



# Scalable Team Architectures

Insights From Today's  
Top Engineering Organizations



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# Introduction

As an engineering leader, you will likely face many interesting technical challenges, but for many, the hardest part of the job is managing people. Whether settling team disputes, tracking key metrics, or reporting to executive management, you have to take in a lot of information and make countless important decisions every day. One of the biggest is how you will structure your team.

Will you assign each team to be responsible for a section of the codebase? Will you use front-end and back-end engineers or make everyone go full stack? Will each engineer report directly to you or do you need another layer of management? If you do need that next layer, when is the right time to add it?

If you're an engineering leader tasked with setting up or improving your team's structure, you're likely spending a lot of time thinking about these questions. In this e-book, you'll meet five engineering leaders and learn how they have structured their teams. You'll learn about some of the unique

challenges they faced and how they made decisions based on their company's size, industry, and product.

Depending on your current situation, you might want to jump directly to a specific section of this e-book. If you're leading several teams but they're heavily interdependent, check out ActiveCampaign's "Three-in-a-Box" Team Leadership Model and how it's allowed the company to create highly autonomous engineering teams as it scales. If you're finding that engineering teams aren't strongly aligned with business goals, learn how Toptal has built Stakeholder-focused Squads to create strong relationships between engineers and business stakeholders despite having a completely distributed team.

If you're leading an engineering team at an early-stage startup, there's plenty in this e-book for you as well. You'll learn how Cube has leveraged the technical strengths of its leaders to create a Front-end/Back-end Split Structure. If you're having trouble finding local talent, read about how Cohesion built its engineering organization using an Augmented Team Model or how Valence hires engineers with nontraditional backgrounds to fill out its Function-centric Engineering Hierarchy.

There's no such thing as the "perfect" engineering team structure. Your organization and product will change over time but learning what has worked for other engineering leaders can help you shortcut your journey.

# /01

## ActiveCampaign's 'Three-in-a-Box' Team Leadership Model



# ActiveCampaign's 'Three-in-a-Box' Team Leadership Model

ActiveCampaign's engineering team structure has gone through several permutations since Rocco Palladino joined the company more than five years ago. Palladino was one of the company's first engineers and has grown with the business into his current role as one of its Directors of Engineering, in which he oversees six teams.

Because Palladino has been with the company through so many phases, he has witnessed the journey that led ActiveCampaign to its current structure. In the following section, he shared several insights, including ActiveCampaign's unique "Three-in-a-Box" Team Leadership Model and the way the company has set up teams to be as autonomous and productive as possible.

## The Early Days

When Palladino joined ActiveCampaign, there were only seven engineers. They reported directly to the CTO while the CEO acted as their product manager.

“We hired full-stack engineers almost exclusively ... and they would do a lot,” Palladino says. The advantage of this approach was that an engineer could hop in and cover any part of the codebase when someone was out of the office. It enabled ActiveCampaign to change priorities quickly without needing to hire new people; its existing team was small and flexible enough to adapt.

When the group grew to more than 10 engineers, it split into two teams; Palladino was made the tech lead on one. Despite being a small team, it didn't have the same cohesion or shared goals that teams at ActiveCampaign do now with dozens of engineers.

“The teams didn't really act like a team,” Palladino says. “They were a bunch of individuals working on different things, so I was ‘leading’ them in that I knew what each were doing, but none of them knew what each other were doing.” Over time, more teams were introduced, each of the teams was led by an engineering manager, and Palladino moved into a director role to offer guidance and leadership to each team.

