a free, downloadable smartphone scanner application that uses a camera to connect with digital content.



TWO-DIMENSIONAL CODES (E.G., QR CODE)⁴

Two-dimensional codes can store more data than a one-dimensional code, including URL links, geographic coordinates, and text. Consumers can use handheld scanners or most smartphones with a free, downloadable scanner application and camera to connect to the linked information.

CURRENT USE

One-dimensional codes are used by retailers for product pricing information, and are widely used by consumers for the same activity.

These codes were originally used solely by manufacturers, but now are commonly used by manufacturers and retailers for a variety of purposes including marketing and retail payments.

POSSIBLE CHALLENGES TO STAKEHOLDERS

- Require smartphone and camera-based scanner application or access to an in-store scanner
 - Content may require access to broadband
 - Require proper scanning technique
- Require smartphone and camera-based scanner application or access to an in-store scanner
 - Content may require access to broadband
 - Contingent upon store environment (e.g., good lighting)



DIGITAL WATERMARKING⁵

Digital watermarks are two-dimensional codes embedded within a product's image, detectable by computers and digital devices but imperceptible by consumers. They are more accurate than other forms of two-dimensional codes and rely less on store features, such as good lighting.

Digital watermarks are currently used by retailers as a pricing tool that reduces the amount of time cashiers and customers spend checking out, but may be used for consumer marketing in the future.

- Requires smartphone and camera-based scanner application or access to an in-store scanner
- Requires access to broadband
- Imperceptibility may lead to consumers not knowing that there is a watermark to scan
- May require special printing capabilities by manufacturer due to layering technique



NEAR FIELD COMMUNICATION⁶

Near Field Communication (NFC) enables non-contact communication between two electronic devices when they detect each other nearby, using wireless communication methods like Bluetooth.

NFC is mainly used by retailers to send consumers information straight to their smartphones using beacon technologies or as a form of mobile payment.

- Requires smartphone
- Requires a Bluetooth-enabled device
- Requires location services to be enabled



VISUAL RECOGNITION TECHNOLOGY⁷

Visual recognition technology matches an image captured through a camera to items collected in an image library or multiple sources of rich data, without requiring a code or marking. The information can be retrieved through a tablet, smartphone, or computer.

Visual recognition technology is being tested by marketers and retailers as a means of measuring customer engagement with advertisements and increasing sales.

- Requires smartphone and camera-based scanner application or access to an in-store scanner
- Requires access to broadband
- Imperceptibility may result in lack of consumer knowledge around visual recognition technology
- Updates to database may be slow when packaging is changed, leading to problems finding products

Technologies largely used by retailers but may be adapted for consumer use in the future

One- and two-dimensional codes are the most prevalent digital links in use today

QR codes and barcodes are the most common electronic or digital methods of communicating food information

Barcodes are mainly used for storing an item's price given their limited storage space, while QR codes have a wide range of uses, from serving as electronic airline tickets to assisting with auto manufacturing inventory. In 2015, ScanLife reported that product information, videos, eCommerce, app downloads, and customer relationship management were the top contents found in QR codes.⁸ In addition, QR codes are the most common method of providing additional food information through digital links, including voluntary bioengineering disclosures. With this in mind, QR codes were the predominant disclosure method used in this study.

QR codes offer a means of communicating more information than barcodes

QR codes were developed as an alternative to traditional barcodes to give grocery stores increased storage space for product information. The codes can hold nearly seven-thousand characters compared to the twenty characters held by traditional barcodes. To make QR codes easier to scan, its developers used a unique ratio of black and white areas on printed matter to distinguish it from

surrounding objects and allow devices to scan from any angle.⁹

QR codes have varied usage on food products

Using QR codes to provide additional food information has not been a prevalent practice in the industry. They typically contain various forms of marketing, but with passage of the Law, groups have emerged to assist manufacturers in providing additional information to consumers. Given that the Law has been enacted but not implemented, once disclosure regulations are written, more manufacturers may opt-in to platforms that assist them in complying with the Law. One such platform is SmartLabel™, developed by the Grocery Manufacturers Association as a digital landing page that hosts food information for consumer access.

Emerging technologies may improve on consumer use of electronic and digital links

Emerging technologies improve on gaps in previous technologies to make scanning more seamless. For example, digital watermarks are read more accurately and rely less on store features (e.g., lighting) than other one- and two-dimensional codes.



Most consumers access information in electronic or digital links using a smartphone, but there are disparities in ownership rates

Smartphones are the most common means of scanning electronic or digital links

Most consumers scan electronic or digital links using their personal smartphones. To access these links, consumers must download a “scanner” or “reader” application through their system’s application marketplace. For Android™ and iOS™, the two smartphone market share leaders, this means choosing from an array of more than 200 and 300 apps, respectively. For Windows® and BlackBerry®, the options are more limited with over 90 and 150 applications, respectively.¹⁰⁻¹³

Smartphones are increasingly adding scanning capabilities to newer versions of software

As newer versions of smartphones are developed, capabilities become streamlined or obsolete. In the case of digital link readers, some major technology players have announced that future releases will begin integrating a digital link scanning capability, namely for QR codes. Apple® announced that the newest iPhone® software will have digital link scanning integrated into their camera; Google™ will add the function to their Internet browser, Chrome™.^{14,15} As a result, some consumers will have greater ease of access to QR codes in the future.

Smartphone ownership in the US has grown rapidly since its inception

In 1995, the first smartphone was released in the US market as a combination of a cell phone and personal device assistant, but had short-lived success. Technology has since developed and a modern smartphone has the combined capabilities of a cell phone and computer — with smartphones growing into seeming ubiquity since their introduction in the market. However, smartphone ownership is not universal: 18 percent of Americans still own non-smartphone cellphones, and five percent do not own a mobile phone at all.¹⁶



Smartphone ownership rates are increasing across the US^{16,17}

77%

of Americans owned a smartphone in 2016, a 9 percentage point increase compared to 2015

67%

of Americans living in rural locations owned a smartphone in 2016, a 15 percentage point increase compared to 2015

42%

of Americans 65 and older owned a smartphone in 2016, up 12 percentage points from 2015

64%

of low-income American households (those earning less than \$30,000 per year) owned a smartphone in 2016, a 12 percentage point increase in ownership from 2015

Digital disclosure methods typically require broadband access to connect to linked webpages



Broadband refers to high-speed connection to the Internet, via wireless or cellular networks

The Federal Communications Commission (FCC) describes advanced broadband service as access to 25 megabits per second (Mbps) download speed. This standard represents the FCC's threshold for consumer access to high-quality broadband service across multiple devices.¹⁸

Sufficient broadband service must be available to access a digital link

While basic two-dimensional codes may store information within themselves, such as a picture or text, a two-dimensional code that connects to a web link requires sufficient broadband coverage. Consumers can access a digital link at speeds far below the 25 Mbps FCC standard. However, the larger or more complex the web link, the faster the broadband speed required.

The research team analyzed FCC data to develop a spectrum of broadband speeds required for digital disclosure, as illustrated in Figure 1.¹⁹ The minimum scan requirement uses a download speed of at least 1.6 Mbps. This is calculated by considering that a basic webpage has an average size of 400 kilobytes (kB) and consumers will only wait about two seconds

for a webpage to load, which industry experts define as a user-friendly wait time.^{20,21}

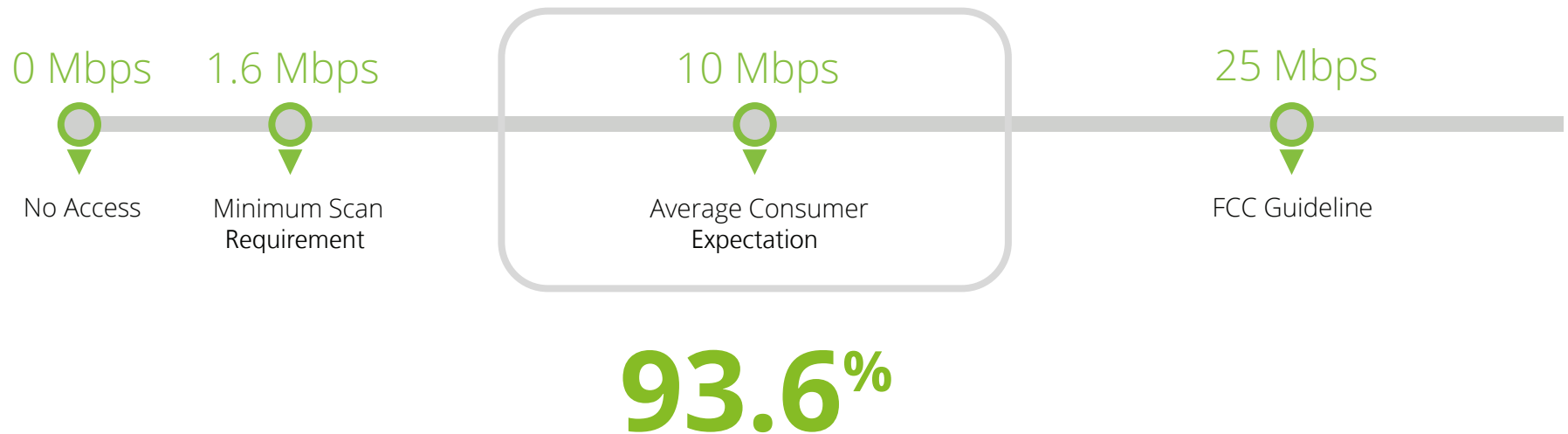
Establishing a standard for consumer expectation is key in understanding access

Manufacturers may choose to use a more complex webpage to communicate the bioengineering disclosure. The average Internet URL is 2.6 megabytes (MB) in size.²² Assuming consumers' expectations remain constant, a minimum speed of 10 Mbps is required to load an average webpage at a speed that meets consumer expectation.¹⁹

Rural areas lack sufficient broadband to meet consumer expectation for speed of access

To better capture the broadband needed to access a digital disclosure, this study developed a composite broadband coverage score. This score evaluated the availability and speed of service within each county of the United States. Mapping coverage across the US revealed counties which lack adequate broadband service — most of which are rural. The Interagency Task Force on Agriculture and Rural Prosperity, a new initiative chaired by the Secretary of Agriculture, aims to improve infrastructure in rural counties, potentially increasing access to advanced broadband service.²³

Figure 1: Broadband Speeds Required to Access Digital Disclosure¹⁹



percent of all Americans (299 million people) live in counties with sufficient access to broadband service to load a digital bioengineering disclosure. This is based on one's ability to load an average-sized webpage within a consumer expectation time of two seconds or less.

Conversely, 20.5 million Americans do not have access to adequate broadband. Seventy-seven percent of those residents live in rural areas.

Food retailer efforts are underway to address potential challenges in accessing bioengineering disclosures through electronic or digital links

Retailers are integral in providing consumers with a means of accessing an electronic or digital disclosure link

The Law requires a look at retailer efforts in addressing potential challenges. Retailers will need to be prepared to aid consumers in accessing bioengineering disclosures. Although consumers have the option to conduct research outside of the store, they may choose to access bioengineering disclosures within stores. Infrastructural accommodations, coupled with employee knowledge of digital disclosure, will enable retailers to provide consumers a means of accessing digital links. Without this support, a heavy burden will be placed on consumers who want to know information about the food they purchase.

In-store WiFi will help extend broadband networks in retail outlets

Broadband is key for digital disclosure. This involves the availability of WiFi for consumer use while in food retail stores. According to the Food Marketing Institute, 97 percent of regional chain stores and 100 percent of national chain stores provide customers with WiFi. However, this number drops to 37 percent when looking at independently operated food retail outlets nationwide.³

Current use of scanners in stores is primarily limited to one-dimensional links

As consumer trends evolve, retailers implement newer technologies to improve the customer experience and increase efficiencies. However, even with the latest developments such as self-checkout and Near Field Communication for mobile payments, one-dimensional link scanners (e.g., barcode scanners at cash registers) are still the most prevalent form of scanners available in retailers. This presents a challenge in accessing electronic or digital disclosures, which are primarily available through two-dimensional links. This is particularly true among small and rural retailers, some of which manually input prices into cash registers and do not have any kind of scanner in store.

Several big retailers have begun piloting programs that entail consumer use of hand-held scanners while they shop in store. According to a 2015 Nielsen study, ten percent of consumers in North America have used a hand held store scanner to purchase products as they shop.²⁴ Walmart's® Scan & Go pilot sites and Target's® Cartless Shopping equip consumers with hand-held portable scanners. Depending on the software, these might be able to scan both one- and two-dimensional codes.



The Law requires a phone number be included with all electronic or digital disclosure links

In a survey conducted by the Food Marketing Institute of food retailers across the country, stores universally reported having a phone available for managers to use. While these may not be available for direct consumer use, managers could use them to assist consumers should they have no other way of accessing the disclosure. Respondents include a variety of retailers, including regional and national chains, small and independent stores, and wholesalers.³

▶ The efforts that retailers and other entities have taken to address potential technology and infrastructure challenges

Retailer efforts to expand WiFi networks will significantly impact consumer ability to access the bioengineering disclosure for consumers with personal devices capable of scanning. However, scanners needed to access digital disclosure links are not widely available for consumer use.



Small and rural retailers struggle to make the infrastructure investments needed to help consumers access digital disclosure

Small and rural retailers have declining customer bases, resulting in less ability to capture profit for store investments

Rural residents are increasingly choosing to shop at large grocery chains farther from home. This is due to a combination of out-commuting consumers — who work in different towns and prefer to shop wherever is most convenient — and an increase in the accessibility of roads and automobiles.

At the same time, the average population needed to maintain a food retail store is increasing. In 2005, the average population needed to maintain a grocery store was 3,252, up from 2,843 in 2000.²⁵ Combined with decreasing customer bases, this results in less profit and smaller returns for retailers.

These challenges result in a situation in which smaller stores struggle to cater to changing consumer desires, which in turn creates a further decline of their customer base. In Iowa, between 1995 and 2005, the number of grocery stores dropped from 1,400 to 700; at the same time, supercenter stores like Walmart® and Target® increased by 175 percent.²⁵ In such a market, small retailers struggle in their ability to provide competitive prices, which 83 percent of consumers noted as the most important factor when deciding where to shop.²⁶

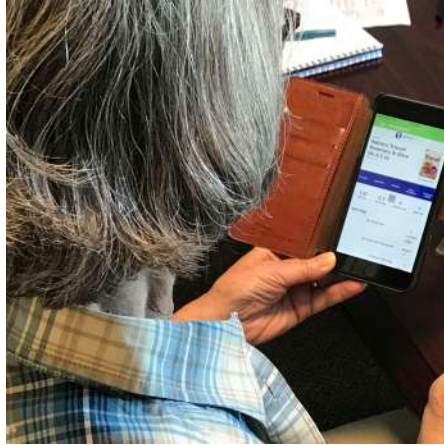
Small retailers have fewer opportunities to gain economies of scale

Providing WiFi for employees and customers offers an opportunity to expand access to digital disclosure. However, grocery retailers see very little return on investment from installing WiFi networks. These stores experience only a 5.8 percent increase in earnings before interest, taxes, and amortization compared to other retailers or restaurants, who see a 32.1 percent increase.²⁷ As such, small and rural retailers are not incentivized to provide WiFi, meaning customers without broadband may find it challenging to access the disclosure.

