Harvard
Business
Review

Project Management

The Project Economy Has Arrived

by Antonio Nieto-Rodriguez

From the Magazine (November–December 2021)

Joerg Glaescher/laif/Redux

Summary. By 2027, some 88 million people around the world are likely to be working in project management, and the value of project-oriented economic activity will have reached $20 trillion. But research shows that only 35% of the projects undertaken worldwide are... **more**

Quietly but powerfully, projects have displaced operations as the economic engine of our times. That shift has been a long time coming.

During the 20th century, operations (which involve the *running* of organizations) created tremendous value, and they did so through advances in efficiency and productivity. But for most of the current century, productivity growth in Western economies has been almost flat, despite the explosion of the internet, shorter product life cycles, and exponential advances in AI and robotics.

Meanwhile, projects (which involve the *changing* of organizations) are increasingly driving both short-term performance and long-term value creation—through more-frequent organizational transformations, faster development of new products, quicker adoption of new technologies, and so on. This is a global phenomenon. In Germany, for example, projects have been rising steadily as a percentage of GDP since at least 2009, and in 2019 they accounted for as much as 41% of the total. Precise data is hard to come by for other countries, but similar percentages are likely to apply in most other Western economies. The percentages are probably even higher in China and other leading Asian economies, where project-based work has long been an important source of growth.

And we're only just getting started. In 2017, the Project Management Institute estimated that the value of project-oriented economic activity worldwide would grow from $12 trillion in 2017 to $20 trillion in 2027, in the process putting some 88 million people to work in project management–oriented roles—and those estimates were made before nations started spending trillions on pandemic-recovery projects.

Forward-looking companies have recognized the organizational implications of this surge. "Soon we will no longer have job descriptions," one senior IBM talent executive told me. "We will have only project roles." That's where the management thinker Roger Martin believes we already should be. "The average person in an office thinks that their life is some sort of regular job," he told me, "and that the projects they work on get in the way of doing it. In fact, in organizations the entire decision factory should be thought of as nothing *but* projects."

Some companies are already starting to make this change. In 2020, Mohamed Alabbar, the founder and chairman of Emaar, the giant Dubai-based property developer, announced that as part of a shift to project-based work, the company had abolished all traditional job titles—including his own—and that employees would now be defined not by the department to which they belonged but by the projects on which they worked. In a similar move, the Richards Group, the largest independently owned ad agency in the United States, has removed almost all its management layers and job titles and now refers to most of its employees as project managers.

This transformation to a project economy will have profound organizational and cultural consequences. The problem is, many leaders still don't appreciate the value of projects and write them off as a waste of time. Typical is the attitude of one executive who recently told me, "If you want to make sure that something is *not* done, make it a project."

It may be that leaders don't value project management because its methods are too complex to be easily applied. Many project managers end up producing reams of paperwork, too, which can create the impression that their role is primarily administrative. Dismissing the importance and potential of projects for these reasons is a huge mistake. When executives ignore project management, products launch late, strategic initiatives don't deliver, and company transformations fail, putting the organization's future seriously at risk.

There's one more thing that executives often fail to recognize: Projects give work meaning. Behavioral and social science show that projects can be particularly motivating and inspiring for team members. The moments they feel most proud of almost always happen on the projects they work on—the successful ones, of course, but often even those that fail.

Leaders need to recognize that their role in the project economy involves more than just the direct sponsorship of individual initiatives. At a broader level, it involves being clear and courageous in selecting and prioritizing strategic projects. It involves adopting a project-driven structure and creating a collaborative and empowering culture that reaches across silos. They must also ensure that project management competencies are developed throughout the organization.

I can say all this with confidence because I've devoted my career to the study of projects and the practice of project management. I've worked as the director of the program-management offices at PwC, BNP Paribas Fortis, and GlaxoSmithKline. I've served as the chairman of the Project Management Institute. I've taught thousands of senior leaders, managers, and project managers at several top business schools. In short, I have worked on and examined projects from every point of view, and what my work has taught me is that we need a clearer, simpler, and more comprehensive approach to project management.

Artist Joerg Glaescher contemplated the intense power of nature by handcrafting waves out of gathered deadwood in the forest near his home in Leipzig, Germany. Joerg Glaescher/laif/Redux

The stakes are high. According to the research firm the Standish Group, around 35% of the projects undertaken worldwide are successful. Given that we're talking about tens of trillions of dollars, and the labor of millions of employees, that's a mind-blowing number. It tells us that we're not only wasting 65% of the time and money that we've invested in our projects but also forfeiting trillions of dollars of new value for organizations and society at large.

We can and we must do better. In this article I'll present a simple but powerful project-management framework that can make the job easier for everyone, and I'll lay out six skills that you'll need to succeed in an increasingly project-centric world.

From Operations to Projects

It's often said that to succeed in times of change, companies need to be organizationally ambidextrous—or as the academics put it, they must balance the *exploitation* of their current capabilities (operations) with the *exploration* of new competencies (projects). In other words, they need to focus simultaneously on running the organization and changing it.

Running the organization (operations). This dimension is made up of the core and legacy activities of the business. It includes functions such as sales, customer service, finance, manufacturing, and IT. Most of the revenues (and fixed costs) generated by firms are from running-the-organization activities. These functions are what keep the company alive. Running the business is about efficiency, productivity, and speed. The focus is short-term, the objectives are mainly performance-driven, and the structure is hierarchical. Culturally, the model is command and control.

Changing the organization (projects). This dimension is key to the future of the company. It includes all the organization's strategic and tactical initiatives and programs. Changing the business is about innovation, transformation, agility, and long-term value creation. The focus is medium- to long-term, the objectives are more strategic, the structure is flat and project based, and the outcomes are less quantifiable than operational results. Culturally, the model is entrepreneurship and collaboration.

The future belongs to organizations that can achieve the right balance of run and change, but most leaders are far better at the former, and so spend more of their time on it. That's a legacy of the 20th century, when, starting in about 1920 and guided by the likes of Henry Ford and Frederick Taylor, most companies made productivity their prime directive. They achieved it with a relentless focus on increasing efficiency, reducing costs, and raising volumes and outputs. Because they mainly produced goods, they grew in mostly organic ways: by increasing production capacity, by standardizing and automating processes, and by entering new markets. Once a year, senior leaders would decide on strategies, projects, budgets, and operating plans and then would manage operations accordingly. Between annual-planning cycles, only a few minor amendments were allowed.

