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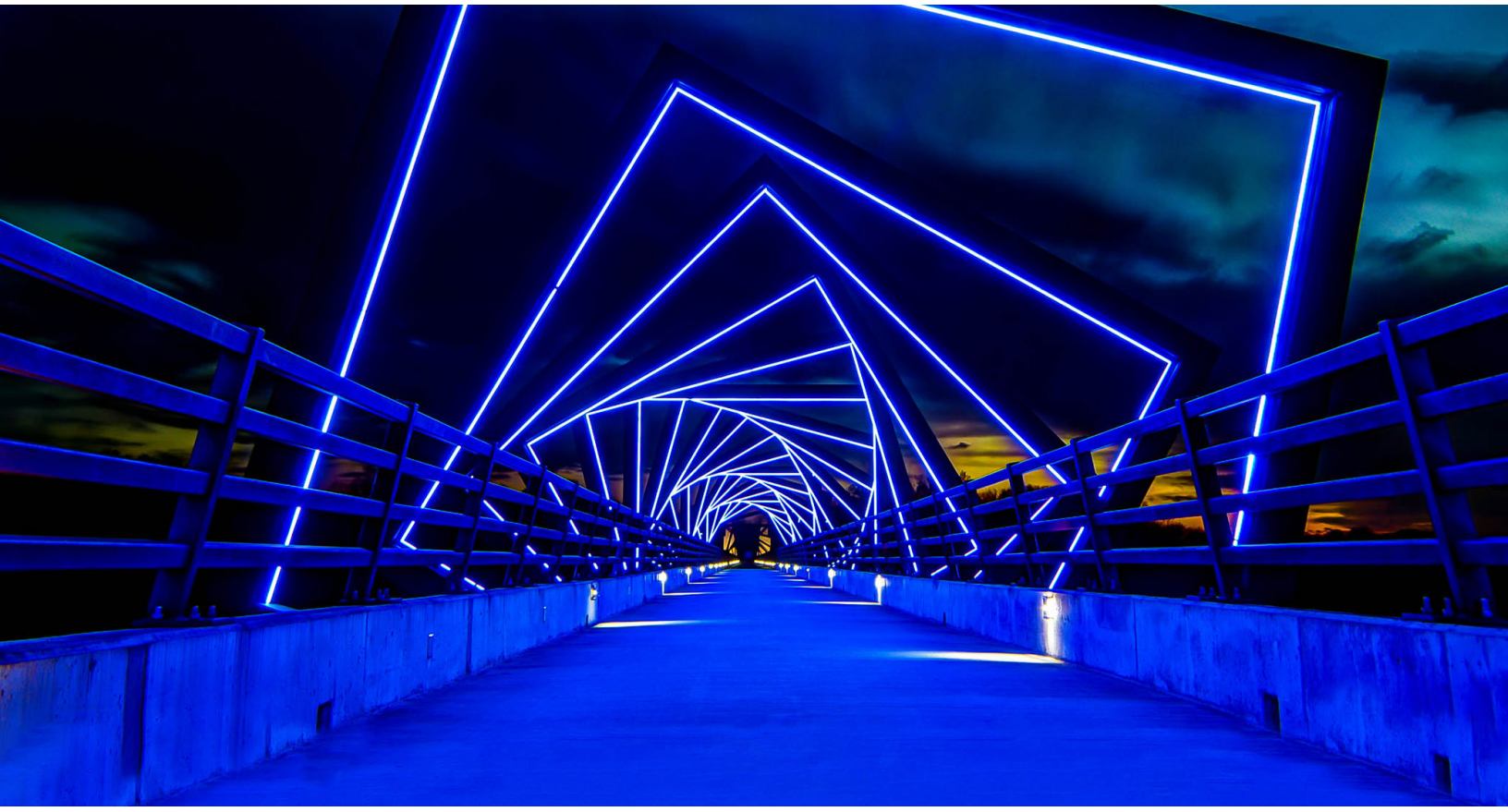
From start-up to scale-up: Accelerating growth in construction technology

To achieve scale, founders, executives, and investors in construction technology need to eliminate the barriers to efficient growth. Here's how.

by Jose Luis Blanco, David Rockhill, Aditya Sanghvi, and Alberto Torres



May 2023

Construction sites in 2023 might in many ways resemble those in 1923, with manual bricklaying, paper blueprints, and scaffold towers. At $12 trillion,[1] architecture, engineering, and construction (AEC) is one of the biggest industries in the world, but historically it has been among the slowest to digitize and innovate.

