

THOMAS H. DAVENPORT ■ IAN BARKIN  
WITH CHASE DAVENPORT

# ALL HANDS ON TECH

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THE AI-POWERED  
CITIZEN REVOLUTION



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All  
Hands on  
Tech



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The AI-Powered Citizen  
Revolution

Thomas H. Davenport and  
Ian Barkin  
with Chase Davenport

WILEY

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# Preface

## **Jay Crofts: Bringing “Shadow IT” Into the Light**

It’s fitting to begin this book with the story of an unlikely hero of citizen development. Jay Crofts is a semi-retired former chief information officer of Shell PLC, the energy giant. Jay Crofts was executive vice president and group CIO of Shell from 2015 to 2023, and about halfway through his tenure he had a bit of a revelation. Shell was in a race to digitalize its business, and Crofts just didn’t feel like it was happening fast enough. His global IT function had a multibillion-dollar annual budget and more than 8,000 staff and contractors, but they still couldn’t satisfy the demand for applications, automations, and analytical models around the company.

Crofts kept telling his people that they needed to get closer to the business in order to create value, but he realized that there were plenty of people in the business who could create value with IT as well. People were getting citizen-oriented tools in their hands, but he was a bit worried about what they were doing with them.

Crofts was based in the Netherlands, and the European Union had passed the General Data Protection Regulation (GDPR) in 2016. He was afraid that citizen development would get out of control and that employees would violate the law by inadvertently making available critical personal data—the medical records of sailors on Shell tankers, for example. He felt that there were lots of smart engineers and other employees at Shell doing innovative things, but there was no safe place to access and store the data they needed to use. Crofts knew those people were thinking, “I want to be

productive, but there is no place to do it. Crofts' group says no, because there is a risk of GDPR violations or cybersecurity issues." He looked around the energy industry and elsewhere to see if anyone else had solved the problem, and they hadn't. Many CIOs were still viewing citizen development as undesirable "shadow IT," but Crofts saw it as a way to bring it out of the shadows and into the light.

So Crofts put Nils Kappeyne, one of his trusted business unit CIOs, in charge of the do-it-yourself (DIY) initiative. They didn't want to call it citizen development because they were afraid engineers might think they were being taught how to vote. Crofts thought the initiative would work out well, but he wasn't sure. The critical thing, he believed, was finding a safe place to access and store data for citizen use. He told Kappeyne to find a place to put the data, and then data owners—which already existed—throughout the business would determine access to it. He said to Kappeyne at the time, "What will bring people to your platform is where the data is."

As the DIY program was rolling out, Shell was deepening its partnership with Microsoft, and that vendor was making big bets on both cloud and citizen development. The data at Shell for citizen use ended up being stored in Microsoft's Azure cloud. And the vendor had also just introduced its Power Platform—a collection of citizen-oriented tools for application development, business intelligence, web portal development, and later workflow automation. Crofts and Kappeyne placed their DIY bets on these Microsoft tools and a few others from vendors like [Salesforce.com](https://www.salesforce.com).

Kappeyne thought that he could keep his day job as a business unit CIO while getting DIY going, but Crofts felt otherwise. "It needs to be big," he said. Kappeyne, already a Shell VP, suggested that the program wasn't worthy of a VP title, and he could take a demotion. "It needs to be big," Crofts said, "and you should keep your VP title." Kappeyne also thought that he could establish the DIY program within a couple of months. Crofts doubted it but didn't say so. Kappeyne stayed in the job for a couple of years and then reluctantly handed it off to somebody else.

Crofts also supported a collaboration with Shell's research function on citizen data science. Dan Jeavons, the head of that initiative, reported into the research organization but was formally included in the IT leadership. Shell collaborated with Microsoft Azure to be able to run models at scale in the cloud. As with the application development DIY program, data was provided to the data scientists, "and they could go to town," Crofts

remarked. The DIY approach, accompanied by effective cloud security, enabled data science to thrive. It was a good fit for a culture where, as Crotts put it, “engineers—many of them come out of school knowing Python these days—question a model if someone else develops it.”

Some IT people worried about losing their jobs, but Crotts thought that they—or some, at least—would move from being developers to coaches and enablers. And that is what has happened. Shell still has plenty of professional developers, and in many cases the DIY program has brought the business and the IT people into closer collaboration.

