Edward J. Hoffman
Matthew Kohut
Laurence Prusak

exclusive sneak peek

THE SMART MISSION

NASA'S LESSONS FOR MANAGING KNOWLEDGE, PEOPLE, AND PROJECTS

Dear Project Managers,

I am honored to be part of PSPMI's programming this year! I hope you enjoy this early look at my new book, coauthored with Matt Kohal and Larry Prusak, *The Smart Mission*.

The Smart Mission was written based on our love for working at NASA. The core of NASA success always came down to the value of mission and people. A common phrase at NASA is that you come for the mission and stay for the people.

Our book emphasizes three themes for the future of work:

1. **Projects and products are fundamentally about how teams work and learn together to achieve great challenges or missions.**
2. **The local level, not an organization's upper levels, is where the action happens and has the greatest impact for success.**
3. **Projects don't operate in a silo, but exist within organizations that are responsible to stakeholders.**

In *The Smart Mission* we identify six principles that every leader and team member must master. We provide a book full of real stories that illustrate each principle with examples of leadership actions. *The Smart Mission* can serve as a workbook for improving leaders, teams, and organizations.

Once again, we appreciate you and your support for leading smart missions!

Warm regards,

Edward J. Hoffman, PhD.
Former, Chief Knowledge Officer & Director, NASA Academy for Program, Project, & Engineering Leadership, and Lecturer, Columbia University, Information and Knowledge Strategy

Special offer for PSPMI members

order *The Smart Mission* at 20% discount direct from the MIT Press. See back page for details.

Introduction

The project is the basic unit of work for many of the largest and most complex organizations in the world. Whether the end result is a software application, antiviral vaccine, or spacecraft, a great deal of work today gets done at the project level. In a very real sense, we live in a project world. From blockbuster films to energy production, the project is the unit of organization for a significant share of global economic activity.

And yet projects are failing us because they are understood and defined in the wrong way. A project of any complexity is an effort to harness multidisciplinary expertise to solve challenges for the benefit of people. But the dominant paradigm of project management is one of control, processes, and tools. This disregards the human dimension—learning, collaboration, teaming, communication, and culture—that is intangible, hard to measure, and resistant to control.

Projects run on knowledge—a combination of learning and experience that enables people to perform tasks. A project can have all the resources in the world, but without the necessary knowledge it is doomed. There are plenty of other reasons that projects fail, but lack of know-how almost guarantees a bad outcome. This kind of knowledge is not a thing that can be found in a book or hoarded by

an individual. It comes from experienced people working in a team setting.

Some organizations understand the interplay of knowledge, projects, and people better than others. This book will explore some of the intangible elements that inform projects and share insights about approaches and practices that successful organizations have adopted to address them so that others can consider new approaches to working and learning in a project environment.

Three leitmotifs recur throughout this book. The first is that projects are fundamentally about how teams work and learn together to get things done. Project teams are not like professional sports teams that play games with clearly defined rules. Project teams may rely on repeatable processes to design, build, test, and deliver products or services, but innovation, whether incremental or radical, depends on team learning. As Arie de Geus of Royal Dutch Shell Group writes, "The ability to learn faster than your competitors may be the only sustainable competitive advantage."[1]

Second, the local level is where the action happens. Innovations and breakthroughs that lead to project success rarely come from the top of large, centralized organizations. If anything, a burdensome bureaucracy will spur a project team to expend considerable time and energy finding ways to work around it. This is nothing new—the agile movement that began two decades ago has brought widespread recognition to the benefits of decentralized decision-making—but the implications for knowledge often go unnoticed. The governance of knowledge and projects in large organizations is typically most effective when it empowers people working at the local level to respond quickly to changing conditions.

Finally, projects don't operate in a vacuum. They exist within organizations that are responsible to stakeholders, whether they are corporations accountable to shareholders or government agencies accountable to political leaders and the public. A project's success or failure depends in large part on the health of this ecosystem.

Projects can vary so dramatically in complexity that it's useful to have models that help explain the dimensions of their knowledge needs. The traditional project management "iron triangle" of cost, schedule, and scope does little to articulate the differences between a project that delivers a sidewalk versus another that delivers a supercollider, let alone accounting for elements like knowledge, learning, communication, team dynamics, culture, or collaboration. We address these elements first by considering the environment at the organization, team, and individual levels.

There is a symbiotic relationship between an organization that pursues its mission through projects and the teams and individual members that execute them. The organization supports its teams and individuals by providing resources and infrastructure for knowledge and learning as well as a culture that shapes the work environment. This enables teams and individuals to learn and acquire the knowledge needed for their projects, which in turn increases the organization's capability for future projects.