All this made operations extremely efficient. But efficiency has its downsides. By commoditizing their processes, companies sacrificed elements of medium- and long-term value for speed. They regularly grew their businesses through acquisition, often at the expense of organic growth, or as an alternative to it. That allowed them to accelerate their product-release schedules or simply to produce more. But there comes a point after which a strategy of more volume, more product releases, and more brand extensions simply runs out of road. Sustainable growth through further efficiency becomes impossible, especially in times of uncertainty and rapid change.

That's where we are today. The yearly operational rhythm that prevailed for a century is out of touch with reality. Every organization, public or private, now operates in an environment of continual and sometimes disruptive change. Projects used to be temporary, and operations permanent, but now the reverse is true: Operations keep you afloat temporarily, and change is what's permanent. Anticipating, managing, and driving change thus become the prime directives. And what's the best way to do those things?

Handle your projects better.

New Terms and Conditions

What exactly is a project? Everybody uses the word, but it means different things to different people. That's a problem. As projects drive more and more of the value that organizations create, everyone needs to have a common understanding of what projects and project management are. So let's briefly define them.

Projects involve a series of planned activities designed to generate a deliverable (a product, a service, an event). These activities—which can be anything from a grand strategic initiative to a small program of change—are limited in time. They have a clear start and end; they require an investment, in the form of capital and human resources; and they are designed to create predetermined

forms of value, impact, and benefits. Every project has elements that are unique. That's key: Each contains something that has not been done before.

Project management, for its part, involves the collection of competencies, techniques, and tools that help people define, plan, and implement projects to achieve their goals. Most project-management methods we use today were developed in the 1970s and 1980s and reflect the efficiency and standardization methods used for operations management. Organizations typically adopted one standardized project-management methodology and applied it consistently to all their projects. Over time, what project management was and what it needed to be drifted apart. Organizations evolved rapidly, and although the number of projects increased exponentially, project management somehow stayed in the past.

Using the traditional model, project managers have focused far too much on *inputs and outputs* (planning, estimation, cost, time, scope, risk management) and not nearly enough on *outcomes and value* (purpose, rationale, benefits, impact, and strategy). It hasn't mattered much to them what happens before or after their projects are complete—they've concerned themselves with deliverables, the idea being that if they can complete their projects on time, on budget, and on scope, then the promised benefits will...just happen.

Typically, project managers conceive of their projects in life cycle stages, moving sequentially from initiation through planning and implementation to closing. You work on one stage until you're done; you move on to the next; and when you've made it through the final one, your project is complete. At no point do you return to a previous stage.

But we now know that projects don't lend themselves naturally to such a rigidly sequential, one-size-fits-all approach. In taking on work that's never been done before, projects involve experiments

and false starts and failures and, as a result, are prone to movement back and forth among the stages. To run projects well, sponsors and managers need to focus on three main things: innovating; creating a high-performing team; and, most important, delivering benefits.

Agile and traditional project management aren't at war with each other. In a change-driven world, companies can't apply just one methodology to all their projects.

In the early 2000s, as the internet and new technologies converged to create an explosion of change, the agile movement began to take hold as an alternative to the rigidity of traditional project-management practices. The focus was on accomplishing work in smaller increments, on delivering value to customers faster, and on evaluating requirements, plans, and results continuously. Agile has been a positive development in many ways, but at times it has led to tribalism in the project-management-expert community. Many leaders see agile as cool and fresh, and traditional project management as obsolete—and so they have rashly instituted agile throughout their organizations.

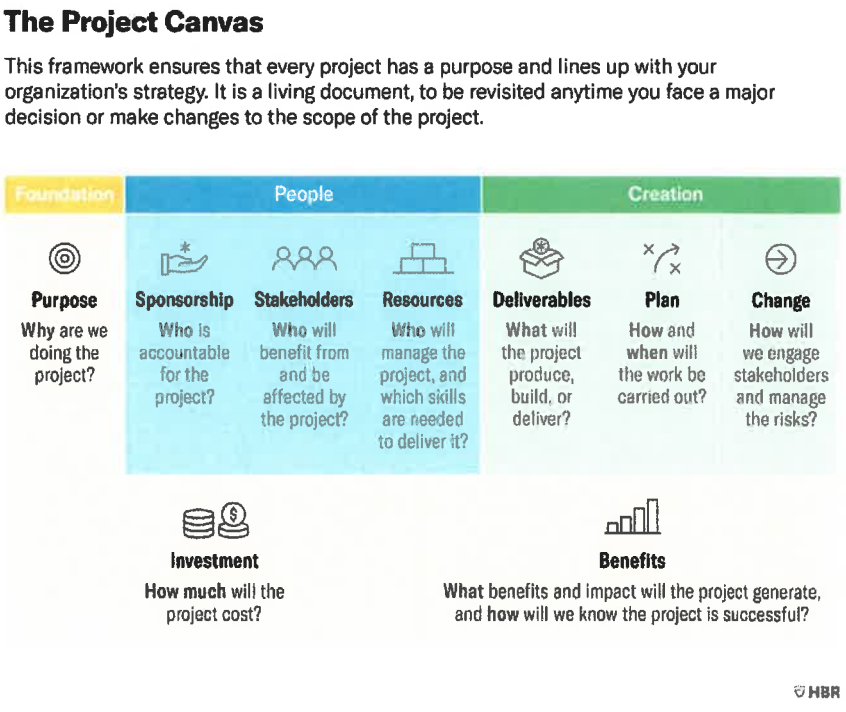
That is counterproductive. Agile and traditional project management aren't at war with each other. In a change-driven world, companies can't apply just one methodology to all their projects. Instead, they need a toolbox of approaches—among them agile and traditional project management, certainly, but also design thinking, change management, and product development—and then must build competencies in all of them throughout their organizations.

But to make that possible, they first need a framework that allows everybody in the organization to see, understand, and work productively on the key elements of any given project.

The Project Canvas

I've created just such a framework for the executives and managers I teach and advise across the globe—a one-page strategic template that I call the project canvas. The concept is inspired by the business model canvas developed by Alex Osterwalder and Yves Pigneur and used by millions of people worldwide. Both Alex and Yves helped with early brainstorming for the design of the project canvas. A few other frameworks with the same name exist, but none has been as widely adopted as this one.

The framework is composed of just three domains: foundation, people, and creation. Each domain is vital to the success of any project.



What distinguishes the project canvas from other guides to project management? A lot of things. It can be applied to any project, program, or strategic initiative. It focuses on value and benefits rather than processes and controls, and it encourages you to focus on how to quickly deliver the elements of greatest value. It helps you ensure that every project has a purpose and lines up with your organization's strategy. It focuses on implementation rather than detailed planning, and—this is critical—it spans not just the traditional project life cycle but also the pre- and postproject phases, to include aspirations and benefits. It's flexible and allows changes to be made quickly whenever necessary.

