

FUTURE-PROOFING THE ENTERPRISE FOR CORPORATE GROWTH AND EXPANSION

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The right IT architecture can help a chief information officer (CIO) or chief technology officer (CTO) “future proof” an organization as it expands into new markets or makes acquisitions. The CIO or the CTO, as a result, needs to create an outline of the technologies required to meet business objectives, the rules that govern them, and the processes and policies that guide a company as challenges and opportunities arise.

From an organizational point of view, the CIO or CTO must be clear on which priorities and solutions to own and which ones will have the most impact on improving the technology infrastructure and grow the company. Expansion requires technology integration, whether it involves entering new markets or making acquisitions. These corporate technology leaders must realize what their leverage point is and figure out how to amass enough credibility to get the integration job done.

To be sure, the success of any integration involves how well any pre-deal or pre-expansion process was planned, and issues dealing with technology are no exception. The combined company needs to establish a governance structure that brings clarity to individual actions. Transparency of roles is important for staff motivation, as is communication to counter uncertainty about roles. Communication is also important in addressing cultural integration challenges. Business leaders convey ownership of cultural integration by actively communicating with people across the global enterprise and by indicating what new approaches and organizational values should be embraced. If an acquired company’s different culture is key to the value it brings, it can prove best not to fully integrate it but to allow it some autonomy.

The CIO is entrenched in this process, but there are challenges along the way. These include information silos as well as privacy issues. Fortunately, at the CIO’s disposal to overcome these hurdles and accelerate the integration process is an increasing array of communication options, collaboration tools, and digital and data capabilities.

HIGHLIGHTS

- As CIOs tackle technology integration and digital transformation in the context of growth today, they have an increasing array of communication options, collaboration tools, and digital and data capabilities at their disposal.
- CIOs today are more in the “ensemble facilitation, management, and cultivation” business than in the provisioning business.

“Growth comes in the form of technology that we know will create value. For example, our services business has a strong focus on delivering solutions for predictive and prognostic analytics, and we know that is a growing business and that **building the right talent, maturing the right technical capabilities and architecture, and delivering outcomes will help that business grow,**” says Ted Colbert, CIO at Boeing.

Key Considerations Going In

A starting point for a CIO in building an internal architecture and a platform for expansion and integration is awareness that it’s not about the technology. The key focus from the beginning should be on what the technology does for the business.

CIOs must understand the operational distinctions between business process architectures and the digital technologies and platforms enabling them. This is as true for a software as a service (SaaS) approach as for repurposing a legacy customer relationship management (CRM) or supply chain system, says MIT Sloan School research fellow Michael Schrage. This means understanding how business processes are designed and aligned to deliver value; what their key performance indicators are; whether the technology architectures make it easy or difficult to monitor, manage, and make trackable business process improvements; and whether the company has designed business processes and technology to make automation easier, simpler, and scalable.

Once IT has a sense of the company’s business architecture, it can come up with a technology framework that cost-effectively facilitates one kind of growth over another, such as optimizing efficiency or flexibility. “I believe that most organizations fail because, after discussing these things, they allow the technologists to redefine it as a technology issue when it’s not,” Schrage says.

In the case of The Boeing Co., “We take the vision and strategy and the

company’s big objectives, we look at the three big businesses we’re in—commercial, defense, and services—and we decompose that into business capabilities that we know will support driving either growth or productivity of those businesses,” says Ted Colbert, the aviation and aerospace company’s CIO.

“Growth comes in the form of technology that we know will create value,” he explains. “For example, our services business has a strong focus on delivering solutions for predictive and prognostic analytics, and we know that is a growing business and that building the right talent, maturing the right technical capabilities and architecture, and delivering outcomes will help that business grow.”

Companies’ building capabilities when it comes to new technologies such as artificial intelligence (AI) or machine learning (ML) can be misguided if there is no clarity about what business issue they are trying to solve, and the only result may be inert capabilities. The launch point instead should be asking the same questions a company’s customers are asking, and considering what capabilities are available to help IT answer those better.