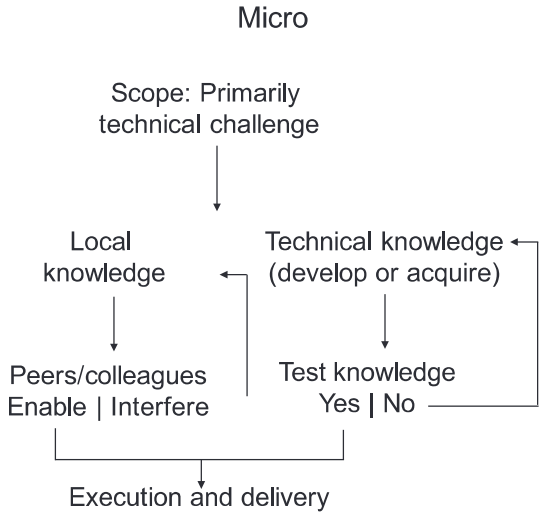
We approach project complexity through the lens of knowledge and learning needs, identifying three project models—micro, macro, and global—that each operate on different knowledge chess boards.

A micro project seeks to solve a problem that is finite and primarily technical in nature. The challenge can be simple or difficult, but the solution comes as a result of having the right technical know-how to get the job done. The classical Greeks called this kind of knowledge *episteme*, or scientific knowledge based on repeatable rules. A micro project can be a straightforward software project such as delivering a feature for a website, or it can require a great deal of innovation (think of an ambitious R&D initiative), but in either case the project team has the authority and ability to focus on the technical challenge at hand. Politics is not front and center, though knowledge of people and processes plays an important part in getting things done.

The VITAL (Ventilator Intervention Technology Accessible Locally) project undertaken by the Jet Propulsion Laboratory (JPL) in the early

days of the COVID-19 pandemic is an example of a micro project. An ad hoc team of National Aeronautics and Space Administration (NASA) engineers went from having no knowledge of medical devices or ventilators to delivering a working prototype of a ventilator that could be made from commercial off-the-shelf parts in 37 days. This crash course in acquiring technical know-how is a master class in rapid team learning. Although team members did manage stakeholder relationships with NASA headquarters and external partners such as Mt. Sinai Hospital and the Food and Drug Administration (FDA), the project's primary knowledge challenge was technical.

While the VITAL team had to develop and acquire its technical knowledge from scratch, the great asset it had from the start was local knowledge of how to run a successful project from concept to closeout. Its unique, time-sensitive mission coincided with pandemic-driven lockdowns, which meant the team primarily operated remotely and on its own. The project had the backing of JPL leadership, enabling the team to maintain a laser-like focus on its goal.

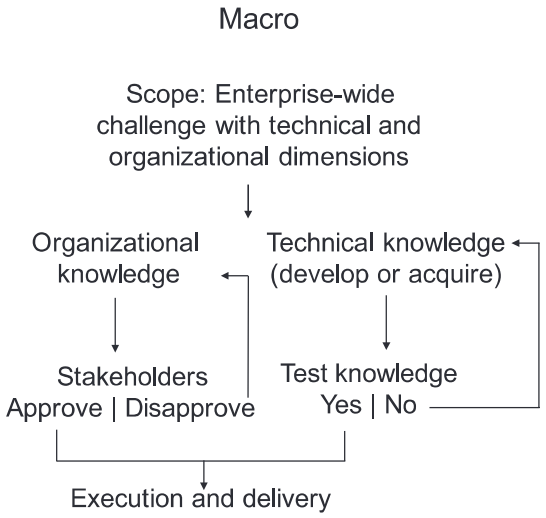


A macro project focuses on a problem that can only be solved by involving a significant part of an organization, ranging from a division or large business unit to the entire enterprise. The need for technical knowledge cannot be divorced from the organizational knowledge required to gain support for changes in resources,

authority, or norms and behaviors. Mastery of organizational politics is necessary to secure buy-in from key decision makers and neutralize pockets of resistance. In addition to technical knowledge (*episteme*), a macro project requires street smarts (which the ancient Greeks called *metis*, a combination of cleverness and cunning) about the organization.

A macro project we will explore is one that Ed led in setting up an enterprise-wide knowledge capability for NASA across its many centers, mission directorates, and functional areas in response to direction from a congressionally backed advisory panel. From the outset, organizational friction was the greatest potential obstacle to success. Knowledge of the organization and its people and culture was far more important than subject matter expertise.