This, however, is changing fast: strong demand for infrastructure, a shortage of skilled labor, and increased stakeholder pressure for data transparency and integration are all accelerating digital adoption. As a result, the AEC tech ecosystem has experienced an explosion of investment and a wave of start-up launches. An estimated $50 billion was invested in AEC tech between 2020 to 2022, 85 percent higher than the previous three years. During the same period, the number of deals in the industry increased 30 percent to 1,229 (Exhibit 1).

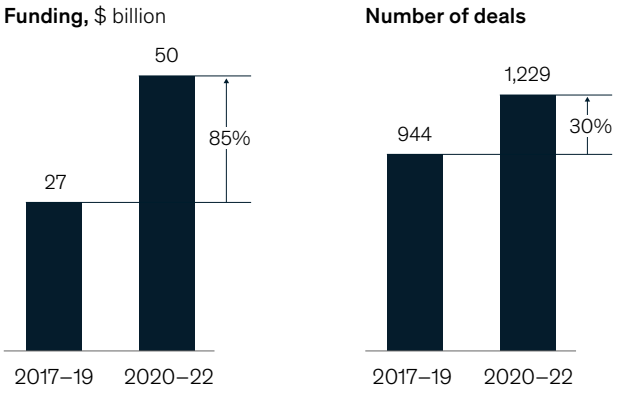
Although the AEC tech industry is maturing, it is not yet at the scale and sophistication of more established software markets like logistics, manufacturing, and agriculture. The industry boasts fewer scale-ups and unicorns relative to its size. And it is hard for AEC tech companies to grow efficiently due to several dynamics among AEC customers, including fragmentation, low IT spend (relative to other industries), and entrenched analog ways of working.

In this environment, how can AEC tech companies accelerate adoption and sales and achieve scale? To answer this question, we surveyed approximately 100 investors and AEC tech players in 2022 and interviewed founders, investors, and large software companies in the industry. Using primary research and publicly available data, we also mapped and analyzed more than 3,000 AEC tech companies.[2] In this article, we review the findings of that research. We outline the investment trends that are accelerating the digitization of the industry, and we suggest how tech businesses, and their investors, can address challenges to get on a path of efficient growth.

Exhibit 1

Global investment in architecture, engineering, and construction tech grew to $50 billion between 2020 and 2022.

Global deals in AEC tech[1]



[1]AEC = architecture, engineering, and construction. Incl management buyout, management buy-in, add-on, secondary buyout, public to private, growth and expansion, and private investment in public equity.
Source: PitchBook, November 15, 2022

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[1] Oxford Economics, March 2023.
[2] PitchBook, November 15, 2022.

Seventy-seven percent of the respondents to our survey expect to invest in AEC tech at similar or higher levels in 2023.

Trends accelerating the digitization of AEC

Digitization of the AEC industry started gathering steam a decade ago, but the pace has accelerated over the past three years—and a number of trends suggest it will continue to do so (see sidebar, "What do we mean by architecture, engineering, and construction tech?").

Economic factors and regulation are prompting investment

A combination of supply-and-demand factors are prompting investment in AEC tech. On one hand, global demand for long-term construction is strong, in part because of increased stimulus by governments, such as the $1.2 trillion Bipartisan Infrastructure Law in the United States and the €800 billion NextGenerationEU fund in Europe. More asset owners are also investing sizeable capital to decarbonize their portfolios to make them climate resilient. On the other hand, there is a shortage of skilled workers as more retire or transition to other industries. The United States has 440,000 vacancies in AEC, compared with around 300,000 in 2019, whereas the United Kingdom's vacancies have nearly doubled since 2019.[3] The industry is deploying digital technology to help increase productivity and bridge this gap between supply and demand.

Meanwhile, regulatory changes aimed at creating a more connected industry are reinforcing this wave of digitization. For example, the United Kingdom's Building Safety Act requires a digital ledger of all building data for new residential buildings, and Sweden's ID06 requires digital records of all the construction workers on a construction site.

Investor optimism is high

Investment in AEC tech has grown multifold and, based on our research, more and more investors are recognizing AEC tech's potential to fundamentally change the structure of the construction industry and redistribute value pools at scale. This momentum is likely to continue. Seventy-seven percent of the respondents to our survey expect to invest in AEC tech at similar or higher levels in 2023, and 64 percent see it generating higher returns versus other verticals.

The tech scene is maturing

The proportion of late-stage venture capital in total AEC tech investment totaled $11.5 billion between 2020 and 2022, more than triple that of the previous three years (Exhibit 2). Meanwhile, M&A continues to be the largest source of funding for AEC tech ventures, accounting for 48 percent of all investments and 68 percent of all exits. The growth of the industry is further reflected in the fact that the median deal size and post-money valuation[4] in the industry has more than doubled since 2017 (Exhibit 3).