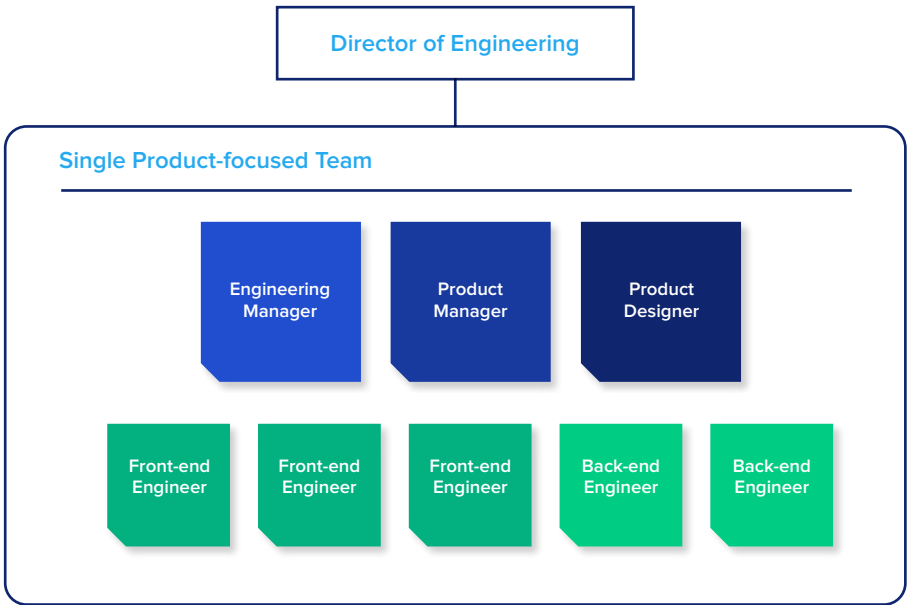
## Adopting Cross-functional Team Leadership

Today, ActiveCampaign has more than 700 employees and its engineering teams maintain internal and customer-facing products used to automate customer experiences, send emails and SMS messages, create and personalize landing pages, report results, and much more. Clearly, learning even a slice of ActiveCampaign's codebase requires some time.

"It took us a while to get to the model we have now," Palladino admits, but as the engineering leaders realized they needed developers and product managers with expertise and long-term ownership of particular areas of the products, they eventually landed on their current system.

"We're currently organized into Scrum teams, and every team has an engineering manager, a product manager, and a product designer. We think of those three as the leaders of the team," Palladino says. He likened this structure to the "two-in-a-box" structure that companies like ThoughtWorks have used.





ActiveCampaign’s ‘Three-in-a-Box’ Leadership Model encourages highly autonomous teams.

The leaders of each team work together to define a cohesive direction for the product, user experience, and engineering. Because each leader has domain expertise in a particular area but is also hyper-focused on a single part of ActiveCampaign’s product, they can operate autonomously and work quickly.

## Team and Member Specialization

“When you’re trying to solve problems of scale—as is the case for ActiveCampaign now—you want some people with specialized expertise,” Palladino says.

To that end, each product team typically consists of five to seven engineers who learn the ins and outs of their part of the product. Each team member further specializes in front-end, back-end, infrastructure, or some combination of engineering skills. This allows each team to plan, execute, test, and deploy updates without the need for outside support.

This ethos of hiring specialists also applies to how ActiveCampaign works with outside contractors. While they're a small fraction of the engineering team, they play important roles in projects with very well-defined scopes or specialized skills but don't require a lot of domain-specific knowledge. Palladino brought up a recent example in upgrading the company's front-end framework.

"Much of our front-end is built on the Ember.js framework," he says. "We were a few versions behind, so we wanted to upgrade the framework, but our engineering teams were all busy on business-critical projects. That was a great project where a contractor with Ember experience could come in and help us get caught up without having to know everything about our company."

Of course, specialized product-focused teams like the ones ActiveCampaign uses require trade-offs, as well. Because this model is optimized for autonomy, it's hard to figure out how to best structure and plan projects that involve multiple teams.

While ActiveCampaign's structure works today, the leadership team is already thinking about the next iteration of its team structure. "We're starting to hire people who have scaled an engineering organization to that next level," Palladino says. "And we're looking to them for guidance."