Ed and his team (which included Larry and Matt) already had the technical understanding necessary to address this challenge. The real work was in engaging stakeholders, understanding their capabilities and concerns, sharing insights with them about the nature of the problem at the agency-wide level, and ultimately earning their approval to move forward with a solution that was both flexible and binding.

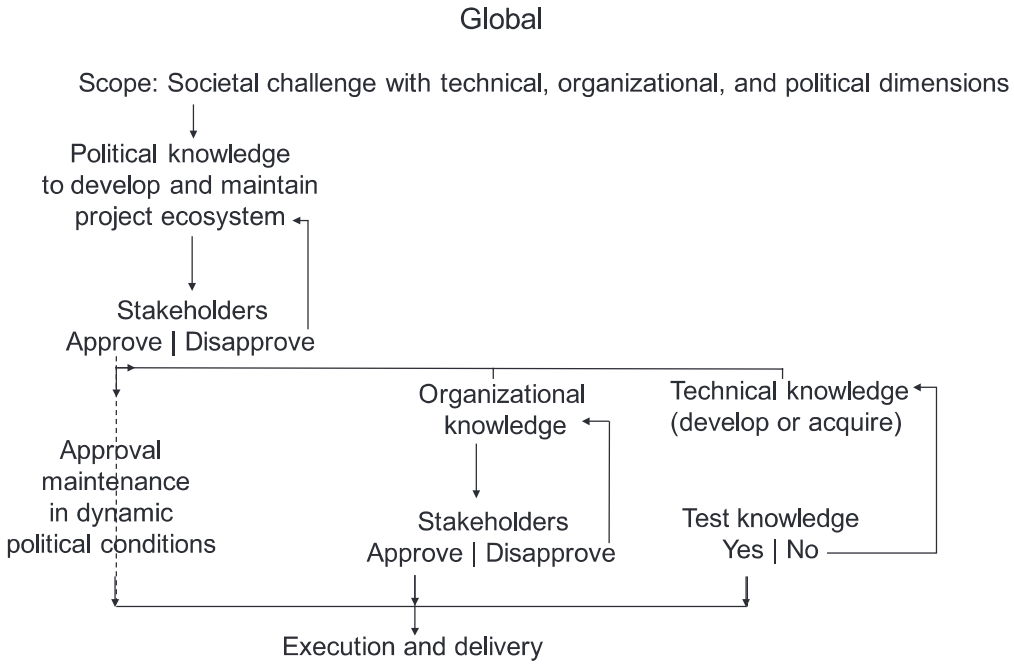


A global project addresses a vast societal challenge. This can be a public health problem like eradicating smallpox, or a knowledge quest such as unraveling scientific mysteries of the universe through

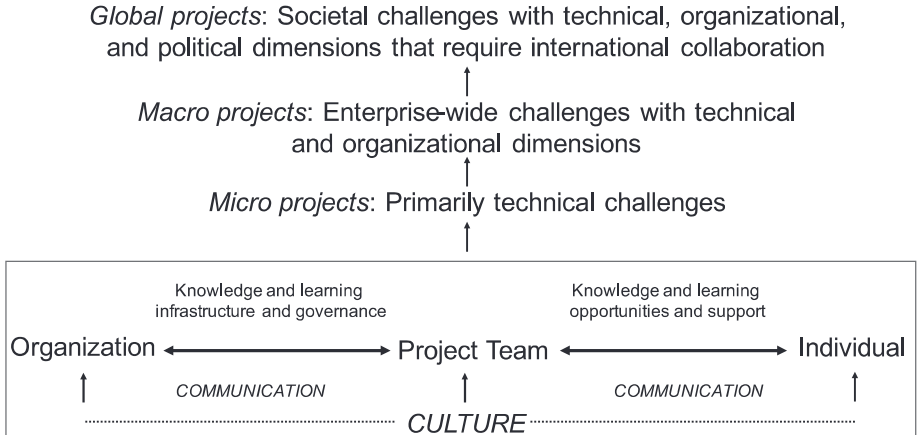
a shared laboratory or observatory. Since these projects transcend national borders, they require the establishment of a new project ecosystem before an organization created for this purpose can begin to tackle the technical aspects of the problem. These projects are inherently political, and they call for practical wisdom about the way the world works (the Greeks called this worldliness *phronesis*—wisdom and prudence acting in the world) in combination with *metis* and *episteme*. They are akin to a three-dimensional chess game: critical knowledge can be identified at global, organizational, and local levels. Global knowledge—an understanding of a project's political dimension—is necessary to manage relationships among governments, corporations, universities, and other key stakeholders. Organizational knowledge is unique since the organization itself has to be created to execute the project. And local knowledge within the project is still just as essential as it is for a project with a narrower scope.