Small and rural retailers are less likely to have access to WiFi in store

Compared to near universal coverage in national and regional chain stores, only 37 percent of independently operated food retail outlets provide WiFi in store.³ Such a difference is likely attributable to the difficulty small and rural retailers face in capturing profit for store investments and lessened opportunities to gain economies of scale.

► **Challenges facing small retailers and rural retailers.** Rural retailers are less likely to have broadband access, and small retailers will struggle to make costly investments in WiFi networks. As a result, consumers who shop at these stores will face difficulties accessing digital disclosures.



Methodology: Human-Centered Design & Crowdsourcing

A multi-modal research approach, employing human-centered design (HCD) and crowdsourcing, allowed for inclusion of a diverse, purposeful sample of US consumers — those with and without digital access in dense and rural populations. Combining these methods allowed the research team to gain a depth and breadth of knowledge around challenges consumers face in accessing information through digital disclosure links.

IN THIS SECTION

- A. Rationale for a Hybrid Model
- B. Focused Human-Centered Design
- C. National Sample, Crowdsourced Discussion

Scope of Work

- ✓ 994 consumers from across the country engaged in crowdsourced discussions
- ✓ 4 sites were selected for field research, including one in each Census region of the United States
- ✓ More than 150 direct observations provided input for human-centered design
 - 40 in-depth conversations were conducted with consumers interested in accessing information on the bioengineered status of their food
 - More than 75 consumers were observed while grocery shopping
 - 42 retailers were visited to determine broadband access, landline availability, and ability to assist with scanning electronic or digital links

Combining research methods enabled breadth and depth of consumer perspectives across the country

This study was informed by a multi-modal research approach

Employing human-centered design and crowdsourcing allowed researchers to access a diverse and purposeful sample of US consumers. This multi-modal approach was necessary so that consumers, with and without digital access, had the opportunity to participate in this study.

Human-Centered Design (HCD) provides detailed understanding of consumer behaviors

Human-centered design (also known as design thinking) is a multi-disciplinary approach used by leading companies over the last decade. It draws from the practices of ethnography, cognitive psychology, and design to understand users' experiences with a product or service. By taking the time to truly understand a user's perspective and rationale, areas of concern can be identified and fixed to provide a better and more seamless experience for consumers.

As it relates to digital disclosure, HCD facilitates an understanding of behavioral, technological, and infrastructural challenges (both real and perceived) that may affect consumers' access to information about bioengineered ingredients in their food. Unlike surveys that capture a snapshot of people's

opinions from a fixed set of questions or big data that reveals trends by layering hundreds of thousands of anonymized data points, human-centered design gathers rich participant-driven data through observation and open-ended questions. Such an approach merges data with an understanding of the social context of human lives, creating deeper, more meaningful insights.

There were more than 150 direct observations that provided input for human-centered design. This includes 40 in-depth participant discussions, 42 retailer visits, and more than 75 observations of consumers in store. Sites were selected according to characteristics meant to pinpoint locations where consumers might face challenges in accessing a digital link. In addition, each participant was screened for potential interest in bioengineered foods. At-risk groups were identified based on secondary research on the current landscape, including age, broadband access, and technology ownership.

After conducting field research and interviews, researchers synthesized data and developed insights and themes to inform this study.





Crowdsourcing provides insights through rich data and social interaction

Crowdsourcing provides an effective channel to engage consumers in a productive online discussion that builds on the insights gathered from field research and validates findings. The crowd brought together different types of consumers from across the country to discuss their views on digital disclosure. Interactions between participants led to in-depth conversations on the topic, and provided more nuanced information on consumers' views than would have been available through a traditional survey or poll.

Crowdsourcing consumer opinions involves monitoring the number of discussion threads, the diversity of respondents, and the engagement of different segments. This allows the research team to adjust the balance of participants as needed to elicit coverage of a breadth of perspectives.

Nearly 1,000 participants were identified and recruited for the crowd, each a consumer with a potential interest in bioengineered food. The group served as an illustrative sample of the US population, capturing a wide diversity in age, income, race, geographic location, and shopping habits.

Once launched, the crowd conversation was monitored to track participation, and refined as needed. Data was collected, grouped according to consumer segments and conversations, and analyzed to gain insight and understanding on challenges to access and potential solutions.

A hybrid approach allowed for depth and breadth of insight into the consumer experience

By combining these two research approaches, this study was able to develop and support insights into different challenges that consumers experience when accessing digital disclosure.

Crowdsourcing provided an illustrative sample of American consumer opinions, while HCD added a depth of understanding through observation. Through both research methods, participants engaged in robust conversations about digital disclosure regarding bioengineered food. Each approach gleaned different types of data points and themes. Ultimately, data from both approaches was analyzed and synthesized, informing the major insights derived in this study.

Human-centered design applies observational techniques and discussion to understand the voice of the customer

At the heart of human-centered design is field research, otherwise known as ethnography

Ethnographic research is a subset of anthropology that focuses on the study of human cultures through observation of people's behaviors in their natural environments. Observation is a powerful tool for gathering insights since what people say and do are often two different things. Simply put, the goal is to understand how people behave in their everyday lives. To better understand consumer access to additional food information through electronic or digital disclosure methods, this study observed and engaged a variety of American consumers through open conversation and observation of shopping patterns.

Ethnographic research is centered on objectivity, empathy, and open dialogue

The first guiding principle employed in the field was an emphasis on objectivity. Researchers worked to

capture observations and facilitate conversation in an unbiased manner. So as to reduce the risk of participant bias, researchers did not disclose the full scope of the study in conducting research. The second guiding principle for human-centered design was framing conversations in a comfortable and empathetic manner in order to facilitate open conversation. In addition, participants were informed of their rights and signed consent forms before conversations officially began. Finally, participant-guided dialogue is a key component of successful ethnographic research. To this end, researchers asked questions in an open-ended manner, inviting participants to elaborate on their responses with context or stories.

Field research sites were selected to identify populations that face potential challenges accessing digital disclosure

Engaging a meaningful research sample is critical

in conducting unbiased, insightful field research. Preliminary insights based on secondary research identified groups of American consumers who may face unique barriers to accessing information through electronic or digital disclosure methods. These include vulnerable and underserved populations, such as low-income, rural, or tribal communities. To effectively and meaningfully engage these populations, the researchers sought to reach a diverse sample of consumers from four carefully-selected regions across the United States.

This study considered five key characteristics in its site selection process: (1) consumer interest in bioengineered foods, (2) access to participants likely to face challenges, (3), broadband access, (4) geographic diversity, and (5) demographic diversity.



Five key characteristics guided the human-centered design site selection process

Interest in the issue of bioengineered foods

Researchers focused on engaging populations potentially interested in accessing information on the bioengineered status of food purchases.

Access to participants likely to face challenges

Researchers sought to include participants likely to face challenges accessing food information via electronic or digital disclosure methods. Based on secondary research, this includes groups that may not own smartphones and may have difficulty using technology.

Limited broadband access

Three of the four sites selected had low access to broadband, determined using a broadband access map of the US based on US Census Bureau and FCC broadband data by county. The map uses a broadband coverage score, a composite of broadband availability and speed.

Geographic diversity

Sites were selected from each of the four major US Census Bureau regions of the United States — Midwest, Northeast, South, and West — providing a diversity of behavior and thought.

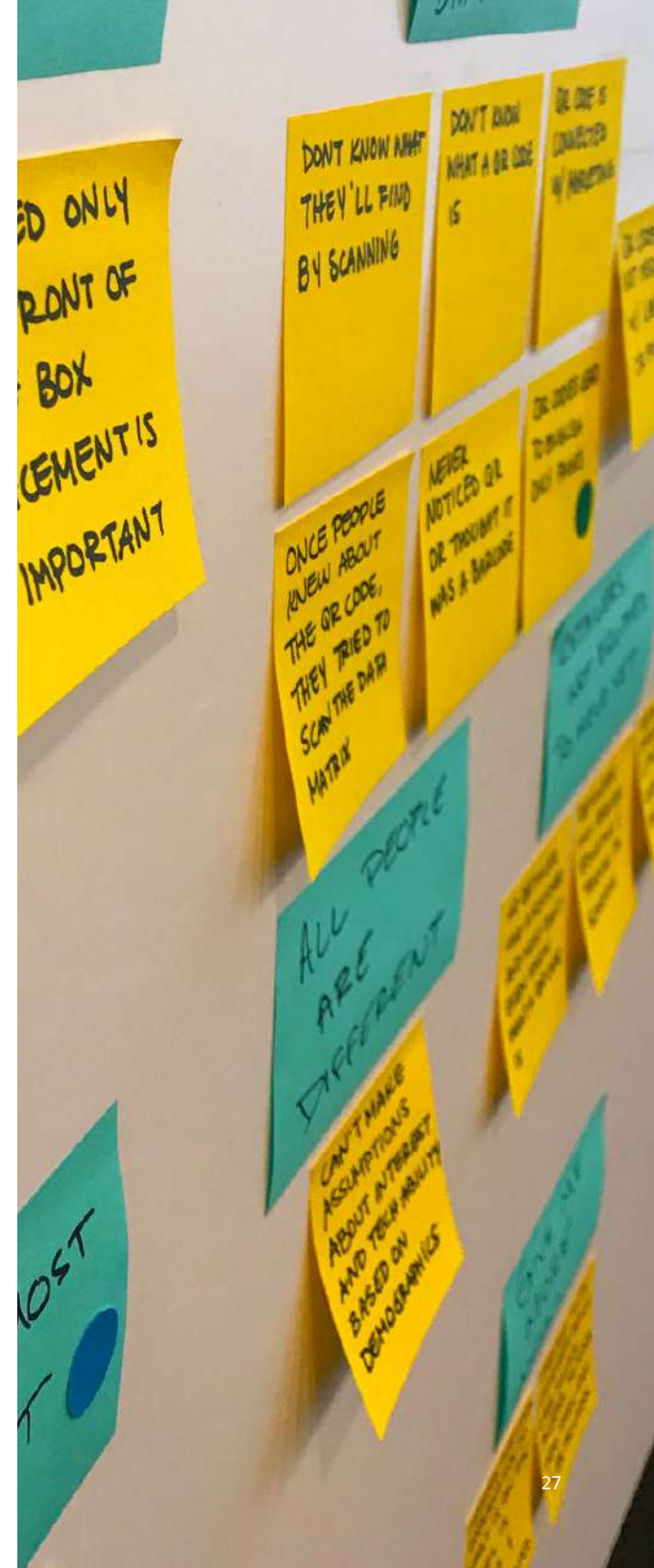
Diverse demographics

A portion of study participants engaged were from racially and ethnically diverse communities, including Hispanic, African American, and tribal populations.

40 in-depth participant discussions

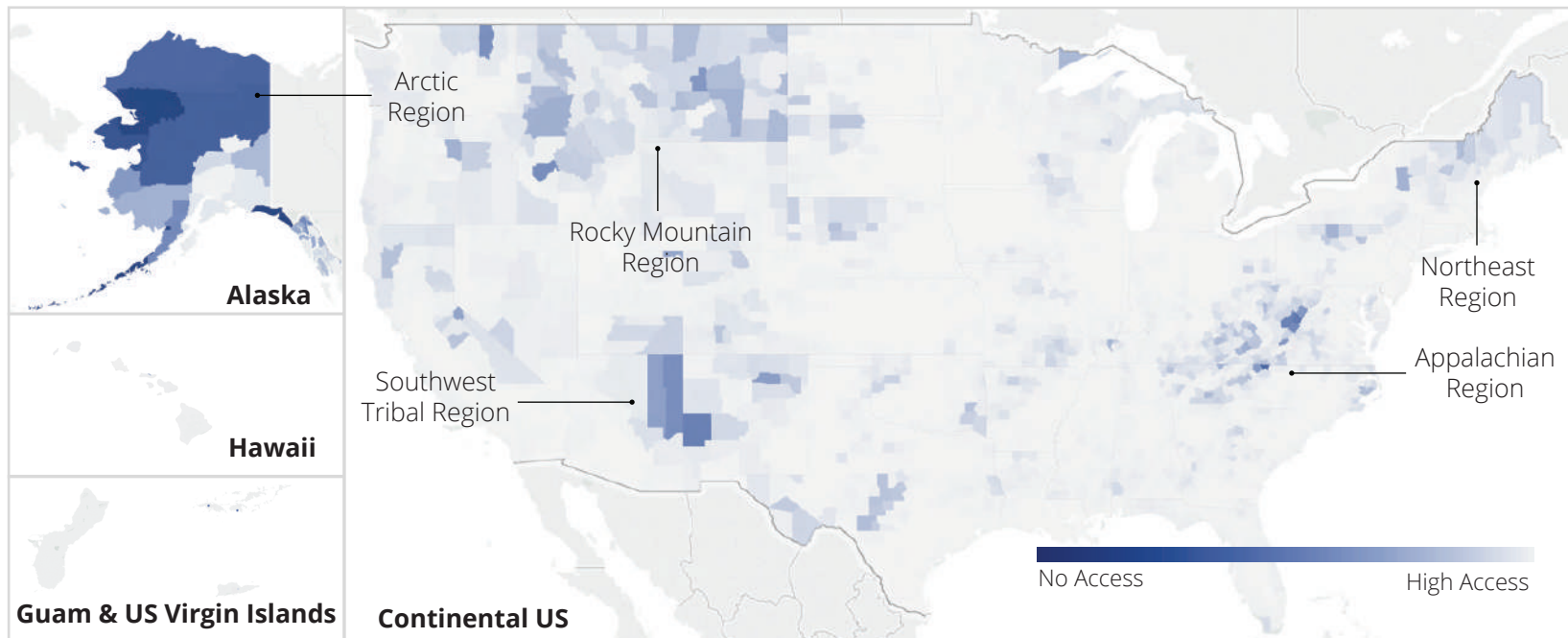
75+ consumer observations

42 retailer locations visited



Ethnographic research targeted the six percent of Americans who live in regions of the country with limited broadband

Figure 2: Limited Broadband Access Map for the United States, by County²⁸



- 99.9% of counties have at least some access to broadband service
- Only four counties have no broadband access, all located in Alaska and comprising a population of less than 12,000 people
- 6.4% (20.5 million) of the American population has inadequate broadband service to successfully access digital disclosure, based on the 10 Mbps threshold
- These 20.5 million people with inadequate broadband live across 1,020 counties, 88% of which are completely or mostly rural

The approach to site selection supported researchers in engaging key consumer groups

Using the guiding characteristics, broadband map, and US Census data, researchers selected four illustrative sites for field research. These included a site in a tribal region of the Southwest, rural Appalachia, rural Vermont, and a city in the Midwest.