# /02

## Toptal's Stakeholder-focused Squads



# Toptal's Stakeholder-focused Squads

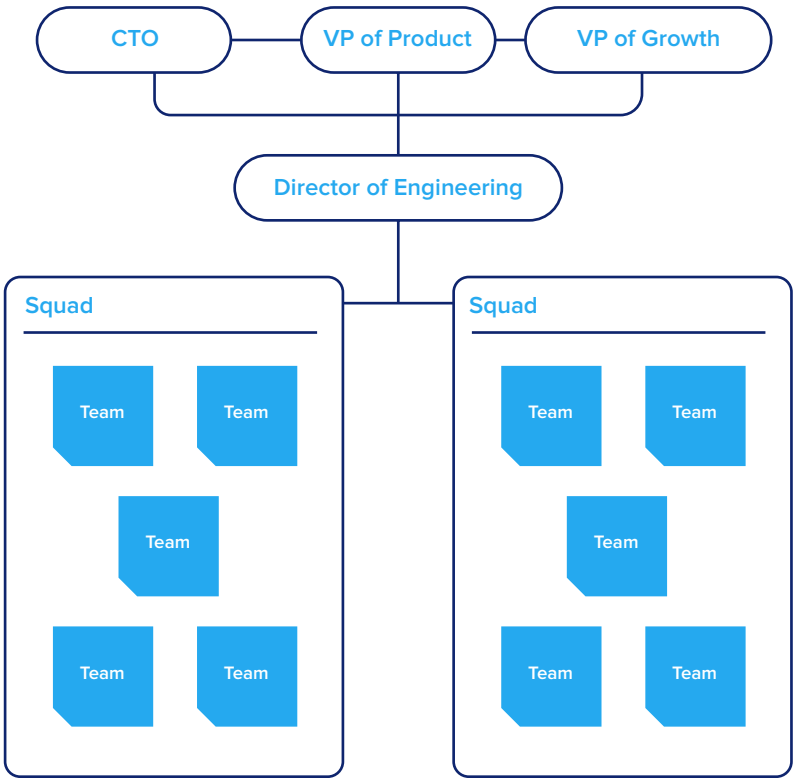
Toptal is the world's largest fully distributed workforce. Its all-remote structure has shaped the business, but whether your company embraces remote work or not, Toptal's team architecture offers insights into what it takes to build a successful engineering organization.

Marco Santos joined Toptal in 2020 and now serves as one of the company's Directors of Engineering. He offered a look into how the company has structured its teams to maximize the value that each delivers to the business.

## Toptal's Engineering Team Structure

"We have a director responsible for a squad of teams centered around a domain," Santos says. "Each squad has a single executive stakeholder that they serve." Santos is in charge of two squads now: Growth (marketing tools, landing pages, etc.) and Data (pipelines, analytics, and data science).

For Growth, Santos coordinates work with the Vice President of Growth primarily but keeps the company’s Chief Technology Officer and Vice President of Product informed of major decisions. The primary advantage of this structure is that engineering teams are in close contact with the stakeholders they support, helping ensure that both parties are always aligned on the goals of each initiative.



Toptal’s Stakeholder-focused Squads ensure consistent delivery of business value.

Each team: Engineering Manager, Front-end Engineer, Back-end Engineer, QA Engineer

This model presents some challenges when a team is responsible for a legacy codebase with cross-cutting concerns. Legacy code doesn't always fit perfectly into a single division, so Toptal has to figure out how to best divide and address the work on a case-by-case basis.

## Speaking of Growth

Toptal's engineering organization has grown quickly, even in just the year since Santos joined. One of the challenges Santos and his fellow directors have faced is figuring out how to structure their teams in ways that each team can grow and multiply as needed.

Like most experienced leaders, Santos is quick to admit that capacity planning is a bit art and a bit science, but a model he's found helpful is the "minimum operating team size": three engineers, one manager, and a half-time quality assurance (QA) engineer. A team of three justifies having a manager, and the team has enough redundancy to avoid falling apart if one of its members leaves.

As a team grows, it will need to be split into two teams eventually, which Santos says he does "like an amoeba." He adds members to an existing team until it's large enough to justify having two managers and then he splits it based on a logical

division of work. This approach preserves the engineering culture they've worked so hard to build while allowing teams to stay focused on single parts of the company's product.

Santos offered some insight into his strategy for finding and promoting new engineering managers: "My personal preference is to have a safe ratio of external hires to internal promotions, especially if you're growing rapidly. If you're growing slowly, focus on internal hires, but if you're growing rapidly, you want to make sure you don't suddenly have a pool of only people you've raised from within."

Healthy organizations need fresh, outside thinking in order to prevent stagnation of culture and ideas. While rewarding excellent engineers with promotions is important for retaining talent, experienced leaders from other companies often help identify blind spots.