At Boeing, “We are applying data analytics and artificial intelligence in every part of our value stream and design engineering to support part reuse and cost optimization in the manufacturing facilities, to help with our production system and predicting its performance, with our customers in the services world, with airplane help management, fuel optimization, crew scheduling,” Colbert says. “We have a whole portfolio of solutions.”

“This approach is important from a scale-up growth perspective,” he asserts. “Airplanes are extremely complicated technologies. They have millions of parts. So you have to be able to use things like machine learning and artificial intelligence to speed up the process of doing things like inspections, and all kinds of other things that we do from a testing perspective around the airplane. That allows you to learn faster, to solve problems faster, and obviously supports the increase in the rate of production.”

But the CIO must be careful. Using these technologies mainly to replace people with automation deprives the organization of that human potential, which is a negative outcome that is possible when a CIO is under pressure to cut costs.

With post-acquisition integration, there is also the matter of whose technology you use. Identifying what to keep and what to jettison is essential to attaining synergy targets. In terms of technology infrastructure, an acquirer can bring the target company onto its own systems or it can choose to adopt elements of the target’s systems if it believes they will supersede its own. Sometimes the size of the company created by the merger necessitates developing a whole new data platform.

Building a data platform involves important questions about processes and governance. These include asking what portion of the organization’s business processes are run through, for example, an enterprise resource planning (ERP) system, hybrid, cloud, or SaaS. Who owns the data—the IT department, the chief digital officer, or the business unit? [SEE SIDEBAR](#)

Flexible Technology Architectures

Whether an acquisition or market expansion is at stake, any growth-oriented organizational structure needs a technology operating model that enables flexibility as conditions change.

Today, expansion and integration mean something radically different from what they meant in 2010 and will mean by 2021, says MIT’s Schrage.

There was a time the CIO’s role was to facilitate interactions between siloed technologies—for example, ERP or CRM systems. “The revolution we have now is basically applications programming interfaces [API]-based,” Schrage says. “What we have now are ensembles of microservices, we have architectures designed around interoperability. And for this reason, CIOs are more in the ‘ensemble facilitation, management, and cultivation’ business than in the provisioning business.”

According to Boeing’s Colbert, “You can’t actually predict the future so you wouldn’t want to build your technology architecture in a way that tightly couples itself to a specific strategy or set of objectives.”

“We think, as an enterprise function, what are the technical architectural principles and technical architectural elements that allow us to deliver value to the company so that it can deliver value to our customers?” Colbert explains. Those principles and elements should come in the form of massive data management, putting in common end-to-end processes—like enterprise resource planning, product life cycle management, manufacturing operations management—and recognizing what from a business capabilities perspective can be common across the enterprise, he says. “Then we look at how to instantiate that technically and to point out the unique areas where the organization can leverage technology to create unique value.”

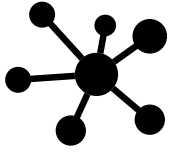
An example of what Colbert is describing is Boeing’s analytics platform, which houses information across the value streams—design, engineering, manufacturing, supply chain, finance, human resources—to allow the company to weave together into cross-functional solutions data

WHERE INTEGRATION STARTS

Some important questions must be asked by the CIO when blending one company’s technology with another’s:

- Is your current enterprise system capable of supporting the integration of new business processes and underlying technologies (is your system fully integrated or interoperable)?
- If your system is interoperable, do you have an enterprisewide data platform?
- Do you have a mature technology and data governance process?
- Do you have a key stakeholder engagement model to drive integration priorities?

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that was once siloed. These deliver insights that support its airplane programs, mechanics, finance teams, HR teams, and more.

“You build a unified approach to data, you build a way to have folks access that data safely, with the right permissions, and then you democratize where it makes sense. And you apply the strongest resources you have on the biggest problems, you put the best data scientists on the biggest problems and solve for those solutions,” Colbert says.

The company also has a platform that allows it to run a hackathon involving a particular business function, such as the supply chain process, to see whether it can be improved. “We’ll get 200 or 300 people together, give them access to the platform, teach them how to use it, how to access the data elements, and we’ll allow them to create product that we then put into a repository for reuse in a different application across the company,” Colbert explains.

