

JOE BRADY



The consumer-driven transformation
of Commercial Real Estate

WORK SHOP

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transformation of
Commercial Real Estate**

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Published by Grammar Factory
Publishing, an imprint of
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Grammar Factory Publishing
MacMillan Company Limited
25 Telegram Mews, 39th Floor,
Suite 3906
Toronto, Ontario, Canada
M5V 3Z1

www.grammarfactory.com

Brady, Joe
Work Shop: The consumer-driven trans-
formation of Commercial Real Estate /
Joe Brady.

Paperback ISBN 978-1-998756-73-5
Hardcover ISBN 978-1-998756-75-9
eBook ISBN 978-1-998756-74-2

1. BUS054020 BUSINESS &
ECONOMICS / Real Estate /
Commercial. 2. BUS054000 BUSINESS
& ECONOMICS / Real Estate / General.
3. ARCO10000 ARCHITECTURE /
Urban & Land Use Planning.

Production Credits

Cover design by Designerbility
Interior layout design by Setareh
Ashrafologhalai
Book production and editorial services
by Grammar Factory Publishing

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INTRODUCTION

CONTAINERS OF THE PAST

THE OFFICE real estate asset class is experiencing the same market dynamics as the retail asset class did starting some twenty-five years ago. And the common denominators are technology and consumer behavior. Rapid technological advancements and evolving consumer behaviors are radically reshaping the economy, workforce, and how we live, work, and play.

Traditional commercial real estate (CRE) models that relied on long-term leases and predictable demand are grappling to adapt to this new dynamic environment. No sector has been spared from disruption, from retail stores to offices to entire downtown cores. As work becomes untethered from physical spaces and online shopping continues to augment brick and mortar, the assets that once formed the backbone of cities now risk obsolescence.

Unless commercial real estate evolves to meet modern needs, it faces becoming increasingly irrelevant. Real estate

that is not deeply integrated with digital technologies, flexible to changing uses, and prioritizing the employee and customer experience will struggle to attract tenants and investors.

The next decade will separate the innovators from the laggards as the industry is forced to reckon with its lack of agility in an era of exponentially accelerating change. As writer and business leader Rishad Tobaccowala says, “The future does not fit in the containers of the past.” We saw this play out in the retail industry and retail real estate. In many respects, office real estate is having a retail moment.

E-commerce retail and hybrid work are two sides of the same consumer coin. Failure to understand the implications of consumer primacy will have disastrous effects for companies, real estate owners, service providers, and the communities in which they all operate. The retail industry learned this the hard way and has taken over a decade to recover.

Consumer primacy puts consumers’ needs and experiences at the forefront of planning, design, and operations. Key aspects of consumer primacy include: convenience, customer experience, flexibility, technology enablement, personalization, and engagement. Consumer primacy is enabled and propelled by technology, which leads to a duality of action. For retail, it means shopping in-store and online. In a work sense, it means working from the office, home, and “third places” (think flexible office operators, Starbucks and the like).

This is a difficult pill to swallow for those who are looking for a “silver bullet” answer. All too often, the public discourse devolves into reductive thinking. There must be an answer. In many ways, one size fits . . . well, one size. Perhaps the key to the future of commercial real estate lies not in better solutions and answers, but in better questions and entirely new opportunities.

Retail real estate started experiencing this existential threat some twenty-five years ago. Technology evolved,

consumers adopted the technology, and retailers were required to adapt or die. While technology evolved, it did so in a way that initially simply enabled existing behaviors. (An example in another industry highlights the impact of technology on consumer behavior. Newspapers and magazines rushed to turn ink into pixels, initially failing to see how the social elements of commenting, sharing and posting were far more important than paper and screens.) Retailers moved quickly to offer online, digital alternatives to support the brick and mortar, physical store. Whole store layouts were changed to support “last mile” delivery. During the pandemic, consumers could drive to the grocery store and have workers put orders in their car trunk with no human interaction. Many who failed to evolve fell victim to irrelevancy and even bankruptcy.

As a result, the consumer gained primacy. More than ever before, consumers determined which locations and retailers were relevant—and voted with their wallets. “Shop” evolved from a noun to a verb—from a place consumers went, to something they did, irrespective of location. E-commerce, or multi-channel retail, gained in prominence as technology allowed consumers to act with agency, autonomy, and optionality (more on this later). Consumers gained power and freedom with regard to their choices.