[3] "Construction: NAICS 23," US Bureau of Labor Statistics, 2023; "UK job vacancies (thousand): Construction," UK Office for National Statistics, March 2023.
[4] Post-money valuation is a measure of a company's valuation that includes all external investments.

What do we mean by architecture, engineering, and construction tech?

A variety of software and tech is used across the architecture, engineering, and construction (AEC) industry. It includes design software, robotics, and tools for the planning, scheduling, budgeting, and performance management of projects (exhibit). Companies in the AEC tech industry range from multibillion-dollar software giants to one-person start-ups.

Exhibit

Software and tech are used across the architecture, engineering, and construction project life cycle, from earliest stage to maintenance.

Use of software and tech in AEC[1] projects

Foundational process		
Enterprise platform and backbone: software accounting, finance, HR, payroll, billing, etc, for all players in value chain **Document management:** platforms for secure version, spec, submission, RFI,[2] etc, management **Compliance, quality assurance, and quality control:** standardized workflows to gain visibility into issues **Integration layer:** platform and interface for integration of digital system and tools **AI and machine learning:** optimized planning, design, etc **BIM[3]:** collaborative development, design, and construction sequence	**Portfolio and concept**	**Capital strategy, portfolio optimization, and project planning:** simplification of and planning support for new projects and financing
	Design and engineering	**Engineering-design tools:** design and simulation software; connected databases; incl automated workflows and generative and parametric design **Advanced visualization:** VR/AR[4] for simulation of building, design elements, and construction sequence
	Preconstruction	**Planning, scheduling, and budgeting:** optimized scheduling; data-driven, automated generation of bills of materials, cost plans, and specs **Customer relationship management:** project and customer identification; pipeline build; customer interaction management **Digital marketplaces:** e-commerce material, labor, and equipment platforms **Contracting and procurement:** supplier identification, tender preparation and pricing simplification and automation, and procurement and purchasing centralization and streamlining
	Construction and commissioning	**HSE[5]:** digital access control; incident tracking; root cause analyses; generation of reporting on ESG[6] topics **Field productivity:** improved efficiency at construction site; increased utilization of materials, equipment, and labor; incl VR/AR **Design management:** updated design changes, RFIs, and field updates **Construction robotics:** robotic and automation use (eg, raising walls, polishing floors) **Performance management:** real-time tracking of project, highlighting areas lagging behind and timeline risks; incl remote monitoring **Contract management:** easy access to client and contractor communication; vendor prequalification tracking; payment management **Off-site commercial construction:** increased time and cost efficiency via standardized construction elements and off-site construction **Precommissioning and commissioning:** commissioning and testing of and building system; personnel training prior to handover
	Operational maintenance	**Facility management and operations:** optimized ROI via occupancy and performance analyses; enhanced operative and tenant experiences; improved maintenance productivity

[1]Architecture, engineering, and construction. [2]Request for information. [3]Building information management. [4]Virtual reality and augmented reality. [5]Health, safety, and environment. [6]Environmental, social, and governance.

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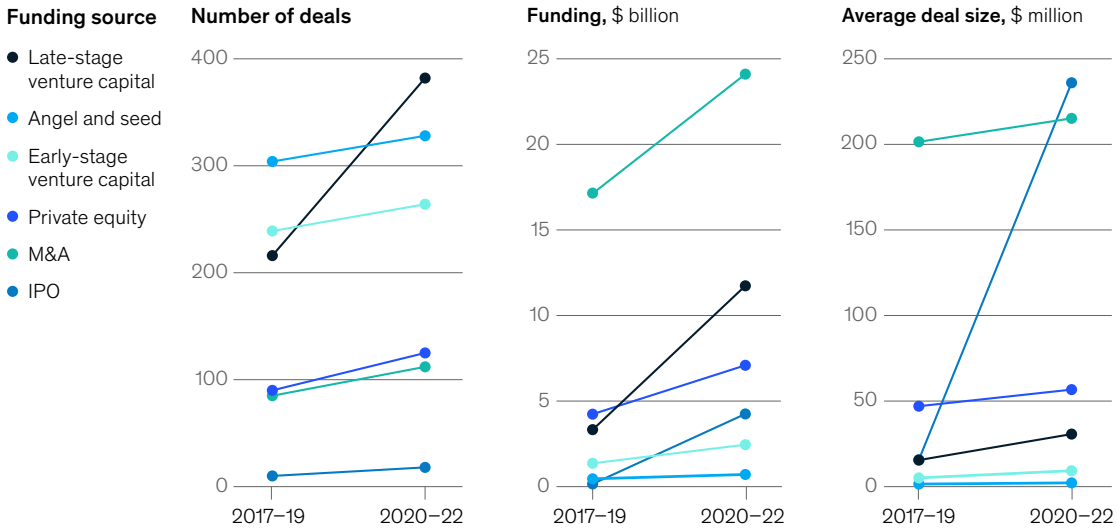
Exhibit 2

Funding sources for architecture, engineering, and construction tech are evolving, with late-stage venture capital investors gaining prominence.