“We put together governance around data access that has representation from across the company, and that group very tactically triages access to data from around the globe so that folks can deliver solutions on that platform,” he says. “It’s where we pull all the data together. You can find the data on the platform, there are reusable APIs on the platform, there are applications that are reusable, the data dictionary is exposed in the right way, and we use it to deliver solutions.”

Boeing’s services business has a platform that allows its customers to do some of their own analytics. “We can also assist them with developing analytic solutions, and then we can deliver full digital solutions to them that are packaged to support their business needs,” Colbert adds.

Building In Security

Today’s organizations are more sensitive to issues of privacy, regulations, and security, particularly with the European Union’s General Data Protection Regulation (GDPR) guidelines going into effect. Security is now part of the technology design from

the beginning, and chief information security officers have a higher profile. “A difficulty with the GDPR, as with a lot of principles-based things, is that it doesn’t give you a recipe for what you’ve got to do,” says Stephen Heidari-Robinson, co-founder and managing director of Quartz Associates, a Hove, U.K.-based reorganization consultancy. “It just gives you standards you’ve got to abide by and you’ve got to work it out yourself.”

Companies must weigh the gain in engaging in revenue-increasing activities that conflict with issues from a security point of view, and they have to decide where this activity should sit in the organization—should it be with the finance department, the CIO, operations, or elsewhere?

Boeing has user-based access control to its system, with everything following its typical approach to protecting the data of the company. “The governance is just a little bit different because the typical governance in the past would be siloed by function whereas today these solutions are cross-functional, and so it requires a triage of requests for access to deliver solutions,” Colbert explains.

The data governance team includes representatives from legal, finance, global privacy, and global trade controls. “We’re highly regulated in all parts of our business,” Colbert says. “We have data experts and there are lots of rules that we have to follow, especially being a government contractor, and as we deliver these solutions we give teams access, we make sure that all the stakeholders have bought into the approach that we are taking.”

When involved with mergers and acquisitions or working with its own subsidiaries, Boeing goes through a process to make sure that it’s not comingling data that shouldn’t be, that the access to data is for a purpose, and that the right technical architecture is tied together to make sure it doesn’t have security or access issues. “Especially in our services business, we are making use of the cloud architectures, and they offer a level of security that helps us with

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role-based access and the right level of segmentation and so on,” Colbert says.

As its business grows in different parts of the world and encounters changing regulations, including the GDPR, Boeing endeavors to put the capabilities to support those businesses in situ. “That allows us to apply regulations within that particular market and reduces the risks of comingling and problems with regulations of data in places where it shouldn’t be. We don’t have this issue at the scale that a lot of other folks would have it because we’re largely an exporter,” Colbert explains.

“The places where we’re growing, whether it’s the U.K. or in parts of Asia, we apply the rules and laws within those markets with a lot of discipline and diligence,” he says. Boeing designs in a great deal of process and has instituted conservative rules about how its network is accessed. “We, as well as our customers and subsidiaries and partners, use a lot of virtual-based technologies to allow people to access tools and systems and data versus moving stuff all over the place, and that tends to have worked well.”

Companies have got to build security and compliance into their agility, Colbert suggests. “Traditional best practices in our world revolve around waterfall methods and thinking, and that is in the context of a long-cycle, safety- and quality-oriented business. There are really important things we do that have to respect that foundation, those best practices,” he says.

Moving forward, “We have to spend more time experimenting and learning and using design thinking-like processes to create value,” Colbert asserts. “That means building in structure, compliance, security,