## **Freelancers: Unlocking Temporary Growth**

One method Toptal uses to bring on engineering talent faster is hiring contractors. "We've got a whole network of freelance engineers available," Santos says, so when a project has an element of urgency or demands an engineer with a specific skill set, contractors can augment Toptal's core engineering team.



There are also times when a project needs to get done but the leadership team isn't sure if the increased capacity will be necessary in the long run. "We think about it like cloud scaling," Santos says. "When you have extra load, you autoscale up a little bit. It's really nice we have this amazing network of talent we can use to scale up."

## Engineering Success in a Remote Company

"Success of a team means delivering stakeholder value. ... If you make your product manager happy and you're delivering at a great pace, then you've done the job," Santos says, adding that being in a distributed team encourages the whole organization to focus on metrics that matter (e.g., delivering value to customers and stakeholders) rather than those that don't (e.g., spending a set number of hours in your chair).

While the metrics Toptal uses vary for every squad and project, there are a few key engineering metrics that Santos tracks across his teams: the release frequency, defect rate, and predictability of their estimates. While estimates are never perfect, a team that "pinballs" between really high and really low numbers of story points each week might indicate that work needs to be broken down better in the future.

Toptal has been able to grow its remote team quickly because it has learned how to onboard new engineers successfully.

**“I’ve never before worked at a company that onboards so well,” Santos says. “As a remote business, it’s critical to get new engineers up and going quickly.”**

With clear expectations, documentation, and structured collaboration, new engineers usually begin coding on day one. This ensures that new team members are brought into a productive and friendly environment that they want to stay with for years to come.

# /03

## Cube's Front-end/ Back-end Split Structure



# Cube's Front-end/ Back-end Split Structure

While it's been several years since ActiveCampaign and Toptal created their first engineering teams, Josh Holat is an engineering leader in the midst of this process today. He is the Chief Technology Officer and co-founder of Cube, a financial intelligence platform that recently closed \$10 million in series A funding.

Holat co-founded the company in 2019 and the engineering team grew to six people in its first two years. After securing funding, Cube doubled its engineering team in the first quarter of 2021, and Holat is reconfiguring his team around the new hires.

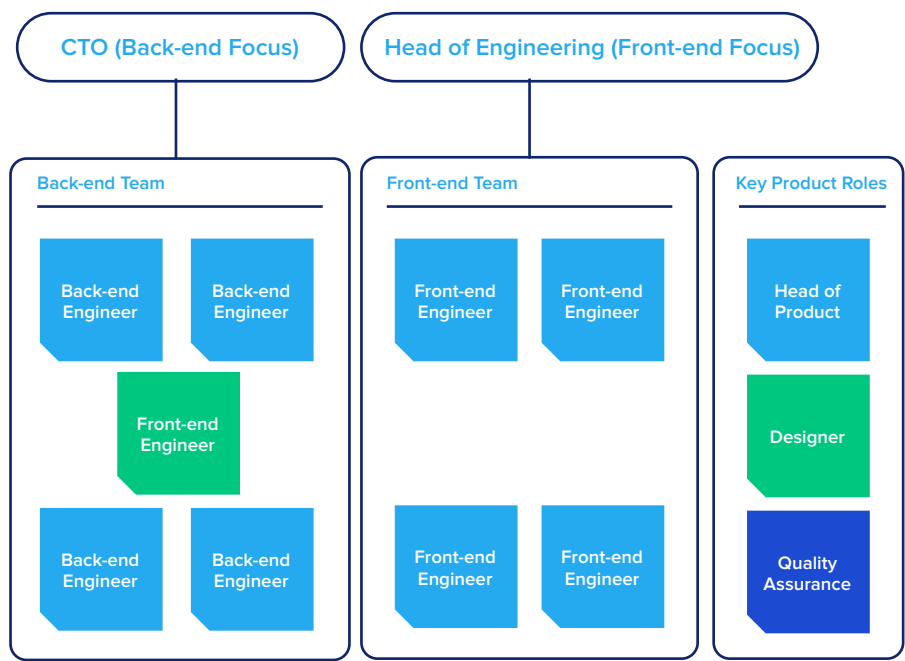
## Hiring a Complementary Leader

While Holat has been a hands-on CTO at Cube, he's not an expert in front-end development. So one of his first key hires was a front-end lead.

