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THE FACTORIES OF THE PAST ARE TURNING INTO THE DATA CENTRES OF THE FUTURE

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Abstract

This essay traces the history and geography of data's materiality by examining the transformation of industrial building stock in Chicago to serve the needs of the data industry. Using contemporary and archival photographs as entry points, the paper unpacks the rise of an information-based economy in relation to the decline of an industrial economy. Buildings where workers once processed checks, baked bread, and printed Sears catalogues now route packets of information and host servers engaged in financial trading. Thus, contained within the physical transformation of some of Chicago's buildings is a larger historical and geographical narrative about the uneven development of capitalism. This historical view reminds us that infrastructure is, and always has been, political.

Résumé

Cet essai retrace l'histoire et la géographie de la matérialité des données en examinant la transformation des bâtiments industriels à Chicago pour répondre aux besoins de l'industrie des données. En utilisant des photographies contemporaines et d'archives comme point de départ, le texte explore la montée d'une économie axée sur l'information par rapport au déclin d'une économie industrielle. Les bâtiments où les travailleurs ont autrefois traité des chèques, cuit du pain, et imprimé les catalogues Sears, transmettent maintenant des paquets d'information et hébergent des serveurs impliqués dans les échanges financiers. Ainsi, à travers la transformation physique de certains bâtiments de Chicago, il existe un vaste récit historique et géographique à propos du développement inégal du capitalisme. Ce point de vue historique nous rappelle que l'infrastructure est, et a toujours été politique.

We live in a data driven world: from social media applications, to "smart" cities (Batty; Shelton, Zook, and Wiig), to the Internet of Things (Wasik), the generation of huge volumes of information about nearly every detail of life has revolutionized fields such as business, government, and even the pursuit of romance. While we tend to focus our attention on the applications of these new technologies, it is crucial to remember that, like other industries, the growth of computing entails physical changes in the landscape. The networks of data centres, fibre-optic cables, and cell towers that power the transmission of digital data and make the internet, mobile devices, and big data applications work are hidden in plain sight in our cities, suburbs, and rural communities. Like the factories, railroads, and highways that formed the backbone of the U.S.'s industrial economy, the infrastructure of computing is now central to modern capitalism.

A robust literature now exists that has sought to unpack the relations between the "virtual" technologies of computing and the material relations that underpin them (see Easterling; Hogan; Parks and Starosielski; Velkova). In this essay I add to this conversation by showing how the material infrastructures of computing connect our digital present to our industrial past. Infrastructures that served one historically and geographically specific regime of accumulation (U.S. industrial capitalism) have been reworked to serve the needs of a digital economy. In this reworking, we are reminded that capitalism is a set of continually evolving social relations that constantly turnover what has come before while never quite abandoning the past.

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In Chicago, where I teach and research, I have been studying the transformation of the city's industrial buildings to serve the needs of the data industry. Buildings where workers once processed checks (Baeb), baked bread (1547 Realty), and printed Sears catalogues (Miller) now stream Netflix and host servers engaged in financial trading. The buildings themselves are a kind of witness to how the U.S. economy has changed, but, more than that, they are what Mattern has described as the "bleed points" where the physical and the virtual meet (2014). By exploring these changes in the landscape and these bleed points, not only do we get a better sense of how data exists in the physical realm, but we are also struck with new questions about what the rise of an information-based economy means for labour and the politics of growth in contemporary cities. I argue that debates about the emergent smart city and the knowledge economy should be grounded in the historical and geographical context of capitalism's uneven development in order to foreground new urban technological formations as political rather than merely inevitable. I use photographs and archival images to help illustrate this context while also bringing the bleed points of the digital age into clearer focus.