Many tribal communities in the US have demonstrated interest in the issue of bioengineered foods. In 2015, California’s largest tribe, the Yurok, banned the growing, raising, or release of GMOs within their territory. Many other tribes express similar concerns around the issue of bioengineered food, with Navajo Nation declaring itself GMO-free in 2015.^{29,30} The Southwest tribal region includes these populations, and also faces challenges as a rural region with low broadband access.

Appalachia is a region of the country with a rich agricultural influence. The importance of agriculture — the largest component of the regional economy — and a communal concern about food labeling made Appalachia an ideal target for research.³¹

Prior to passage of the Law, labeling efforts existed across a number of states. In the Northeast, Vermont was the first state to implement a

mandatory GMO labeling law and have it impact the marketplace. Rural communities were a major influence in pushing for this legislation, and some even held a “Right to Know” march, in favor of GMO labeling.^{32,33}

In order to represent the voices of populations who may face challenges in accessing digital disclosure in an urban setting, researchers visited

a Midwestern city. Like Appalachia, the Midwest is a key region for agricultural development in the US.³⁴ Aside from being one of the nation’s largest producers of dairy products, lead researchers in the field of bioengineered food hail from Midwestern universities; other researchers frequently travel to the region to perform studies.³⁵ This area acts as a hub for a diverse population in a region that is influential in the field of bioengineered foods.

Figure 3: HCD Research Site Selection Factors

| | SITE 1 | SITE 2 | SITE 3 | SITE 4 |
|-------------------------------------|---|------------|---------------|--------------------------|
| CONSUMER INTEREST | POTENTIAL INTEREST IN THE ISSUE OF GMO FOODS | | | |
| ACCESS TO HIGH-BARRIER PARTICIPANTS | <ul style="list-style-type: none"> ✓ Smartphone and non-smartphone owners ✓ Access to low-income populations ✓ Access to study participants over the age of 60 | | | |
| BROADBAND ACCESS | LOW BROADBAND ACCESS (<10 MBPS) | | | OTHER BARRIERS TO ACCESS |
| GEOGRAPHY | WEST | SOUTH | NORTHEAST | MIDWEST |
| DEMOGRAPHICS | TRIBAL | RURAL | | LOW-INCOME, DIVERSE |
| LOCATION SELECTION | SOUTHWEST TRIBAL REGION | APPALACHIA | RURAL VERMONT | MIDWESTERN CITY |

The crowd conversation provided insights at scale on the consumer experience in digital scanning

Fostering meaningful conversations between diverse participants allowed researchers to develop crowd insights

In the context of this study, crowdsourced discussions provided the research team with data on participants' thoughts around engaging with electronic and digital disclosure methods. In addition to gathering information on each participant, the crowd platform enabled individuals to interact with one another by responding to, and rating, each other's comments. This created a robust dialogue that transformed traditionally qualitative feedback into a quantitative data set that articulated the key challenges individuals face when attempting to access digital information. It should be noted the focus of the discussion was on identifying challenges in compliance with the Law.

Participants were selected to determine challenges in accessing digital disclosure

This study engaged a broad and diverse population as a means of fostering dynamic discussion within the crowd platform. As in HCD, participants were selected based on the following characteristics:

- Interest in accessing information on bioengineered food
- Member of a group facing potential challenges,

including low-income earners, rural residents, and members of Native American populations

All participants also had to have access to a technological device in order to participate, so it was assumed that underserved populations would be less represented through this research method and that those individuals would be better engaged through ethnographic research. In total, the crowd conversation included nearly 1,000 American consumers from around the country.

Consumers were broken into two groups to measure the impact of wording bias on responses around bioengineering disclosure

Research indicates that most consumers are unfamiliar with the GMO issue, and may have soft opinions that are sensitive to question wording. In order to account for this sensitivity, participants were broken into two separate crowd conversations. These crowds were highly similar in all aspects, except for a slight difference in question wording: the first group included a prompt that sought crowd thoughts around digital disclosure, and the second group included the same prompt with a reference to bioengineered or GMO foods. Upon a review of the results, there was no statistically significant difference between

technological challenges referenced across the two groups and the results were consolidated into a single group for analysis.

All crowd participants engaged in the conversation through both direct feedback and social interaction

The crowd platform was structured to foster a dynamic discussion, where participants not only answered questions about their own views and behaviors, but reacted to one another's. Participants were prompted with an initial, open-ended question where they provided thoughts around challenges they would face in using electronic or digital disclosure links. Next, participants rated comments from their peers based on how much they agreed with the comment and how much they cared about the issue discussed. Finally, crowd participants were able to reply to comments to continue the conversation with one another. This dynamic engagement created a dataset that fostered a networked sentiment analysis across participants by measuring the degree to which independent participants shared similar feelings around digital disclosure, and the extent to which those feelings were shared.



BROAD REACH

994

crowd participants who demonstrate potential interest in the issue of bioengineered foods, each providing an initial comment on challenges they would face accessing digital disclosure

CLEAR RATINGS

13,551

ratings given, with consumers ranking how much they agreed with and cared about other comments (average of 13.6 ratings per comment)

RICH DISCUSSION

3,399

written responses to comments

Through interaction, the crowd coalesced into large groups with similar and overlapping concerns

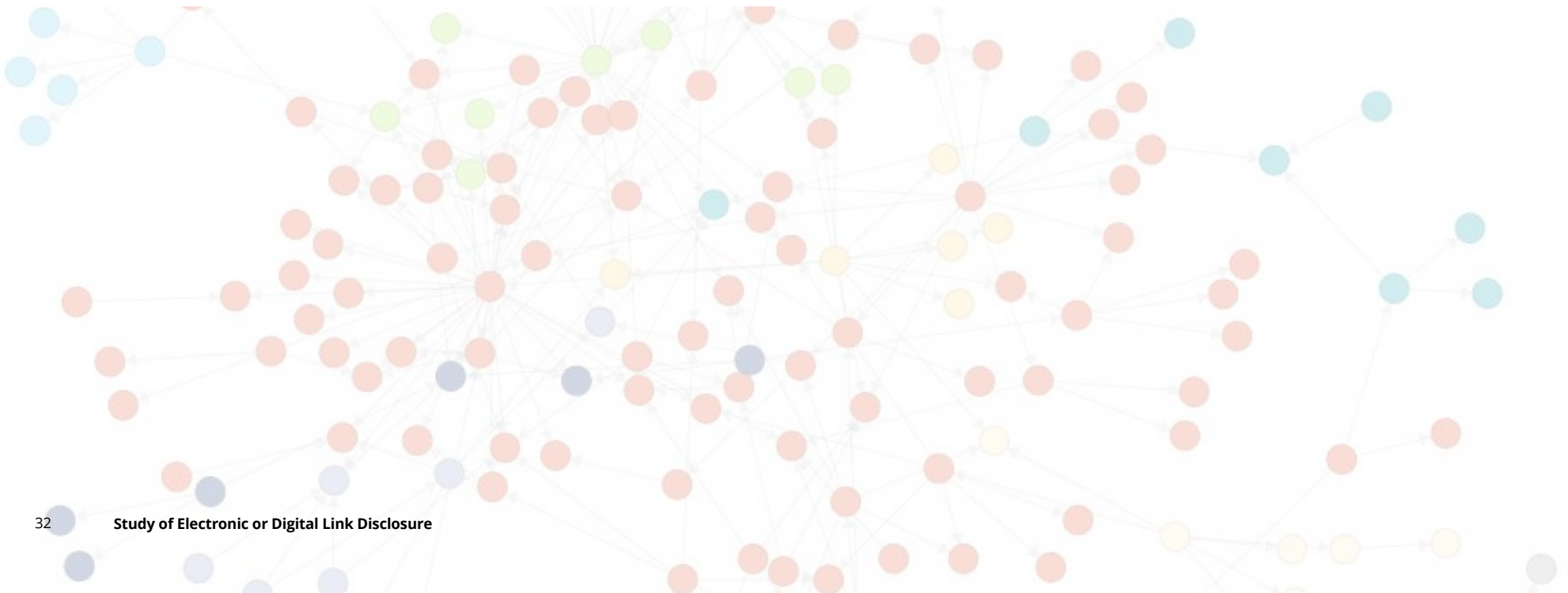
Crowd interactions pointed to common concerns among consumers

Through the crowd platform, participants read, rated, and reacted to other opinions and comments. The exposure between various perspectives allowed the research team to learn more about each participant's sentiments than the information they originally included in their comment. Researchers measured the level of agreement between each of the participants to

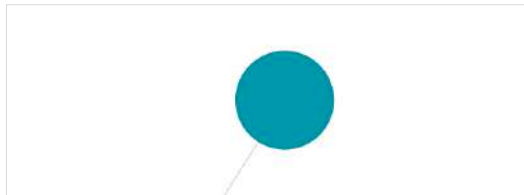
identify groups with similar opinions on digital disclosure. This enabled the development of a network map to visualize the natural "conversations" that developed between crowd participants.

The research team identified key challenges and behaviors mentioned by the crowd participants in their comments. The crowdsourced discussion helped identify the demographic groups most likely

to be concerned about each of the challenges. Furthermore, the interactions in the crowd allowed the identification of commonalities between different concerns. Crowd participants rated comments on two parameters: (1) how much they agreed or disagreed with the comment and (2) how important they thought the comment to be. The research team was able to extrapolate additional perspectives from each participant based on the other comments with which they highly agreed.

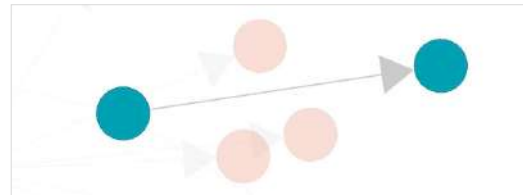


How to read the network map:



Participant

Each dot represents a comment from a crowd participant. Only the comments considered highly important by at least one other person are included.



Interaction

Each arrow represents a rating given from one participant to another, with an arrow pointing to the comment that was rated. Only the strongest ratings, where participants highly agreed with the comments and thought they were important perspectives, are shown.



Levels of Agreement

The distance between two comments, or the length of the arrow, indicates the level of agreement. The higher the level of agreement, the shorter the distance between two dots. In general, the closer two comments are to each other, the more the crowd participants shared common viewpoints.



The Reality: Understanding Digital Engagement with Consumers

Currently, low awareness of digital links results in low recognition of their use for food information. As consumers attempt to access bioengineering disclosures through electronic or digital methods, some face key challenges. These challenges include difficulties recognizing the link, accessing it through use of tools, scanning the link appropriately, and loading the webpage to view information, among others.

IN THIS SECTION

- A. The Consumer Journey
- B. Technological Challenges
- C. Contributing Factors

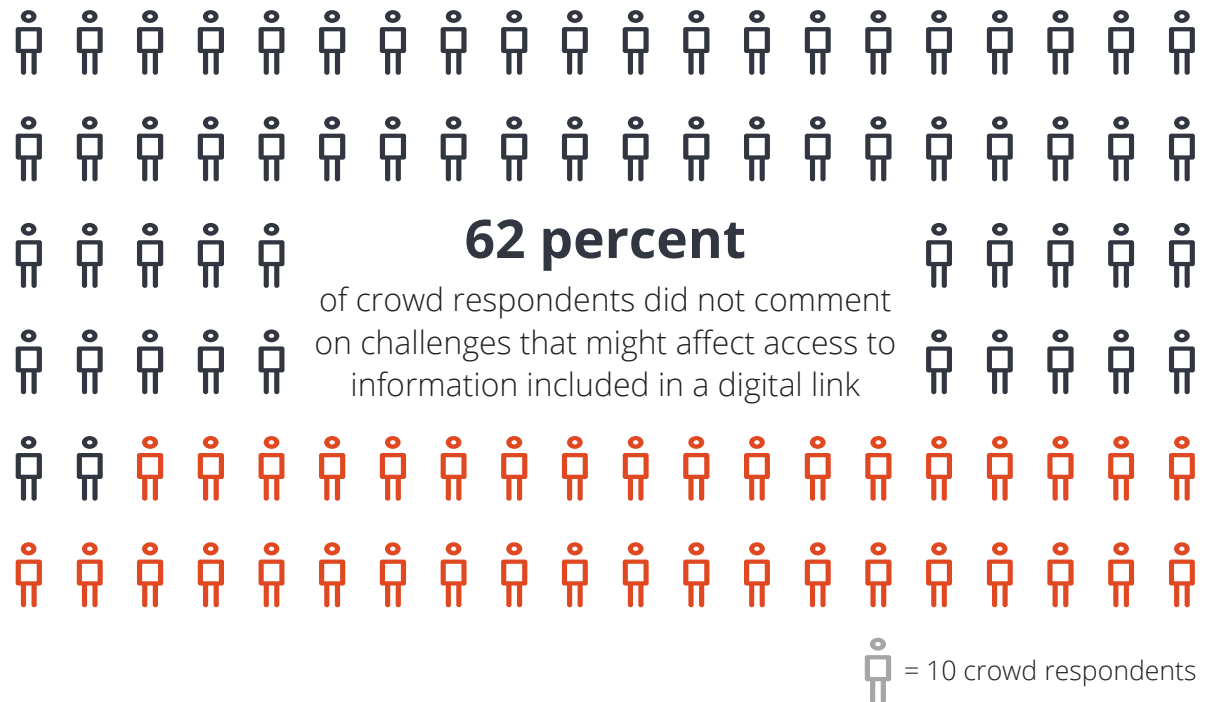
Key Takeaways

- ✓ 62% of interested consumers believe they would be able to access an electronic or digital food disclosure
- ✓ Among the population included in this study, consumers face four primary technological challenges in using electronic or digital links:
 - Digital links are not inherently associated with additional food information
 - Consumers may not have access to equipment capable of scanning digital links
 - The market provides hundreds of scanning apps, many of which are not intuitive to use
 - Consumers may be unable to connect to broadband
- ✓ Technological challenges disproportionately impact low-income earners, rural residents, and Americans over the age of 65
- ✓ Consumers who are uncomfortable using technology or unfamiliar with the issue of bioengineered foods have additional contributing factors that may challenge access

When asked, most interested consumers believe that they would be able to use an electronic or digital link to access a bioengineering disclosure

Through crowdsourced conversations, nearly 1,000 consumers provided insight into their grocery shopping behaviors and potential challenges in accessing the bioengineering disclosure through an electronic or digital method.