One influential aspect of the Shell DIY approach to citizen development is the “zone” program, in which different zones (green, amber, red) get treated differently in terms of governance. We’ll describe the approach later in the book, but suffice it to say here that it has been adopted by a variety of organizations. Microsoft has endorsed it for Power Platform customers, for example, and the Project Management Institute has adopted it for its teachings on citizen development. Several companies we spoke to said they had adopted the Shell zone approach.

But perhaps even more influential for the worldwide spread of citizen development has been the idea that a corporate IT organization can get behind citizen technology activity and give it the support it needs to thrive. Crotts is pretty modest about this achievement:

People really liked it, and it’s one of the fastest things going. A significant number of engineers adopted DIY, and we’ve given them credit for the work. The tools are easy to use, and the data is there. Once other CIOs understood it they thought it made sense.

Crotts mentioned several DIY projects that have enabled energy transition activities or substantially reduced fuel consumption in Shell operations. He doesn’t say that citizen development has transformed the huge company, but as he put it, “We’ve hit singles all across the globe.”

## **Benjamin Berkowitz: A Finance Professional Turned Citizen Automator**

One shining example of citizen automation turning a domain expert into a digital transformation leader is Benjamin Berkowitz. A self-professed

“finance guy,” he was motivated to solve operational and budgetary challenges in the hospitals where he worked. He studied history and psychology in college and earned an MBA. He’s now pursuing a PhD in management and organizational behavior. He wanted to know what made enterprises tick.

Berkowitz began his career in the healthcare field, working first as a financial analyst at Boston Children’s Hospital before moving to Mass General Brigham (MGB). Based in Boston, MGB is the largest hospital-based research enterprise in the United States, with revenues of nearly \$19 billion and more than \$2 billion in annual research funding. It is, in short, a hospital with a lot of work for its finance department. Berkowitz’s 11-year career at MGB afforded him the chance to experience and impact almost every part of it. Starting as a team lead for payer strategy and contracting, he then moved to lead revenue calculation and revenue finance systems, finally becoming director of financial analysis and strategy, and chief of staff of revenue cycle operations—the lifeblood of any healthcare business, since it’s how the organization gets paid for its work. But on this journey he found himself doing more than simply overseeing financial functions.

Berkowitz had always been interested in making work processes more efficient and effective. Early in his career that meant using Microsoft Access to automate reporting. He then graduated to using SQL to process large data sets in order to process revenue models. This trend then accelerated in his revenue cycle job at MGB. In his own words, Berkowitz was “bouncing around from department to department, automating as he was going.” He didn’t know he was a citizen automator; he hadn’t even heard the term. He was just applying his penchant to problem-solve to challenges as they presented themselves and using the automation tools at his disposal.

Berkowitz’s pivot to becoming a full-time champion of automation began while looking at budgets, as finance people are wont to do. The growth of MGB’s operations over the previous decade had been strong. Staff levels grew accordingly. But Berkowitz was now facing a challenge. He had 800 people in the RevCycle and Shared Services Center and no end in sight to growth in hiring. The challenge was compounded by talent shortages and rapid wage inflation. Clearly the status quo wasn’t sustainable. As part of a budget planning conversation, he said to his VP, “There must be a better way for us to manage all of this work.”

His next steps (highlighted in an article<sup>1</sup> Berkowitz coauthored) addressed the growing scale of work to track and catalog an increasing number of healthcare providers. The current system was slow and inefficient. It took three different hospital administrators to collect, aggregate, and export data, all of which was performed manually.

In response, Berkowitz and his colleagues recruited external developers and partnered them with a process specialist from the finance department to redesign workflows to better facilitate automating the tasks sequence involved. They developed automations to collect provider data, format it, and present it to members of the finance team. Their solution also highlighted the next actions, so as to assist the team in efficiently moving each process forward. The results were frontline finance employees being free to focus on higher-value work and the ability to handle provider growth without having to hire more staff.

Berkowitz was hooked. But his organization needed more convincing before jumping headlong into automation. Berkowitz then pursued lots of research, conferences, discussions with experts, and proofs of concepts to help settle on robotic process automation (RPA) as the tool of choice. His tenacity paid off, and he was able to convince his leadership to set up a new department. In 2019, with strong support from his CFO, he established the intelligent automation department with himself as director, reporting to the VP of finance and administration. Always budget conscious, Benjamin then faced the choice of how to staff the initiative. He decided rather than bringing on a large team of developers, he would recruit internally for citizens like himself. What's more, he would focus his efforts on the five to six departments where operational improvements from automation would have the biggest impact. He didn't want to leave out other, smaller departments like legal and contracts, so he set up a small central team of developers to support their needs.