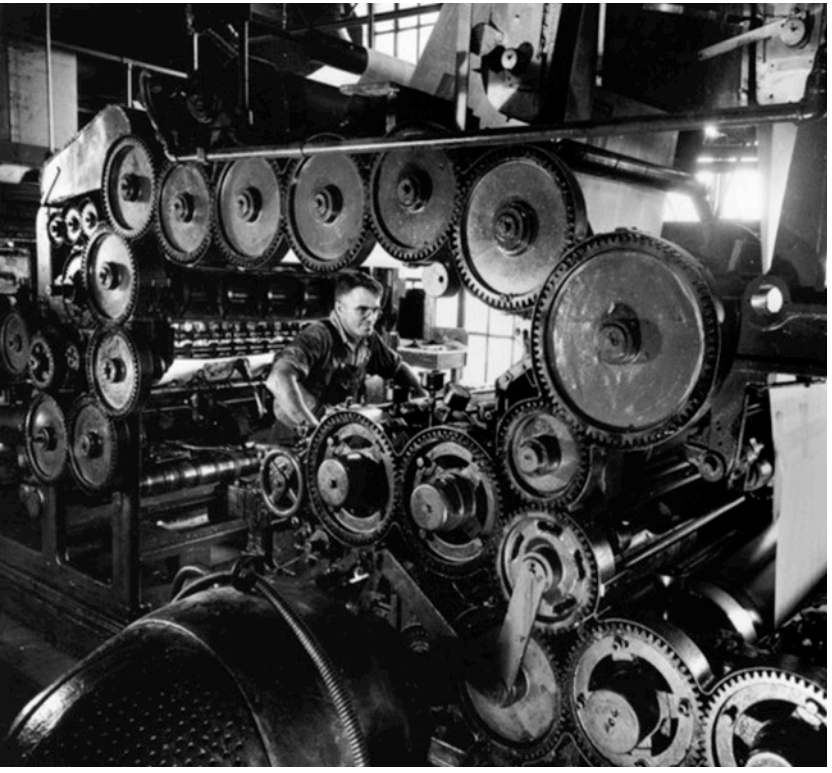
In what follows, I provide a brief overview of the role of data centres in Chicago's urban development. I then describe the adaptive reuse of industrial buildings for data purposes as an "analog to digital" shift. The final section considers the political implications of this shift in terms of employment and urban economic development policy.

From Analog to Digital

Data centres have been described as the factories of the 21st century (Cook). A data centre is a facility that contains servers that store and process digital information. When we hear about data stored "in the cloud," that data is materially stored in a data centre. Contrary to the ephemeral-sounding term "cloud," data centres are highly energy- and capital-intensive infrastructure. Servers use tremendous amounts of electricity, which generates large amounts of heat, which in turn requires extensive investments in cooling systems in order to keep servers operating. These facilities also need to be connected to fibre-optic cables, which deliver information via beams of light and constitute the "highway" part of the "information superhighway." In most places, fibre-optic cables are buried along the rights of way provided by existing road and railroad networks, meaning the pathways of the Internet are shaped by previous rounds of development (Burrington).

What is important to keep in mind here is that an economy based on information, just like one based on manufacturing, still requires a built environment through which inputs and outputs circulate. In other words, place always matters. For the data industry, taking advantage of the places that have the power capacity, the building stock, the fibre-optic connectivity, and the proximity to both customers and other data centres is often central to their real estate strategy.

As this real-estate strategy plays out, what is particularly fascinating is the way in which infrastructure constructed to meet the needs of a different era is now being repurposed for the data sector. In Chicago's South Loop, the former R.R. Donnelley & Sons printing factory, at one time one of the largest printers in the U.S. producing everything from Bibles to Sears catalogs, is now the Lakeside Technology Center, one of the largest data centres in the world and the second largest consumer of electricity in the state of Illinois (Miller). The eight-story Gothic-style building contains vertical shafts formerly used to haul heavy stacks of printed material between floors, and these columns are now used to run fibre-optic cabling through the building (which comes in from the railroad spur outside). Heavy floors built to withstand the weight of printing presses are now used to support rack upon rack of server equipment. What was once the pinnacle of the "analog" world of the printed word is now a central node in global financial networks.



Photograph of printing press #D2, 1949. R.R. Donnelley & Sons Company. R.R. Donnelley & Sons Company. Archive, Special Collections Research Center, University of Chicago Library

Just a few miles south of Lakeside Technology Center is the former home of Schulze Baking Company in the South Side neighborhood of Washington Park. Once famous for its butternut bread, the five-story terra-cotta bakery is currently being renovated into the Midway Technology Center. Like the project in the South Loop, the Schulze bakery contains features useful to the data industry. The building also has heavy-load-bearing floors as well as louvered windows designed to dissipate the heat from bread ovens (or in this case, servers). The neighborhood as a whole also makes the Schulze desirable. I interviewed a developer working on the Schulze redevelopment project and he told me that because the surrounding area had been deindustrialized, and because a large public housing project, the Robert Taylor Homes, had closed down in recent decades, the nearby power substations actually had plenty of idle capacity to meet the data centre's needs.

