<LOW-CODE/ NO-CODE>

Citizen Developers and the Surprising Future of Business Applications

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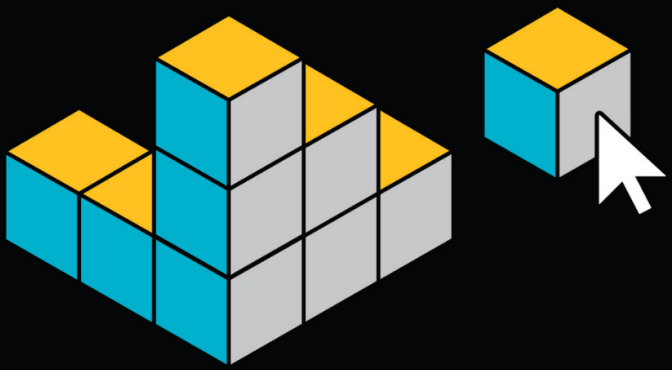

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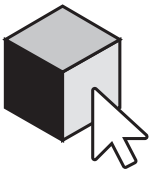
Low-Code/No-Code: Citizen Developers and the
Surprising Future of Business Applications

Racket Publishing | www.racketpublishing.com

ISBNs
ISBN: 9798985814736 (paperback)
ISBN: 9798985814750 (hardcover)
ISBN: 9798985814743 (ebook)

Printed in the United States of America

Cover design: Luke Fletcher | www.fletcherdesigns.com
Interior design: Jessica Angerstein



< Part I>

Application Development in the Here and Now

>_Chapter 1

Workplace Tech: The Struggle Is Real

"Where you stand depends on where you sit."

—RUFUS MILES

For decades, our relationship with workplace systems, applications, and technology has been complicated.

In October 2018, the high-end professional services firm PricewaterhouseCoopers surveyed more than 12,000 employees across different countries and industries.[1] As a lot, rank-and-file workers chafed at the tools their organizations required them to use. For example, nearly three in four respondents reported knowing of technologies that would improve the quality of their output.

A little more than half felt that their leadership chose workplace tech with their employees in mind. Perhaps not surprisingly, the folks in the corner offices sang a far more sanguine tune. Figure 1.1 displays the chasm between the two cohorts.

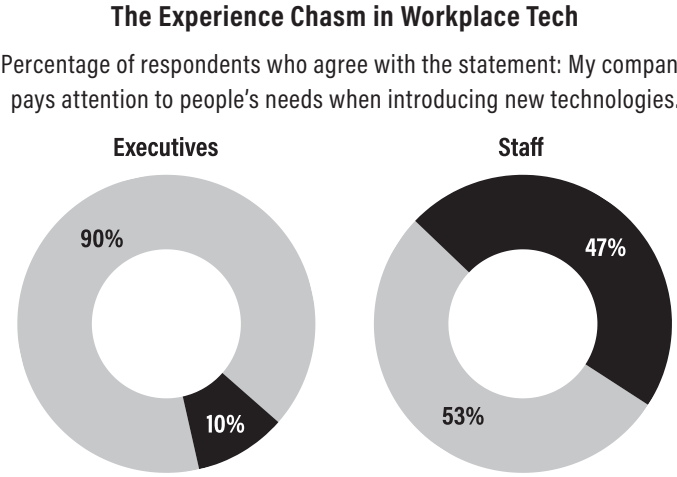


Figure 1.1: The Experience Chasm in Workplace Tech
Source: PricewaterhouseCoopers

In a word, *wow*.

At least there's an upside. (There's nowhere to go but up, right?) In its report, PwC correctly notes that the status quo affords plenty of opportunity for senior leaders interested in improving their employees' well-being. The top brass would do well to finally address the critical and longstanding deficit in workplace tech. Sure, the required investments in new applications and technologies would be sizeable, but so would the potential returns. Employers could increase employee job satisfaction, performance, and even retention.

Would the juice be worth the squeeze?