He opened up internal recruiting to anyone who wanted to be an "embedded developer"—a name chosen to emphasize that the team was made up of subject-matter experts (SMEs) working closely with and serving their colleagues. These citizen automators could have the business-level

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<sup>1</sup> Ben Armstrong and Benjamin Berkowitz, "Scaling Automation: Two Proven Paths to Success," *MIT Sloan Management Review*, February 28, 2024, <https://sloanreview.mit.edu/article/scaling-automation-two-proven-paths-to-success>.

discussions that IT would struggle to have, and they knew who to go to for answers to their questions.

Next, he needed to generate buzz, recruit talent, and put in place a series of best practices. In addition, since he was reporting up to finance leadership, he was conscious that he needed to nurture a strong working relationship with IT if this was to be a success. The embedded citizen developers and centralized developers would all report to him, and they would surely encounter issues involving integration with multiple systems.

To attract talent, he provided a clear and rewarding career path, with a new job code, a different pay scale, and three levels of qualification—junior, normal, and senior automation developer. He also created an intake lead role in which a person could play part champion, part ambassador, working with departments to look for opportunities to leverage the tools and capabilities of the team. Berkowitz described this role as similar to a primary-care physician: helping a department diagnose a workflow situation and working with the right specialists to develop automation solutions that fit their needs.

The success of Berkowitz's department was no secret; one day in the spring of 2021, he got a call asking if he wanted to come to work at the pharmaceutical company Vertex, a pioneer in the development of treatments for serious diseases like cystic fibrosis and sickle cell. Ready to try out a different industry and a different set of potential challenges, he said, "Let's give it a go."

Berkowitz now serves as the director of digital automation at Vertex. Unlike at MGB, he works for IT and has a centralized team. As stated on his LinkedIn profile, he is "creating pathways for citizen developers throughout the organization, further democratizing automation tools and accelerating the return on investment of the program." Vertex is rolling out a different tool set than he used at MGB, which is more focused on cloud-based citizen development.

Of note, Vertex's leaders have set a bold top-down mandate of discovering five new drugs in five years.<sup>2</sup> Berkowitz hopes that leveraging his team's automation capabilities will contribute to making this bold goal a reality.

As for the MGB program, its success gained the attention of the IT organization. Upon his departure, the IT department laid claim to the team.

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<sup>2</sup><https://www.bizjournals.com/boston/news/2024/02/05/vertex-2023-earnings.html>.

## **“Mr. Citizen”—The Citizen Development Pioneer with the Arrows to Show for It**

Although in our research we found many examples of organizations embracing citizen development, that doesn’t always happen. One prominent proponent of the idea—we’ll call him “Mr. Citizen” because he works for a consumer products company, which didn’t want us to identify the company or him—advocates strongly for the idea internally and externally in social media (from which we take this description), but hasn’t always received support from his organization.

Mr. Citizen wasn’t always a citizen developer. For many years he spent most of his workday entering data into Excel. The area in which he works is a data-rich activity, but the data typically comes from all over the place: ERP systems, supply chain management systems, marketing projections, sales databases, and lots of spreadsheets. He became very good at moving data in and out of Excel spreadsheets, but he knew that he—like every other human—occasionally made mistakes in this process. He crammed so much data into Excel that the program often broke. And it wasn’t much fun. It also didn’t allow much time for thinking about big-picture improvements in his business process.

Despite the tedium of the Excel work, Mr. Citizen did it for years because he knew of no alternative. He wanted to spend less time on data entry and manual reporting, and more on statistical analysis of the data. He and his colleagues had asked his company’s IT department for systems that would make this process much easier, but they never got much encouragement—the IT backlog was too long, and they wouldn’t take on any project that wasn’t an enterprise process.

So Mr. Citizen began looking for alternatives to Excel. He tried a popular business intelligence tool, but it didn’t really help much. So then he explored a tool known for its analytics and “data pipeline automation” capabilities called Alteryx, and a system called Tableau for the visual analytics of the data and statistical analyses. Later he experimented with a tool for automation of data integrations and APIs called Parabola. These tools saved him lots of time, and he became an advocate for their use both inside and outside his organization. These tools weren’t supported by the IT department, but Mr. Citizen found them easy to download and use. He wasn’t banned from using them, but IT told him that he didn’t need Alteryx

because all it did was write SQL queries. Why didn't he just write them himself, they asked. Of course, it was because he is not a SQL programmer. Still, he struggled to get his IT organization to put Alteryx and the other tools on the list of approved software. He continued to build tools to save himself and his colleagues time and drudgery, reducing the need for IT professional help, but getting no respect for it.