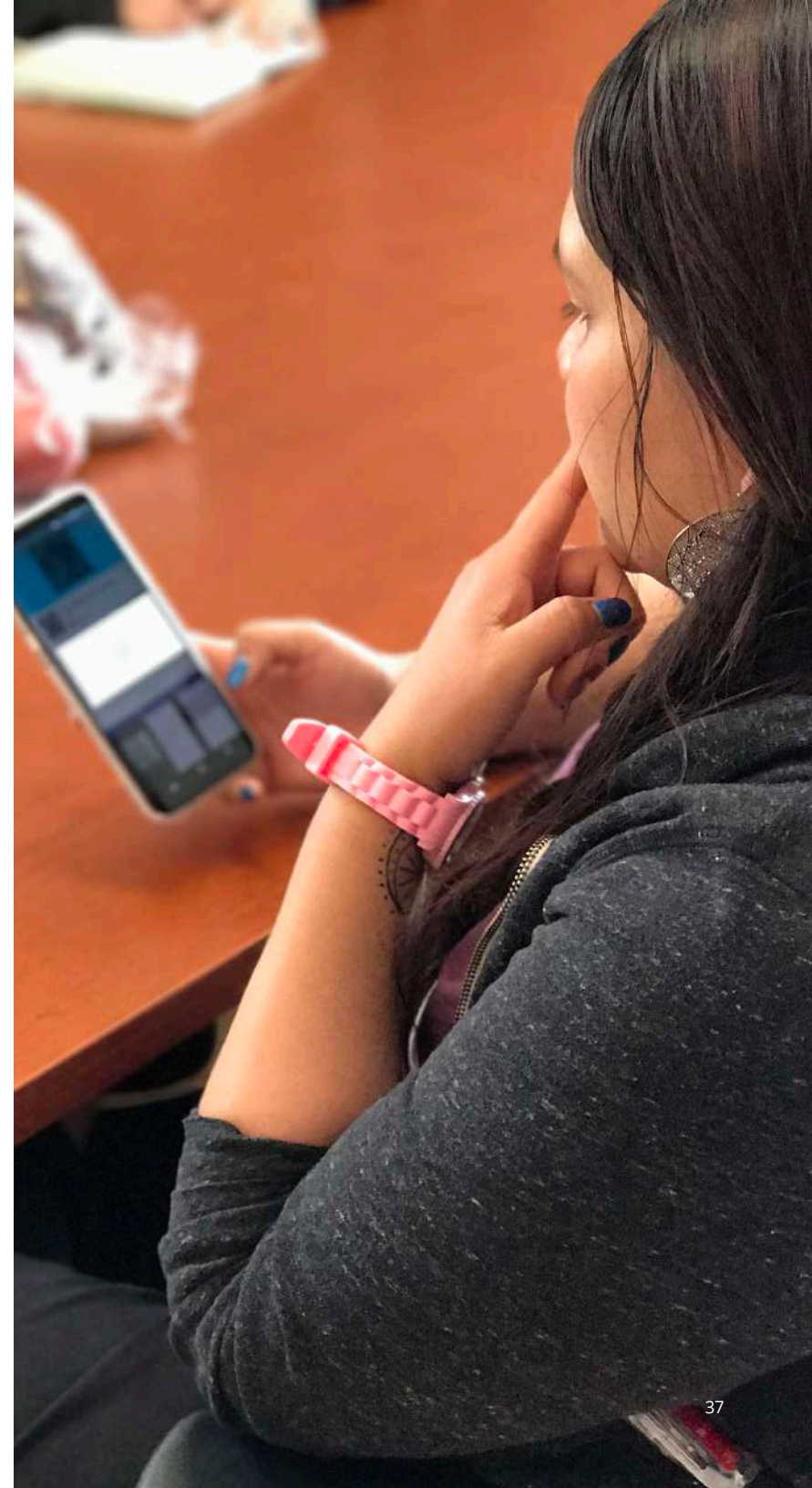
The majority of crowd participants did not comment on challenges when asked about electronic or digital disclosure methods. Many in this group explicitly noted a lack of barriers, indicating that those with ready access to technology typically did not see technological challenges. Other respondents that did not comment on challenges shared positive feelings towards the idea of scanning food products for more information. Still others offered additional thoughts related to implementation of the law or regarding consumer behaviors that are unrelated to challenges associated with scanning.



Yet, in observations, some consumers faced challenges that impeded access to disclosure

Consumers may not initially remark on challenges in accessing a bioengineering disclosure through electronic or digital methods. However, observations of the ways in which people scan point to key impediments in their ability to access information through such links. Even those comfortable using technology faced challenges in scanning. Put simply, **consumers may not know the challenges they face in accessing digital disclosure until they actually try to access it.**

The following pages outline a consumer journey, the steps a consumer must take to access information through an electronic or digital disclosure method. Throughout the consumer journey, technological challenges and contributing factors may impede consumers along the way. Technological challenges directly impact whether a consumer would have access to the bioengineering disclosure through an electronic or digital link. Contributing factors are issues that can inhibit adoption of or engagement with digital disclosure.



Most consumers were equally concerned with a range of topics, pointing to relationships between different challenges

Interconnected consumer networks reflect a variety of overlapping concerns

The graphic to the right connects participants to comments that they most strongly agreed with to identify the most common perspectives. Each color represents a group with a similar reaction to digital disclosure. The groups identified here allowed the research team to link together challenges and behaviors based on common concerns to identify root causes and develop more effective mitigation strategies.

The research team found that most groups discussed a variety of topics around a central theme. For example, participants that stated they did not know how to use a scanner app tended to highly agree with participants that stated they did not have a phone capable of reading electronic or digital disclosure links, indicating that groups with these kinds of barriers may have many members in common.

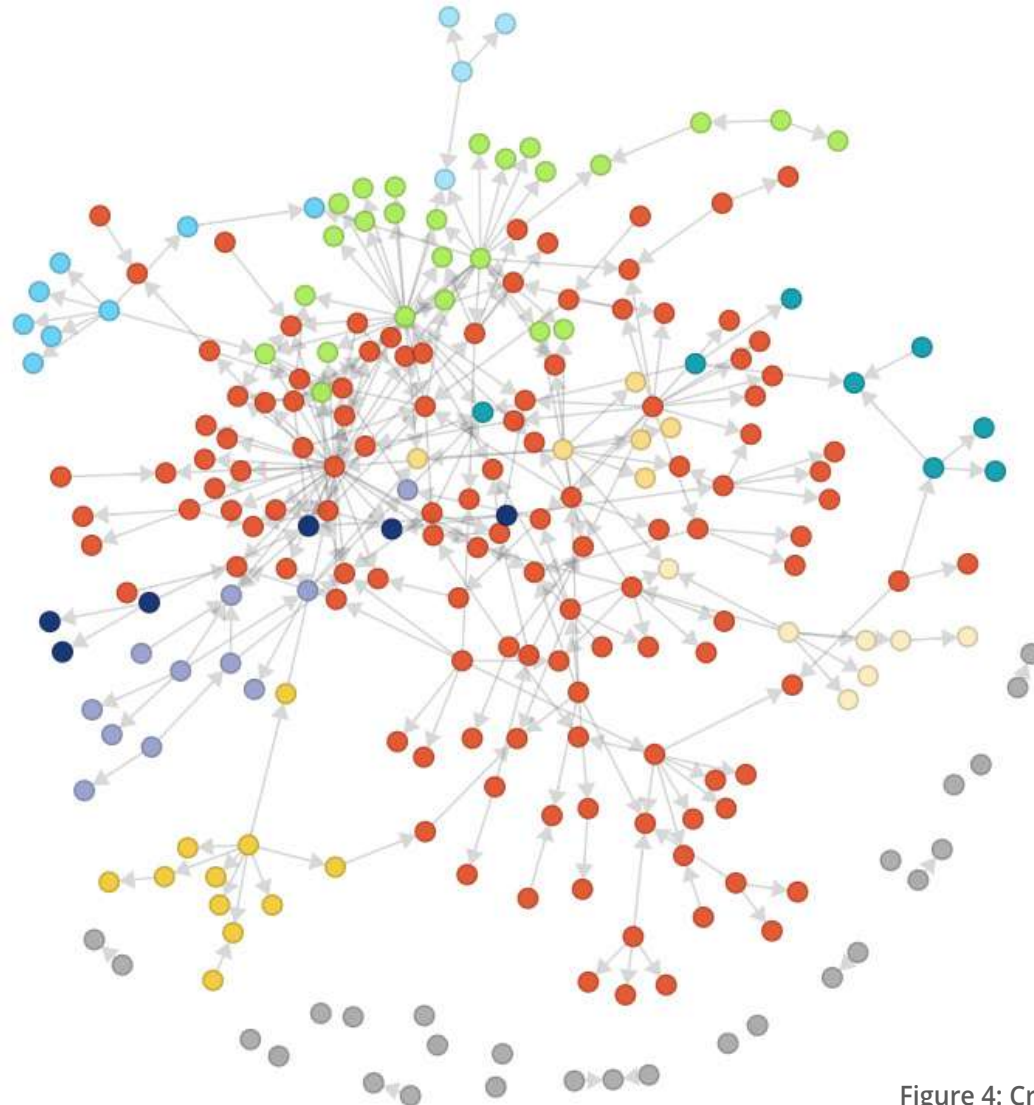


Figure 4: Crowd Network Map

Crowd Conversation Categories

Conversation has many focuses

- Equally concerned with a wide range of topics

Conversations focused on scanning

- Inexperience with digital links and security concerns
- Concerned with abilities to scan, prefer a physical label
- Interested in scanning, dependent on time constraints

Conversations focused on tools

- Worried about not having the tools needed to access the scan, including data service, smartphones, and an app
- Concerned phones will not be able to read information
- Concerned with lack of smartphones and broadband
- Concerned the technology will not work
- Concerned about impact to phone battery and data

Conversation focused on positive feelings

- Generally feel positively about digital scanning

Conversation focused on other topics

- Various other concerns shared by only a few people

“

I would use this scannable technology if it was available to me, I am not aware of it in the grocery store where I shop. If a smartphone is needed then I would have a problem with product labeling and information, because I do not have any of these devices.

.....
- Crowd participant

I really do not know much about the technology involved with QR codes and scanning.

.....
- Crowd participant

Sometimes the signal for my cell phone in the store gets very weak. I have mentioned it to the store manager who said they would look into it. They currently have a scanning system for reduced pricing but I am unable to use it because of the above mentioned.

.....
- Crowd participant

Four technological challenges may inhibit consumer access to additional food information through an electronic or digital disclosure method

CONSUMER JOURNEY

The consumer journey maps the key steps a consumer must take in order to access information via electronic or digital disclosure methods

TECHNOLOGICAL CHALLENGES

Barriers that directly impact consumer access

CONTRIBUTING FACTORS

Contributing factors that can inhibit adoption of or engagement with the digital disclosure

RECOGNIZE
the electronic or digital disclosure



ACCESS
the tools required to scan



■ ■ ■ ■
Low association with additional food information

Digital links are not inherently associated with additional food information, and consumers often assume they are for marketing or industry use



■ ■ ■ ■
Lack of suitable equipment to scan

Consumers may not have equipment capable of scanning digital links on their own, and in most cases there is not a viable alternative provided by retailers

▼ **Lack of familiarity with scanning**
Consumers may recognize electronic or digital links, but do not know how to access information due to a lack of familiarity with scanning

▼ **Lack of technical knowledge**
Scanning digital links is not an intuitive process for many consumers who lack technical knowledge on how to download and use scanner apps

SCAN

the electronic or digital link



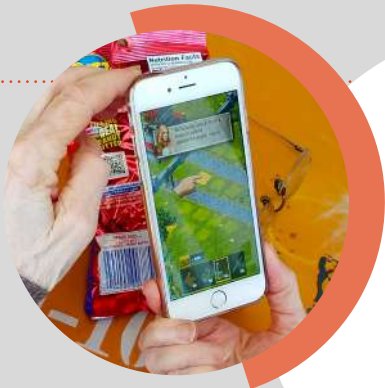
LOAD

the associated webpage



UNDERSTAND

the disclosure contents



Confusing or malfunctioning apps

There are hundreds of scanning apps available in the market, many of which are not intuitive to use, causing consumer confusion and difficulty opening link results



Low broadband access

Consumers may be unable to connect to broadband, or connect at a speed that is so slow that they cannot load information

Unclear disclosure language

The language used in current voluntary bioengineering disclosures is not clear or consistent across products, resulting in misunderstanding among interested consumers

LOW ASSOCIATION WITH ADDITIONAL FOOD INFORMATION

Digital links are not inherently associated with additional food information, and consumers often assume they are for marketing or industry use

Digital links are not generally recognized as a means of communicating food information. They have been used for a wide array of purposes — from marketing to electronic coupons to mobile pay — and not exclusively by food manufacturers. As a result, consumers do not necessarily associate them with additional food information.

Moreover, many consumers do not notice an electronic or digital link or assume that it is relevant only for retailer or manufacturer use. This is likely a result of the varied usage of digital links, and the fact that food information has only recently become available through such methods. At the time this study was conducted, the Law's regulations were not yet implemented. In addition, as newer technologies emerge, the types of digital links will change and may further confuse consumers who seek to access electronic information. Such misunderstandings around the use of digital links point to the need for an educational campaign.



“ ” | I've seen it before, I know it's a barcode and I mean, that's all I can tell you about it.

- Ronnie, referring to a QR code on a food product

Consumers are unfamiliar with QR codes

A QR code is currently the most widely used form of electronic or digital disclosure on product labels. Yet, in detailed conversations with consumers, 29 out of 40 participants did not know what a QR code was.

A number of participants assumed that it was a tool for manufacturers or retailers, akin to a new type of barcode. Ronnie, a single father of two living in rural Appalachia, had seen a QR code before but did not know anything more about it — he did not know that it contained food information, he did not know how to scan it, and he did not know it was accessible to consumers. Rather, he assumed the QR code was for the manufacturer and did not concern him.

A lack of knowledge around QR codes was most clearly seen in direct observation and open-ended discussion with study participants. However, even in crowdsourced conversations, 24 respondents noted low recognition of electronic or digital codes. While this is a small portion of all crowd participants, these respondents addressed this issue without being asked about it directly.

Secondary research echoes these findings. A study conducted by the Annenberg Public Policy Center in July 2016 found that only 15 percent

of Americans scanned barcodes or QR codes to find information about a product's ingredients or nutrition information in the prior year; 29 percent had scanned these to find the price of a product or to check out at a store during the same period.³⁶

These consumer perceptions are validated by retailer and manufacturer use of QR codes for varied purposes. While they are increasingly employed as a means of providing food information, QR codes also currently deliver other product information, videos, eCommerce, app downloads, and customer relationship management.⁸ This was readily seen in field observations, where retail outlets display QR codes at self-checkout, and store signage and advertisements include QR codes which can be scanned for marketing purposes.



YOUR TICKET

GATE

14

TERMINAL

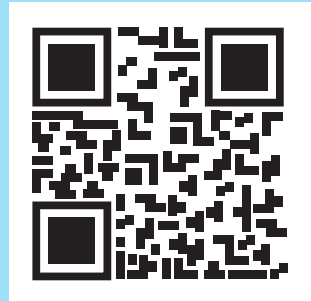
1

DEPARTS

12:00PM

STATUS

On Time



Consumers do not know that digital links contain food information

While some participants observed in this study did not know what a QR code was, those that did know did not realize it could contain additional food information. A number of case studies illustrate the varied associations that consumers have with QR codes and the resultant lack of association with additional food information.