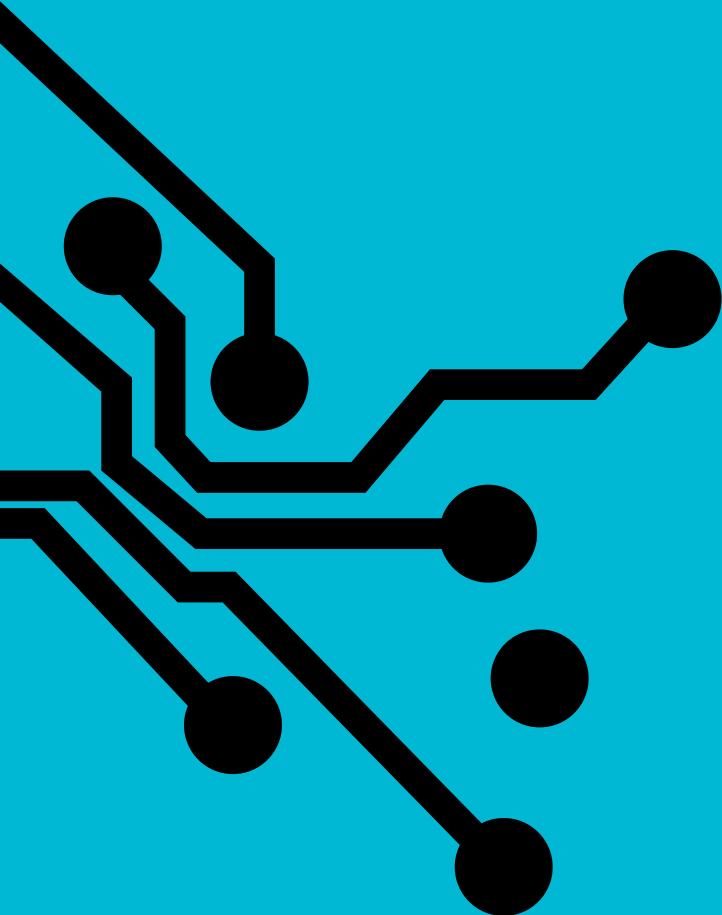
quality, and safety from the beginning, but doing it in a very fast, iterative way. And that sounds just like agile, like everyone’s doing it, but if you’re doing it at the scale that we’re doing it, it’s much more complicated.”

Accelerating Integration

The CIO acts in concert with the CEO and the rest of the C-suite to communicate and effectuate the new company strategy. Setting expectations with technology users, listening to how the changes impact people, communicating decisions, and moving forward decisively round out the important actions to take. Communicating their vision and consistently working to engage others help CIOs influence and inspire their IT team members and the rest of the organization toward a common goal.

Using a variety of communication methods—technology platforms, conversations, the “café” format of answering questions, videos, and social media—rather than just sending emails has been shown to lead to better results in terms of getting organizational cooperation. Informing people about what’s going on and getting their input on what the answer should be when it comes to integration will result in a better outcome for that process and the perception that it was fair, says Quartz’s Heidari-Robinson. “Once you’ve got that certainty, then you can start exciting people in all kinds of different ways, and it’s there that we’ve got a lot to learn from technologies and technology companies and the way that they excite their staff. There is a difference between the medium and the message, and you need to get both of those things right.”

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Digital technologies that help integrate global teams include collaboration tools such as Skype for Business, Slack, and Chatter, which reduce coordination and communication costs and make it easier, simpler, and more configurable to collaborate. “These digital infrastructures have become better on the bandwidth level—the breadth of tools and the manner in which people would be able to collaborate, in the augmented reality sense, in the real-time notification sense, the overlay of analytics to alert people in anticipation of things that they will have to do,” says Schrage. “We see that in supply chains, in professional services firms, in the FANG [Facebook, Amazon, Netflix, Google] companies. They are fantastic at that. So is Microsoft, and those companies are in the process of enabling business companies to emulate them.”

For businesses put together with acquisitions and scattered around the world or for new integrations, these collaboration tools can be transformational. The important thing is to have teams set up in a way that they are truly integrated and to be clear on objectives, says Heidari-Robinson.

As customers become more sophisticated in their use of mobile devices and digital technologies, companies have a need to become more digital themselves, which also enables them to integrate newcomers faster.

Becoming more digital presents challenges, too. As a company’s digital footprint increases, it becomes more tightly integrated with data and systems, in some ways making M&A more difficult, Colbert says. “The interdependence of the processes and the companies gets instantiated through data and process, and breaking that up may not be as trivial as one wants it to be,” he notes.