“What I really needed was a strong front-end team lead, but when we hired Jason [Bellamy, now Cube’s Head of Engineering], we got a really strong engineering manager as well,” Holat says. While having both a CTO and Head of Engineering early on made the division of labor a little unconventional, Cube made it work, knowing that the temporary arrangement would ensure both leaders could contribute in the most effective ways possible.

Today, Holat and Bellamy lead the back-end and front-end teams, respectively.

“Once your application becomes sufficiently



Cube is using a Front-end/Back-end Split Structure.

complex, you want people who specialize in front end and back end, and it's crucial that you set up your early code well," Holat says. "That's what you'll be building your whole app on." With just four front-end and four back-end engineers on the team, Cube hasn't broken them into different product teams yet. Instead, they divided the engineers by their specialties, and the two engineering leaders act as hybrid technical and managerial leads.

## What About Supporting Roles?

For an engineering team as small as Cube's, you might wonder how the company staffs roles that support engineering (product, site reliability, QA, etc.). Small startups usually don't have the budget to hire full-time people in those positions.

Like most startup CTOs, Holat has gotten creative. For example, he still knows the codebase well enough that he can offer feedback on pull requests and be the primary on-call engineer. Cube hired a freelance site reliability engineer to help it set up and orchestrate its continuous integration and delivery pipeline. Holat also uses contractors for isolated parts of the codebase, like Cube's marketing site or smoothing out the rough edges in the CSS.

Temporary help is invaluable for companies that aren't able to commit to full-time hires but know they need expertise that isn't available in-house. Many startups rely on talent marketplaces like Toptal to help augment their teams early on.

## Metrics, Estimates, and Tracking

While some small engineering teams don't invest much time in tracking, reporting, or estimating work, Cube has started putting some of these best practices into place. "Surfacing numbers like test coverage and how long a ticket takes to go from started to shipped helps push engineers to pay attention to these metrics," Holat says.

The engineering team uses Fibonacci Agile estimation to track capacity and velocity, but Holat admits that estimation has limits. It makes Cube's engineers think about the complexity of the work but, from a management perspective, the data is more useful in aggregate than on a story-by-story basis.

## Where It's Going

Holat says that Cube's structure is still a work in progress. As the team continues to grow, he and Bellamy plan to start aligning teams with products.

“As this codebase gets more complex, we’ll need engineers with experience in each specific part of the product,” Holat says. “As I get busier and can’t manage a team anymore, we’ll hire technical leads to support each team, as well.”

While splitting teams too early might impede knowledge transfer, at some point it’s impossible for every engineer to know what everyone else does. Cube hopes that these forthcoming product-focused teams will allow it to scale its teams and product to the next identified milestone.



# /04

## Cohesion's Augmented Team Model



# Cohesion's Augmented Team Model

While many engineering leaders grow their teams primarily through in-house hires, Cohesion Chief Technology Officer Nik Patel has taken a different approach. Instead of building all of its engineering teams internally from the ground up, he's opted to hire satellite teams provided by offshore consulting companies to get started.

Using this approach, Cohesion has scaled up from a single five-person engineering and product team to 30 engineers in little more than a year, including a solutions engineering team that's responsible for implementing Cohesion's platform with each new customer. Patel shared how he has structured the company's engineering teams to maintain strong communication and track performance throughout the technology side of the organization.

## Why Staff Augmentation?

"Back in 2019, when we were just finding product-market fit, we had to build something fast," Patel says.

“Hiring is a huge operational challenge, so we put out an RFP to find a company that already had teams of engineers we could use.” The major advantage of this approach was that Patel could get started quickly and didn’t have to worry about the operational complexity of hiring, onboarding, paying, and managing each team.

In Cohesion’s case, it has satellite teams in India and Argentina, as well as in-house engineers in the United States. While the consulting company that manages the satellite teams handles payroll and legal paperwork for each hire, Cohesion sets the culture, team structure, and engineering processes that each team follows. This enables Patel to offload most of the administrative tasks while maintaining the quality control and reporting structures he needs to run an effective engineering team.