Global deals in AEC tech, by funding round[1]



[1]AEC = architecture, engineering, and construction. Incl management buyout, management buy-in, add-on, secondary buyout, public to private, growth and expansion, and private investment in public equity.
Source: PitchBook, November 15, 2022

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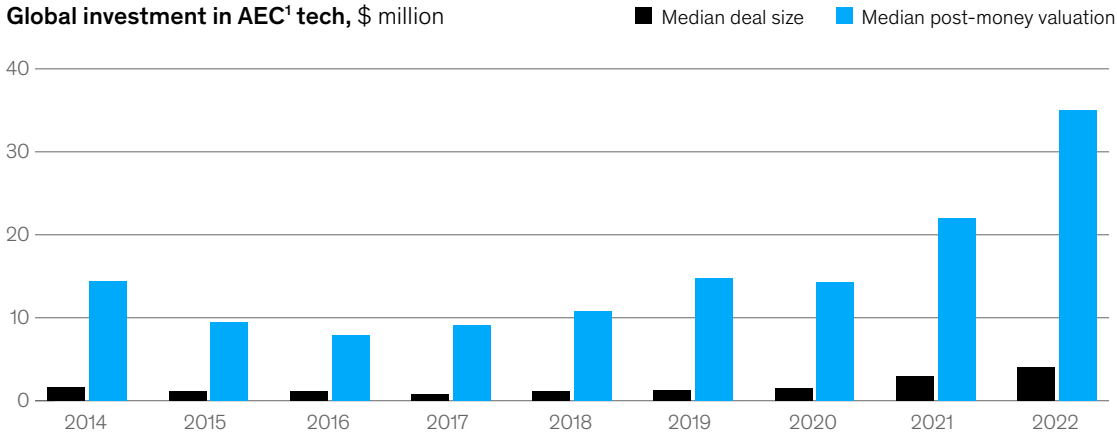
Exhibit 3

The rapid growth of architecture, engineering, and construction tech since 2017 is reflected in increased median deal size and post-money valuation.

Global investment in AEC[1] **tech,** $ million



[1]Architecture, engineering, and construction.
Source: PitchBook, November 15, 2022

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Companies and customers are still seeking interoperability

In 2020, we observed that AEC tech players were targeting multiple use cases to address customer pain points.[5] This trend has continued, led by customer demand for interoperability—either through virtual platforms built using open standards and workflows, such as openBIM, or with one-stop-shop platforms such as those developed by some of the largest AEC tech companies. Indeed, nearly half of the companies we analyzed offer customers solutions that address three or more use cases.

AEC technology and property technology are converging

Until now, AEC tech and property technology (proptech) have evolved as separate ecosystems. AEC tech has focused on the design and construction of assets, while proptech has focused on the financing, planning, operation, and maintenance aspects of assets. This is starting to change, as customers and technology players see value in connecting the two. Our analysis shows that 20 percent of AEC tech companies also address at least one proptech use case: for example, linking the design and operation of building management systems using a digital twin.

Hurdles to scale AEC tech investments remain

While the trends above have helped expand the ecosystem of AEC-focused tech businesses and start-ups, investors and founders still wonder how best to pursue efficient growth—defined as the ability to grow annual recurring revenues (ARR) and to generate free cash flow (FCF) from those revenues.[6] Our analysis across industries shows that as software companies expand, efficient growth increasingly correlates strongly with valuations (Exhibit 4).

Within the AEC technology industry, however, our research also indicates that efficient growth is particularly tough to achieve for four reasons:

1. *Customer fragmentation.* The average construction company employs fewer than ten people. The average project involves more than 100 different suppliers and subcontractors. So achieving scale requires selling to a large number of companies. This means that sales growth can be labor intensive and slow. As one investor noted, "This is a risk-averse and fragmented sector at its core, so growth is slow, but it is extremely sticky."