Today, in the post-pandemic era, we are seeing the same threat thrust upon office real estate. Company employees are the new consumers. “Work,” like “shop,” has migrated from noun to verb—from a place we went, to a thing we do, irrespective of location. “Work” and “office” are decoupled. The pandemic created a tectonic shift, whereby employees have primacy and are voting with their feet regarding when and where they work.

While employees have gained strength, companies need to adapt and evolve. In the wake of the pandemic, one of the driving forces for RTO (return to office—a coordinated plan

to bring employees back into the office following extended periods of working from home) is advancement of workplace and company culture. But culture is built on trust. When managers issue RTO edicts, they erode trust.

Mandates are counterproductive. Instead, leaders need to support their employees and create environments where it's truly advantageous for those employees to be in the office. Specifically in the keyboard economy where output is created in the form of information and data products, software and application, research and development, creative products, consultancy and expert services, intellectual property, financial products and services, and networks and platforms. Leaders need to clearly articulate times when being together in one place is essential, and curate those gatherings accordingly.

Productivity has been the holy grail for employers. Unfortunately, it has remained elusive in terms of consistent measurement. Regardless, we still hear requirements for buildings and offices based on driving productivity. As I will argue in this book, we should abandon the productivity pursuit in favor of a more germane and tangible outcome: effectiveness. Effectiveness denotes impact. Effectiveness is directly tied to the overarching success of the enterprise. In contrast, productivity is an industrial era construct. While there are still industries and jobs where productivity is important, the conceptual age of work is more reliant on effectiveness and impact. We will explore this further. But first, allow me to introduce myself properly.

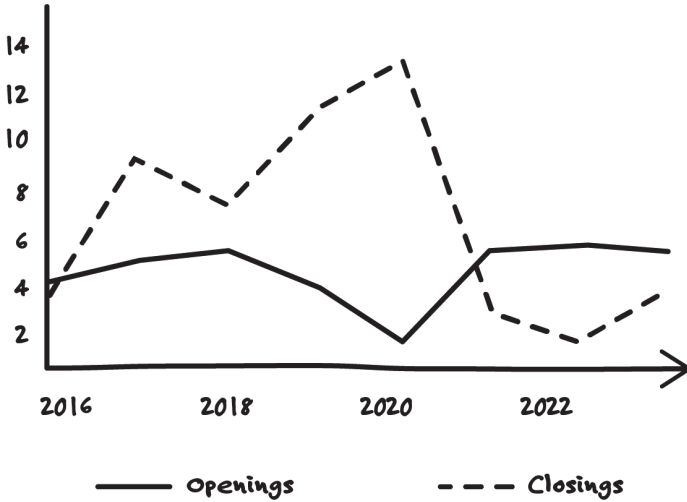
A seasoned professional with a unique perspective

I have spent much of my career in commercial real estate. I've had the opportunity to lead one of the biggest retail real estate organizations in the world, Walgreens. During the pandemic, I scaled an innovative flexible office business in the Americas. I've brokered, invested in, and developed hundreds of thousands of square feet of commercial real estate. I've rolled out retail stores in Brazil, Malaysia, China, and South Korea in addition to thousands in the United States. I've advised major corporate occupiers of office space across Europe in the wake of Brexit. In short, I've been fortunate to sit at virtually every seat at the real estate table.

As I reflect on over thirty years of deal making, advising, developing, and investing, it has become clear that the world is changing faster than ever and office real estate is struggling to keep up. We are hearing and reading about the office apocalypse in the news. The same salacious headlines and gloomy predictions were made about the retail real estate industry fifteen years ago. I have seen this movie before.

I was inspired to write this book as a call to arms for the commercial real estate industry, highlighting some of the lessons it can learn from retail. The retail sector continues to adapt; the chatter about the retail apocalypse is history. Relevant retailers, whether high-end luxury brands or daily-needs grocery stores, continue to adapt and thrive. Between 2017 and 2020, we saw 162 retail bankruptcies, accounting for 13,722 store closings. At the same time, the industry added 15,430 new stores, driven heavily by dollar store openings. Between 2022 and 2023, there were only twenty bankruptcies and 1,646 store closings. And the retail industry added another 10,500 stores, showing a steady recovery.

Figure 1: Retail Openings and Closings



Source: PNC RE Market Research, ICSC Research

But office is a different story.

Once valued at over three trillion dollars, the office industry is grappling with apocalyptic headlines, maturing leases, and looming debt expiration. And all in the face of changing consumer/employee behavior. As we will explore, “work” and “office” are no longer intertwined—at least not to the same degree as before. The notion of working nine to five, Monday to Friday is anachronistic. We are in the conceptual age where ideas and outcomes matter.