Mr. Citizen could probably spend all of his time as a citizen developer, but he believes that a key aspect of his value—and that of any citizen developer—is his combination of citizen technology skills and business function expertise. Because he possesses both types of skills, he can now not only build many technology solutions for his part of the business, but also communicate effectively with IT professionals about requirements for enterprise-level systems they might build. He commented on social media that he believes entry-level workers should spend their time learning some aspect of the business (supply chain management, for example) and not learning professional IT skills.

On social media, Mr. Citizen wrote a sort of “open letter to IT teams” blog post (it's long, so we won't reproduce it all here) that expresses his relationship to them, as well as listing some of the accomplishments he and his team made with citizen technologies:

...And if I'm being honest, you weren't always the best to work with. You had a real command-and-control approach to technology: We'd ask you for something and you'd gather a bunch of requirements just to disappear for 6 months and come back with something that usually missed the mark.

Remember that huge business intelligence initiative we did? We were going to modernize our whole reporting infrastructure into a one-stop shop for all our supply chain analytical needs. You came to me with big promises.

But when it came time to gather requirements, I was vague. I had no idea how to tell you what I needed, and you didn't know the business well enough to understand me. In the end (18 months late and way over budget), you left me with the same stuff I had before, in a slightly prettier package.



This doesn't have to happen anymore. Your approach is changing, it's less about command-and-control and more about enablement—empowering operators with a flexible stack and all the tools we need to solve our problems on our own.

I'm changing, too. I'm using low-code/no-code tools—as a citizen developer—with loads of benefits:

- **I've saved a ton of time and money** (without having to bug you much). Literally thousands of hours, millions of dollars.
- **I'm more data literate.** I've been building my own data pipelines, working with relational databases and creating my own data models.
- Because I'm more data literate, **my communication with you is becoming more effective.** I don't give you vague requirements anymore—I talk in terms of selection criteria, filter criteria and modeling steps.
- **And that huge backlog of yours – I can help alleviate it.** There aren't enough of you to go around, so you rightfully prioritize the big stuff – and there are lots of smaller things that I know you'll never get to. We can take care of that stuff ourselves now.

Here are some examples of what my team and I have been able to do with little to no help from you:

- **We automated our product allocation process,** a highly manual process that in my 11+ years here you never wanted to touch. We were able to save over 40 hours *per week* (not to mention the huge morale boost for our allocation team).
- **We built out a data model and a suite of analytics to support our promotional planning process.** It routinely identifies millions of dollars worth of planning errors. But the need for this was specific to our market, so it was never going to make it to the top of your backlog.
- **We built functional prototypes of data models** that supported our demand planning and claims teams. In fact, they're serving as inspiration for your product teams to build global solutions.

You might be skeptical. You're worried about governance and best practices. I get it. But that's no reason to tell us not to use low-code/no-code tools — it's a reason for you to help us learn these practices. You've developed them over decades — we won't get it overnight, but with your support, we'll get there.<sup>3</sup>

Mr. Citizen, as his remarks suggest, is conscious of governance in citizen development himself, and writes social media posts to people in other companies counseling them to follow responsible citizen practices like building only small solutions, producing documentation, and testing for data quality. The IT group in his company, as he also acknowledges, has finally admitted that citizen development might be useful in some circumstances, but the group still appears to be more interested in controlling it than encouraging it.

Like some other citizen developers we've observed whose work is not appreciated by IT or their broader organization, we'd guess that Mr. Citizen is likely to eventually leave the company. However, we have no doubt that he'll find another company or entrepreneurial venture in which he can create value from the combination of skills he now possesses. We also suspect that his employer—even its IT teams—will miss him.

## The Future of Work

Stories like Jay Crotts's, Benjamin Berkowitz's, and "Mr. Citizen's" are becoming more common in enterprises across the globe. This sort of change is taking place at companies of every size, in every industry, across every function, department, and team.

Challenged by staffing shortages and inflation, facing heightened competition, and coming to grips with the reality that every element of a business is now inextricably attached to data and software, leaders and individual contributors in companies of all sizes are stepping up and stepping in to drive the changes they know are needed. They are beginning to succeed, empowered by an enormous shift in the power dynamics that have long defined enterprise operations.

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<sup>3</sup>"IT Teams—Can We Talk?" Parabola.io blog post, Feb. 2024, <https://parabola.io/blog/it-teams-can-we-talk>.