2. *Multiple customer personas.* Founders frequently tell us that identifying the *real* customer is tough because they lack a clear understanding of user versus buyer personas. Depending on the project, for example, the customer could be the project manager, IT manager, or procurement manager. And often, purchase decisions are made at the project level, not the enterprise level. As a result, companies need to resell the product again to the next project, which drives down net retention and raises acquisition costs. As one investor said, "The most successful companies have a plan to sell to the enterprise, not just the project."

3. *Low margins and economic headwinds.* Making the case for spending on software can be tough for AEC companies when there is limited capacity for investment. The industry has low margins and increasing economic headwinds, including materials cost inflation. Moreover, the typical IT spend for AEC companies is 1 to 2 percent of the revenue,

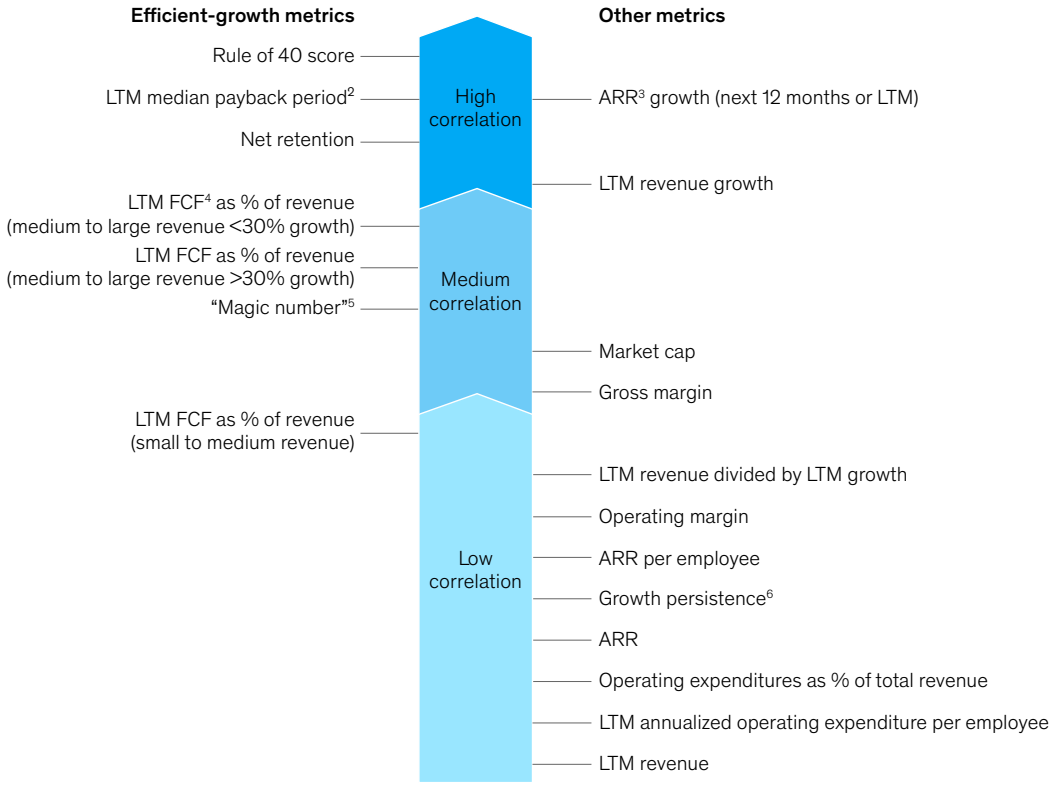
[5] "Rise of the platform era: The next chapter in construction technology," McKinsey, October 30, 2020.

[6] Annual recurring revenue is the revenue that a company (often businesses that operate on a subscription-based model) expects to receive from customers on an annual basis. Free cash flow is the cash generated by a company after paying operating expenses and capital expenditures.

Exhibit 4

Enterprise value in software companies typically correlates with efficient growth metrics.

Correlation of metrics with valuations for SaaS companies[1]



[1] SaaS = software as a service. Based on analysis across 100 software-as-a-service companies of correlation with enterprise value divided by next-12-months revenue multiple. [2]LTM = last 12 months. Median payback period from latest 4 quarters; payback period = 1 / (gross margin × [new annual recurring revenues in quarter / sales and marketing in previous quarter]). [3]Annual recurring revenue. [4]Free cash flow. [5]Net new revenue divided by spending on sales and marketing in previous quarter. [6]Current quarter revenue growth divided by previous year's revenue growth in same quarter.

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compared with the 3 to 5 percent average across industries.[7] Against this backdrop, solutions must come with a business case. Although ROI can be high, until recently players have not been effective at quantifying benefits. As one investor said, "In a low-margin industry, and in this market environment in particular, it is important that companies can clearly demonstrate and measure the cost-saving benefits of their product."