“Becoming more digital helps in the inorganic growth process because it allows you to share and take data from the mother ship, as it were, to the acquired, to add those together and make one plus one equal five,” Colbert explains. “Whereas, if you’re

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not very digital, you have less visibility into the areas of the company that create value, the intellectual property of the company. And it’s hard to make that force multiplier happen very fast. If you’re digital, the ability to force-multiply outcomes comes at an order of magnitude faster than if you’re not digital.”

Data integration is essential for digital transformation, which is the ability to see and react to the IT assets that a company has. Better data management is also a priority for CIOs as more companies are making a commitment to predictive analytics, that is, to convert that data into some sort of predictive utility.

Looking Ahead

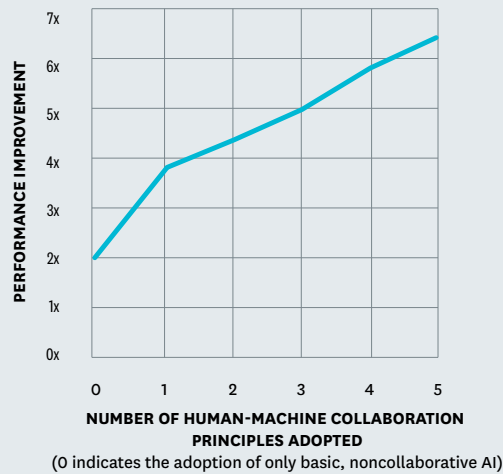
Intelligent agents—that is, digital entities such as Alexa and Siri capable of acting on behalf of the humans they represent—appear to be one of the fundamental technology trends relevant both to the way people work and the skill sets they will need in the future, Schrage says. While these agents are useful, Schrage believes software designed to augment and enhance people’s best attributes will play a bigger and more important role in enterprise software. He sees this form of personal amplification, or “selvesware,” in his coinage, in the form of recommendation engines and digital advisors that prompt people to behave in more productive ways. “Promoting ‘agency’ will prove more important than providing agents,” he predicts.

Using data-driven digital media to augment individuals can be extended

FIGURE 1

PERFORMANCE IMPROVEMENT WHEN HUMANS AND MACHINES WORK TOGETHER

SOURCE: "COLLABORATIVE INTELLIGENCE: HUMANS AND AI ARE JOINING FORCES," BY H. JAMES WILSON AND PAUL R. DAUGHERTY, HARVARD BUSINESS REVIEW, JULY-AUGUST 2018



to augmenting collaborations and teams. These technologies will increasingly intersect with ML capabilities, says Schrage. “The seeds for the quasi-automation of work can be seen as organizations look to automate certain processes in ways that changes in data patterns will lead to valuable adaptive responses. This shift will combine with predictive analytics so that, increasingly, automated systems anticipate changes rather than simply react to them.”

Companies in different industries are already automating processes constructively, and not just with an eye toward replacing people. Recent research on human/machine collaboration (“Collaborative Intelligence: Humans and AI Are Joining Forces,” *Harvard Business Review*, July-August 2018) demonstrates how machines are being used today to enhance human cognitive and physical abilities as well as to interact with others. The research finds that companies achieve the most significant performance improvements when humans and machines work together rather than when AI is deployed mainly to displace employees. [FIGURE 1](#)

The question of how to build the right technology infrastructure that aligns with business objectives while at the same time helping improve the whole integration experience draws on the technology, business, and people skills of CIOs and CTOs.

Combining traditional best practices, such as having a business case, and forward-looking activities, such as negotiating quasi-autonomous systems, will help CIOs and CTOs maneuver in the context of rapid change, global growth, and increased security and regulation concerns. Using technology not just to automate but also to augment people’s capabilities, helping individuals and teams use digital tools effectively, and pushing the organization to improve its way of working by adopting new technologies are the priorities of today’s CIO/CTO.