## **Communication and Culture Structures**

Many engineering leaders balk at this approach to building teams because they worry about the communication and cultural challenges outsourcing presents. Patel admits that he’s had to make adjustments to the team’s process to make it work, but for Cohesion, the benefits have outweighed the costs.

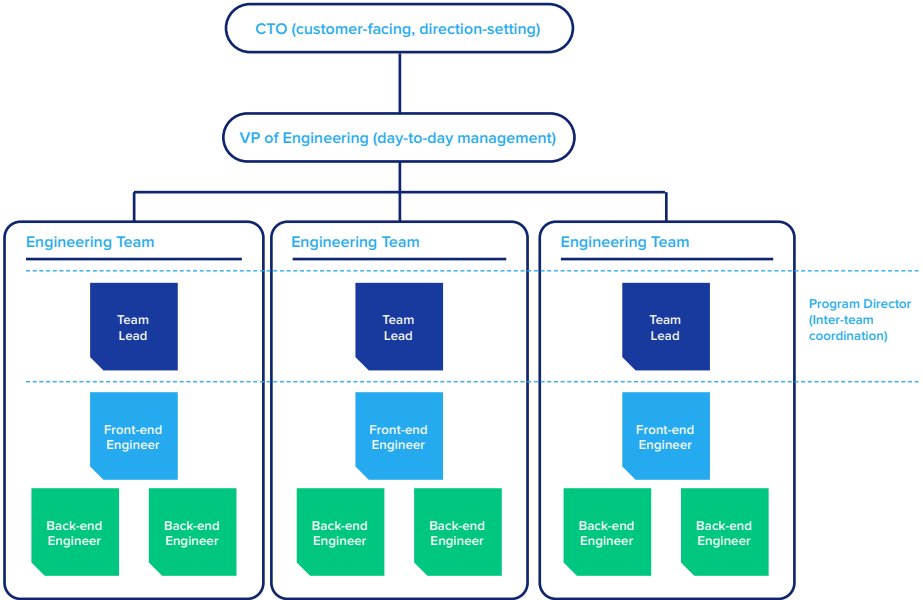
When Patel was setting up Cohesion's first satellite team, he spent three weeks in India and worked in the evenings to overlap with the company's office in Chicago. As Cohesion added more engineering teams, though, the dual schedule became difficult to manage.

"We set up an overlap time from 8 AM Central to 12 PM Central every day where all the teams work at the same time," Patel says. "From an engineering standpoint, that is our productivity time that we hold sacred." The team limits meetings during that time to only those that are absolutely essential so that engineers can work and communicate internally as much as possible during their four-hour block.

Another challenge Patel has had to solve in using the augmented team approach is handling cross-team communication.

Each team has a "team lead" who is the primary technical expert in the team's area of focus. As the number of teams grew, team leads were being pulled into more meetings, which prevented them from keeping their hands in the code.

So Patel hired a program director who handles the coordination, accountability, and communication aspects of developing Cohesion's product. Patel is also working on hiring a vice president of engineering to serve as the day-to-day support for managing each team so that he can stay focused on customers and the big picture.



Cohesion's Augmented Team Model includes a cross-cutting Program Director.

Patel doesn't treat these satellite teams as replaceable cogs in an engineering machine. Instead, he integrates them into Cohesion's broader mission and treats them the same as internal team members. "We tell them about what is going on with the company," Patel says. "Engineers, regardless of where they are in the world, are problem solvers, and they like to know how their solutions are being used."

## How Does the Augmented Team Approach Scale?

As Patel has grown Cohesion's engineering team,

he's started focusing on metrics more than the company did in its earlier days. "Gut feeling works when you're a small team, but as you scale, it doesn't work as well," he says.

Cohesion's KPI framework now uses three levels of reporting:

- **Team KPIs:** Reports each team lead's primary challenges or areas of emphasis (e.g., number of experiments, cycle times, etc.). These are created by the team leads, and tracked and reported only at the team level.
- **Inter-team KPIs:** Tracks metrics common to all teams (e.g., committed story points versus actual story points, deployment frequency, etc.). This helps Patel see which teams are delivering at a high level consistently and which might need a bit more attention.
- **Department KPIs:** Shows the rest of the business how engineering contributes to the company's strategic goals (e.g., uptime and meeting service-level agreements).