Travis, an agricultural professional in Appalachia, had an app that stores all of his retailer membership reward cards. When grocery shopping, Travis takes out his phone, opens his app, and the app produces a QR code. Travis then takes his phone to a store kiosk, scans the QR code, and the kiosk downloads coupons to his smartphone. Upon checkout, Travis scans the QR code on his app again, and all the coupon discounts apply directly to his purchase.

In this way, Travis was very comfortable using QR codes, but he only associated them with sales, discounts, and coupons. He added, “Well, it’s just even knowing what they’re for...What are they? Why are they on the box?” He did not understand that a QR code would link to product information.

Natalie, a mother of two young boys, uses QR codes regularly as part of her scrapbooking. She likes to include videos in the scrapbook pages, so she uploads them to a webpage that generates a corresponding QR code. As a result, her kids recognize QR codes and constantly ask her to scan whenever they see one. However, Natalie had never encountered one with additional food information, and assumed that QR codes on food packages were used for advertising.

Shannon lives in a tribal region in the Southwest. She had seen QR codes before and knew that her sister scanned them for “price deals.” As a result, she thought these were a new type of barcode. Indeed, QR codes were extremely prevalent in her county, but they were used in a variety of different settings — including mobile checkout or company marketing — and not necessarily linked to food information. Simply recognizing QR codes did not help Shannon to understand that she might be able to access a bioengineering disclosure this way.


Just as a lack of recognition of QR codes was most clearly seen in direct observation, the fact that consumers do not associate these codes with food information was best noted in ethnographic

study. Yet a small group of crowd participants also commented on a lack of knowledge that QR codes contain additional food information. The conversation prompt included a reference to additional food information being available in digital links; 20 participants noted that they did not know that such links were used for this purpose. As with a low recognition of QR codes, other crowd participants may have shared these associations, but did not choose to comment on this in their textual responses.

“““

I don’t know how I would go about using them. Would I need to have some kind of app? Would the app be secure? Would I be tracked?

- Crowd participant, discussing a lack of knowledge around using digital links



“That code? I don’t know. That’s the code [manufacturers] use, we don’t use it.”

– A young store employee

“That’s a SmartLabel™. I don’t know what it’ll show you, but several items have it.”

– A regional chain store manager

“[It’s] for people who don’t want to read [the information] on the box.”

– A cashier explaining content found on QR codes

Retailers are also unaware that digital links include additional food information

In visits to 42 retailers across four regions, only two knew that digital links would provide additional food information. In a visit to a high-end national specialty food retailer in a Midwestern city, researchers asked eight employees what they would find in scanning a digital link and not a single person knew the content or how to access it.

Retailer assumptions regarding digital links are made based on past and present link usage

Unsurprisingly, like consumers, retailers generally associated QR codes with coupons, marketing, or manufacturer use. At a corner store in a Southwestern tribal region, an employee commented that scanning a digital link would lead to a brand marketing video. In reality, though not yet required by law, the digital link connected to a page with food information, including a bioengineering

disclosure. This encounter illustrates how, going forward, consumers may receive inaccurate and inconsistent information from retailers — even if well intentioned — leading to further confusion.

Instructional text may help to guide consumers, but will not be enough to educate them on use

Consumer confusion could be solved in part by the Law’s mandate stating that digital links used for bioengineering disclosure must say, “Scan here for more food information” or other equivalent language. However, both retailers and consumers in the field tended to overlook guiding words surrounding the digital link, making it even more imperative that retailers possess a better understanding of the disclosure. Further, such language does not specify that the additional food information is a bioengineering disclosure.

Current QR code uses that may contribute to consumer confusion⁸

Tickets (Concerts, Movies, Transportation)

Brand Marketing (Sports, Products)

App Downloads

Self-Checkout for Retailers

Food Recipes

Coupons & Promotions

Classroom Learning

Military Identifications

Social Media Sites

Scrapbooking

LACK OF SUITABLE EQUIPMENT TO SCAN

Consumers may not have equipment capable of scanning digital links on their own, and in most cases there is not a viable alternative provided by retailers

Many consumers lack access to the basic equipment needed to scan digital links. Across the country, 23 percent of Americans do not own a smartphone. While ownership rates are increasing nationwide, low-income earners, rural residents, and those above the age of 65 face more limited access to such devices.¹⁸

Most who own smartphones will be able to scan using their smart devices. Yet smartphone ownership is not necessarily a proxy for access, as some smartphones are not capable of scanning electronic or digital links. A device might be older, malfunctioning, or lack storage space, inhibiting one from scanning effectively. For those who do not have a scanning tool of their own, retailers are not currently equipped with scanners for consumers to use.



“

Yes, you can scan it, but I don't have anything to scan it with... I have a basic flip-phone, as do most of us up here.

- Pam, describing the lack of access to scanning equipment in her rural town

Twelve percent of study participants noted challenges in accessing the tools needed to scan

Currently, electronic and digital disclosure methods require a device that can scan a link on a product package. While in-store scanners may be used, consumers primarily use their personal devices for this activity. Some smartphones may be able to scan links with a built-in camera; others require consumers to download a scanner application. However, not all consumers own smartphones. A study conducted by the Pew Research Center in January 2017 found that 23 percent of the adult population in the US does not own a smartphone.¹⁶ While not all members of this population will care to access the bioengineering disclosure, those who do will be challenged in attempting to obtain this information through an electronic or digital link.

In direct observation and crowd responses, consumers across the board noted a lack of access to this basic equipment as a concern. However, this concern was most profoundly articulated by older and low-income consumers. Even in the crowd discussion — which was facilitated online, and thus likely involves participants who are more technologically enabled than the broader population — six percent of respondents did not own a smartphone. Double this number noted challenges in accessing the equipment

needed to scan, including not owning a smartphone, having a smartphone that could not scan, limited or no phone storage available for a scanning app, or lack of a scanner available in retail stores.

Participants echoed these concerns in direct observations. In one encounter, Pam, a long-time resident of rural Vermont, discussed great interest in accessing food information, including the bioengineered status of her food. However, she owns a flip-phone and would not be able to scan QR codes on her own.

Jolanda, a mother of two who shops for her large family in a tribal region in the Southwest, owns a smartphone but cannot use it for anything other than phone calls or text messages unless it is plugged in. Otherwise, her battery dies quickly and her phone shuts off, causing her frustration and embarrassment.

Peter and Yemi, a couple in a Midwestern city, spoke about their constant struggle to find space for needed apps on their smartphones. In the midst of our conversation, Yemi received a pop-up notification that she was running low on storage space. Neither had space available for a new app, particularly without knowing what they would get from scanning a digital link on a food package.

SUMMARY OF CHALLENGES TO ACCESS



NO SMARTPHONE OR SCANNER TOOL

Older and low-income consumers in particular may not own a smartphone or other equipment that would allow them to scan an electronic or digital link.



SMARTPHONE OR TOOL IS INCAPABLE OF SCANNING

A phone may be too old to scan electronic or digital links; or malfunctioning tools may prevent apps from downloading or scanning.



SMARTPHONE OR TOOL DOES NOT HAVE ENOUGH MEMORY FOR AN APP

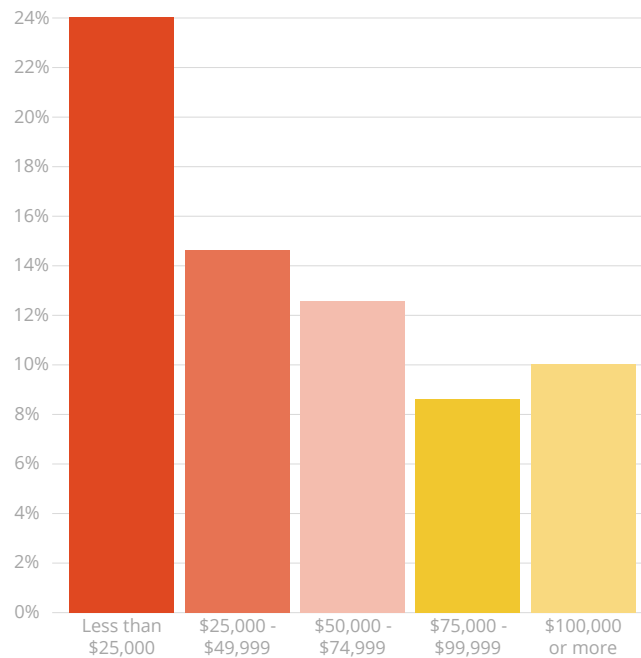
Smartphone storage capacity varies based on manufacturer, age, software, and hard drive.

Older, low-income, and rural residents face greater challenges accessing scanning tools

Rates of smartphone ownership in the US are increasing across all demographic groups, but a few key populations still face lower rates of ownership. According to the Pew Research Center 2017 Mobile Survey, 58 percent of Americans over the age of 65, 36 percent of those earning less than \$30,000 a year, and 33 percent of those living in rural areas do not own a smartphone.¹⁶

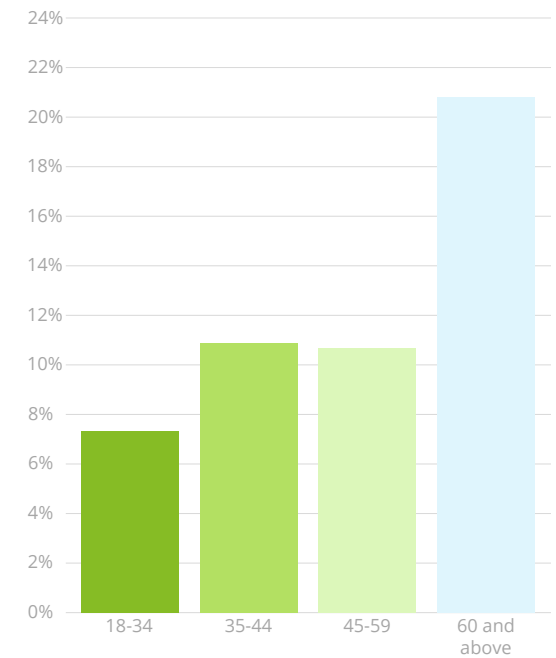
While not all of these consumers are interested in accessing a bioengineering disclosure, similar findings emerged in analysis of crowd responses. Respondents earning less than \$25,000 and those over the age of 60 were far more likely to mention a lack of effective scanning equipment as a challenge. Smartphones and mobile plans are costly, and even cheaper phones and plans can constitute major hurdles for low-income budgets. Older Americans, as well, are less likely to own smartphones, partly due to limited income and partly due to technological discomfort and inexperience.

Figure 5: Percentage of crowd respondents noting challenges accessing scanning tools, by annual household income



24% of respondents earning less than \$25,000 mentioned a challenge accessing scanning tools, compared to 8-10% of those with annual incomes greater than \$75,000

Figure 6: Percentage of crowd respondents noting challenges accessing scanning tools, by age



More than 20% of respondents over the age of 60 mentioned a lack of scanning equipment in their initial crowd comment



100%

of stores surveyed by the Food Marketing Institute reported having phone lines that store managers could use on behalf of a customer³

Consumers without phones are unlikely to find in-store scanners available

In field visits to 42 retailers across the country, not a single retail outlet had a scanner available for consumers to use to scan electronic or digital links. This included supercenters, grocery stores, specialty stores, general stores, and corner stores. While this may be a solution at one point in the future, few retail outlets are currently equipped to provide such devices for consumer use.

Landlines do not provide a viable means of accessing the bioengineering disclosure

At first glance, contacting a manufacturer via a phone number would seem to offer a helpful alternative for consumers who do not have access to a scanning device. In research conducted by the Food Marketing Institute, all stores reported having an accessible landline phone.³ However, as discovered in field research, there are certain problems that consumers face in trying to use landlines to access a bioengineered food disclosure.

First, landlines are not in place for consumer use. In visiting a regional chain in Appalachia, members of the research team asked a retailer to use a

landline to access disclosure on a food product. A manager at the store offered her personal phone to researchers to dial the number provided on the food product. While stores may technically have landlines in place, availability of the phone and convenience during the shopping experience is compromised.

Second, phone lines currently do not provide the same type of information or experience as electronic or digital disclosure. In attempting to access information by phone, researchers found phone lines that were only open during East Coast business hours; this presents a clear challenge for many consumers who shop and seek information in the evening or on weekends. In addition, those answering calls may not be equipped to provide information on the bioengineered status of food products.

In one attempt to seek a bioengineering disclosure through a landline, a researcher visiting a general store in rural Appalachia was directed to a telephone by a store employee. She called a phone number provided on the package and was asked to provide personal information including first and last name, a contact number, and an

email address. She waited over seven minutes on the line only to find that the person on the line worked for the retail chain and did not know if the product contained bioengineered ingredients. The researcher would need to follow up once the retailer heard back from the manufacturer. It took six weeks to receive a voice mail response, which came at 6am on a Saturday morning, saying that the product is “non-GMO.” Such an experience clearly illustrates the challenges inherent in attempting to obtain food information over the phone.

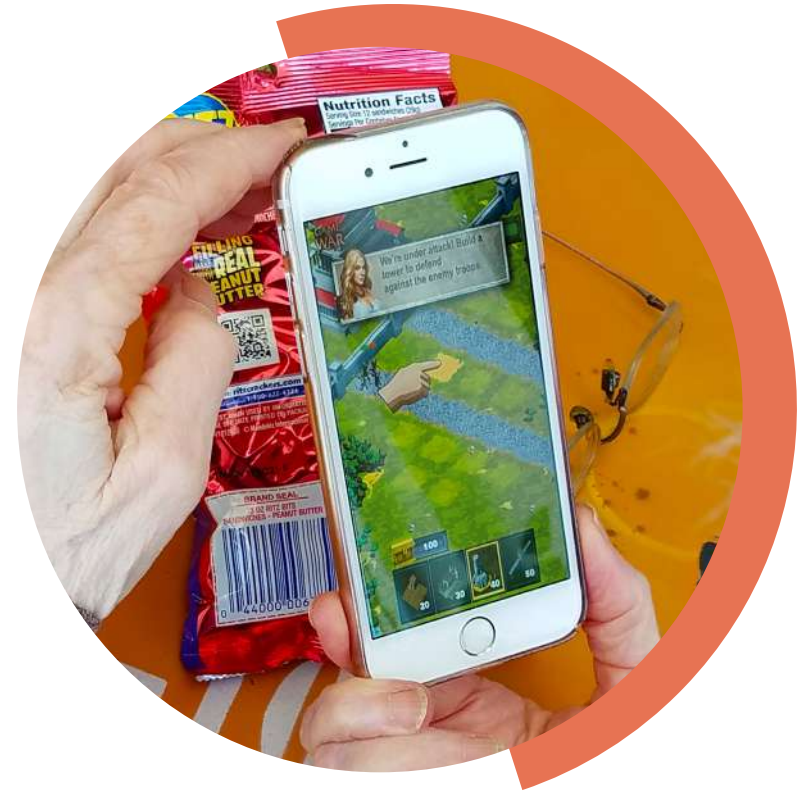
► **The availability of landline telephones in stores.** Landlines are universally available in store. However, they do not provide a viable means of accessing the digital disclosure due to limited availability of such phones for consumer use and restricted manufacturer call center hours.