While owners and investors of office real estate may face economic loss or even bankruptcy, the biggest issue for me is the health of communities where the real estate is located. We are seeing the beginnings of “urban doom loops” in urban cores, particularly those urban cores focused on one type of activity: work. Introduced by economist Lyman Stone in his

National Review article titled “The ‘Urban Doom Loop’ and the Future of American Cities”, published in August 2020, an urban doom loop describes a vicious cycle of declining urban areas. It occurs when a city experiences a decrease in population (including daytime population tied to workers) and economic activity. These declines lead to reduced tax revenue, which in turn causes a decline in public services and infrastructure, further exacerbating the population and economic decline. In order to have strong cities, we will need to see investment in live/work/play oriented communities.

Creating healthy ecosystems of live/work/play

Communities rely on healthy ecosystems of live/work/play, just like nature relies on healthy ecosystems. Monocultures in nature, agricultural practices of growing the same crop over a large area every year, are vulnerable to pests and diseases, reduced biodiversity, soil degradation, and reduced resiliency.

Monocultures in real estate (workplaces focused solely on work, with little room for anything else) lead to increased vulnerability and economic risk, and reduced resilience against external changes. We are seeing the consequences of this in the Central Business Districts (CBDs) of cities like Chicago, San Francisco, Seattle, Boston, St Louis, and Philadelphia. Post-pandemic, fewer office workers mean supporting businesses languish and close. Cities lose tax revenue. City officials grapple with cutting city services or raising taxes on the remaining businesses. Neither choice is good and cities enter an urban doom loop.

Instead, communities need to focus on BBDs (better business districts). BBDs represent healthy ecosystems where people live, work, and play on a seven-day basis. The smartest and most creative people are attracted to these environments. BBDs are more resilient than traditional CBDs.

That's just one of my passion points. As a lifelong learner, I had a yearning to study the past in order to prepare for the future. I recently completed a course through Massachusetts Institute of Technology called "AI and Business Strategy" and another course, through the University of Chicago Booth School of Business, on behavioral economics. Those two classes helped solidify my thinking around accelerating technology (AI) and changing consumer behavior (behavioral economics).

In this book, I will share my thoughts and experiences around the future of commercial real estate for owners, occupiers, and communities. I will explore the history of technology and work, which go hand in hand. I will question why we still focus on agricultural and industrial era constructs. And I will explore the many lessons of relevancy (and irrelevancy) from retail, and thoughts on how the office asset class can adapt and evolve.

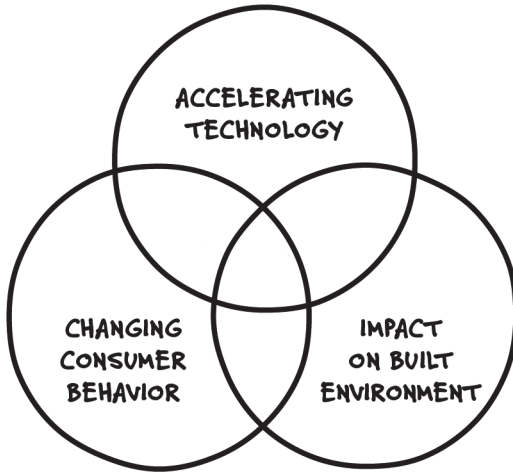
This book will examine technological platform shifts, the impact on retail over the last twenty years, the growing impact on work, how "old" approaches to work impact the health and wellness of workers and entire communities, the future of work (FoW), the new role of leadership, along with design, sustainability and predictive analytics. Finally, the book will conclude with predictions on the future of commercial real estate.

The three key components for consideration are:

- 1 Accelerating technology;
- 2 Changing consumer behavior; and
- 3 The ultimate impact on the built environment.

This book is intended for leaders who make decisions involving the built environment. Whether you are an owner, occupier, service provider, elected official or community member, the health of your community is being driven by consumers. Consumers represent seventy per cent of US GDP.

Figure 2: Three Key Components for Considerations



Real estate needs to become more dynamic and agile as the needs of consumers change. The retail sector was the first to experience this consumer shift. The office sector is now facing its own series of challenges, including expiring debt on properties, erosion in value, and uncertainty with renewals (research shows fifty per cent of all office leases will expire by the end of 2025).

Corporate leaders need to understand that “work” and “office” are decoupled, as I stated earlier. Many argue that employees have the upper hand given the near-full employment rate in the US economy. I submit that consumer primacy will always prevail in the keyboard economy, where effectiveness is prized over productivity. Where outcomes drive the economy. Where innovation propels whole new industries.