The project canvas works with all project-management methodologies, and it guides each stage of the process. It is used before the project begins, to assess how well it has been defined and whether it's ready to go. It is used throughout the project to track progress and ensure that critical elements and assumptions remain valid. It is used near the end, to assess whether the project is delivering its intended benefits, and after the project is over, to capture lessons learned and build up competencies found to be lacking.

The canvas process begins just before you invest heavily in a project but after you have put both a project manager and a project sponsor in place. Those two roles are key to the success of any project. It's common to think of a project manager as focusing primarily on the technical aspects of the project—with the goal of providing the deliverables on time, within scope, and on budget—while the project sponsor oversees and supports the project manager and ensures that the project stays true to its purpose and delivers its promised benefits. But that division diminishes the role of the project manager, who also needs to be concerned with purpose and benefits. When it comes to how a project is run and what its goals are, the manager and the sponsor must be on the same page—which, of course, is exactly what the project canvas makes possible.

The canvas has to work for everybody, so it must be built on consensus. The project manager should start by convening a project-definition workshop—a meeting that brings together the project sponsor, key stakeholders, and company experts, not to mention anybody else who might provide relevant information, including customers and suppliers. This meeting might take two or three hours. Don't rush it. Make sure everybody has a blank copy of the canvas. Review the goals, scope, and details of the project, and walk through the elements of the canvas template. Then have everybody brainstorm for a while. Start with the foundation, and then move through the other domains and their building blocks. Ask participants to share their views and opinions, and then using a master copy of the canvas, summarize the main themes that have emerged for each domain and building block. You'll now start to see a picture of the challenges ahead.

At this point, your canvas will have a lot of information on it. Ask yourself, Does it all work together as a cohesive and integrated whole? Does it make sense from a strategic and an organizational perspective? Does it acknowledge that you'll be implementing your project in a fast-changing and multiple-priority environment? Now is the time for some careful thought and focused iteration. If you are missing or unclear about two or more building blocks, it's probably too early and too risky to start your project. Take more time to define them. And if you still can't do that, don't start the project at all.

When the meeting ends, the process is far from over. Your next step is to share the document you've produced with other stakeholders and incorporate their feedback.

The canvas is now a living document, to be revisited regularly. Consult it each time you face a major decision, and update it any time you make changes to the nature of the project or your goals. You might even want to feature the canvas in your drumbeat

communications. Consider producing a video, drafting an article, or facilitating a short workshop around one (or more) of the elements in the canvas on a regular cycle—perhaps once a month.

Skills and Training

Projects are only as good as the people who run them. So what are the main qualities that leaders need to excel in a project-driven world?

I divide them into six categories.

Project management skills. Executive sponsors need a solid grounding in the essentials of project management. They need to know why projects succeed or fail, how to ensure that a particular project's technical fundamentals are robust, and which characteristics of that project to consider when choosing its project manager. In addition, they need to understand the technical complexity and constraints associated with how plans and estimates are developed.

Project managers, for their part, need to be able to use tools and techniques to determine the rationale and business case for a project. They must be adept at working with contributors and partners in defining scope. They need to know how to identify and manage risk effectively. Once a project is underway, they are responsible for establishing reporting mechanisms to monitor execution and quality. When delays or changes to the plan are foreseen, they need to be able to anticipate their impact and come up with viable alternatives.

Product development and subject matter expertise. Project sponsors and managers need to develop a reasonably proficient understanding of the technology, features, product, service, or capabilities that the project aims to produce. This will do a lot for them: It will give them credibility with the team and the stakeholders. It will enable them to communicate in the language of the experts and the product teams. It will ensure that they

understand what the project benefits are, and how and when they will be achieved. And it will help them understand how the project connects with the organization's overall strategy.

Strategy and business acumen. Because of their seniority, executive sponsors tend to have a good understanding of their organization, its strategy, and its key competitors. They're also typically savvy when it comes to the financials and the environment in which their projects will be implemented. Project managers often need to develop these skills. Being able to connect the project benefits and purpose to concrete business priorities is essential for winning buy-in and achieving goals. Also key is a strong focus on a project's benefits and impact, even in the early stages.

Leadership and change management skills. Project sponsors and managers today need strong leadership and change management capabilities. They have to create high-performing teams; provide direction; manage and persuade across multiple cultures; build bridges across the organization; communicate clearly and effectively; evaluate, develop, and coach staff; and resolve disagreements in ways that all parties can embrace.

Agility and adaptability. There's no question that project sponsors need to adapt to agile methods. In the old world, they were expected to lead according to a predetermined plan and treat decisions as simple and binary. But in a change-driven world, they won't have all the answers and will need to alter their course and cancel projects regularly. Many agile training groups

offer very helpful courses and certifications that can provide a solid knowledge base.

Similarly, project managers need to be comfortable working in uncertain contexts and making plans and decisions with only limited information. They should be prepared to apply some agile methods or adaptive techniques, among them Agile Project Management, Scrum, Kanban, and Scaled Agile Framework.

Ethics and values. Project sponsors and managers are role models. They create a safe, respectful, nonjudgmental environment in which the project team can build trust and communicate openly. In the launch phase of any project, consider developing a code of ethics to guide you and the project team. Start by consulting existing models. Both the Project Management Institute and the International Project Management Association have codes posted online.

Mastering these skills is no small task, but fortunately plenty of good options for learning are available. Some business schools offer yearlong programs in project management. Groups such as the Project Management Institute and Prince2 offer internationally recognized programs of accreditation. PM2, from the European Commission, and Praxis provide free project-management frameworks online, and the International Project Management Association offers a competency framework for technical skills. The best option, however, is to develop an in-house training program specific to your organization's needs and culture.

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Great projects don't just make work better—they make the *world* better.

If managers and organizations want to build the competencies required to transform themselves and thrive in the new project economy, they'll need to get comfortable devising strategies that

are driven not by efficiency but by change. They'll need to allocate more resources, budgets, and decision-making power to projects and project teams at the expense of the traditional departmental hierarchy. They'll need a simple framework, such as the project canvas, so that everybody in their organizations can get involved. They'll need to build project management competencies and adopt new technologies. They'll need to encourage a shift in focus from inputs and outputs to outcomes and value. They'll need to broaden the scope of their ambitions for their projects, by including, for example, a focus on diversity and sustainability.