In theory, the answer was obvious.

Isolating Cause and Effect

In practice, however, things were murkier. After all, the real world is a messy place with myriad factors at play. It's nearly impossible to ascertain if an independent variable (increased tech spending)

affects a dependent one (employee performance), never mind to what extent. The arrow can go both ways.

In an alternate universe, researchers could use the controlled environment of a laboratory to answer these interdependent questions. Experiments, placebos, random assignments, double-blind studies, and other techniques would definitively isolate cause and effect and, in the process, provide conclusive, inarguable answers.

Fortunately, all hope is not lost. Academics, researchers, and social scientists have for decades embraced natural experiments to find solutions to thorny real-world problems. They routinely study and analyze real-life situations to ascertain the relationships among variables. Their job isn't easy.

One such natural experiment would arrive not long after the publication of the PwC survey in the form of COVID-19. In this limited and perverse sense, the pandemic could shed light on the effects of massive corporate expenditures in workplace tech. Specifically, how would they affect employee performance, satisfaction, and retention?

We were about to find out.

Gartner predicted that global business IT spending in the US alone in 2021 would hit $3.8 trillion, an increase of 4 percent from 2020.[2] No doubt that part of the uptick stemmed from the pandemic. In November 2020, KPMG reported that businesses had spent an estimated $15 billion extra *per week* on technology to enable remote work.[3]

Those numbers certainly qualify as significant cabbage, but was the money well spent? What was the return on investment (ROI)?

The word *disappointing* comes to mind.

A June 2022 study found the following:

> Ninety-one percent of employees reported being frustrated with the applications they use in their current positions.
> Seventy-one percent of leaders acknowledge that employees will consider looking for a new job if their current employer doesn't provide access to the tools, technology, or information they need to do their jobs well.[4]

According to a separate 2021 survey, one in five employees said their existing workplace technology made their job harder.[5]

Who's to Blame for the Status Quo?

Throw shade at your IT department if you want, but it—and its employees—are often convenient scapegoats. Rapidly rolling out new applications and systems isn't easy under normal circumstances, to say nothing about pandemics. Regardless of what management gurus claim, digital transformation—a piece of business jargon that I despise—is a tough row to hoe.

In reality, resource-related challenges are old hat. They've been plaguing IT departments since long before the pandemic. Exhibit A: In April 2018, Salesforce Research released its Enterprise Technology Trends report.[6] Among its most interesting findings: 72 percent of IT leaders claimed they lacked the time and resources to work on their own strategic projects. Ever-increasing project backlogs prevented them from focusing on their critical priorities. Again, the company gathered these statistics *before* COVID-19, and the Great Resignation shook many IT departments—and the organizations behind them—to their foundations.

More than a year into the pandemic, a decent chunk of employers struggled to stay afloat, let alone be profitable. In June 2021, Accenture reported that 28 percent of firms were operating "without proper

tools and processes at scale." What's more, one in five organizations claimed that their backlog exceeded fifty initiatives.[7]

Ouch.

Now, all departments within any given enterprise matter in the abstract. It turns out, however, that some groups are *more* important—a point that COVID-19 drove home.

The Pandemic Validated the Importance of Workplace Tech

Starting in March 2020, workplace technology went from *important* to *downright essential*. The reason is simple: Under the extraordinary circumstances of COVID-19, millions of employees simply couldn't work without lots of new tech.

Slack cofounder and CEO Stewart Butterfield was an early media darling on how to navigate our new normal. One of his frequent talking points is particularly salient here: Although employees couldn't meet in person during the days of lockdown, they were able to remain productive because of the communication and collaboration tools at their disposal. (And, yes, Slack is one of them, although now it's part of Salesforce.)