You will benefit from this book by having a wider picture of the changes impacting corporate real estate.

A LOOK IN THE REARVIEW MIRROR

“Software is eating the world.”

MARC ANDREESSEN

THE STORY OF civilization is, in many ways, a narrative of technological innovation. Each new discovery, each push forward, has inevitably altered the way we interact with our environment and with one another. Technological platform shifts occur when there are major transitions in core technologies and infrastructures that impact or enable significant sectors of the economy and society. Each platform shift, which we will explore in detail, impacts the built environment required to support people and businesses.

Platform shifts are usually driven by new or expanding technology that provides improvements in cost, accessibility, usability, and functionality. Incumbent platforms are often disrupted by nimble startups introducing these shifts. In this chapter, I'll offer a brief history of platform shifts, with a focus on their impact, and the subsequent challenges faced by commercial real estate. But first, let's take a quick look at work

through the ages, as this provides a backdrop for the platform shifts that have occurred in the last century.

A look at work through the ages

It is important to look at history for insights into how people worked, where they lived, and how technology, or lack thereof, impacted their quality of life. With each major platform shift, we see an acceleration in productivity and quality of life driven by new and emerging technologies. Jobs were invariably replaced, with even more jobs emerging to harness the power of the emerging technologies.

Agrarian age (8000 BCE–1500s)

Agriculture demanded labor centered on small-scale, locally accessible real estate augmented with handicrafts. Work was subject to both time of day and time of the year. Family units and small communities supported bartering, leading to money-based exchanges. Work was manual with a minimal level of technology. It was truly good to be the king as the monarch claimed ownership over all the land in the kingdom. The term “landlord” emerged during the era of feudalism. The king would grant portions of his land to nobles, who were his “lords.” The lords generally rented the land to tenant farmers, who worked the land in exchange for rent, typically in the form of crops and commodities.

First industrial revolution (mid-1700s–late 1800s)

The first industrial revolution saw a shift from field to factory. Work became centered in factories where assembly lines, new machine tools, and emerging labor specialization emerged. Field to factory also fueled urbanization. By the end of the 1800s, over fifty per cent of the US population lived

in urban areas for the first time. Long hours, low wages, and poor conditions were common for the early industrial workers. Inventions like the telegraph, telephone, light bulb, and internal combustion engine led to the second industrial revolution. Meanwhile, agriculture became more commercial and productive, requiring fewer people to produce the same outputs. The transportation revolution occurred, with new railroads allowing bulk goods and people to move farther and faster than ever before.

Second industrial revolution (late 1800s–early 1900s)

The second industrial revolution saw revolutionary innovations that consolidated industrial supremacy through new electricity-driven and oil-fueled technologies for transportation, mass production, communication, and consumer markets. Factory mechanization reduced the need for some jobs, increased overall productivity, and created new job categories, including the role of management. Greater urbanization, increased leisure time, and different consumer lifestyles developed alongside mass production.

Cities grew horizontally and vertically, thanks in part to technological advancements in the use of steel and the electricity. The Home Insurance Building in Chicago, completed in 1885, was considered the first true skyscraper. While work was still happening in factories, office buildings emerged to meet the needs of new consumer industries and mass-produced goods targeting the growing middle class. In 1900, agriculture accounted for twenty-five per cent of GDP and forty per cent of the US workforce. By comparison, only around two per cent of the US labor force worked in farming in 2000.

Post-industrial age (1950s–1990s)

The post-World War Two era saw an acceleration in infrastructure, computers evolving from room-sized mainframes

to personal computers, and transportation moving not only people and goods but information via the internet. Suburbanization grew as roadways and cars allowed workers to live in growing ring communities around urban centers. The first shopping malls emerged to quench the growing demand for consumer goods. Automation replaced some manufacturing jobs while administrative and white-collar office jobs expanded. Work still maintained elements of both agrarian and industrial era constructs with nine to five, Monday to Friday schedules, even in office settings. Advancements in communication and the internet led to increasing globalization and outsourcing of manufacturing overseas. Real estate continued to evolve and adapt, with old industrial or warehouse buildings repurposed into residential lofts and tech workplaces.