If all of us as leaders can do these things, just imagine what we'll collectively make possible: By executing our projects better, we'll be able to provide trillions of dollars' worth of additional benefits to the world.

Editor's note: Antonio Nieto-Rodriguez is the author of The Harvard Business Review Project Management Handbook *(2021), from which this article was adapted.*

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Antonio Nieto-Rodriguez is the author of the Harvard Business Review Project Management Handbook, the HBR article The Project Economy Has Arrived, and four other books. His research and global impact on modern management have been recognized by Thinkers50. Fellow and former Chairman of the Project Management Institute, he is the founder of Projects&Co and the Strategy Implementation Institute. He is a member of Marshall Goldsmith 100 coaches. You can follow Antonio through his LinkedIn newsletter Lead Projects Successfully, his

online course Project Management Reinvented for Non–Project Managers, and his website.

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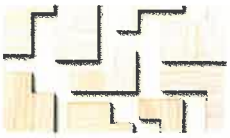
Agility Hacks

Is Project Management the Right Career for You?

The Rise of the Chief Project Officer



Does Your Project Have a Purpose?

Harvard
Business
Review

Project Management

Agility Hacks

by Amy C. Edmondson and Ranjay Gulati

From the Magazine (November–December 2021)

Ellie Davies

Summary. In the past 20 years, the agile approach to improving products, services, and processes has swept the business world. Rooted in software development, agile has spread to many other functions, and some companies have turned much of their organization,... **more**

In the past 20 years, the agile approach to improving products, services, and processes has swept the business world. It calls for organizations to adopt small, empowered, cross-functional teams,

break initiatives or challenges into small modules, and develop solutions using rapid prototyping, tight customer-feedback loops, and quick adaptation. Rooted in software development, agile has spread to many other functions, and some companies have turned much of their organization, including the C-suite, into agile teams.

Although agile can benefit the parts of a business that must be nimble—those that manage shifting customer relationships, explore new markets, and develop new products quickly and responsively, for example—it is less effective for operations or functions that require consistency and efficiency rather than agility. Consider mature, high-volume production processes such as those used to produce aluminum, commodity chemicals, and paper. They can run efficiently for weeks or months without interruption, and tweaks can be extremely costly and even dangerous. Other repetitive activities, including bill processing, payroll, and budgeting, are also best run with bureaucratic systems. Indeed, bureaucracy—characterized by specialized functions, fixed rules, and a hierarchy of authority—has gotten a bad rap: When designed well, it excels at ensuring reliability, efficiency, consistency, and fairness.

But understandably, such systems don't adapt quickly to changing circumstances in the market, and occasions arise when businesses need to bypass them to tackle select projects that demand speed, flexibility, and experimentation. Examples include jump-starting an R&D function to generate more-radical innovation; figuring out how to serve the needs of a strategic new client in an emerging market whose requirements differ

dramatically from those of existing customers; and responding very quickly to a sudden contextual change, as happened during the early days of the Covid pandemic.

In such cases, how can large, established organizations bypass their own processes to act quickly and effectively while leaving the overall system alone? Our research identified several large companies—among them PepsiCo, Sony, Novartis, and GE—that used temporary teams to carry out time-sensitive strategic projects quickly. All employed agile principles and values, but some did not use formal agile methods. Instead, they used what we call *agility hacks*. Similar in spirit to life hacks, they are shortcuts or novel methods that increase productivity or responsiveness, and they deliver on computer programmers' original use of the term "hack": a quick, effective, if inelegant, solution to a specific problem.

In some instances, teams were unleashed to pursue a new market opportunity; in others, they were formed to respond forcefully and creatively to serious performance problems such as an alarming and sustained decline in revenues. Team members knew they were trying to capture something that the organization would otherwise miss. All teams used unorthodox methods to achieve results quickly; they acted as work-arounds to get things done outside the organization's established architecture and normal operating processes. Although the projects differed in size and duration, we uncovered commonalities in their approaches—related to their purpose, the permission granted to them to operate outside the norm, and the disciplined, iterative process they employed—that other companies seeking to create agility hacks can apply.

Purpose

Each project we studied began with an animating purpose that was inspiring and actionable—for example, winning a bid for a mega-order, regaining a key account, or catalyzing novel

innovation. The importance of the goals helped minimize pushback from the custodians of standard operating procedures in the organizations. And in all cases project team members—and those in other parts of the company whose expertise or resources were necessary to succeed—believed that the objective mattered.

When to Use Agility Hacks: Three Examples

When dealing with an immediate crisis that requires fast execution (e.g., saving a large corporate account)
When ...

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Consider what happened at GE in 2012. Indian Railways, the second-largest rail network in the world, had announced a $2.5 billion plan to revamp its entire fleet of diesel locomotives and asked for bids to be submitted within six months. Given the decades-long life span of a locomotive, it was a rare opportunity. But Nalin Jain, a young executive at GE India, realized that a variety of factors stood in the way of being able to submit a bid in time to compete: the company's plodding traditional systems; the distant location of GE Transportation's headquarters in Erie, Pennsylvania; Indian Railways' vague requirements and the likelihood that the specifications would shift during the bidding process; and the deal's high risks (bid too high and the deal would be lost; bid too low and the deal would result in a massive financial loss). A nimble approach to assembling a winning proposal was the only option. Jain pulled a team together and got to work. The team needed expertise in manufacturing, sourcing, finance, and contracts, and in how a government tender process worked in India. It also needed people who could think about the problem in new ways. By highlighting the enormous size of the opportunity and making the case that it might be possible to win

the bid and make it profitable, Jain gained the support of executives and the cooperation of various groups at GE whose expertise was critical to putting together a strong bid.

Another example is PepsiCo UK. In mid-2016, the unit had experienced two consecutive years of declining revenues and was poised to suffer a third. Ian Ellington, the general manager, knew he needed to take action. But he realized that PepsiCo's entrenched systems and rules would impede rapid, novel responses. Ellington also knew that reforming the entire organization from within would take too long and most likely engender significant resistance. His solution was a "SLAM" (self-organizing, lean, autonomous, and multidisciplinary) team tasked with turning the ship around. Over eight weeks, team members reached out to key stakeholders with brand expertise or relationships with frontline retailers to understand what had gone wrong and to collect and generate ideas for revitalizing the different brands and accounts. Some brand experts, for instance, had ideas for improving online sales but had never been invited to experiment with them. The SLAM team did not dictate solutions; rather, it collected ideas and empowered others to create a viable path out of the decline. It led to an increase in UK revenues of 2.3% in the first year and 2% in the second.