4. *Adoption and scaling challenges.* Driving tech adoption in a projects business like construction poses several challenges: users often switch

[7] "Gartner top strategic technology trends for 2022," Gartner, October 2021.

products among different projects—sometimes they need to adopt different tools depending on client preferences, and staff come and go. Furthermore, the industry has traditionally had limited digital capabilities, although this is changing as workers become accustomed to using digital technology in their everyday lives. And as one AEC company executive said, "The pandemic forced us to accelerate adoption from the office to the site overnight."

Strategies for scaling AEC tech businesses

For companies that can overcome these barriers, there is a big prize up for grabs: a customer base that is larger than most other industries. So what does it take? Our analysis of tech companies in AEC, as well as other industries like manufacturing, travel, and logistics, shows five common growth characteristics.

Pursue a big total addressable market and a bold vision

As one investor told us, "If the extent of your vision is to sell tools to solve a niche problem, then we're not excited. We are looking for founders with vision and mission to improve outcomes for big swathes of the market." Having a bold vision—and being able to effectively articulate how it benefits the user and the broader industry—helps attract talent, investors, and customers, and allows companies to move faster as they continually course-correct toward a North Star. For example, one AEC tech company focuses on improving predictability of project outcomes and uses that simple vision to expand the total addressable market (TAM) beyond contractors and planners to cover a far broader customer set, including project owners, banks, and insurance companies.

A bold vision usually means founders are thinking about the entire AEC tech ecosystem and figuring out ways in which their company can work with other providers to create a seamless user experience and unlock newfound value for a broader set of customers. For example, one AEC design platform expanded its core offering beyond architects and engineers to connect to product suppliers, and thus monetize transactions for building products used in designs.

Achieve a great product market fit

Finding the right product market fit is a key part of the investment decision-making process for investors in most industries, but AEC tech companies often do not get it right. In fact, as our survey indicates, the most common issues observed by AEC tech investors are an overfocus on engineering (rather than product and market fit) and product fragmentation (Exhibit 5).

As one AEC tech player noted, "Niche, technical design tools are often built by self-taught developers and construction professionals who built the tool to solve a specific problem or fill a gap in their workflow. As such, the very nature of those tools focuses on the tech and not the user experience." In our discussions with start-ups and investors, three common themes emerged that can help create a better product market fit. All three elements require strong product management capabilities.

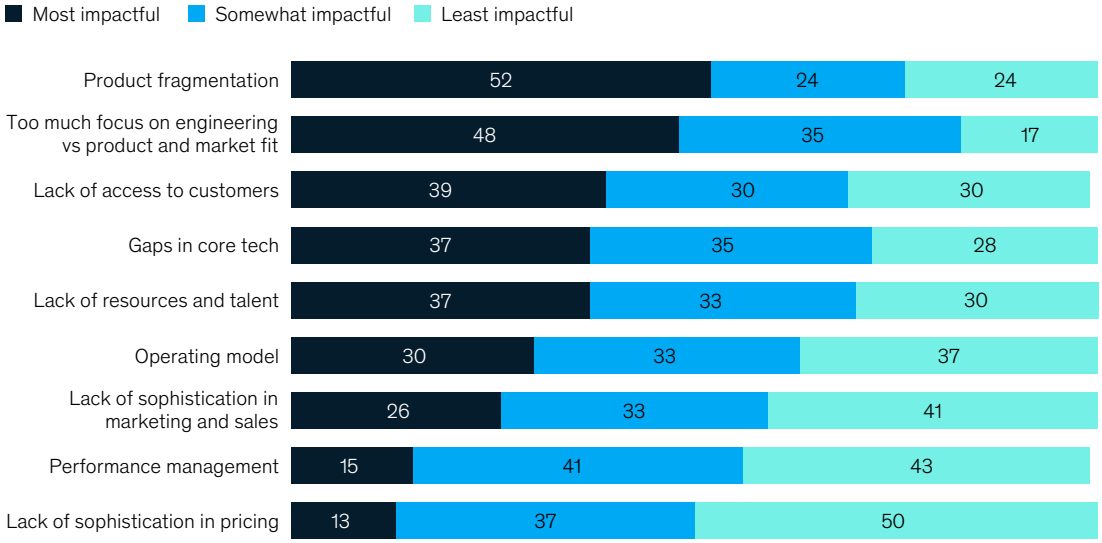
First is focus. Since customer needs differ across segments, companies would do well to focus on one or a few specific segments, whether they are targeting architects or subcontractors or distributors. As one founder put it, "I have potential customers in manufacturing, retail, construction, and facilities management across more than ten geographies, but we have to focus, or we will achieve nothing."

