

OBJECT LESSONS



# barcode

JORDAN FRITH

B L O O M S B U R Y

# Barcode

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# 1 THE LITTLE BLACK LINES THAT CHANGED THE WORLD

When I was sixteen years old, a friend of mine showed up to high school with a tattoo of a barcode on the back of her neck. I thought it was one of the coolest things I'd ever seen, and I asked her why she got a barcode tattoo. She responded vaguely with something about how we're all cogs in a capitalist machine, and my friends and I nodded in admiration. In a more romantic version of that story, I would tell you that was the moment I became interested in barcodes. But that's not this story. Instead, she put her long, blonde hair back down to cover her tattoo, I headed to class, and then I didn't spend more than a few seconds thinking about barcodes for almost twenty years. I interacted with barcodes countless times. I scanned groceries at self-checkouts and watched delivery people scan barcodes when they delivered packages. I used

barcodes on tickets to board flights and to get into a bunch of indie-rock shows. Despite—or maybe because of—the fact that they were everywhere, I barely noticed barcodes. They were a part of the world I took almost completely for granted. It felt like they had always been everywhere, and to quote the popular podcaster Roman Mars, “It’s hard to imagine now, a world without barcodes.”<sup>1</sup>

The reality, of course, is that barcodes have not always existed. Some people reading this book may remember a time before most things they bought had a barcode. But for someone my age—I fall in the dreaded “geriatric millennial” category—it’s difficult to remember a time before barcodes were key to everything from shopping to sending mail to getting into events. Until I started researching identification infrastructures a few years ago while writing a book about Radio Frequency Identification (RFID), I had never considered what a grocery store was like or how a supply chain was managed before almost everything had a barcode.<sup>2</sup> In other words, barcodes are a classic example of what happens when an infrastructural object becomes immensely successful: we stop thinking about it; it fades into the background. The learned invisibility and mundanity of the barcode is the ultimate symbol of its success.

Few technologies have been more successful. Barcodes were first patented in 1952, but the most recognizable barcode symbol—the IBM symbol used for the Universal Product Code (UPC) and International Article Number (EAN)—was not invented until the 1970s. Rather remarkably, that

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same barcode symbol remains almost completely unchanged as it now approaches its 50<sup>th</sup> birthday. Many of the major companies that helped develop the most significant barcode standards no longer exist, but those standards are still going strong. Essentially the same objects that transmitted data to early computers in the 1970s are now transmitting identification data stored in gigantic data centers. Some barcode technologies have changed, and some newer data standards for different types of barcodes have been developed. Nonetheless, the most iconic type of barcode that was used in the 1970s is still used today. There's something almost poetic about an infrastructural object remaining a steadfast constant as the systems it connects to became almost unrecognizable.

At almost fifty years-old, barcodes remain one of the world's most important data infrastructures. More than six billion barcodes are scanned every day, and there are few signs that number will decrease any time soon.<sup>3</sup> Of course, just because barcodes are everywhere doesn't automatically mean they're interesting. Pencils are everywhere, but not many people are writing books about pencils (though that might be a great book!). So why barcodes? Why write an entire book about objects that are basically just patterns of lines and spaces? The primary answer is because barcodes are one of the most important technologies of the last half century, and yet they are mostly ignored. As sociologist Nigel Thrift detailed in his cataloguing of transformative identification processes in the 20<sup>th</sup> century,



“The first of these is the humble barcode. The barcode is a crucial element in the history of the new way of the world, one which remains largely untold.”<sup>4</sup> Barcodes played a significant role in everything from the rapid expansion of the global economy to the growth of logistics to the transformation of physical retail spaces. Decades before people started hyping “big data revolutions,” barcodes were contributing to a data revolution of their own.<sup>5</sup> Just in the grocery industry, barcode adoption led to increased efficiency and inventory accuracy that enabled stores to stock more types of products and adjust inventory based on analyses of buying behavior.<sup>6</sup> Additionally, barcodes “transformed market research” by providing concrete data about consumer practices.<sup>7</sup> They even transformed physical spaces, and analysts have linked the growth of larger retail spaces to barcode adoption.<sup>8</sup>

While chapter 2 examines the early roots of barcodes in retail, their impact extended far beyond consumer spaces. Barcodes have long played an essential role in global supply chains and made it possible to track products at an unprecedented scale. By the early 1980s, the defense and automotive industries adopted barcodes to manage supply chains, and many other industries followed soon after. By 2004, 90% of all Fortune 500 companies used barcodes in some aspect of their business.<sup>9</sup> To return to the earlier quote from Nigel Thrift, the sheer scale of the contemporary global economy would be difficult to imagine if barcodes did not exist—the identification data they produce is a

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key enabler of global markets that require a huge amount of information to manage complex logistics. As MIT professor Sanjay Sharma argued, “If barcodes hadn’t been invented the entire layout and architecture of commerce would have been different. The impacts are very difficult to overestimate.”<sup>10</sup> Yet despite the crucial role barcodes have played in the contemporary way of the world, their story remains mostly untold.