Permission

A motivating purpose provides a starting point. But agility hacks fail unless they deviate from conventional ways of doing things. In every case we studied, project teams were given permission—and resources—by senior leadership to try new things fast, without going through the usual channels and approvals. But significantly, none of the teams we observed were skunkworks—off-site autonomous enterprises shut off from the rest of the organization. Instead, all relied on support from and interactions with colleagues in traditional roles.

The Indian Railways team at GE bypassed organizational layers and reported directly to the CEOs of GE India and of GE Transportation. The team kept them abreast of progress and hurdles. Given the stringent cost and customization requirements, it wasn't clear whether GE could make a profit on the deal. Worse, Indian Railways had put out similar bids in the past only to pull them back later. For these reasons, there was resistance within GE to even pursuing the deal. With the strong support of the two CEOs, however, the team overcame those obstacles by moving fast to recruit key experts from within GE, sharing the cost across divisions, engaging extensively with Indian Railways, triangulating information from different sources to improve cost estimates, and taking quick action to test ideas. When the team encountered problems in getting necessary resources or decisions, the senior executives intervened.

Ellie Davies constructs temporary interventions in the forests of England to consider the complex interrelationships between landscape, individual experience, and meaning. Ellie Davies

Consider also an agility hack launched in 2013 by Sony's new CEO, Kaz Hirai. An important part of his transformation effort, it reversed a long period of slow decline that had started in the early 1990s. Hirai recognized that a risk-averse bureaucracy had prevented exciting innovations from getting from the lab to the market because they didn't fit neatly into one of Sony's existing business verticals. His solution? An innovation hack that enabled

the pursuit of concepts outside existing product categories and ultimately launched a series of successful innovations. He assembled a team that reported directly to him, allowed it to bypass Sony's cumbersome budgeting and decision-making processes, and ensured that it could quickly access whatever resources and technologies it needed from wherever in Sony they resided. This setup provided the team with the air cover to imagine new possibilities and then get them done within and outside the Sony organization. Among the innovations the team launched was a popular 4K home projector that cast high-resolution large-screen images onto walls and also served as a piece of furniture, and a glass speaker system housed in a light bulb.

At pharmaceutical companies, R&D tends to be a top-down affair: Senior leaders allocate research dollars to specific areas, often leaving lab scientists boxed in by defined therapeutic areas, such as cardiovascular disease or cancer. In addition, specific scientific methods, disciplinary silos, and a reluctance to fail often discourage risky experiments.

When Jay Bradner left academic science to become head of R&D at pharma giant Novartis, in 2016, a series of breakthroughs had put the company in a strong place. But Bradner wondered how many great ideas were being missed by not tapping into the more out-of-the-box thinking of bench scientists—a question amplified by the departure of a number of them who had left for start-ups. So when scientist Ian Hunt suggested a new approach to catalyze more-radical innovation, Bradner invited him to step away from his current role and give it a try. The result was Project Genesis.

Set up as a competitive, fast-paced innovation contest, Project Genesis encouraged cross-disciplinary teams to pitch proposals for dream projects to a panel of scientists, which included Bradner. Of the 90 proposals, five were ultimately selected. The winning teams then received lab space, funding, and time to develop their concepts further. One scientist told us, "I am

surprised by how much Genesis speeds things up. We were able to get prime lab space and equipment in just a couple of weeks." Each project was able to tap into diverse expertise as needed. But despite their risky, novel content, all the projects remained housed inside the parent organization. After 18 months, each would have to either find a home within one of Novartis's existing R&D programs or end the project.

Following its positive reception, Project Genesis attracted more than 150 proposals in its second round, in 2018. The panel selected six to be funded. Although the full impact of the initiative remains to be seen—it takes many years to bring a new drug to market—Bradner praises Project Genesis for quickly generating efforts to explore breakthrough ideas with little cost and disruption to the overall organization. "Genesis isn't very expensive," he says. "It isn't very disruptive." But it greatly accelerated the launching of initiatives in new areas, boosted collaboration and engagement among scientists across disciplines, and increased the number of transformative technologies and therapeutics in the pipeline.

Process

The agility hacks we studied were anything but chaotic or sloppy. Each followed a systematic, disciplined process of rapid trial and error aimed at producing results within a tight time frame. All shared a bias for action. They didn't let the pursuit of perfect solutions get in the way of speed. In every case the project processes were designed to accelerate the pace of learning—despite risks—by forcing progress and providing guardrails. (Gulati's article "Structure That's Not Stifling," HBR, May–June 2018, offers guidance on how companies can empower employees and yet retain control.) They embodied what we call "execution as learning," a structured approach to getting projects done while paying close attention to what works and then changing course frequently in small, responsive ways. (For more on this, see "The Competitive Imperative of Learning," HBR, July–August 2008.)

Novartis and other firms we studied that ran innovation contests set up rules and timelines for the competition process and for the projects selected for funding. Project Genesis offered coaching and presentation-skills training to scientists who chose to compete and facilitated collaboration among them by hosting structured ideation sessions and creating an internal social media platform. That allowed people to find partners in key disciplines more easily. A fast-paced schedule of deadlines was posted to put the pressure on the ideation process.

PepsiCo UK's initial SLAM team and the others that followed worked intensively on a tightly defined mission, with a deadline, and used a structured agile method. The process included forming a team charter around the problem or opportunity; identifying a team leader, coach, and stakeholders; specifying key work areas, which were sorted into one-week blocks; designing successive experiments; and adopting a set of practices that organized the collaborative work in a transparent, iterative way. The process allowed SLAM teams to bypass organizational roadblocks and coordinate as needed with colleagues in various functions, such as marketing or manufacturing, to ensure execution of time-sensitive tasks. Once results were achieved, team members returned to their former roles. The GE Transportation team pursuing the Indian Railways deal was also able to move fast as long as it didn't violate size, cost, and other parameters outlined by the customer and GE leadership.

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Admittedly, agility hacks are short-term solutions that don't address underlying causes of entrenched performance problems. But they can be extremely effective in tackling immediate challenges quickly and in doing so awaken people to new possibilities and pave the way for success.