Schulze Baking Company advertisement. University of Illinois Chicago Digital Collections

Examples of this "adaptive reuse" of industrial building stock abound. The former *Chicago Sun-Times* printing facility recently became a 320,000 square foot data centre (Harley); a Motorola office building and former television factory in the suburbs has been bought by one of the large data centre companies (Sverdlik); and the once mighty retailer Sears, which has one of the largest real-estate portfolios in the country, has even created a real-estate division tasked with spinning off some of its stores into data centre properties (Ryan). Beyond Chicago, Amazon is in the process of turning an old biscuit factory into a data centre, and in New York some of the world's most significant data centre properties are housed in the former homes of Western Union and the Port Authority, two giants of 20th-century modernity.

To be sure, not every data centre project involves reusing existing buildings. Many of the large tech companies, such as Facebook and Google, focus on building standalone state-of-the-art facilities custom-built to their needs. Yet even in these examples, place still matters. For instance, Facebook, Google, and Microsoft have all built large data centres in the Pacific Northwest in regions that have cheap electric power and high-voltage power lines that formerly served the timber and mining industries. The common thread is that across urban adaptive reuse projects and rural developments, there is no blank slate upon which the world of data simply emerges. What we see here in these stories is the seesaw of capitalist development and how decline can actually create conditions for growth. As certain industries and regions decline, some of the infrastructure retains its value, thus providing incentives for savvy investors down the road to seize upon an opportunity. More broadly, we

The Schulze Baking Company operated on Chicago's South Side from 1914–2004. The historic building is being turned into a data centre. Photo: Graham Pickren

see that understanding where the infrastructure of computing is and why requires grappling with previous rounds of uneven capitalist development spanning back a century or more to the development of the railroads, the telegraph, and the industrial and political needs of the 19th and 20th centuries. Cycles of boom and bust, tensions between capital's fixity and mobility, and the shifting prominence of a "cognitive cultural capitalism" (Scott) vis-à-vis manufacturing all therefore provide much-needed context in understanding big data and computing today.

While this essay does not attempt to review the vast literature on critical political economy in order to pinpoint the macroeconomic drivers of an industrial to post-industrial shift, of which computing's rise is a part, (see Harvey; Arrighi; Brenner), what this literature offers is a relational approach to understanding how built environment, capital, and social relations intersect. Rather than neatly periodizing different phases of capitalist urbanization and situating data as novel, what I focus on instead are the continuities between an (always temporary) industrial period and the (similarly temporary) ascendancy of digital capitalism. Across these different moments, we see material relations—the mixing of labour, non-human objects, and value—unfolding in ways that produce winners and losers. Both printing factories and data centres are political sites as well as sites that transform resources and materials. In what follows, I briefly consider both the labour politics and the urban growth politics that flow from this analog to digital shift.

Data, Labour, and Urban Politics

How computing continues to animate changes in the physical landscape is of course linked to changes in the social landscape. Many studies of technology focus on one or the other, but in this section I link them together. First, there is the issue of labour and employment. Data centres gen-

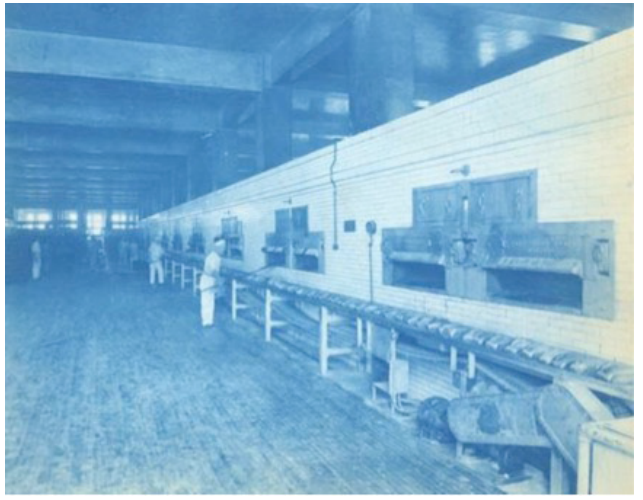
erate tax revenues but do not employ many people, so their relocation to places such as Washington Park is unlikely to change the economic fortunes of local residents (even so, the developer on the Schulze project hopes to have an IT-training component of the facility available to local residents). If the data centre is the "factory of the 21st century," whither the working class?

Data centres are in many ways crucial to changes such as machine-learning, which threaten to automate large numbers of tasks across a range of both high- and low-skilled jobs that involve routine work. By one measure, as much as 47% of U.S. employment is at risk of being automated ("Automation and Anxiety"). Buried within the question of what the factory of the 21st century means for working people is the larger issue of the relationship between automation and the polarization of incomes. Both low- and high-skilled jobs that are non-routine (i.e. difficult to automate) are growing in the U.S. Some of these jobs will be supported by data centres, freeing up workers from certain tasks (say, medical image analysis) so that they can focus on other skills ("Automation and Anxiety").