We dedicate a chapter to a case study of the international collaboration required to design, build, and operate the International Space Station (ISS), a one-of-a-kind project that remains a model of cooperation among partners that compete in other arenas. The working relationships that have emerged from the partnership are not the sum of the bilateral relationships among the various space agencies; they are the hard-won result of a shared sense of purpose.

Before there could be an ISS, the partners had to reach an agreement to work together toward a goal that no single country could achieve on its own. From a NASA perspective, this required the political knowledge necessary to build and maintain a new project environment that could serve this global mission while respecting the interests of each partner. NASA's ISS team then had to develop organizational knowledge about how to work effectively in this partnership in addition to addressing the myriad technical knowledge challenges of constructing a space station that would be continuously inhabited for years on end.



As these models suggest, technical knowledge is critical but insufficient unless the problem is essentially technical *and* the project team is empowered with the authority to solve it without interference. In our experience, complex projects rarely, if ever, have a purely technical focus. Yet few organizations acknowledge their need for organizational or political knowledge.



Project-based organizations, whether they're companies, government agencies, or nongovernmental organizations, come in different shapes and sizes. Factors such as problem novelty, cost measurement,

and point of customer involvement help to distinguish the kinds of projects an organization might sponsor. We offer three archetypes for organizations that accomplish their work through projects while acknowledging that most large organizations are hybrids that combine elements of more than one of these models.

A *complex project-based organization* is in the one-and-only business. These are organizations like NASA or CERN, the European Organization for Nuclear Research, that solve fundamentally novel problems. Cost and schedule are measured in terms of the project life cycle rather than a unit of production (e.g., the time and dollars required to manufacture a single automobile in a mass-production operation). The customer, which in the case of NASA or CERN is often a team of scientists seeking to run highly sophisticated experiments and collect data, is typically involved throughout the life cycle because of the complexity of the problem. Success is impossible without significant technology development and innovation.

A *mass-production organization* is a manufacturer working at scale, whether it makes cars or candy bars. Problems in production are measured, scored for criticality, and tracked until resolved. These organizations use lean or agile methodologies to improve quality and efficiency and have a separate research and development (R&D) function focused on breakthrough innovations. Customer feedback informs the design and production process, but the point of sale is where most customers enter the picture.

An *entrepreneurial organization* in this framework is something like a pure software-as-a-service (SaaS) organization, for example. The minimum viable product provides the initial basis for continuous testing and improvement, which is informed by ongoing customer feedback. Since there are no per-unit physical capital costs as there are with cars or candy bars, the unit cost goes down with every subsequent sale.

These distinctions are useful when thinking about how organizations work with knowledge. Since knowledge is inherently social, the structure of an organization plays a huge role in its approach to knowledge development, retention, and transfer.

Three Models for Project-Based Organizations

	Complex Project-Based Organization	Mass-Production Organization	Entrepreneurial Organization
Product	One-and-only	Scalable manufacture	Permanent beta
Problems	Novel	Measurable	Hackable
Technology	New/invented	R&D > innovate Lean or agile > improve	Minimum viable product
Cost	Life cycle	Unit	Zero marginal
Schedule	Project completion	Productivity rate	Iterative
Customer	Involved at inception	Involved at point of sale	Involved in testing
Knowledge Need	Innovation + limited production	Innovation + continuous improvement	Bootstrap + innovation