Second is feedback. As one investor told us, "Many contech [construction technology] firms are founded by industry professionals who launched their business to solve a problem, so they have huge product focus. We need to see more founders with a balanced product and market/customer focus." One way to sharpen market focus is to build a network of customers and collaborators. Most successful players do this through their investors' networks and beta customers, who benefit from low-cost early releases in return for investment in testing and

Exhibit 5

Product fragmentation, product and market fit, and access to customers affect profitable growth in architecture, engineering, and construction tech.

Impact of barriers to profitable growth in AEC tech,[1] % of respondents



Note: Figures may not sum to 100%, because of rounding.
[1]AEC = architecture, engineering, and construction. Question: What are the most impactful barriers to profitable growth in construction tech?
Source: McKinsey survey of 104 AEC tech investors and operators, 2022

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development feedback. And a side benefit is that they can provide access to a critical mass of other customers (Exhibit 6).

Third is flexibility. Nearly every start-up and scale-up we have spoken to has seen a big shift in their product proposition because they responded to market views and kept evolving to optimize the product market fit. For example, one start-up developed an app to measure material waste from construction sites but eventually evolved it to measure embodied carbon in materials.

Build a customer acquisition engine with a scalable revenue and distribution model

Valuations for start-ups are tied strongly with the ARR growth metric. In a fragmented market like AEC, customer acquisition is difficult and expensive. Based on our research, leading players differentiate themselves with three moves to maximize the ARR bang for each buck spent on marketing and R&D:

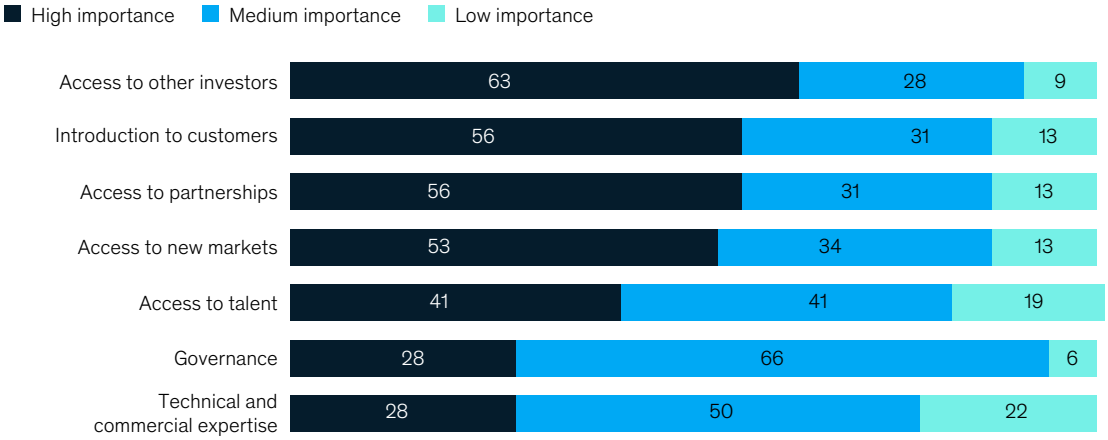
— *Deliver a scalable revenue model.* As one investor said, "Some products require so much customization that the software company becomes a consultancy." Successful businesses have a product that can be deployed with minimal customization and training (and that usually means software rather than hardware). And where customization or training is required, they invest time only in high-potential customers and often partner with independent software vendors to deliver at scale.

— *Find creative routes to market.* You're never going to crack the market one customer at a

Exhibit 6

Aside from capital, the most important thing investors bring to architecture, engineering, and construction tech companies is access to their networks.

Importance of investor contributions (excl capital) to AEC tech companies,[1] % of respondents



Note: Figures may not sum to 100%, because of rounding.
[1]AEC = architecture, engineering, and construction. Question: Apart from capital, what are the most important things that investors bring to tech companies in the sector?
Source: McKinsey survey of 104 AEC tech investors and operators, 2022

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time. Successful players use their investors and existing customers to open new routes to market. They also lock in users early. For example, one design software player gave away free copies of its software to architecture students, who then took it to their new employers. Moreover, these players have a channel strategy aligned with customer tiers, and that includes not only value-added resellers (VARs) and distributors but also low-cost remote channels (including multilingual remote inside-sales centers) and self-serve, web shop, and e-commerce.