The data supports Butterfield's assertion. HR and workplace benefits consulting firm Mercer surveyed 800 employers in the months following the outbreak of COVID-19. Ninety-four percent of respondents said that employee productivity was the same or higher than before the pandemic *even when they worked remotely.*[*]

Flip the scenario, though. Imagine if we'd worked in our usual offices and met in person, but we couldn't communicate via sophisticated digital technologies. The pandemic's work-related outcomes—equivalent worker productivity and relatively minimal disruption—almost certainly would have been different.

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* The survey lives behind a paywall, but the company made an infographic available for free at https://tinyurl.com/mercerRPM.

When it came to work, technology saved us.

There. I said it.

Survey results confirm that information technology and the people who lead it are now more likely to be sitting at the big-boy table. Consider the 2020 Harvey Nash/KPMG CIO Survey of 4,219 global IT leaders from a variety of industries.[8] More than three in five reported that the pandemic had *increased* their influence within their organizations and with their colleagues. More than four in five expected their budgets and headcounts to grow in the next year. Upon hearing the news, I suspect most of them reacted with the words, "About freakin' time."

As I've been saying for more than a decade, *all* companies are tech companies. Some just haven't realized it yet.* (Cue Marc Andreessen's quote about software eating the world.) The pandemic shed light on many things; the importance of technology for any contemporary business is just one of them.

Understanding the Dual Nature of Contemporary IT

One could write a lengthy book about the many competing and even conflicting demands that IT leaders and departments routinely face. Many people have. At a high level, their challenges stem from one simple reality: The notion of a monolithic IT department is an antiquated one. Contemporary IT represents two related but distinct groups. And this brings us to the world of DevOps.

Its origins trace back thirty years, but DevOps has only taken off in the past eight. (Google Trends makes me seem smarter than I am.†)

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* That sentence has adorned the home page of my website for a decade.

† See for yourself at https://tinyurl.com/dev-phil-ops.

This portmanteau fuses two essential technical disciplines: development and IT operations. In theory, the organization that has embraced DevOps is facing reality. Its management has recognized that employees who build new applications and launch new features typically don't share the same priorities as their counterparts tasked with upgrading and maintaining existing systems and applications. Developers get jazzed about shiny new things; IT security analysts worry about leaks, hacks, malware, and ransomware—as they damn well should.

In October 2021, Rackspace Technology surveyed 1,420 IT professionals.[9] The results may surprise you, but grizzled industry types just nodded their heads:

> A full half of global IT leaders reported that they weren't "fully confident" in their ability to respond to an increasing array of intricate threats.
> Perhaps most alarmingly, 86 percent of respondents revealed that their organizations lack the necessary skills, expertise, and resources.

At least the IT bigwigs aren't alone. Consider the results of a February 2020 McKinsey Global Survey. Nearly nine in ten executives reported experiencing skill gaps in the workforce or anticipated them within a few years.[10]

Yikes.

Economics is the study of scarcity. Paul Samuelson called it "a choice between alternatives all the time." One doesn't need to be John Maynard Keynes or Adam Smith, however, to appreciate the fundamental tradeoff between developers and operations folks. By definition, a dollar for one group means one fewer dollar for the other. (A notable exception: JPMorgan Chase CEO Jamie Dimon

has said that his company's cybersecurity is effectively unlimited. He previously authorized more than $600 million in *a single year* to protect his customers' assets and information.[11])

As Figure 1.2 shows, the resource tradeoff is real.

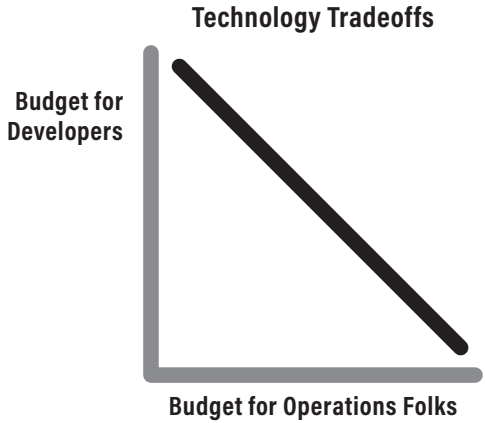

Figure 1.2: Technology Tradeoffs

Bottom line: Organizations spend more on operations, maintenance, and security. As a result, there's less money to allocate to proper developers.