Digital age (1990s–2010s)

The digital age saw information, creativity, and services become key economic assets. Amazon was founded in 1994 and went public in 1997. Facebook was founded in 2004 and Steve Jobs unveiled the first iPhone in 2007. Cloud computing emerged to further bolster the power and accessibility of mobile apps. Young professionals returned to downtown living, revitalizing former industrial areas into mixed-use neighborhoods. While the impact of the global financial crisis cannot be understated, the speed of technology and consumer mobility helped dig the global economy out of a deep recession.

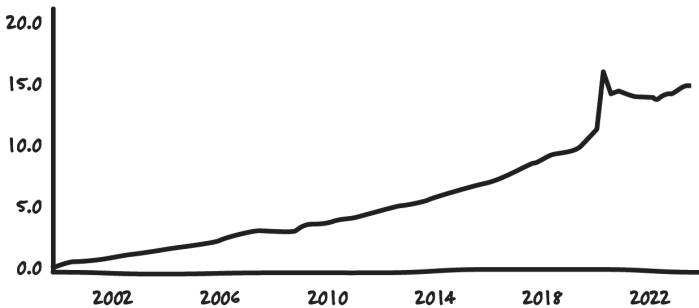
The emergence of e-commerce saw many traditional retailers fail, leading to the closure of thousands of stores. In other instances, e-commerce complemented in-store activity and vice versa. Research has shown the presence of brick-and-mortar stores actually increased online sales revenue in certain trade areas. Conversely, the closing of a store was shown to decrease online sales in that same trade area.

Conceptual age (2015–present)

The world moved from the digital age to the conceptual age in the early 2010s as ubiquitous smartphone adoption, cloud computing, high-speed internet, 5G connectivity, and big data all heralded the biggest technological leap in human history. Increasing priority was given to user experiences, conceptual and creative skills, design thinking, and customization. Routine digital tasks were increasingly automated. We saw the explosive emergence of generative AI (GenAI) in 2022, most notably in the form of platforms like ChatGPT, the impacts of which we will explore in a later chapter.

Most importantly, the world experienced a pandemic, which created a tectonic shift in how and where consumers worked. E-commerce as a percentage of total retail sales moved from eleven per cent in 2019 to 16.5 per cent at the height of the pandemic. Estimates show the percentage rising to around twenty per cent by 2027.

Figure 3: E-Commerce Retail Sales as a Percent of Total Sales



Source: U.S. Census Bureau

The pandemic forever changed consumer work behavior. After spending over two years predominantly in at-home working environments, consumers (employees) adopted more live/work activities. They had more time, and more disposable income, as a result of not physically commuting to an office. Even when the pandemic subsided, things were never the same. The average time spent in the office moved from four-plus days per week to two and a half days per week.

A brief history of platform shifts

To gain a better understanding of the impact of technology on consumer behavior, let's delve deeper into some of the most important technological milestones in recent history. This will help you appreciate the potential and power of technology over the next five to ten years. Specifically, how these exponential changes will impact consumers and the real estate in which they live, work and play.

Mainframes to personal computers

In the 1960s and 1970s, mainframe computers were the dominant computing platform for businesses and institutions. IBM set many of the standards in mainframe design and functionality. UNIVAC (Universal Automatic Computer) helped introduce mainframes into business and governmental organizations for data processing tasks. Control Data Corporation, or CDC, led by supercomputer pioneer Seymour Cray, made some of the faster supercomputers and biggest mainframes from the 1960s onward.

Mainframes were primarily used for large data processing tasks related to census taking, finance, and so on. They required very large, dedicated rooms with specialized cooling. In 1959, the IBM 7090 mainframe measured 3.6 meters by

1.5 meters by 1.7 meters (9.18 cubic meters), weighed around 9,000 pounds, had a processing speed of roughly 100 kilohertz, and had a memory of 128 to 1,024 kilobytes (water cooled). In comparison, a modern laptop measures 31.7 centimeters by 21.6 centimeters by 1.9 centimeters (1,300 cubic centimeters), weighs 3.5 pounds, has a clock speed of three gigahertz, has eight to thirty-two gigabytes of memory, and is several thousand times more powerful.

Personal computers were designed for individual/personal use rather than shared use. I remember experiencing this platform shift. As a young electrical engineering student, I felt lucky to be part of the first class at Villanova University using the new VAX-11/780 mainframe computer from Digital Equipment Corporation (DEC). We were the first class not required to use punch cards in the old IBM mainframe. Before the VAX, engineering students would need to “program” using punch cards. They had to physically input the necessary ones and zeros needed to drive programming languages like FORTRAN, COBOL, and BASIC. Users had to ensure that scores and scores of punch cards were in the right order and orientation. Many a day was ruined when gravity took hold and the punch cards were dropped and jumbled . . .