This satellite team structure is likely to change as Cohesion grows. Each of the augmented teams was brought on with a "build-operate-transfer" clause that allows the company to bring them in-house in the future. It's likely that these teams will continue to work remotely but may be directly paid and managed by Cohesion once it has the operational bandwidth to do so.

# /05

## Valence's Function-centric Engineering Hierarchy



# Valence's Function-centric Engineering Hierarchy

It's rare to find an engineering leader who has led teams at both large and small companies, but Snehal Kundalkar is just such an executive. For the last two decades, she has been in engineering roles with some of the most recognized brands in the world, including Apple and Reddit. Today, she is the Chief Technology Officer at Valence.

Valence is a mission-driven startup building a community for the next generation of minority leaders, starting with the Black community. Kundalkar shared the different skills engineering leaders need at early-stage startups, as well as her team structure at Valence. She also conveyed some of the lessons she learned at larger companies that are helping her build her startup's engineering team today.

## Building the Team From Scratch at Valence

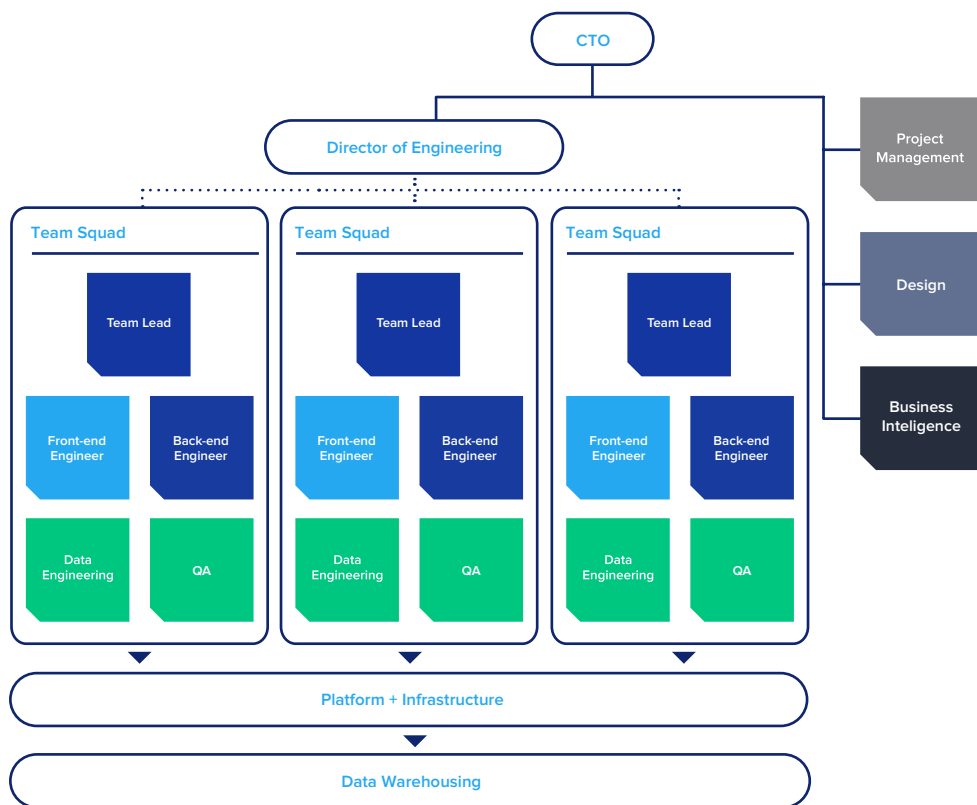
"When I joined, Valence was testing a beta product, but it needed a lot of work," Kundalkar says.



“It was super important for me to revisit key decisions around the technology stack to prepare the product to scale.”

Valence is in the early stages of building out its organizational structure, with 14 engineers on three product-focused teams. The company is working to double its engineering team in the next three months, but Kundalkar pointed out that the team is maintaining a flat structure as long as possible. “In order to be nimble and maintain a lower time to market, you need to operate like multiple small companies within the larger organization,” she says. She saw this relatively flat hierarchy work well at Apple during her time there.

Her undergraduate and graduate studies were in Computer Engineering and Computer Science, respectively. This deep technical background allows her to guide her team and ensure they get the support they need on a day-to-day basis.