CONFUSING OR MALFUNCTIONING APPS

There are hundreds of scanning apps available in the market, many of which are not intuitive to use, causing consumer confusion and difficulty opening link results

While newer smartphones promise to scan electronic links directly through a camera, most smartphones require the use of an app to scan. Some of these are user-friendly, but the plethora of available options offer inconsistent experiences. This presents the greatest obstacle to those who are the least tech-savvy, but even those with great comfort using technology — including young consumers — face problems in using apps.

Of particular concern, many apps include pop-up advertisements. These result in poor user experience and run counter to standards set forth for disclosure in the Law. App development is not managed for consistency, with apps designed for revenue generation instead of information access.



“”

Why do I have to go visit this or rate it right there?...I'm not here to like your page. I'm here to see what the contents are.

- Peter, referring to links that came up on his app when he scanned the QR code

Scanner apps vary in design and operation, with some more difficult to use than others

There are hundreds of apps available that allow consumers to scan or read digital links on a smartphone. The availability of these apps depend on type of smartphone and operating system that a consumer uses. The two smartphone market share leaders, Android™ and iOS™, have more than 200 and more than 300 mobile scanning apps, respectively. Windows® and BlackBerry® have more than 90 and more than 150 applications available, respectively.¹⁰⁻¹³

Each app operates slightly differently. Some contain instructions, while others rely on a greater amount of user knowledge. Some only scan digital links, while others include additional options like price comparison or health information. Some link directly to information, while others require that users click on a web link once the digital link is scanned.

While this variety may cater to diverse consumer desires, the sheer scale of options results in consumers being unable to determine which app is most appropriate for their needs. In conversations with consumers, even those who were comfortable navigating smartphone technology struggled to

download appropriate link readers. Only one consumer out of 40 observed had a phone with built-in scanning capability, so most consumers needed to have an app to scan.

Dane, a college student in a tribal region of the Southwest, was very comfortable using his smartphone. He had never scanned a QR code before, but was able to find an app that could scan the digital links. However, it took him several tries to figure out that he had to click on a web link rather than an advertisement to be redirected to the webpage linked in the QR code. After scanning a few different products, he expressed his frustration, noting, “You just can’t touch the advertisements.”

Hannah, a recent college graduate living in a city in the Midwest, did not have a scanning app on her smartphone. To find out which one she should use, she typed “how to scan label with smartphone” in a search engine. She downloaded a scanner fairly easily, but questioned the reliability of the app she was using as it lacked legitimacy in how it looked and felt to use. While she was interested in accessing the bioengineering disclosure, she was wary of doing so using a tool that she did not trust.

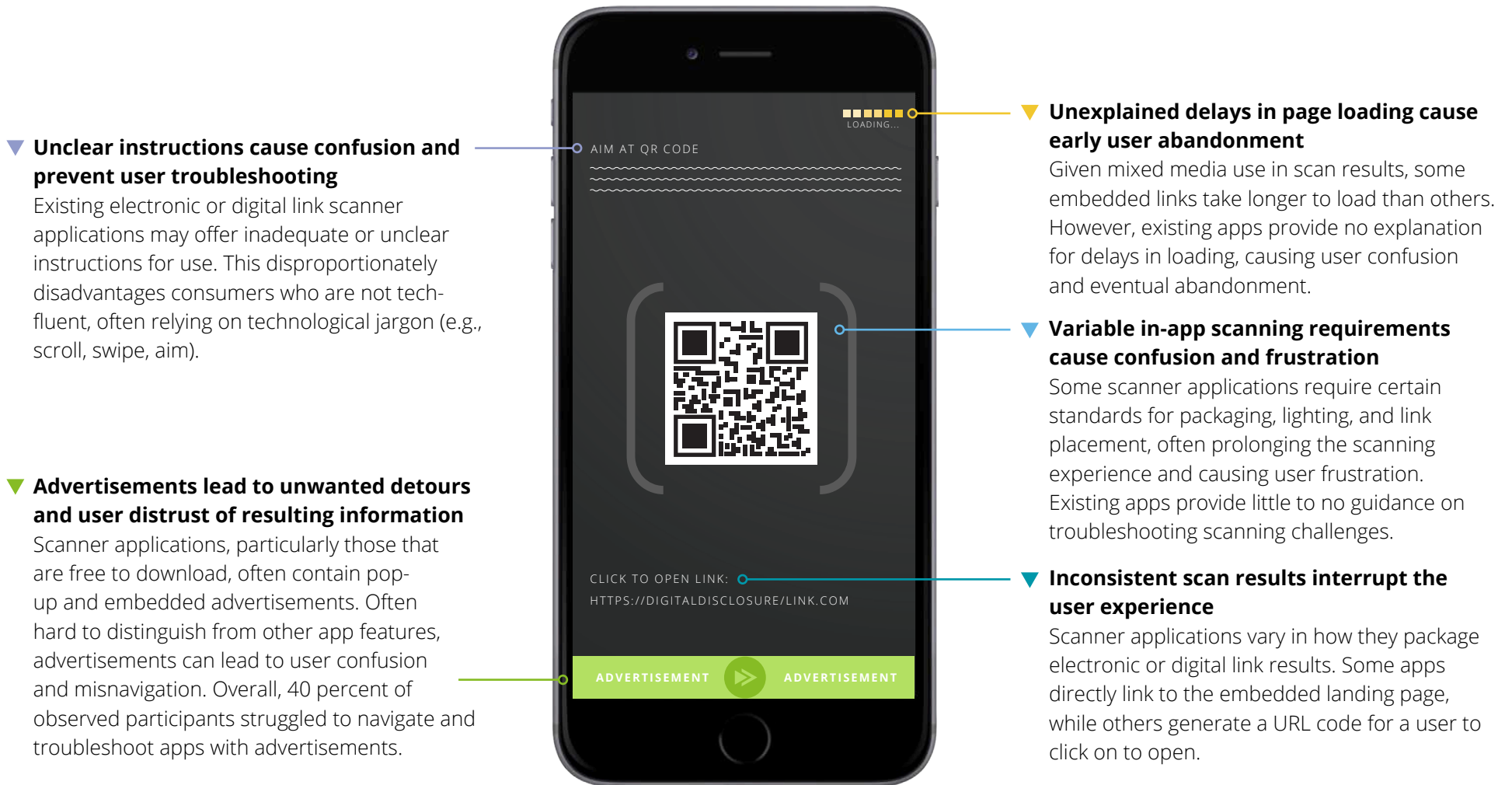
As technology constantly changes, consumers struggle to choose a single scanner app

As electronic and digital link technology evolves, readers will need to adapt to be compatible with new scan methods. This can already be seen today as barcode scanners are modernized to read QR codes as well, but will likely change as newer technologies — like digital watermarking or visual recognition — are integrated into food products.

Consumers discussed the challenges associated in trying to use multiple apps to scan, and determining which apps could be used across different types of scans. One crowd participant noted that she would prefer to use “one downloadable app that could read each and every single QR code, barcode and/or other electronic [link].” Another commented that she did not want to download an app for different brands, but would download one that “could be used for all food items.”

As different types of scans are integrated into the market, scanning may become simpler and more streamlined for consumers. Yet it could also become increasingly challenging for consumers to navigate the phones and apps needed to read electronic and digital links.

Figure 7: A variety of design issues with apps challenge consumers who seek to access bioengineering disclosure through digital links





Pop-up advertisements confuse consumers and run counter to the intent of the Law

The vast majority of scanner applications are free to download — between 98 and 99 percent.¹⁰⁻¹³ Yet these apps are generally not designed for information access; they are designed for revenue generation. As such, they are incentivized to include advertisements so as to garner profit.

Built in to the structure of most apps, pop-up advertisements confuse and distract consumers. Many consumers are frustrated with the redirect and do not know how to navigate to the information they were originally seeking, at times testing patience and causing consumers to give up.

These advertisements are particularly troublesome for those less familiar navigating smartphone technology. Marjorie, a rural resident who did not

own a smartphone of her own, used researchers' phones to scan. She did not understand why an advertisement for a game came up on the screen after she scanned. She was not able to close out of this window to find the voluntary bioengineering disclosure on her own.

The use of marketing and promotional information runs counter to standards set forth in the Law. According to the Law, electronic and digital disclosure links must provide access to the bioengineering disclosure without marketing or promotional information. The challenge is that app developers and food manufacturers do not have the same incentives or deterrents, yet both need to operate together. As such, USDA will need to consider how to address the hundreds of apps currently in the market that operate counter to the intent of the Law.

According to the Law, USDA must ensure that an electronic or digital link disclosure “provide access to the bioengineering disclosure located, in a consistent and conspicuous manner, on the first product information page that appears... **which shall exclude marketing and promotional information.**”

LOW BROADBAND ACCESS

Consumers may be unable to connect to broadband, or connect at a speed that is so slow that they cannot load information

Across the US, 6.4 percent of consumers have inadequate broadband access to load a basic digital link — particularly, though not exclusively, in rural locations. Compared to FCC standards, 39 percent of rural Americans and 41 percent of Americans living on tribal lands lack access to advanced broadband service.^{18,28}

Food retailers are increasing the availability of free WiFi offered in store, but there are still limitations to how consumers can use those networks. This is especially significant for consumers who have limited data usage on their mobile plans. While data service may technically be available in an area, this group often cannot afford to access the Internet outside of WiFi networks, indicating that alternative means of access will be required in certain areas.



“““

Now the cellular coverage up here is tough. Sometimes depending on where you are you may not get any reception whatsoever.

- Norm, referring to challenges accessing data service in rural Appalachia

Broadband access is not universal, particularly in rural regions of the US

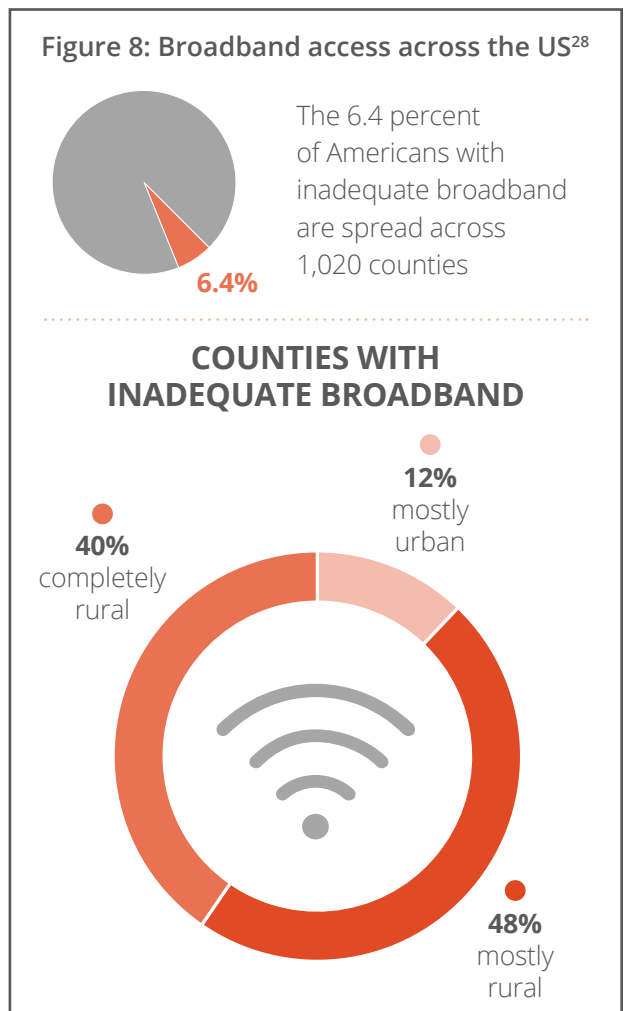
According to the FCC, 34 million Americans (10 percent of the population) lack access to advanced broadband service. This is particularly true in rural and tribal areas, with 23 million Americans living in rural areas (39 percent) and 1.6 million living on tribal lands (41 percent) lacking access to advanced broadband.¹⁸ The Secretary of Agriculture promotes expansion of broadband networks in rural areas as part of infrastructural improvements and technological innovation in rural America. He stated, “We think we ought to have the same push to have broadband connectivity all over the country because in the 21st century it is just as important as a telephone, water, sewer, roads.”³⁷

The FCC’s advanced broadband standard is based on a threshold of 25 Mbps download speed, with the expectation that, at such speeds, consumers are able to access high-quality broadband service across multiple devices. Yet gaps remain even when adjusting for the more modest service likely needed to download information available through a digital scan. This study focuses on a threshold of only 10 Mbps download speed, as a digital link for a single webpage requires a lower speed to access

information. Based on the 10 Mbps standard, this study finds that 20.5 million people (6.4 percent of the US population) have inadequate broadband to load a basic electronic or digital link.²⁸

Similar to FCC reports on access to advanced broadband service, this study found that rural Americans are more likely to experience challenges accessing broadband at levels needed to load a bioengineering disclosure webpage. Of the 1,020 counties with inadequate broadband, 88 percent are mostly or completely rural. This represents 15.8 million rural Americans, or 38 percent of the rural population.²⁸

Moreover, while broadband may technically be available in a specific location, individual access is often dependent on provider. In attempting to access disclosure webpages in locations across the US, load times — and even data access itself — were often notably different when connecting through different providers. Standing side by side, one individual may be able to easily scan a disclosure link, whereas another may scan without successfully accessing information.



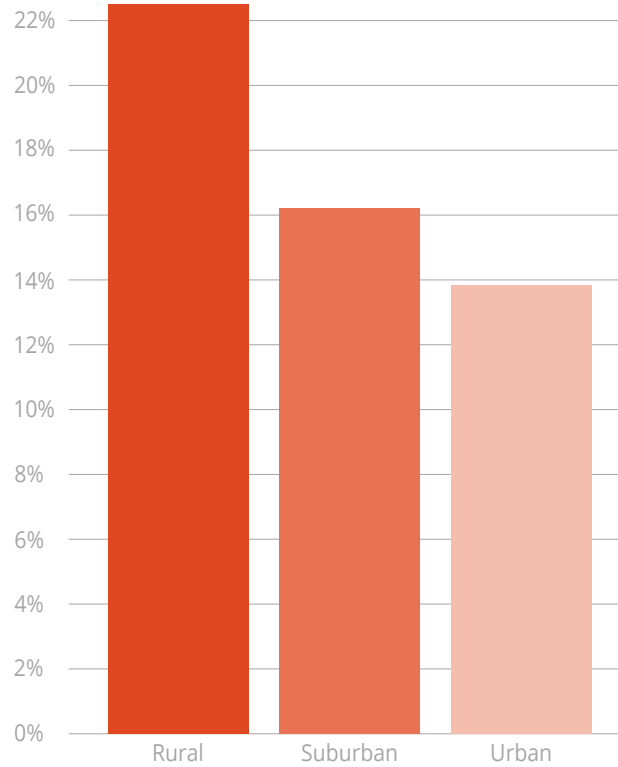
Rural and low-income respondents were most likely to note broadband availability as a challenge in accessing digital disclosure

Access to data or WiFi networks was the most commonly cited challenge among crowd respondents, with 16 percent of participants noting limited broadband in their initial comments. This included those who lacked access to adequate data or WiFi networks, had problems with slow connections, or mentioned limited data usage available on phones.