The other reason I want to tell the story of the barcode is that it’s a far more interesting story than most people might imagine. The success of barcodes was far from inevitable, and their future was in serious doubt at a few moments of juncture. In an article that belongs in the pantheon of “this did not age well,” *Business Week* declared in 1976 that the barcode was a failure just two years after it was adopted in the grocery industry.<sup>11</sup> The barcode’s story is filled with twists and turns, consumer protests, and labor battles about automation. Barcodes even became a symbol of the possible apocalypse in some evangelical Christian communities and managed to play a significant role in the 1992 US presidential election. Beginning in the 1980s, the same barcodes people scan on cans of soup became a prominent symbol used in dystopian science fiction and are even a popular tattoo people still inscribe on their bodies. This book examines how a technology initially adopted for grocery stores somehow became an iconic symbol of capitalism and one of the most recognizable objects in the world.

# The many symbols of the barcode

Barcodes are one of many technologies grouped under the automatic identification and data capture (AIDC) umbrella. Other AIDC technologies include radio frequency identification (RFID), optical character recognition, magnetic stripes, facial recognition, and smart cards—all of which automate processes of identification in one way or another. Barcodes are certainly not the most powerful AIDC technology. As discussed in chapters 2 and 3, they work by containing identification data in patterns of lines and spaces, and the amount of identification data they're able to contain cannot compete with AIDC technologies like RFID. In addition, barcodes are optical technologies that must be scanned through a direct line of site, which contrasts with more advanced wireless AIDC technologies that have broader communicative potential. Nevertheless, while they may not be the most powerful identification infrastructure, barcodes have been by far the most successful. Decades before people started talking about communicative objects as part of the Internet of Things, barcodes had already become a bridge between the physical and digital that made material objects machine readable and connected them to digital networks. No other infrastructure in history has automated more identification data than the humble barcode.

While barcodes fall under the larger AIDC umbrella, barcodes themselves are also an umbrella term for many different symbols. The most recognizable symbol is the IBM barcode that is used in retail all over the world and found on the cover of this book. That barcode symbol is likely what most people think of when they hear the word “barcodes,” but it’s merely one of almost 300 different types of barcode symbols in existence.<sup>12</sup> Most barcode symbols are barely (if ever) used, but there are various symbols—such as Code 39, Codabar, and Code 128— that have been widely adopted in various industries. Many of those symbols look a lot like the iconic IBM symbol, with the main difference being how much data they contain within their varying patterns of lines and spaces. In fact, the most famous barcode symbol happens to be one of the least powerful in terms of data capacity. The IBM symbol contains only 12 digits, which are far fewer than symbols like Code 39 that can encode 43 numbers and letters. The simplicity of the IBM barcode, as I discuss later, ended up being one of its strengths.

To complicate things a bit more, not only is the word “barcode” a term for a wide range of symbols, but there are also two broad categories of barcode technology. Barcodes like the IBM symbol or Code 39 are examples of “linear barcodes,” which means the data is contained in one direction and the symbol is one dimensional. Linear barcodes are the lines and spaces most people think about if they ever think about barcodes at all. However, as chapter 8 examines, in the 1990s a different type of barcode

technology emerged: 2D barcodes, the most recognizable of which is the QR Code. I'll leave the details of how 2D barcodes work for later, but the most important point is that many people might not realize 2D barcodes even *are* barcodes. They work in fundamentally the same way as linear barcodes by encoding data in patterns and spaces, but they don't typically contain the recognizable lines of linear barcodes.

I promise the rest of this book is not going to be about lists of AIDC technologies or catalogs of different barcode symbols. I address those points in this introductory chapter primarily to explain choices made in the rest of the book. Throughout the following chapters, I mention different types of barcodes, but for clarity's sake, most of the discussion focuses on UPC/EAN barcodes because those were the first widely adopted barcode and paved the way for other symbols used in other industries. The oldest of all the widely used symbols is also still the most famous and is the type of barcode that almost everyone reading this book would recognize. Additionally, throughout this book, when I use the word "barcode" I'm mostly referring to the more traditional types of linear barcodes unless otherwise noted. In chapters 8 and 9 I do use the phrase "linear barcode" to compare them to 2D barcodes, but unless the context dictates, you can assume that when I write "barcodes" I'm talking about linear barcodes rather than their 2D cousins. I made that decision for a very practical reason: I use the word "barcode" a whole lot throughout these chapters and figured

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this book would be much easier to read if I used one word rather than two whenever possible.

Maybe most importantly, I wanted to note early on that barcodes aren't just the lines on products at grocery stores. They're also the patterned objects identifying movement in supply chains, the mobile boarding passes scanned to board planes, the multiple symbols on the packages left on your doorstep, and the QR Codes scanned to do everything from access a restaurant menu to get video instructions for an at-home Covid-19 test. Barcodes are everywhere, and they come in many shapes and sizes.

## Conclusion

I first started researching barcodes as a hobby, as a side project to distract from other work. That hobby turned into something more as I immersed myself in the history of this most humble of objects. I went from casually reading about barcodes to spending a week in the summer of 2022 at Stony Brook University's George Goldberg archive combing through primary sources key to the barcode's history (and yes, I was surprised to discover that there's an entire archive devoted to the barcode). I found something almost romantic about these objects that hold so many parts of our world together while almost never getting the credit they deserve. I initially assumed there would never be enough to write more than a few short articles about barcodes

and ended up struggling over which stories I had to cut from this book. Immersing myself so deeply in the world of the barcode has been—and no one was more surprised by this than me—the most fulfilling research journey of my career. Ultimately, if this book accomplishes what I hope, you'll stop for just a moment the next time you're in a self-checkout line and think about all the history and deeper cultural meaning embedded in those ubiquitous patterns of lines and spaces.