Before moving on, let's take a time-out.

You may have read the first few pages of this chapter and yawned. (I can take it.) Why is this information relevant? More concretely, say that you work at a one-hundred-person entertainment company with a single full-time IT employee. Does all of this DevOps stuff *really* affect you?

Trust me. It does.

Regardless of whom you call when your computer doesn't work, the odds are that the dual nature of IT function profoundly influences how you and your colleagues do your jobs. Consider the following scenarios:

- You found a bug in one of your company's homegrown systems. Six months later, it's still there mocking you.
- A ransomware hack prevented you from accessing critical systems and information for a month.
- After weeks of back-and-forth to set up a meeting to discuss new enhancements to key systems, the head of IT cancels because she needs to fight another fire.
- A single IT employee unexpectedly leaves. Who will mind the store as management frantically searches for a suitable replacement?

I suspect that you're getting my drift. If these circumstances eerily describe your current sitch, at least you can solace in the fact that you're not alone. Over the years, oodles of other people and organizations have faced identical dilemmas.

For decades, employees frustrated with their employers' internal systems, applications, and devices could either lobby for internal change, grin and bear it, or quit. Starting in the mid-2000s, however, a new—if unsanctioned—option began growing in popularity.

Shadow IT

It's time to introduce another possibly foreign concept: shadow IT. It refers to the workplace technologies employees use that centralized IT departments haven't sanctioned.

A little background will put shadow IT into context.

Rewind to 1996 for a moment. Mary is a director of sales at a large retail outfit. She hates her employer's homegrown customer relationship management (CRM) system. Mary yearns for the days of a more contemporary alternative and pleads her case with the C-suite. (Yes, tech envy is a thing.) For the time being, however, there's not much she can do.

For years now, Mary has been able to quickly spin up her own CRM and fly below the radar. Let's say that she signs her department up for Salesforce. Thank the advent of smartphones, cloud computing, and software as a service (SaaS). Small monthly charges are easier to sneak past internal auditors than massive one-time bills.

Mary may be happy with her new CRM system, but at least a few of her colleagues won't be when they find out. Nothing against Salesforce but, generally speaking, shadow IT can raise the eyebrows of security and compliance peeps. At a minimum, it sets a dangerous precedent: Employees can do whatever they want.

An itchy executive going rogue and signing up for Salesforce represents just one example of shadow IT. Others include using a personal email account to conduct company business or working on your own tablet in the office.

On the whole, shadow IT is far more common than one might think. In 2017, the Everest Group found that half of all enterprise purchases fell under the umbrella of shadow IT.[12]

Employees who deliberately opt to circumvent IT—or at least try—will usually tell you they have no choice. In an ideal world, they'd use sanctioned tools, systems, and applications. Sadly, those internal technologies are deficient and, in many cases, have been for a while. The rank-and-file frequently justifies going rogue because the ends justify the means.

This statement goes double for executives with profit-and-loss (P&L) responsibilities and lucrative stock and bonus packages. Antiquated tech or systems directly affect their compensation, making the costs of inaction just too great. Even *if* they get caught, they'll deal with the consequences later. Ask forgiveness, not permission.

At the risk of excusing potentially dangerous behavior that jeopardizes the entire organization, imagine if IT concedes the point. The CIO admits that the company's current technologies are deficient—or even a sad state of affairs. What if IT promises to make changes, upgrade systems, and introduce new tools as soon as possible?

In many cases, the CIO's assurances wouldn't placate anxious constituents. Those much-needed enhancements may take too long to arrive. IT often can't deliver the goods quickly enough. Although the reasons vary, an inability to hire more developers is one of the usual suspects.