On the flip side, the manufacturing sector, which has provided so many people with a ladder into the middle class, is in decline in terms of employment. The data centre also embodies and facilitates that polarization, as data management supports the logistics of offshoring and automation that displaces workers. To paraphrase Joseph Schumpeter, data centres seem likely to both create and destroy. The political problem is that where jobs are created, where they are destroyed, and who is affected are socially and geographically uneven. For neighborhoods such as Washington Park, capital is once again flowing and sparking surplus-value creation, but this swell of investment does not raise as many boats as it used to under previous regimes of accumulation. The neighborhood is prized for its infrastructure but not necessarily for its people. In fact, the developer of the Midway Technology Center told me that the low population of the neighborhood was an added bonus for building security.

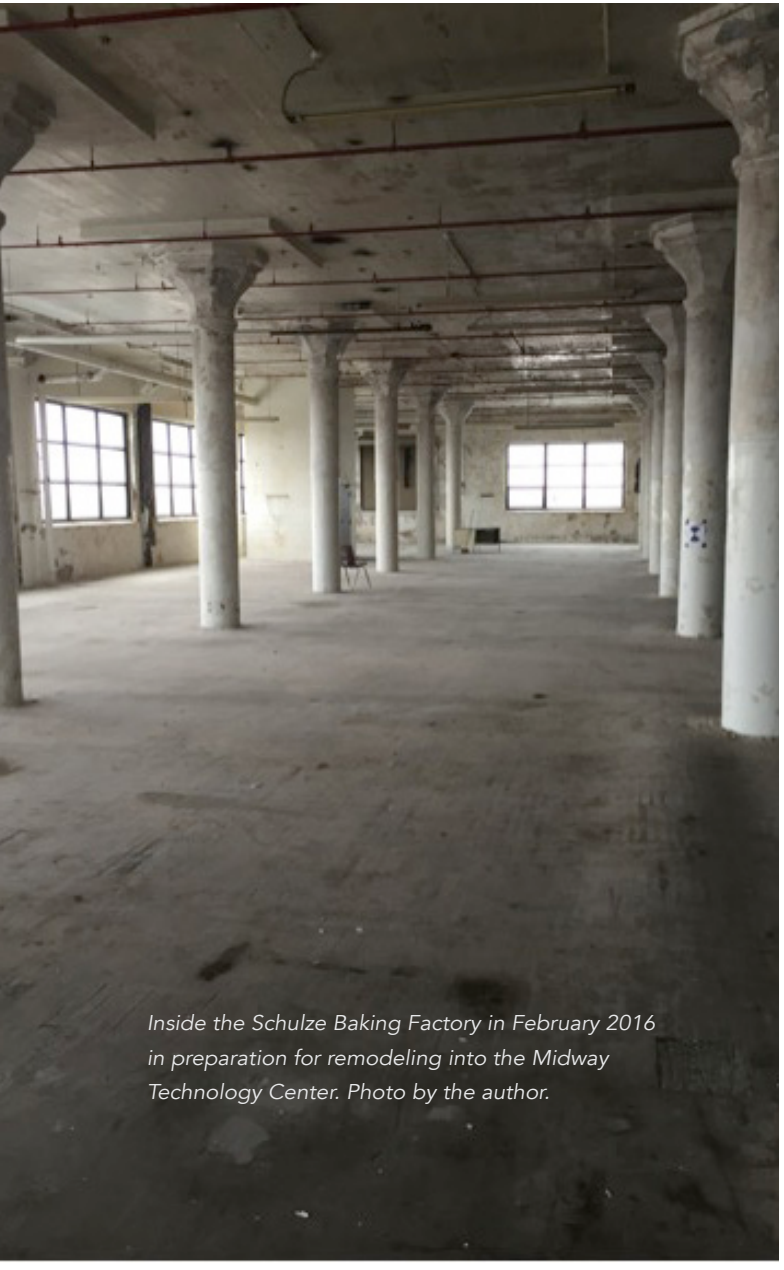
Second, the physical Internet today is expanding in ways that are path-dependent but also being shaped by the current neoliberal political economic context in which urban and regional entrepreneurialism and place-marketing figure prominently (Harvey). Public officials around the world are eager to grease the skids of data centre development; for example, Chicago has the Data Center Express, a public-private partnership whose purpose is to streamline the process of data centre development, and generous tax incentives are often part of the data centre development process in any location. As the Associated Press recently reported, state governments across the U.S. extended nearly $1.5 billion in tax incentives to hundreds of data centre projects nationwide during the past decade ("Competing for data centers"). For example, an Oregon law targeting data centres provides property-tax relief on facilities, equipment, and employment for up to five years in exchange for creating one job (Hammil).