The platform shift from mainframes to PCs started the untethering process from terminal to mobile keyboard. Previously, if you wanted to accomplish any processing activity, you were bound to the location of the mainframe and adjacent terminals. Even if it was the office of the university building, users were required to ply their trade in a factory-like setting.

The PC allowed activity to happen in more diverse locations, although early connectivity and internet usage required a hard connection. From a real estate perspective, companies and institutions were able to reclaim the rooms formerly occupied by mainframes for more direct engagement and use by employees and colleagues.

Wired to wireless telephones

There was a time when you actually called someone's house. We were tied to the landline for communication and connectivity. Even the early internet days were tethered to terra firma. The cellular technology boom in the 1990s drove wireless engagement and non-stop envy. Remember those cellular antennas on cars? Some entrepreneurs made tons of cash by selling fake antennas, just so you could look cool and hip, as if you had a phone in your car.

There's no more seminal moment in untethering than Gordon Gecko, standing on a beach in the Hamptons, talking to Bud Fox, in the movie *Wall Street*. Gecko, a character made famous for his "greed is good" mantra, was talking on his Motorola brick phone (a DynaTAC 8000X), which cost 3,995 dollars in 1987 (or 11,885 dollars in today's dollars). Today, we take for granted the fact that you can call anyone, anywhere, at any time. Even apps like WhatsApp make the cost of long-distance calls essentially free.

The combination of untethering from both mainframe computers and landlines allowed consumers to gain more freedom and agency in where and how they conducted personal and professional business. The rise of the cell phone, augmented by the beauty and design of products like the iPhone, allowed people to realize their dream of talking on the beach (or anywhere they liked), like Gordon Gekko.

Physical to cloud computing

Enterprise computing shifted from on-premise servers to a cloud model starting in the 2000s. Traditionally, businesses owned and operated their own physical servers and data centers to host computing infrastructure and applications. This required large capital investment and ongoing maintenance. The real estate requirements and the need for constant "up

time” resulted in significant operating expenses as well. Downtime was not an option.

With the rise of cloud computing, businesses were able to leverage servers, storage, databases, software, analytics, and more on hosted platforms by providers like Amazon Web Services (AWS), Google Cloud, Azure, and others. This provided a flexible, pay-as-you-go service. It greatly reduced the capital expenditure and operating expenditure requirements of owning and running your own data center.

One of the larger implications stemmed from obsolescence avoidance. Running a data center was like running a business. For many companies, their core business function was likely not data center management. With technology increasing and new innovations emerging at a frequency of months, not years, companies were able to take advantage of cloud providers that were constantly innovating and updating.

This meant fewer on-premise data center jobs, replaced by cloud-related roles. Those roles included cloud architects, cloud security, and cloud app developers. The platform shift from physical data centers to cloud computing allowed businesses to be more responsive, innovative, and focused on their core business goals.

The emergence of GenAI

Some call the emergence of GenAI more important than electricity and even the discovery of fire. There are multiple characteristics of the GenAI platform shift, including scale and pace, the intelligence factor, the transformation potential, and trust or ethical factors.

Compared with other platform shifts, GenAI evolved quickly from a relatively narrow research approach to a commercially viable platform, accessible by millions of consumers much faster than any other platform shifts. The low

marginal cost of deploying AI models also enables remarkably wide reach.

Unlike hardware or software platforms, GenAI has some capacity to process information, to reason, and to learn and respond adaptively. This introduces an entirely different level of complexity in terms of systemic impacts compared to inert tools.

GenAI is a tool and is therefore susceptible to misuse or misinterpretation. The “black box” nature of large language models, as well as the propensity for biases and control issues, introduces completely new ethical dimensions relative to previous platforms. Maintaining responsibility and trust remains a burning topic for the leaders in GenAI as well as government regulation. The potential for misuse is extraordinary. Just like Oppenheimer questioned his groundbreaking work on the atomic bomb, the founders of OpenAI and Turing Award winner Geoffrey Hinton, the godfather of deep learning and an early pioneer in neural networks, remain outspoken about the potential existential threat associated with unchecked AI.

GenAI will invariably impact existing jobs in and around highly automatable tasks through responsibilities like data collection and processing, pattern recognition, and production and services. Here’s a list of potentially impacted roles:

- **Customer service reps:** AI is automating simple queries, conversations, and sentiment analysis.
- **Food counter workers:** Self-service ordering and AI-powered kitchens can displace workers.
- **Administrative assistants:** AI is automating scheduling, documentation, and more.
- **Telemarketers:** Natural language AI can conduct sales calls and outreach.