— *Supercharge the sales team.* Successful software companies incentivize their direct-sales teams to cross-sell and upsell and drive key account management capabilities. One leading player with multiple brands centralized its go to market across brands to accelerate cross-sell and upsell and capped bonuses on some established products to incentivize sales of new products. The best sales organizations are underpinned by data that allows them to see the relationship between specific, often siloed, sales and marketing activities and overall growth outcomes.

Improve net retention with customer success

Our analysis shows that as software companies grow, the most important driver of valuation shifts from pure growth, often measured by ARR, to include the ability to generate FCF from ARR. In short, it's not enough to just have customers; you need to earn money from them. In what is commonly referred to as the "rule of 40," the sum of percentage growth and the FCF rate should equal 40 percent or higher.[8]

[8] Paul Roche and Sid Tandon, "SaaS and the Rule of 40: Keys to the critical value creation metric," McKinsey, August 3, 2021.

As software companies grow beyond the start-up and scale-up stages, growth rates slow, and free cash flow (and hence, valuation) is increasingly driven by operational efficiency.

Achieving strong FCF is in large part about optimizing the payback period—that is, how long does it take to recover your customer acquisition costs. This means acquiring new customers efficiently, retaining customers, and upselling and cross-selling to them. This is measured by net retention rate (NRR),[9] which requires a laser focus on customer success. Across sectors, companies with high NRRs demonstrate three common characteristics:

— *They know their numbers.* At the heart of customer success is a data-driven understanding of how customers obtain value from a specific product. Maximizing NRR is a game of inches, so leaders analyze the many drivers of growth and churn (upsell, contract cancellation, additional licenses, and so on) at a customer level and respond with targeted interventions (for example, offering bundles for additional "seats" as usage reaches contract limits).

— *They set up a dedicated customer success function.* A team that can work with customers to get maximum value from the product is particularly important in AEC, where customers are less digitally mature and solutions are less well established. For example, the largest AEC technology companies have customer success teams and run conferences and training for their users. One software company hired a retired construction contractor for its customer success function to better understand customer needs.

— *They deliver customer success at low cost.* Customer success does not have to mean dedicated (and expensive) customer support. It can often be delivered at lower cost by cultivating user communities and promoting the use of online tutorials, for example. One AEC tech company gained thousands of users on zero-marketing spend by leveraging its community forums and industry networks—effectively putting its own customers to work.

Build functional maturity as you scale

As software companies grow beyond the start-up and scale-up stages, growth rates slow, and FCF (and hence, valuation) is increasingly driven by operational efficiency. This typically comes down to optimizing NRR as well as marketing and sales spend (which can be 50 percent or more of the

[9] Net retention rate is a metric that shows how effective a company is at driving growth in its existing customer base while keeping the churn low.

revenues of typical software companies). At-scale software companies in the top quartile for valuation typically exhibit the following characteristics[10]:

— *Optimize marketing and sales spend.* Leading software players allocate marketing and sales spend against future, not past, revenue opportunities to give high-growth accounts the biggest coverage. They also continuously segment customers, targeting lower-potential customers through web sales/e-commerce and inside sales while increasing spend on the highest-potential customers.

— *Continuously optimize pricing and track impact.* Leading players build customer business cases to link pricing to the value generated for customers. They also track the impact of pricing changes in near real time and optimize accordingly. Companies would also do well to make sure their payment terms are right. As one investor explained, AEC tech players often price based on a project or milestone. "This is not ARR, even though some may call it that. And because construction is often subject to delays, this means the risk attached to these revenue streams is very high, which puts off potential investors."

— *Lean on data and automate processes.* Successful software companies leverage data, AI, and automated processes across the business in a variety of ways, including identifying leads and proactively targeting cross-sell and upsell opportunities, leveraging usage information in pricing and product decisions, and assessing developer velocity.

— *Strengthen the business-building muscle.* Tech companies of every size often reach the tip of a growth curve without a market-ready venture or offering that can pick up the slack, so their growth dips. Leading players maintain momentum by launching net-new businesses more quickly. They incubate new businesses thoughtfully, with dedicated resourcing for product development and go to market.

Several tailwinds are powering growth in the AEC tech industry despite the near-term challenges of the economic slowdown. To capitalize on the investment opportunities and achieve efficient growth, investors and tech companies can learn from the most successful AEC tech companies and catch the wave in this exciting industry.

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The authors wish to thank Daniele Di Mattia, Julien Gagnon, Josh Johnson, and Adam Singer for their contributions to this article.

Designed by McKinsey Global Publishing

[10] "SaaS and the Rule of 40," 2021.