It also appears that tax incentives have now become a bargaining chip for the data centre industry to use to create competition between regions and localities. In an editorial written in *The Detroit News* as tax breaks were being considered by the state legislature, one data-company CEO wrote "If Michigan doesn't pass the legislation, it means we can't come to Michigan because our clients won't and the reason is simple: More than 20 other states have passed the same set of data center tax policies being considered in Michigan" (Kramer). There is little new in this race-to-the-bottom discourse, but in previous eras cities and regions could potentially expect jobs to be created and that some of capital's return to an area could be invested in labour.



Bakers working the conveyor belt at Schulze Baking Company, circa 1920. The new data centre will employ significantly fewer workers than the bakery. By Fred A. Behmer for the Jeffrey Manufacturing Company, via Wikimedia Commons

More philosophically, as a geographer, I've been influenced by scholars such as David Harvey and Neil Smith, who



Inside the Schulze Baking Factory in February 2016 in preparation for remodeling into the Midway Technology Center. Photo by the author.

have theorized capitalist development as *inherently* uneven across time and space; thus, boom and bust and growth and decline are two sides of the same coin. The implication here is that the landscapes we construct to serve the needs of today are always temporary. The smells of butternut bread defined part of everyday life in Washington Park for nearly a century. Today data is in the ascendancy, constructing landscapes suitable to its needs. Yet those landscapes will also be impermanent. What remains common over time, however, is that people struggle over the trajectories of that uneven development.

Studies of infrastructure remind us that telecommunications and transport technologies have always been political. Remembering that people struggled to exercise some modicum of democratic control over the changes wrought by railroad networks and telecoms offers important insights for struggles around contemporary networks of computing. For example, in Banks' brilliant essay on the continuities between railroads and the Internet, he notes that because railroads were once so central to everyday life, in the U.S. they became regulated as "common carriers," a legal designation that prohibited price gouging and discrimination but also allowed local publics to make demands on this private infrastructure (2015). Many of these demands simply provided that trains stop in particular towns so passengers could get off and buy goods and services ("Lines of Power"). The city of Lowell, Massachusets even required rail companies to run their tracks right to factory doors. Other groups, such as Native Americans, some southerners loyal to the Confederacy, and many elites tried to block the expansion of railroads altogether. In Chicago in 1897, an armed mob marched on City Hall and successfully prevented the extension of Charles Tysen Yerkes' monopoly contract on the city's urban rail network. In all of these cases, Banks reminds us that these groups were not attempting to return to some pre-railroad past, but to exert "control over the contours and contexts of connection" (Banks).

Likewise, today the web is an almost inescapable part of everyday life, even for those without access. Yet it was only in February of 2015 that the U.S. designated Internet service providers as "common carriers," thus preventing them, like previous publics did of the railroads, from operating a "tiered" Internet that blocks, throttles, or prioritizes specific content over others (Banks). Thus the democratization of network infrastructure continues to be fought, as the debate over "net neutrality" indicates, and various groups are contributing to alternative visions of what ubiquitous computing might look like. For example, instead of contracting with Internet service providers who operate a near monopoly in most cities, as Yerkes did with trains in Chicago, over 100 U.S. cities are currently seeking to build out municipally owned and operated Internet services that prioritize low-cost, speed, and access to underserved communities (Nguyen). Ethnographic work that gets up close to the ways in which people struggle to carve out control over technologies, combined with the kind of historical view that Banks provides, creates a powerful lens through which to capture the historical conditions from which phenomena such as the smart city emerge.

In sum, thinking about computing and big data as physical and historical phenomena helps to contextualize the rapid

social and technological change taking place within space and time, rather than viewing this shift as a movement towards a kind of inevitable end state. For media scholars and others, the goal of much recent work seems to be to open up digital technologies and networks and the black-boxes of new socio-technical formations in an effort to make these formations more bottom-up, responsive, and inclusive (Jeffrey and Levin; Mattern). The vignettes discussed here are intended to show the layers of history and politics embedded within our everyday technologies. Visually recognizing these layers by studying buildings serves, even in a small way, to make the smart city and the digital present less abstract and more grounded the everyday spaces of contemporary life.

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