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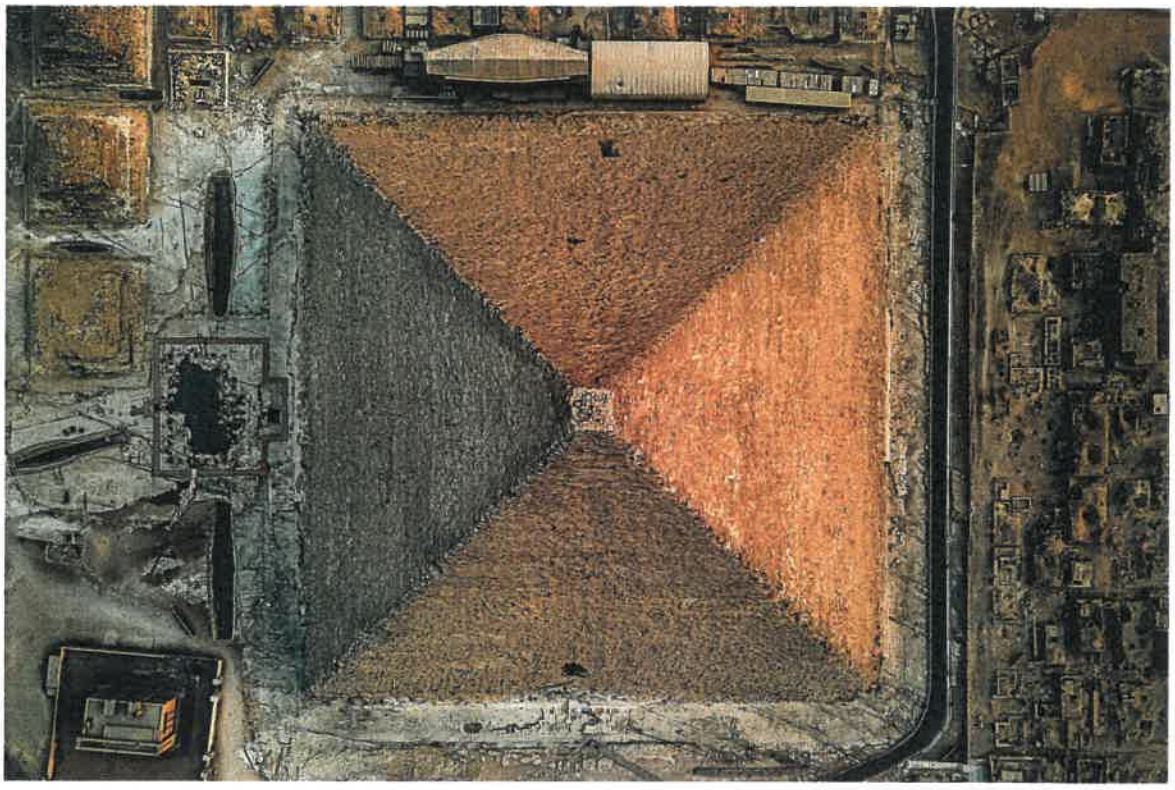
Make Megaprojects More Modular

by Bent Flyvbjerg

From the Magazine (November–December 2021)



Alexander Ladanivskyy

Summary. In conventional business and government megaprojects—such as hydroelectric dams, chemical-processing plants, or big-bang enterprise-resource-planning systems—the standard approach is to build something monolithic and customized. Such projects... **more**

With climate change forcing the pace, many sectors are

contemplating major changes in technology and basic infrastructure. The oil- and coal-fired power generators of the last century are giving way to wind farms and solar arrays. Fossil-fueled cars and networks of gas stations may soon be consigned to history. In almost every industry, large capital investments will need to be made, and with them will come big risks.

I've researched and consulted on megaprojects for more than 30 years, and I've found that two factors play a critical role in determining whether an organization will meet with success or failure: replicable modularity in design and speed in iteration. If a project can be delivered fast and in a modular manner, enabling experimentation and learning along the way, it is likely to succeed. If it is undertaken on a massive scale with one-off, highly integrated components, it is likely to be troubled or fail.

Unfortunately, in conventional business and government megaprojects—such as hydroelectric dams, chemical-processing plants, aircraft, or big-bang enterprise-resource-planning systems—the norm is still to build something monolithic and customized. Such projects must be 100% complete before they can deliver benefits: Even when it's 95% complete, a nuclear reactor is of no use. Components are typically bespoke, with a high degree of specificity rather than modularity, which limits opportunities for learning and increases the costs of both integration and rework when problems arise. New technologies and customized designs are common, which further hinders speed and modular scale-up. What's more, the size of megaprojects is typically specified many years before operations are slated to begin. That spells disaster if more capacity is built than is ultimately needed or if demand is greater than expected and additional capacity cannot be added.

The Channel rail tunnel between France and the UK, for instance, has a fixed capacity, and because tunnel use is roughly half of what was projected, huge and expensive capacity goes unused. The investment has been a financial calamity.

Eurotunnel: When Success Spells Disaster

In many cases, large projects that look like marvels of human achievement and ingenuity prove to be economic ...

↘

Cost overruns may not matter if you are a large multinational such as BP or Tesla contemplating a $10 million project. At such firms, coming in at $10 million over budget would make little difference to the bottom line. But when the estimated budget starts at $10 *billion,* the stakes are much higher, even for governments. Smart organizations, therefore, adopt processes and technologies that lend themselves to modularity and rapid learning and involve less-complicated rework when problems arise.

To entrepreneurs in the tech industry, much of this will sound familiar and logical. But large corporations and governments have yet to internalize these lessons for big-ticket projects. To be sure, many megaprojects—such as bridges or power plants—are unlikely to ever be completely modular, but there is still plenty of scope for choosing technologies that enable rapid scaling and introducing modularity by applying tried-and-true technologies in innovative ways. Let's begin by considering the factors that enable projects to scale up rapidly.

Why Speed and Modularity Matter

Speed is important to the success of megaprojects because with extended timelines come increased risk and uncertainty. Decades of research by Philip Tetlock, a professor at the Wharton School, have established that people can forecast certain events—such as GDP growth, macroeconomic policies, business cycles, technological advances, and geopolitical conflicts—with some accuracy over periods of up to one year. After that, however, accuracy declines rapidly, and beyond a time horizon of three to five years, it disappears into the mists of randomness.

And Tetlock is probably overly optimistic in that assessment. His findings are based on the work of highly skilled forecasters, and the forecasts he studies are simplified, often framed as yes or no answers to questions such as: "In the next year, will any country withdraw from the euro zone?" or "Will North Korea detonate a nuclear device before the end of this year?" Most real-life forecasts do not have binary answers but instead cover a wide range of possible outcomes. They address questions like: "How many people are likely to die from Covid-19 over the next year?" or "How much is the California high-speed rail system likely to cost?" Binary questions are easier to answer than ones with many possible answers, but the latter are more common in practice.