Rural respondents were most likely to comment on low broadband access, with 22 percent of those living in rural areas mentioning this as a challenge. As seen in Figure 8, access to broadband is particularly difficult in rural areas, echoing FCC findings.

Field research mirrored these findings. In open-ended conversations, many participants mentioned the need for quality broadband to scan, but those living in rural areas were more vocal about broadband challenges. In these locations, consumers could cite which carriers provided reliable service in the county, and which grocery stores were in the middle of broadband 'dead zones.'

Figure 8: Percentage of crowd respondents noting challenges accessing broadband, by geography



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22% of rural respondents commented on broadband access as a challenge in accessing information via an electronic or digital link

Though rural residents were more likely to note challenges accessing reliable broadband networks, urban and suburban consumers also shared this concern, with 16 percent and 14 percent mentioning this in their crowd responses, respectively. Indeed, according to the FCC, 4 percent of urban residents in the United States lack access to advanced broadband service.¹⁸

In addition, many of these comments reflect the diversity of issues surrounding the availability of broadband, including the lack of store WiFi, slow connection speeds, and limited data usage on phone. All of these contribute to consumer challenges in accessing disclosure through electronic or digital methods.

Scott, a Veteran living in a city in the Midwest, explained that his data service is always turned off to avoid going over on his limited monthly data plan. He looks for free WiFi wherever he goes, and generally links to store networks when they are available. Without store WiFi, Scott would not be able to connect to the digital disclosure webpage.

“

My grocery store is in a dead zone where I have no cell phone reception and the store WiFi is slow. If I had to access the Internet for information about the food, it would likely take me three hours to do my grocery shopping.

– Crowd participant, commenting on difficulties accessing broadband in store

When access is slow, consumers assume that digital links do not work

A lack of data or WiFi service will prohibit access to a digital scan, but slow load times may confuse consumers who do not understand why a page remains blank. This may be particularly problematic with complex webpages that contain more content to load, such as videos or graphics.

In observations, when pages were slow to load, consumers often assumed that they made a mistake in scanning. After 55 seconds of trying to scan and waiting for the page to load, Jonni, a young woman in a tribal region in the Southwest, asked if she should make another attempt. After waiting 30 seconds on her second try, she gave up, thinking that the link was not working.

Figure 9: Sample of retailers and associated broadband access

| Retailer | WiFi Access | Data Access (1-5 bars) | Scan Time |
|--|-------------|------------------------|--|
| National Discount Chain Appalachia | ✗ | | 30 seconds (data) |
| General Store Appalachia | ✗ | | 25 seconds (data) |
| Regional Chain Midwestern City | ✓ | | 2 seconds (data) |
| Supercenter Store Tribal Southwest | ✓ | | 2-5 minutes (WiFi) 7 seconds (data) |
| Regional Chain Rural Vermont | ✗ | | 12 seconds (data) |
| General Store Rural Vermont | ✗ | | 2 seconds (data) |

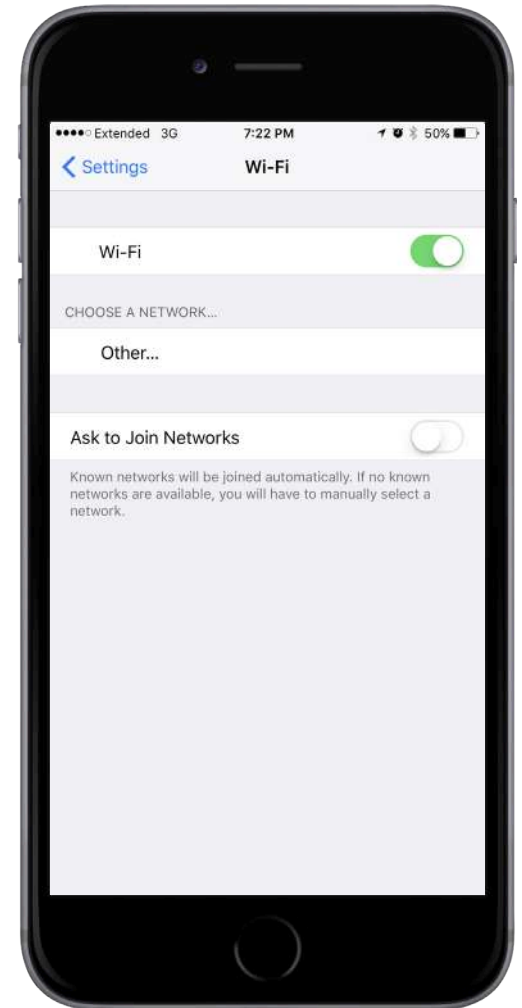
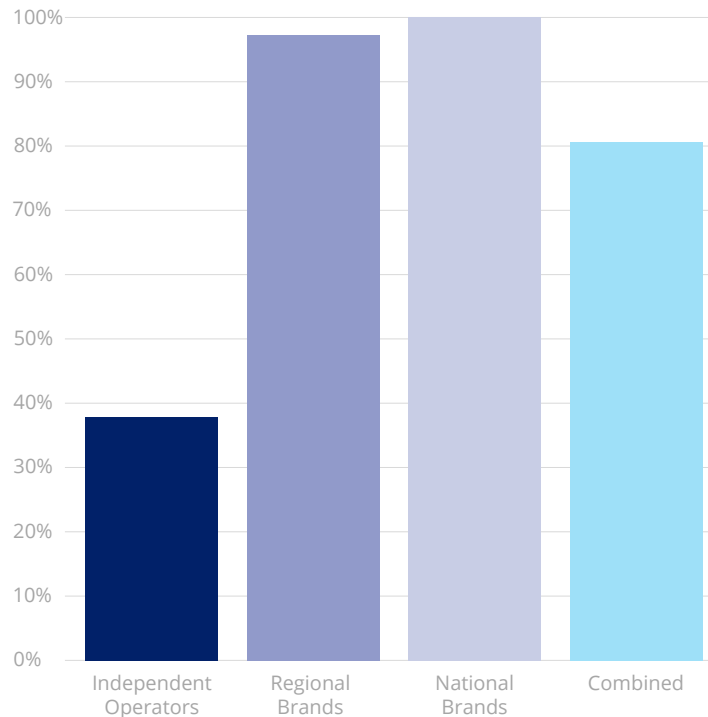
Food retail outlets across the country report strong and growing coverage of WiFi networks in store

The Food Marketing Institute represents nearly 40,000 retail food stores across the country, including single owner grocery stores, large multi-store supermarket chains, and mixed retail stores.³⁸

Based on a representative sample of its members, the Food Marketing Institute found that there is strong coverage of WiFi networks in stores across the country. Over 80 percent report some level of coverage in store. Regional and national chains report close to 100 percent WiFi coverage, with access provided in at least some sections of the store. Independent operators (i.e., wholesalers with independently owned stores) reported far less WiFi coverage (37 percent).³ As consumers increasingly demand access to WiFi networks, many stores are investing in this infrastructure to provide increased coverage in the coming years and stay competitive in the market.

► **The availability of wireless Internet or cellular networks.** Increasing availability of broadband networks will expand access, particularly, although not exclusively, in rural regions of the country.

Figure 10: Percentage of stores with WiFi access in store, by type of food retailer



Researchers took a screenshot of a phone in a regional brand store that had no WiFi available. The only data service available was through an extended network.

Despite strong coverage, in-store WiFi may be limited for consumers

Retailer initiatives to increase the availability of WiFi networks will improve access for consumers who seek to scan electronic or digital links. However, while many stores have complete WiFi coverage, there are still limitations to how consumers can use those networks.

First, many retailers place limits on the amount of time that consumers are able to use store WiFi. In conducting field research at stores across the country, researchers found 15 retailers that advertised available WiFi. However, most only provided access for a limited period of time, sometimes as low as 30 minutes. The average time spent grocery shopping is 43 minutes.³⁹ If consumers were to stop and scan digital links, that time would likely increase and may come up against WiFi time limits.

Second, connection speeds may be so slow that consumers assume the signal is not working. For example, in a supercenter with free WiFi advertised around the store, it took 90 seconds to connect to a webpage after scanning a product, far beyond the two second wait time that most consumers expect when loading a webpage.

Third, access is often variable throughout the store. Indeed, network strength and availability may change from aisle to aisle. In visiting retailers, signal strength was generally best towards the front of the store and weakest towards the back.

Small and rural retailers often lack access to WiFi in store

In contrast to regional and national chains, independently owned stores have lower rates of WiFi availability, with only

37 percent reporting coverage.³ This is likely due to high capital costs associated with this infrastructural investment.

Such challenges were readily apparent in field research in rural and tribal regions. In a rural Appalachian town, none of the local retailers — including independent, regional, and national chain stores — offered WiFi available for public use. While visiting a regional grocery chain in the tribal Southwest, researchers were informed that access to WiFi was only available at the fast food restaurant across the street. The closest grocery store with WiFi was a supercenter located a half hour away.



▼ CONTRIBUTING FACTORS

Supplementary factors may challenge consumers who are low-tech or do not fully understand the complexity of bioengineered food disclosures

Throughout the consumer journey, there are a number of contributing factors that may inhibit adoption of or engagement with digital disclosure, but do not directly impact consumer access. First, consumers may recognize digital links but lack familiarity with scanning. Second, scanning is not intuitive for consumers who lack technical knowledge on how to download and use scanner apps. Third, the language used in current voluntary bioengineering disclosures is unclear and inconsistent across products, resulting in misunderstanding among interested consumers.

Tech-savvy consumers may be able to overcome a contributing factor on their own, whereas technological challenges may prevent consumers from being able to access the desired information. However, consumers who have the least comfort using technology will struggle with these factors, as they involve a familiarity with the tools and skills needed to scan.



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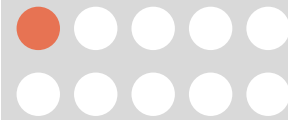
So, what do I do? Click it like I'm clicking a photo?...See to me this is hard. Because it's hard to get a good angle on it...I can't get it. I can't get it! What am I doing wrong?

– Amy, struggling to scan a digital link

Contributing factors impact a variety of consumers, but particularly groups less likely to have smartphones

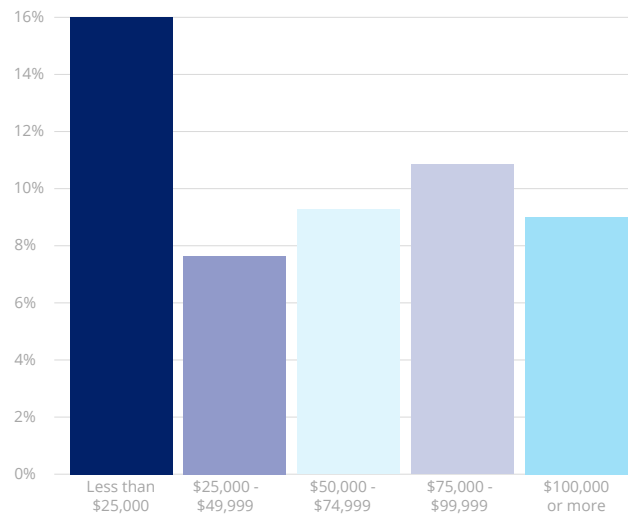
Technological challenges have a disproportionate impact on certain consumer groups. Namely, of those who are interested in accessing the bioengineering disclosure, low-income populations, rural residents, and consumers over the age of 60 are more likely to lack the tools and broadband services needed to effectively access an electronic or digital link.

Contributing factors, too, are more likely to impact specific groups, including low-income participants and those above the age of 60 — the same groups that are less likely to have access to devices needed to scan. Looking at consumer responses in the crowd, these two populations were more likely to comment on a lack of familiarity with scanning, limited technical knowledge in downloading or using apps or scanning technology, and confusion with labeling information.



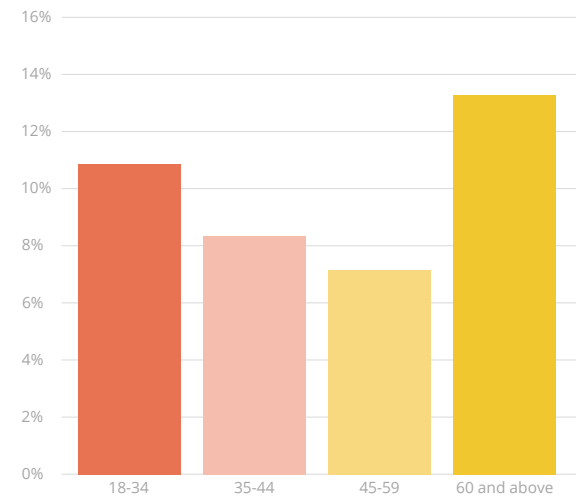
10% of crowd participants commented on a contributing factor

Figure 11: Percentage of crowd respondents noting contributing factors, by income



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Low-income respondents were more likely to name contributing factors as potential barriers to access than higher-income earners

Figure 12: Percentage of crowd respondents noting contributing factors, by age



.....
Respondents over the age of 60 were more likely to name contributing factors as potential barriers to access than younger participants



I'm not very good at figuring out how scanning QR codes works. I consider myself pretty tech-savvy, but I still don't know if you need an app to read them.

- Crowd participant, noting a lack of understanding in scanning digital links

Many consumers are unfamiliar scanning electronic or digital links

Most consumers observed in this study had never scanned an electronic or digital link before and did not know what they were supposed to do to get the information from a digital link. Secondary studies find this pattern repeated more broadly across the American population. A survey conducted by the Annenberg Public Policy Center in July of 2016 found that 85 percent of Americans had not used barcodes or QR codes to find information about a product's ingredients or nutrition information in the prior year.³⁶ For most consumers, scanning electronic or digital links is a new practice.

In practice, this meant that a diverse group of consumers had questions around scanning. Some turned to a search engine for answers that were

not always right. Can I use my phone or do I need an app to scan? How closely should I hold the camera? Where should I click to access the link? Scanning electronic or digital links is new for most consumers. Many will likely learn to use electronic or digital links on their own; others may not.

Some consumers lack the technical knowledge needed to download or use an app or scanning technology

While many consumers who are unfamiliar with scanning will be able to troubleshoot issues and successfully scan on their own, those who are not comfortable using smartphone technology may struggle in two key ways: downloading an app and using the app or scanning technology.