The Interminable War for Tech and Data Talent

Before COVID-19, the Linux Academy estimated that two in three employers couldn't find qualified candidates to fill their open IT positions.[13] In 2017, Forrester Research predicted that the software developer deficit in the US alone would reach 500,000 by 2024.[14] (I'll bet my house that the pandemic makes that estimate look paltry by comparison.) IDC reported in its September 2021 Market Perspective that the global shortage of full-time developers will increase from 1.4 million in 2021 to 4.0 million in 2025.[15]

In its September 2021 report "The Tech Talent War Is Global, Cross-Industry, and a Matter of Survival," the venerable consulting firm Bain & Company revealed the intensity of the battle.[16] Across the board, the demand for both tech and data workers far exceeds their supplies. What's more, society doesn't just mint new programmers and data scientists overnight. As with doctors and lawyers, it takes time. Figure 1.3 shows how the demand for different tech-related jobs has mushroomed.

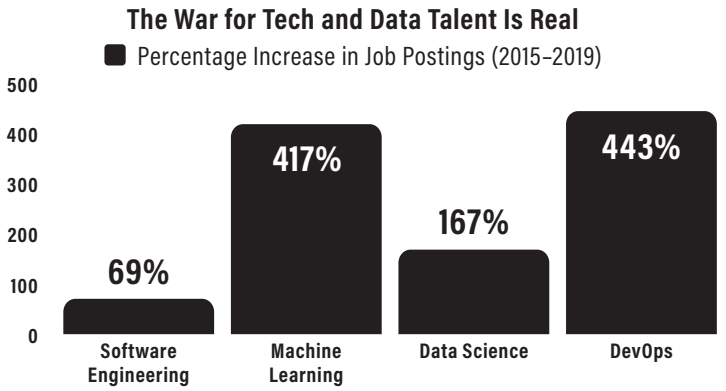

Figure 1.3: The War for Tech and Data Talent Is Real

Note Bain's & Company's dates in Figure 1.3. They stem from prepandemic times. As a result, they fail to reflect the new business applications that the rise of remote work has heaped upon IT departments. That caveat aside, however, Bain's management recommendations hold up today, especially "find[ing] creative ways to widen their funnel of candidates."

Against this backdrop and that of #BlackLivesMatter, in February 2022, Google launched a $100 million Career Certificates Fund. From the Social Finance website, a national impact finance and advisory nonprofit:

> Supported by inaugural training providers Merit America and Year Up, learners upskill and earn Google Career Certificates—industry-recognized credentials that equip people with the skills needed to enter in-demand fields such as data analytics, IT support, project management, and user experience design. The program focuses on helping people from underserved communities access well-paying, high-growth jobs.[17]

The fund comes on the heels of the company's highly touted 2020 creation of a six-month career certificate program aimed at disrupting higher education. Google aspires to create equivalents to traditional four-year degrees for a fraction of the cost,[18] and early results have been impressive. More than 250,000 people entered the IT certificate program in its first two years.[19]

Hiring part-timers is another potentially promising way to increase the pool of technical candidates. Unfortunately, that dog won't hunt, says Arnal Dayaratna, a VP of research at the global market intelligence firm IDC:

> While part-time developers provide an invaluable resource for organizations to continue digitizing business operations and processes, there is no substitute for trained full-time developers that have the skills to architect digital solutions with due consideration for their long-term viability, scalability, and security.[20]

Jargon aside, Dayaratna is right. It's a half measure.

And the severe talent scarcity isn't confined to software developers and general tech workers. Data wizards are also in short supply. Consulting firm QuantHub in 2020 reported a shortage of 250,000 data scientists with no end in sight.[21]

As further proof of the imbalance and the need to address it quickly, consider higher education. For the past six years, colleges and universities have been scrambling to create degree and non-degree programs for data analysts and scientists.[22] I should know. I used to work for one of them.

Retention Issues and Remote Work

Forget hiring *new* developers. Thanks to the pandemic, employers as a lot are struggling to retain their *current* ones.