Entrepreneurs and financiers in Silicon Valley, who compete in winner-take-all markets, have long understood that speed is critical. New ventures in the tech industry place a great emphasis on developing a minimum viable product within their first year and establishing themselves as a market leader within three to five years. LinkedIn cofounder Reid Hoffman calls this process "blitzscaling" and argues that scale-ups, and not start-ups, are what distinguish Silicon Valley from other tech ecosystems.

Speed is only half the equation. Former Alphabet chairman and CEO Eric Schmidt and former Google senior vice president of products Jonathan Rosenberg identify the other half: Ship and

iterate. "Create a product, ship it, see how it does, design and implement improvements, and push it back out," they advise. "The companies that are the fastest at this process will win."

Alexander Ladanivskyy used a drone to photograph the Great Pyramid of Giza, zeroing in on the modular pattern of rocks on its top. Alexander Ladanivskyy

Iteration ensures that the quality of delivery constantly improves as you go along. As Harvard Business School professors emeriti Carliss Baldwin and Kim Clark demonstrated over two decades ago, iteration enables learning by creating a feedback loop in which the experience from delivering one module improves the delivery of the next, repeatedly. Iteration also provides scope for experimentation. Instead of going full-scale immediately, you experiment with a few modules, improve the next ones, and repeat until you master delivery, at which point you go full-scale. It's easy to see how speed contributes to this process—the faster you iterate, the more you learn and the further you can drive cost down and safety and productivity up.

Humans are inherently good at experimenting and learning, which is why a venture based on modular replicability is more likely to succeed than one that depends on long-range planning and forecasting—something humans are inherently bad at.

Let's look next at a megaproject that epitomizes a smart scale-up.

Giga Nevada: Scaling Up the Smart Way

Tesla's Gigafactory 1, also known as Giga Nevada, is a $5 billion high-tech lithium-ion-battery factory under construction east of Reno. The goal of the megaproject is to make electric vehicles and

home-power systems more affordable by producing batteries at an unprecedented scale. If completed as planned, Gigafactory 1 will have the biggest footprint in the world, at more than half a million square meters, or 107 football fields.

The building is modular by design. At the outset, Tesla defined a minimum viable production facility, or "block," that could be operational as soon as it was completed, delivering learning as more blocks were being built. Construction of Gigafactory 1 started in late 2014, and by the third quarter of 2015, the first portion had been finished and was producing the Tesla Powerwall, a home-energy-storage system. In July 2016, Tesla celebrated the grand opening of the factory, with three of 21 blocks completed, amounting to approximately 14% of the expected total size. Mass production of battery cells began in January 2017, just a little over two years after the project broke ground. That pace is much faster than is common in projects of this size, where operations typically start five to seven years after construction begins. In 2014, the projected capacity of Gigafactory 1 was 35 gigawatt-hours a year. That capacity seems to have been achieved even before completion of the factory, indicating that significant learning in construction and manufacturing has taken place.

Tesla reaped two substantial advantages from its emphasis on speed. First, the company lowered the risk of cost overruns, which tend to balloon as schedules drag on. Second, it began generating revenue within a year of deciding to go ahead with the project—much earlier than would have been the case had it used the conventional approach to megaprojects. Both advantages are crucial to fast-growing companies that cannot afford to have funds tied up in slow-moving, risky construction projects.

Unfortunately, traditional megaprojects tend to turn out rather differently.

Monju and the Problem of Negative Learning

Japan's Monju nuclear power plant, a prototype fast-breeder reactor, was the first of its kind for commercial use. Named after the Buddhist deity of wisdom, it was intended to become the cornerstone of a high-priority national program to reuse and eventually produce nuclear fuel in a country with few energy sources of its own.

The plant was entirely custom designed: Each part and component was created and produced for a unique application and featured cutting-edge technology. Construction got underway in 1986, and initial criticality (that is, a sustained fission chain reaction) was attained eight years later, on schedule, in 1994. Then test operations began, followed by inauguration in August 1995. In December of the same year, a major fire shut down the facility, resulting in a five-year delay, which was considerably extended as further problems were uncovered. Test runs did not begin until 2010, and shortly thereafter, a three-ton machine used for refueling fell into the reactor vessel. It took nearly a year to retrieve the machine.

Following further problems and the discovery of serious maintenance flaws, in May 2013 Monju was ordered to suspend its preparations for restarting the reactor for commercial use. The Nuclear Regulation Authority declared the operator of Monju unqualified to operate the reactor, and in December 2016, the government closed the plant permanently.

After more than 30 years and $12 billion in expenditures, Monju is said to have generated electricity for all of one hour during its 22-year lifetime. Decommissioning is expected to take another 30 years, until 2047, at a further cost of $3.4 billion. If previous experience is anything to go by, those numbers are optimistic, with additional delays and cost overruns a near certainty. At a minimum, Monju will end up a 60-year, $15 billion venture with zero or negative benefits. Monju is not alone—it is merely one of the most obvious examples.

The contrast with Tesla could not be starker. There was nothing in Monju's design that compared with the replicable production modules at Gigafactory 1, where learning was continual and scaling got better and better and faster and faster. At Monju, everything was done just once, with extreme complexity. That created a phenomenon that operations experts call negative learning, a dynamic in which learning slows rather than accelerates progress. The more the Monju team learned, the more obstacles and additional necessary work it identified.

Like Monju, many megaprojects are difficult to break down into replicable units that can be rapidly iterated to deliver learning and improvement. As soon as you dig a hole in the ground, for example, things seem to become unpredictable, bespoke, and slow. But difficult does not mean impossible. In almost any project, large parts of the work can be made replicable, giving even the least-scalable projects some room for turning negative learning positive. The choice is not an either/or: scalable or not scalable. It is a matter of degree: getting as much scalability as you can into any project, including the least likely ones.

Let's look at an example.

Madrid's Modular Metro

Manuel Melis Maynar understands the importance of scalability. An experienced civil engineer and the president of Madrid Metro, he was responsible for one of the largest and fastest subway expansions in history. Subway construction is generally seen as custom and slow by nature. It can easily take 10 years from the decision to invest in a new line until trains start running, as was the case with Copenhagen's recent City Circle Line. And that's if you don't encounter problems, in which case you're looking at 15 to 20 years, as happened with London's Victoria line. Melis figured there had to be a better way, and he found it.