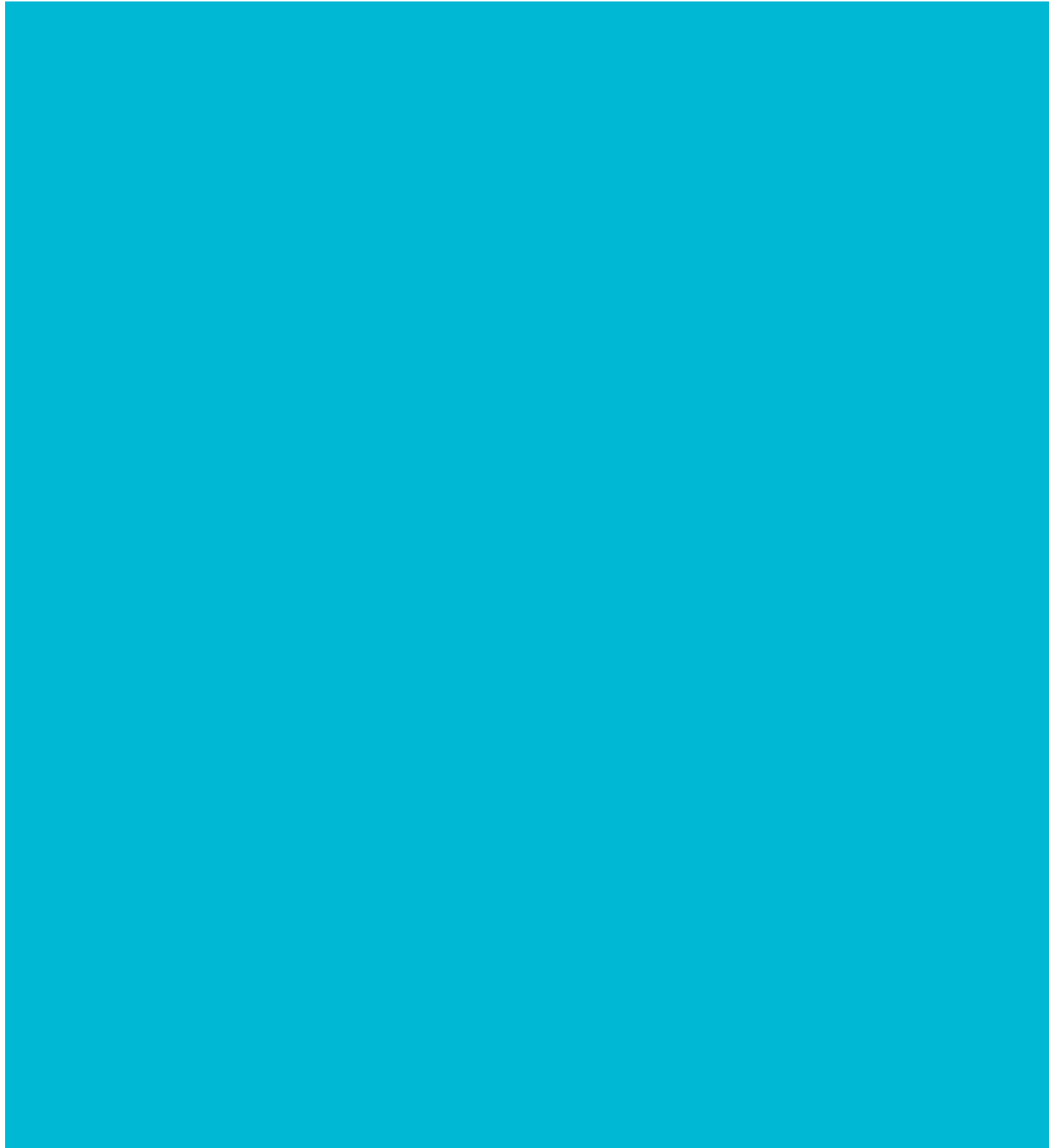
The focus on technology is stronger than ever before, according to Colbert. “And what is different than before is, we actually have technology that works, infrastructure that can support scale, methods that allow us to move with speed and agility, and businesses that recognize that technology [and] data can enable growth and can disrupt whole businesses and business models. Whether you’re in a company that’s growing or doing a lot of inorganic growth through acquisition, I think it’s a time to use your curiosity and creativity, leverage all the amazing capabilities that have emerged over the past several years, and build something new and build something different.”



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