- **Paralegals and legal assistants:** Contract review, research, and case prep automation will expand.
- **Software developers:** AI coding assistants and generative programming supplement human efforts initially.

While job displacement will invariably occur, new jobs will harness the power of GenAI. We are in the early innings of adoption and exploitation, but likely areas of new job growth include:

- **AI trainers:** Experts needed to provide domain-specific data to train AI models within sectors like healthcare, law, customer support, and so on.
- **Prompt engineers:** The key to extracting the optimal information is asking better questions. Once the large language models (LLMs) are trained, prompt engineers will develop creative queries to extract specific and precise output. There are many use cases, from medical diagnosis to critical infrastructure management to real estate portfolio management.
- **AI designers:** Hybrid user experience and machine learning experts who focus on human-centered design of AI assistants, conversational agents, and related systems.
- **AI ethicists:** Specialists who provide guidance around responsible development and deployment of AI systems so they align with ethical principles on things like fairness, accountability, and transparency.
- **AI operations engineers:** IT professionals who manage deployment, monitoring, and optimization of GenAI in production environments. Managing office and retail buildings will be augmented by GenAI, tied to IoT

(Internet of Things) sensors. No longer will buildings be down for extended periods because really smart buildings will inform managers about preventive maintenance and repairs before failures occur.

The rate of change of the rate of change

For each of the platform shifts, we see a real-world, built-environment need to adapt and evolve. Nowhere is this clearer than in the realm of real estate, where every structure we build is a reflection of our current technological capabilities and cultural norms. There are dramatic impacts on users, or, as I refer to them, consumers. Both in the retail and office setting, consumers engage in and participate in activities in the built environment.

But the rate of change OF the rate of change is accelerating. Consider the amount of time it took for different consumer products to reach 100 million users:

The telephone (1876): 51 years

Television (1926): 26 years

Mobile phones (1973): 16 years

Amazon Prime (2005): 15 years

Facebook (2003): 12 years

Pokémon Go (2016): 1 year

TikTok (2016): 9 months

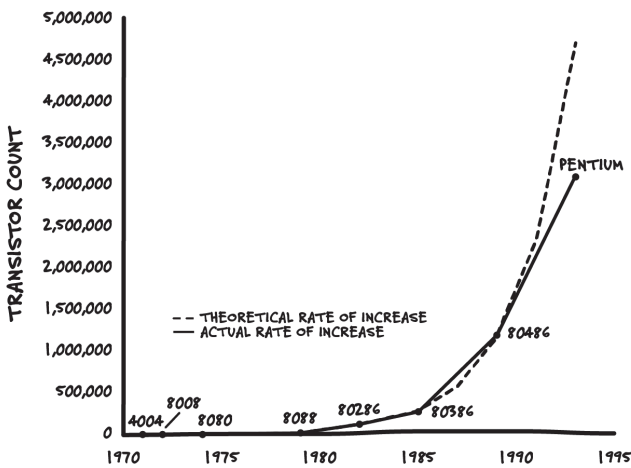
ChatGPT (2022): 2 months

Threads (2023): 5 days

Venture capitalist and software engineer Marc Andreessen is famous for saying, “Software is eating the world.” Maybe software was just the appetizer. It’s becoming more and more evident that advanced technology, driven by GenAI and synthetic biology (more on this later), are the main course.

We are approaching the limits of Moore's law. Gordon Moore, cofounder of Intel, posited in 1965 that the number of integrated circuits on a chip would double every eighteen months, while the cost would be reduced by fifty per cent. That trend continues to hold true and, when you double power and cut costs by half for fifty years, you see an incredible exponential curve.

Figure 4: Moore's Law predicts that the transistor count on microchips doubles every two years



Source: Wikipedia, Moore's Law and Intel

Similarly, consider the iPhone, arguably one of the most successful and prolific products in the world. The average iPhone, with almost unlimited access to apps via the App Store, combines and replaces over fifty other tools, gadgets, and devices. The iPhone 15 has approximately 100,000 times the processing power of the computer that landed man on the Moon over fifty years ago. The exponential impact of doubling power and halving costs will continue to have bigger and more impactful benefits in our personal and professional lives.

As we've seen from Moore's law, the rate of change continues to increase, particularly when you consider Gordon Moore posited his theory in 1965. Many futurists, like Ray Kurzweil and Paul Saffo, are known to share a similar sentiment. Namely, that today is the slowest day of change for the rest of our lives. Change will continue accelerating with each platform shift.