Valence uses a Function-centric Engineering Hierarchy to shorten feedback loops and maintain independent teams.

The downside to building largely independent teams is that silos can develop as a company grows. To keep their “bus factor” high, Kundalkar has team members rotate so that less-experienced engineers shadow more-experienced engineers to learn about new domains and parts of the codebase. She used this method at Reddit as the company grew from 250 to 500 people to ensure that knowledge didn’t get lost when a senior engineer left.

## Overcoming Talent Acquisition Challenges

One major difference between management at a relatively unknown startup versus a household name is recruiting. “I didn’t realize how much of an upper hand we had when we were recruiting as employees at Apple,” she says. “When I left Apple and I joined Reddit, it became clear that smaller companies experience a huge uphill battle with talent acquisition.”

Instead of trying to compete on perks and pay, Kundalkar decided to take a novel approach. She began recruiting strong candidates with nontraditional backgrounds and those who didn’t happen to be based in technology hot spots like San Francisco. She looked for bootcamp graduates, international graduate students, and career changers to help fill roles. She was excited by how much potential she found.

“You have to believe in the ability of human beings to expand,” she says, adding that some of the skills these unconventional engineering candidates brought in helped strengthen Reddit’s product. “Some of the skills they had from their multidisciplinary backgrounds were the same skills our customers had.” This gave her team unique insight into building a better user experience.

Kundalkar has built a distributed, remote team spanning 12 countries. By leveraging

Toptal's global talent network, Valence finds and onboards specialized engineers in days instead of months, stays within budget, and provides great opportunities to engineers in places where local jobs might not be as lucrative. "Through Toptal, we found really good talent around the world, as or more efficient at times than local candidates," she says.

While many startups restrict their options to only developers who are local, Valence is proving that there's more than one way to build a successful engineering team; 80% of its engineers are freelancers and most are international.

"To find great talent, you have to look at places your competition is not looking," Kundalkar says. "Especially at a startup when your competition offers stocks, bonuses, free food, haircuts, and laundry service."

## **Startup or Big Company?**

Kundalkar shared her thoughts on where engineering leaders should start their careers. Is it better to start at a big company with an established structure? Or is it better to build a startup engineering team without any preconceptions developed at an existing company?

"It totally depends on what you want to learn and contribute," she says. "There is no right or

wrong choice. If you already have management experience and want to get the satisfaction of defining and owning the strategic roadmap of your company, join a startup.”

However, for junior to middle management positions, she says, “While companies with name recognition might decorate your résumé a little better, these companies require you to have prior management experience.” She mentioned that upward mobility could also be slow in larger organizations. In contrast, managers in smaller startups will get more creative freedom, exposure to new technology, and more opportunity to have an impact. Smaller companies also allow you to “build your management muscle” as the company grows, she says.

Still, it’s clear from Kundalkar’s career that you don’t have to pick a side and stay with it forever. The engineering management lessons she learned at global giants like Apple and well-known brands like Reddit are helping Valence build an effective engineering organization from the ground up.

# Conclusion

It's clear from each of these leaders that there are a wide range of viable team structures you can use depending on your situation.

For example, if you want to ensure that engineers are focused on delivering business value, Toptal's stakeholder-focused structure helps it ensure that engineers are delivering business value attached to key company initiatives, while ActiveCampaign's Three-in-a-Box Leadership Model helps it increase team autonomy. Alternatively, you might consider breaking teams into a Front-end/Back-end Split Structure as Cube has done.

Similarly, there's variety when it comes to hiring freelancers versus hiring full-time staff. While each of the leaders in this e-book uses freelancers, they all have different ways of working with them. ActiveCampaign uses freelancers to help with specific, narrowly defined projects and Cube uses

freelancers to fill in gaps in its growing engineering team, while Valence and Cohesion center their teams around freelancers.

No engineering team structure stays the same forever. As a leader, you have to be flexible and solve problems as they arise. You can apply the patterns you learned about in this e-book, but you should also make them your own.

If you're looking for the top global talent, keep Toptal in mind. Toptal can help you hire pre-screened, self-managed engineers who can elevate your team as you find the structure that works best for you.

Written by Karl Hughes  
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# Amazing talent, when you need it

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