First, a number of consumers were unable to download a scanner app on their own. In one

observation, Erica, a young mother living in a city in the Midwest, did not know what a QR code was called. She decided to turn to a web search to figure out which app to choose on her own. Her results led her to try to download a Fitbit application — a tool which is designed to track health activity, not to scan QR codes. A lack of guidance on which app she should use to scan led her to an app that didn't let her scan at all.

Second, some consumers lack the technical abilities to scan electronic or digital links on their own. Barbara, a longtime resident of a rural Appalachian area, only owned a flip phone and had never scanned a QR code before. When she was given a smartphone to scan a QR code, she held the food product over the phone screen rather than directing the camera at the product, similar to how one might scan a barcode at a store checkout.

Living in a city in the Midwest, Shirley also did not own a smartphone of her own. Just like Barbara, she initially held the food product over the phone screen instead of directing the camera at the QR code. Realizing that the product wasn't scanning, she paused and read the instructions on the screen: "Aim at QR code." She again tried to scan using the same technique, before researchers assisted her.

With appropriate instruction, both Barbara and Shirley were able to scan successfully. Yet without direct assistance, they were not able to access the bioengineering disclosure available through the digital link.

Voluntary language currently used in bioengineering disclosures is not always understood by consumers

The issue of bioengineered foods is complex, with terms like genetically modified organisms (GMOs), genetically engineered (GE), and bioengineered communicating distinct ideas but often used interchangeably. For example, many of the items currently containing a bioengineering disclosure include the following text: "This product includes ingredients sourced from Genetically Engineered

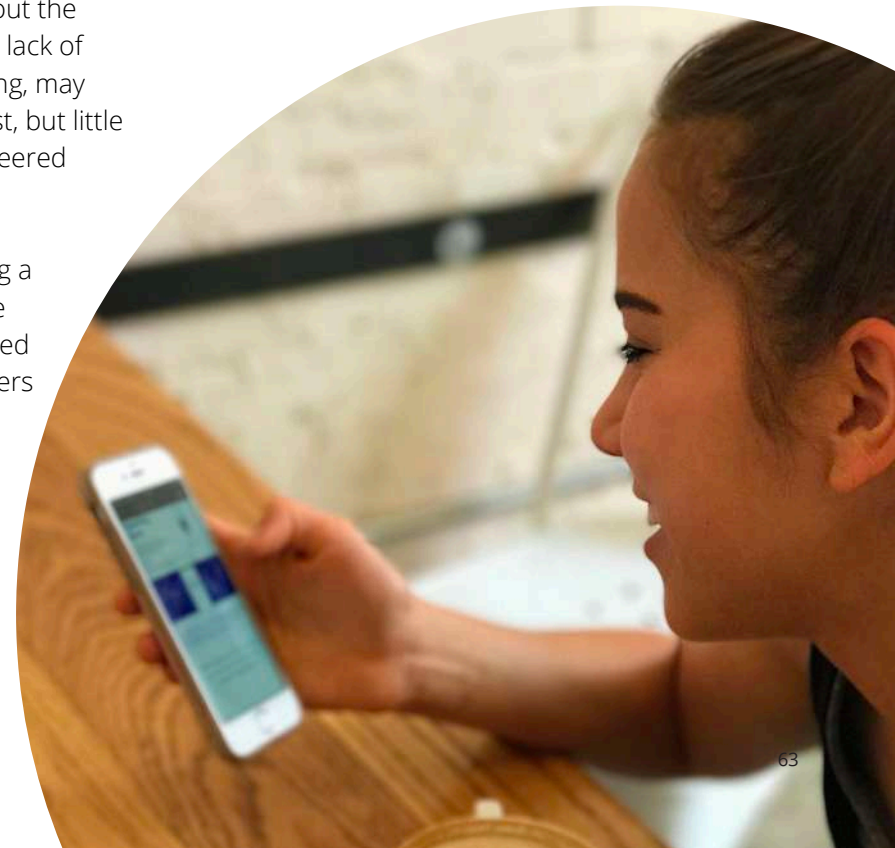
(GE) crops, commonly known as GMOs." However, genetic engineering and genetic modification are considered by some to refer to distinct processes.

The use of multiple terms is compounded by a general lack of knowledge around the issue of bioengineered foods. A study conducted by the Pew Research Center in December 2016 found that many Americans have limited familiarity with the issue of genetically modified foods, and 71 percent have heard little to nothing about the issue.¹ The use of multiple terms, and a lack of clarity over what they are communicating, may further confuse consumers with interest, but little understanding, in the issue of bioengineered foods.

Many of the considerations surrounding a lack of clarity in or understanding of the bioengineering disclosure will be resolved as the law is implemented and consumers learn more about bioengineered foods. Yet consumers currently face bioengineering disclosures that are challenging to understand.

For example, Rich is passionate about

the food he eats and regularly calls manufacturers to try to obtain product information that is not readily available on label. He cares about accessing information on the bioengineered status of his food, but was confused by the material presented to him in the bioengineering disclosure. He noted, "Do it in human language...consumer language, not things relating to chemical engineering or biology, or things of that nature. Pick simple words to use for the consumer that would be important."





Looking Ahead: Implementing the Law

In implementing the National Bioengineered Food Disclosure Standard, government and interested groups can take meaningful steps to improve information access for consumers facing potential technological challenges.

IN THIS SECTION

- A. Investing in Retailer Infrastructure: A Cost-Benefit Analysis
- B. Additional Implementation Considerations

Key Takeaways

- ✓ In order for the Law to have intended outcomes for interested consumers, USDA and interested groups should address technological challenges and contributing factors
- ✓ Scanners require the installation of WiFi networks in store, which may be cost prohibitive for small retailers
- ✓ Installing in-store scanners provides limited benefit to retailers due to limited consumer understanding and rapidly changing technology
- ✓ Without an educational campaign, the law may result in increased cost to retailers and manufacturers without providing additional benefit for consumers
- ✓ Offline alternatives are necessary for consumers who lack access to a scanning device or broadband
- ✓ USDA should consider developing or endorsing user-friendly scanner apps to enable consumers to access information and implement the Law as intended

Retailer investments can increase access to digital disclosures, but may prove cost prohibitive for small and rural retailers

There are two options for installing scanning technology, each with associated costs

The first and simpler means of scanning electronic or digital links in store is through a smartphone or hand-held scanning device. This phone or device must have a built-in screen and be capable of accessing the Internet. Such devices can cost as little as \$30, and the necessary applications can be downloaded free of charge.⁴⁰ Professional hand-held QR scanning devices are often more expensive, starting at \$1,000.⁴¹

The other option is a handy scanner connected to a tablet or monitor via Bluetooth or USB. The scanner reads the electronic or digital code and sends that information to the monitor or tablet which displays the disclosure on the screen. Handy scanners are often found in retailers. Newer versions are capable of scanning both traditional barcodes and QR codes, and can cost as little as \$40.⁴² Additional software may be required but is often available free of charge. Tablets and monitors vary in cost, with monitors starting at \$100 and tablets at \$80.^{43,44}

Electronic and digital links other than QR codes are beginning to be used more broadly

One emerging scanning technology is digital

watermarking, a technique owned and developed by Digimarc™. Similar to QR codes, apps available on smartphones and similar devices enable users to scan digital watermarks. However, most handy scanners are not yet capable of scanning digital watermarks. Some have begun to integrate the capability into existing scanners, but these scanners are often much more expensive, with some starting around \$250 per scanner.⁴⁵

Other technologies, such as Near Field Communication and visual recognition, are limited to apps on smartphones or similar devices. While these may be used by manufacturers in the future, existing scanners do not yet have the capability to read these types of electronic or digital links.

A parallel example to the implementation of in-store scanners can be seen in the transition of debit/credit card systems to chip readers. Only 39 percent of retailers have adapted to chip technology, while 49 percent have plans in place to upgrade. A major reason many retailers have been slow to transition is a lack of implementation strategy.⁴⁶

\$30

Starting cost of a smartphone capable of downloading applications that can scan most electronic or digital links⁴⁰

\$120

Starting cost estimate for a handy scanner with QR capabilities and tablet/monitor combination^{42,44}

\$250

Starting cost estimate for a handy scanner with digital watermarking capabilities⁴⁵

\$10,050

Cost of one year of WiFi, including installation fees, for 0 to 5,000 square feet of coverage⁴⁷

Digital disclosure requires access to the Internet

Electronic and digital disclosure methods not only require a scanning tool, but access to a reliable wireless network. This is the primary cost for retailers seeking to improve consumer access to digital disclosure. Many retailers have already integrated WiFi in their storefronts or have plans to install networks in the near future. However, small, independent, and rural retailers are less likely to have WiFi installed due to the high capital costs and limited economies of scale.

Retailers can either provide WiFi access for the entire store or can create a designated scanning area

Providing WiFi is a significant expense for retail stores. One year of WiFi in a retail store could cost \$10,050 to cover 0 to 5,000 square feet of space.⁴⁷ To improve the quality of service, retailers could pay for extended coverage, with costs increasing in relation to a store's size, as seen in Figure 13. Supercenters are the only exception, as their large size results in them paying less for coverage per square foot.⁴⁷ Thus, smaller

stores would bear a disproportionate cost. Furthermore, costs are highly dependent on the number of concurrent users in addition to the square footage of the coverage.

Top providers also mentioned that broadband service is not always available in all locations.⁴⁸⁻⁵² While providers did not specify exact locations where service was not available, the national broadband heat map indicates that rural areas are most limited in the availability of these services.

Retailers see little return on investments when installing WiFi

While installing WiFi networks increases access for consumers, retailers see little return on this costly investment. Food retailers experience only a 5.8 percent increase in earnings before interest, taxes, and amortization compared to other retailers or restaurants, who see a 32.1 percent increase.²⁷ These limited benefits are especially challenging for small and rural retailers, and may be overly costly given their limited ability to gain economies of scale.

Figure 13: Average WiFi costs for complete store coverage, by cost per year⁴⁷



▶ **The costs and benefits of installing in retail stores electronic or digital link scanners or other evolving technology that provide bioengineering disclosure information.** While scanners are modest in cost, they must link to WiFi, requiring installation of networks in stores where they do not currently exist. This may prove cost prohibitive, particularly for small and rural retailers. In addition, there are limited benefits due to limited consumer knowledge around digital disclosure.

Thoughtful action can improve access for consumers facing technological challenges

Educating consumers on digital disclosure can improve access

Many consumers simply do not know that food information is available through electronic or digital disclosure methods. Effective education campaigns can help inform consumers on how to access and understand information available through such methods. These could include the use of community resources such as local radio stations or community centers, social media networks, and publications targeted at specific demographics.

Several study participants noted that Facebook® community groups are an essential means of communication and information sharing, especially in rural and tribal areas where smaller, tight-knit communities are more prevalent and homes are spread out. In addition, partnerships at the local level may be an effective way to educate consumers using community networks. A public servant working

in a tribal region noted that fostering relationships between youths and elders was an effective means of sharing lessons on technology use in the community.

Educating retailers on digital disclosure can improve access

Many of the same approaches to educate consumers on the use of electronic or digital links can be harnessed to educate retailers on the same issue. An additional means of reaching food retail employees could be through industry partners, which provide especially effective channels of sharing knowledge. For example, the Food Marketing Institute could work with its network of retail stores to inform employees on the types of information available through electronic or digital links and how to access this. As a result, retailers would be better equipped to help consumers access this information.

Educating the American public can improve understanding of bioengineered food

Most Americans have limited familiarity with the issue of bioengineered or GMO food. Educational campaigns could work to expand understanding on the issue for the public, at large, building on many of the same methods used to educate them on digital disclosure more generally.

A digital link itself could be used for such a purpose. Such a method of disclosure allows for much more information to be shared than is possible on a traditional food label, and thus provides an excellent opportunity for consumer education regarding what it means for a food to be bioengineered. Moreover, digital links could increase access to food information due to the increased flexibility of such methods of disclosure.



For example, if disclosure webpages were to incorporate a translation function, information could be more easily understandable for consumers who are not comfortable reading English. As a result, these methods present an opportunity to make information on bioengineered foods more accessible and understandable for a diverse array of consumers.

Offline options can increase access for consumers who lack smartphones or broadband access

In seeking to provide greater access for populations who lack smartphones or broadband, on-package identification could link consumers to data that is available offline. As the Law already requires that the electronic disclosure is accompanied by a telephone number, this could be an especially effective means of expanding access to the bioengineering disclosure. Consumers could use this number through landlines and/or non-smartphone cellphones as a means of obtaining information on the bioengineered status of their food.

There are two primary ways in which this might be achieved. First, a landline-enabled bioengineering disclosure could allow consumers to call into a

phone number with a code that provides them 24-hour disclosure information via an automated recording. (This would account for the fact that many customer service centers are open only during business hours, when many consumers are not shopping for food.)

Alternatively, packages could include a text message alternative for consumers who have access to a mobile phone. Such an approach is seen in cities across the US, where public transit riders can use their phones to request estimated arrival times of buses or subways when traveling. Often subway stations have displays that list estimated arrival times, but most bus stops do not list these directly. However, many municipalities provide arrival times through an SMS text system, allowing those without smartphones access to estimated bus arrival times. Riders locate a bus stop code number on their bus stop sign and text the code to a designated number. Within moments, they received estimated arrival times for the bus stop. A similar approach could be taken with food products, where consumers could text a code to a phone number provided on package and receive the bioengineering disclosure via SMS text.

Developing or endorsing user-friendly scanner apps can ease the consumer experience

Consumers face significantly different experiences when using different apps to scan digital links. Endorsement or development of user-friendly apps can help to make sure that consumers are able to access bioengineering disclosure information clearly and correctly.

Creating standards for apps, or endorsing apps that meet a certain set of standards, would help to link consumers appropriately to information available in electronic or digital disclosures. In an example of government and private industry partnership, the IRS endorses third party filing software — including the apps they provide for tax-filers — to help taxpayers e-file safely and appropriately. These standards could help provide a more consistent consumer experience. Examples include requiring that scanner apps have clear instructions for scanning, no advertisements, and are free to download.

Alternatively, USDA could develop a scanner app that meets standards set forth in the Law.



““

A lot of the things could be really beneficial if we take the time to find out about them and I think the information is out there, it's just taking the time to look it up... but that's so overwhelming because there are so many sites and there's a lot of verbiage and some things are hard to translate.

- Cindy, speaking about her desire to access food information

Conclusion

Consumers are navigating a new world of digital engagement. The use of electronic and digital links presents novel opportunities and challenges for consumers seeking to access information on their food purchases. While there are some notable challenges, most consumers would be able to access this information given the proper education and tools to do so.

An ever-changing technological landscape makes it difficult for consumers to recognize the proper means of accessing information. Interested consumers must understand the ways in which information is available to them, especially when that information becomes available through new methods. In working to implement the National Bioengineered Disclosure Standard, USDA and interested groups can work together to make the bioengineering disclosure properly accessible to the American public.

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