Why is this important? Because traditional corporate real estate has historically been based on a ten-year cycle. When you compare the exponential acceleration from technology (read: Moore's law) with the traditional commercial real estate cycles, you see an incongruity. The incongruity is further exacerbated by strong inertia in the commercial real estate markets.

The inertia of the combined retail and office markets, topping seven trillion dollars, means that it's difficult to steer the ship and course correct. Inertia is the tendency of an object to resist any change in its state of motion. In science, the inertia of an object is directly proportional to its mass. More mass (read: industry size) means more resistance or inertia. Agility is the ability to move quickly and easily. While CRE is striving to talk the agility game, few are actually delivering on the mandate. Inertia is powerful.

The establishment is based on the ten-year lease agreement. Lenders want to lend at ten-year intervals. Investors depend on leveraged returns based on loans. Developers and owners are dependent upon what lenders and investors demand. Tenants are subject to the overwhelming forces above them. Consider the fact that there's a "lord" in "landlord" and "ant" in "tenant."

Compounding the challenge is the uncertainty around FoW and the future role of the office. Amid all of these changes, what is CRE to do? How can a midcap tech company, for example, sign a ten-year lease when its business model

is likely stale in six months? Later, we will explore ways for CRE to synchronize with the technological age of acceleration.

Real estate has a proven ability to adapt and evolve. At the heart of our earliest advancements was the wheel. While today it seems rudimentary, its invention ushered in a new era of transportation and logistics, allowing civilizations to expand and trade over vast territories. As trade routes flourished, so did the need for infrastructure, prompting the establishment of inns, trading posts, and larger urban centers. The land around these hubs became prized real estate.

Fast forward to the Industrial Revolution, and we see the steam engine, the telegraph, and electricity playing transformative roles. Factories required workers, and workers needed homes. This led to the rapid expansion of cities and the birth of the modern suburb. Once again, real estate evolved to support the technology-driven needs of society.

Employees were required to work in the factories because that's where the machines were located. In contrast, today's digital revolution has decentralized where and how work is done. Offices are no longer the sole hubs of professional life. Homes, coffee shops, and even parks have become viable workplaces, thanks to the portability of technology.

From supercomputers to smartphones, our world is more connected, more automated, and more data-driven than ever. The real estate implications? A demand for smart homes, connected offices, and urban spaces that can seamlessly integrate with this tech-driven world.

As we journey forward in this book, it's vital to understand that technology doesn't just "happen." Every innovation is a solution to a problem, a response to a need. Real estate, from the homes we live in to the offices we work in, must evolve in tandem with these technological shifts. The very essence of "value" in property is being redefined by our technological progress.

In the chapters that follow, we will delve deeper into the many ways accelerating technology impacts our lives and reshapes the landscapes, both literal and metaphorical, of our world.

CHAPTER SUMMARY

Technological innovations have long driven and enabled transformations in how humans interact and organize themselves across societies. Major platform shifts occur when emerging infrastructures significantly impact economic and social systems. Key examples explored include the transition from mainframe computers to personal computing, landline phones to wireless mobiles, on-premise enterprise computing to cloud-based services, and now artificial intelligence.

Each shift enabled greater capabilities and efficiencies. At the same time, these disruptions required adaptations by users as well as physical spaces like real estate. Work patterns and locations changed as technology untethered processes from previous constraints like centralized factories. The rate of change has dramatically accelerated in recent decades as per Moore's law, but real estate planning cycles remain lengthy.

AI represents an exceptionally consequential shift given the scale and speed of diffusion so far. It also demonstrates more technological intelligence and autonomy than prior innovations. While promising immense productivity potential, AI threatens to automate many existing jobs. However, it will also generate new labor needs and categories. Managing such workforce transitions remains critical.

Historically, technological progress shaped settlements and infrastructure to support societal needs in areas like trade, manufacturing, and knowledge-intensive industries. Today's digital and AI revolution carries possibly more far-reaching implications across economic, governmental, and urban domains. The businesses and

regions that can artfully adapt to enable human-machine synergy will likely thrive most.

Corporate real estate is one sector grappling with these platform shifts in profound ways. Location constraints around work are dissolving as cloud computing and remote collaboration tools proliferate. Yet the purpose and layout of offices is contested given the (still important) need for in-person community. Balancing flexibility with predictability across distributed workforces raises structural questions and cultural challenges.

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