Technology is no longer owned by any one department or function. Data and its analysis are no longer the property of only the PhDs and the hard-core number crunchers. And these genies cannot be put back in their bottles. From now on, all employees have the ability to be system designers, data analysts, coders, and creators. Every one of them is empowered to act on their unique set of experiences and their specific levels of expertise with process, product, customer, partner, or whatever other component of the elephant they touch every day. No one knows it better. And, until now, no one was able to contribute such well-informed insight toward making things better. The value of this grassroots, bottom-up, SME-first approach to transformation cannot be overstated. Creation of technology at the front lines will fundamentally change the way change happens. And there is no going back.

However, there is certainly more to be done to ensure that we can all move forward successfully. Because, while employees are more empowered than ever before, the question is, are they ready? Are their enterprises ready? Are the policies, procedures, and controls ready to safely enable this new reality?

We think the answer is no—or at least not yet in most organizations. But there are significant efforts being made to prepare. Some of these efforts will prove successful; others will not. Our discussions with leading global organizations, midsize national organizations, and small local firms has revealed a wide range of awareness, preparedness, and maturity of mechanisms in place to make the most of what can only be described as a revolutionary new way of imagining, enacting, and driving change. This book is our attempt to distill what we've seen and what we believe enterprises need to consider in order to jump onboard a train that has already left the station. Failing to do so will likely result in entire enterprises finding themselves in the way of that very train.



# Introduction

When we began discussing the idea for this book, the COVID pandemic was just receding, leaving behind it a tumultuous set of realities about how work was to be conducted going forward. Bosses and their employees were trying to determine where work should occur (return to offices or continue to work virtually) and who would be doing the work (talent shortages were only just starting to become the new reality of enterprise growth and resource management).

We knew that automation and intelligent machines were already a significant force in enterprise operations. Tom had recently published his 22nd, 23rd, and 24th books—all about artificial intelligence (AI) and the role that it was playing in transforming business operations, analytics, and skills needed for the future. Ian had just co-authored his first book on intelligent automation. He had recently sold his robotic process automation (RPA) consulting firm, which had helped large enterprises grasp, adopt, and manage process automation in their front- and back-office operations. There was no doubt in our minds that AI-powered automation was a hot topic. But, the question remained, who was going to be doing the automating? Similarly, there was also no doubt that data was taking a center-stage role in almost every transformation discussion. But who was going to be doing the collecting, cleaning, and analyzing of it?

The labor shortage left companies with big plans and small teams to achieve those plans. The one bright light in that reality was that technology was clearly getting “easier.” Amateurs were building applications that could

previously only be created by professional technologists. Data science teams were able to do more with the teams they had—harnessing capabilities like automated machine learning (autoML) that allowed data scientists to leverage more sophisticated models in less time, sometimes taking advantage of people with quantitative—but not PhD level—skills. IT teams were able to develop testing scripts more quickly and integrate systems with easier tools than application programming interfaces (APIs), once the only digital glue that could hold a company’s plethora of systems together. A little later, generative AI came along and transformed everyone’s notions of how best to communicate with smart machines for citizen development and many other purposes.

Amid the reality of talent shortages and technology advancements there would emerge two major forces that we believe will forever alter the landscape of work—and we’re confident that’s not hyperbole. Those developments are the converging trends of technology becoming more human and humans becoming more technical. This book is our exploration of that reality, in which everyone (if they so choose) can play a significant role in shaping the type of work they do and how they do it.

We see this as a good-news story. It’s an aspirational tale of the unleashing of human ingenuity at scales never before seen or, until now, possible. This is a reality in which anyone with the gumption and a get-up-and-go spirit can design, build, and use complex information creations of their own imagination.

That said, this is also an environment in which much could go wrong if those same creators are not guided, supported, and overseen by those with greater knowledge of data security, compliance, and general best practices. The last section of the book is devoted to these risk-reduction approaches.

## **Our Experience**

This book is the culmination of many years of discussion and sharing of our respective points of view on the trends and changes occurring in the world of work.

Tom’s points of view came from his extensive research, consulting, and writings on AI, data science, and the application of analytics in enterprises. His publications in both journals and in book form have covered a wide range of topics including automation (*Only Humans Need Apply*), analytics (*Competing on Analytics*, *Analytics at Work*), and AI (*The AI Advantage*, *Working with AI*, *All In on AI*), and low-code/no-code development (“When Low-Code/