Begun in 1995, the Madrid subway extension was completed in two stages of just four years each (1995 to 1999: 56 kilometers of rail, 37 stations; 1999 to 2003: 75 kilometers, 39 stations), thanks to Melis's radical approach to tunneling and station building. In project management terms, it offers a stark contrast to the experience of the Eurotunnel, which has cost its investors dearly. Melis's success was the result of applying three basic rules to the design and management of the project.

No monuments. Melis decided that no signature architecture would be used in the stations, although such embellishment is common, sometimes with each station built as a separate monument. (Think Stockholm, Moscow, Naples, and London's Jubilee line.) Signature architecture is notorious for delays and cost overruns, Melis knew, so why invite trouble? His stations would each follow the same modular design and use proven cut-and-cover construction methods, allowing replication and learning from station to station as the metro expanded.

No new technology. The project would eschew new construction techniques, designs, and train cars. Again, this mindset goes against the grain of most subway planners, who often pride themselves on delivering the latest in signaling systems, driverless trains, and so on. Melis was keenly aware that new product development is one of the riskiest things any organization can take on, including his own. He wanted none of it. He cared only for what worked and could be done fast, cheaply, safely, and at a high level of quality. He took existing, tried-and-tested products and processes and combined them in new ways. Does that sound familiar? It should. It's the way Apple innovates, with huge success.

Speed. Melis understood that time is like a window. The bigger it is, the more bad stuff can fly through it, including unpredictable catastrophic events, or so-called black swans. He thought long and hard about how to make his window radically smaller by organizing tunneling work for speed. Traditionally, cities building

a metro would bring in one or two tunnel-boring machines to do the job. Melis instead calculated the optimal length of tunnel that one boring machine and team could deliver—typically three to six kilometers in 200 to 400 days—divided the total length of tunnel he needed by that amount, and then hired the number of machines and teams required to meet the schedule. At times, he used up to six machines at once, completely unheard of when he first did it. His module unit was the optimal length of tunnel for one machine, and like the station modules, the tunnel modules were replicated over and over, facilitating positive learning.

As an unforeseen benefit, the tunnel-boring teams began to compete with one another, accelerating the pace further. They'd meet in Madrid's tapas bars at night and compare notes on daily progress, making sure their team was ahead, transferring learning in the process. And by having many machines and teams operating at the same time, Melis could also systematically study which performed best and hire them the next time around. More positive learning. A feedback system was set up to avoid time-consuming disputes with community groups, and Melis persuaded them to accept tunneling 24/7, instead of the usual daytime and weekday working hours, by asking openly if they preferred a three-year or an eight-year tunnel-construction period.

No monuments, no innovation, modular, and fast. Sounds like a recipe for boring, low-quality design, right? But go to Madrid and you will find large, functional, airy stations and trains—nothing

like the dark, cramped catacombs of London and New York. Melis's metro is a workhorse, with no fancy technology to disrupt operations. It transports millions of passengers, day in and day out, year after year, exactly as it is supposed to do. Melis achieved this at half the cost and twice the speed of industry averages—something most thought impossible.

A Wiser Path

The contrasting experiences of the major projects presented here suggest that in embarking on big ventures, companies and governments need to carefully choose and wisely invest in technologies that lend themselves to smart scaling.

Consider again the energy industry. In order to survive, it has to break the current vicious circle of negative learning and crack the code of fast, replicable scale-up. Small modular reactors (SMRs)—nuclear power plants costing an estimated $1 billion each—aim to do just that. Financed by Bill Gates and Warren Buffett, the proposed construction of an SMR in Wyoming may be a first step in that direction. But with an estimated timeline of seven years for the project, it is still very slow. With the climate crisis looming, we don't have time to wait.

In terms of scalability, a superior alternative is wind. Turbines are inherently modular and replicable—and are thus ideal candidates for smart scale-up. Initially they were constructed on-site, but the nascent industry quickly learned that this was inefficient and shifted to manufacturing them indoors, using industrial processes and logistics that could be effectively controlled and optimized. The UK's London array was the largest offshore wind farm in the world when it was completed in 2013, costing $3 billion in 2012 prices. The project broke ground in March 2011, electricity production began in October 2012, and all turbines were fully operational by April 2013, just two years and a month after construction started. And by today's standards, less than a

decade later, that's no longer particularly fast. In 2018, the Walney Wind Farm extension, which is off the coast of England and has 87 turbines, was built in less than a year.

Energy is not the only sector that is starting to move away from the traditional megaproject. Consider the space industry. NASA typically takes a decade to plan and another decade to build its complicated designs. Its missions are too big to fail and too slow to start over when they do. The longer the time, the higher the risk of ultimate failure, with little opportunity to learn along the way. But a new generation of space entrepreneurs (Elon Musk among them) are dramatically lowering costs and delivery times by relying on the use (and reuse) of standard, industrially manufactured building blocks.

Take the case of Will Marshall, who began his career as a young engineer working at NASA's Jet Propulsion Laboratory. Eventually, he got tired of the slowness and waste of Big Space and decided to do things differently. Along with two other NASA alumni, he founded Planet Labs and built a satellite called Dove in his garage in Cupertino, California.

With a weight of 10 pounds, a build time of a few months, and a cost under $1 million (including launch and operations), Dove satellites are radically smaller, faster, and cheaper to build than anything at NASA—but they are equally well engineered and more agile. Each satellite is made up of three CubeSat modules, which are themselves made up of multiples of 10x10x10 cm modules—what Marshall calls Legos. The CubeSats use commercial off-the-shelf components for their electronics and structure, like those mass-produced for cell phones and recreational drones, keeping cost and delivery times low. During the 2010s, Planet Labs launched several hundred satellites—the largest constellation ever put into orbit—that provide up-to-date information for climate monitoring, farming, disaster response, and urban planning.

Planet Labs lost 26 Dove satellites in 2014. They were sitting on a big rocket that exploded on the launchpad. Stacked against his nine successful launches at the time, the loss hardly affected the business, however. The lost satellites were quickly replaced, and the new ones were put into orbit. Marshall's modular approach means that every mission is cheap enough to fail and fast enough to replicate in the event of failure, with lessons immediately applied in the next iteration.

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My advice to anyone planning a big project is to follow the examples of Tesla, Planet Labs, Madrid, and wind farms. Where you can, pick basic technologies that lend themselves to modularity and replicability. Where that's difficult, try to apply regular, tested technologies in innovative, modular ways so that you can learn as you go, driving down cost and accelerating speed with every iteration. If this approach can be effective with something as difficult and necessarily bespoke as digging a subway under a city, it can work for most any project. The possibilities are as rich as your imagination.

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