Consider the words of Marko Kaasila, SVP of product management at the Qt Company. After his firm copublished research with Forrester in June 2021, he spoke with Owen Hughes of TechRepublic:

> The unforeseen need for rapid digital transformation in recent months has placed a huge drain on developers who have not been equipped with the tools they need to manage the dramatic rate of change. The welfare of software developers in today's fast-paced world has been overlooked as companies digitally innovate in order to survive.[23]

The acceptance of remote work adds pressure to IT execs who want their employees to, you know, show up at the office occasionally. In April 2020, researchers Jonathan Dingel and Brent Neiman of the University of Chicago approximated that 100 percent of US technology workers can do their jobs remotely.[24]

Think about that number. Every. Single. One.

As a group, technology workers aren't too keen on the idea of returning to an in-person, Monday–Friday, 9–5 work schedule. In May 2022, Morning Consult surveyed 638 hybrid or fully remote techies. Roughly 60 percent of respondents said they weren't interested in returning to full-time, in-person work. Good luck calling their bluffs. In the current labor market, they're holding pocket aces. They won't be unemployed for long—and they know it.

Organizations face an uphill battle in finding and retaining talented tech workers. Forcing these employees to return to a prepandemic work environment and schedule only intensifies the

challenge. And remote work adds yet another fly in the ointment. From "Microsoft Digital Defense Report":

> While most industries made the shift to remote work due to the pandemic, it created new attack surfaces for cybercriminals to take advantage of, such as home devices being used for business purposes.[25]

Employees who work from home and connect to their home networks pose a new array of security risks[26] outside the scope of this book. Suffice it to say that securing a remote or hybrid workforce requires new software, employee training, and possibly hardware. Supply chain and geopolitical issues further complicate the latter. As a result, IT departments are shifting dollars away from application development—the *Dev* part of DevOps.

A Way Forward

This chapter has shown that IT departments face an untenable status quo. Their lack of resources prevents them from meeting their constituents' growing needs. The current labor market makes it nearly impossible for them to procure those resources. Faced with an often-unresponsive IT department, shadow IT is proliferating, giving many executives agita.

At this point, you might be thinking, "Don't bring me problems. Bring me solutions."

It's among the most hackneyed management tropes—and has been for years. Maybe your boss has uttered those words at some point, and you rolled your eyes.

IT departments routinely unable to meet their constituents' needs can choose one of three options.

#1: Ask Them to Be Patient

"We know that you need critical apps to meet your business goals. They're coming—eventually. Really. We promise. We just don't know when."

Good luck with that.

#2: Encourage Them to Go to Development Shops

"Fine, we admit it. We can't deliver the goods. Go ahead and find other developers who can."

Outsourcing app development can be a particularly tough needle to thread. Horror stories abound, and the data supports this contention. Consider the words of Tom Dunlap, director of research for Computer Economics:

> Application development can be a tricky outsourcing category to get right. Application developers are expensive and, in many cases, are rightly seen as options to outsource. But our moderate service-satisfaction numbers show there is a risk associated with this type of outsourcing.[27]

Although the second alternative is better, it's hardly ideal.

#3: Allow Nontechnical Employees to Develop Their Own Business Apps

The third option is hands down the most plausible one. Not coincidentally, it's also the subject of this book. Together, an emerging group of tools (called *low-code/no-code*) and tech-savvy employees (called *citizen developers*) are democratizing the development of business applications. Chapter 5 explores the group in depth.

Before continuing, however, we need to cover how firms have historically built and deployed new tech. Let that serve as the starting point for the next chapter.

Chapter Summary

- In case any of us forgot, workplace tech keeps the wheels moving. The pandemic gave us an essential reminder of its primary import.
- The marked shortage of developers means that IT departments can't meet their constituents' needs. They're unable to develop and deploy critical business applications and systems.
- This challenge is neither small nor ephemeral.
- Few tech workers want to return to the office on a full-time basis. This reality makes finding and retaining them even more problematic.