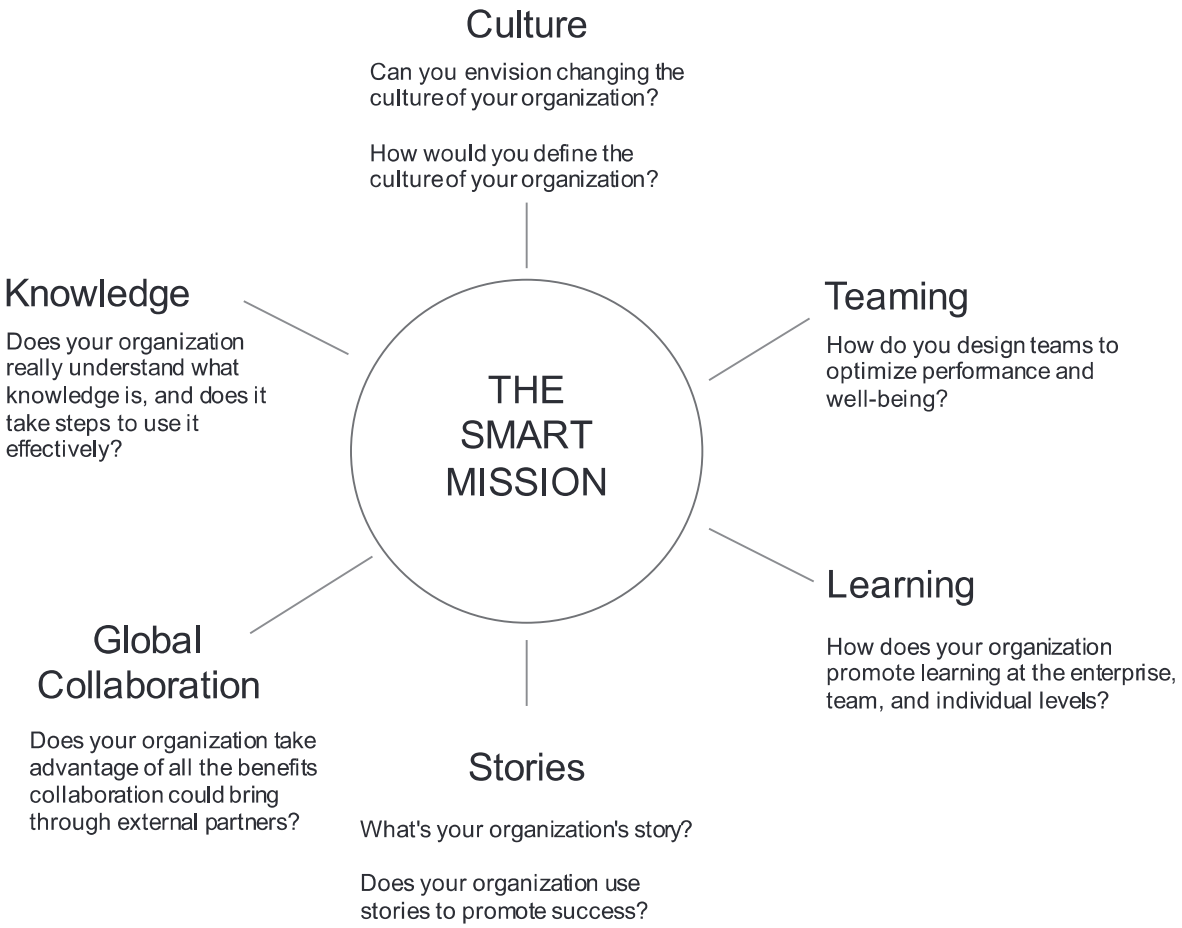
Why this book now? Most books about project management are written for academics rather than practitioners—they are strong on theory and advice but short on real-life application. None that we know of focus on the relationship between projects and knowledge. The missing ingredient is people. Knowledge is a social phenomenon. Team dynamics and organizational considerations including governance, incentives, and culture can either promote or inhibit the learning and collaboration necessary for project success. There isn't a neat algorithm for optimal performance in project-based organizations; the intangibles make all the difference. Even so, we have sought to identify enabling practices that can help organizations and teams reckon with those intangibles.

This book is about missions—assignments or tasks with a defined purpose or objective—specifically missions undertaken by project teams, organizations, or societies. The three coauthors collectively spent over 60 years supporting one of the world's preeminent mission-driven organizations—NASA. While our assignments ranged from tackling challenges of strategic governance to the creation of knowledge systems to talent development for project and

program-based teams, the consistent purpose was to help create successful project teams in advance of mission need.

The term *successful* is tricky. It speaks to value and implies factors such as performance, cost, timeliness, scientific achievement, and public recognition. Perceptions of mission success can change over time. The Hubble Space Telescope began as a spectacular, high-visibility failure, and through a process of adaptive response to changing conditions became a cherished symbol of excellence.

We believe that all missions can be smart. A smart mission recognizes that few things go as planned, and that both learning and unlearning are essential. It understands that knowledge creation happens at the team level, and therefore works to design and sustain a strong, inclusive team that collaborates effectively. It is conscious of the culture it develops and maintains. Above all, it values people, and offers them the opportunity to be part of something that has meaning and purpose.



The authors have decades of experience understanding knowledge and projects. Ed trained as a social psychologist and then spent 33 years with NASA, founding its project academy and retiring as its first chief knowledge officer. During his last decade at NASA, he brought in Larry and Matthew to help the agency address some of its challenges related to knowledge and project management. Larry is one of the world's leading authorities on the subject of knowledge in organizations, having written nine books and more than 50 articles and consulted with more than 300 organizations around the globe on the topic. Matthew has run a consultancy focused on learning and development for over a decade and has written widely about leadership, communication, and influence.

Our shared experience with NASA gives us a unique perspective, but this book is not solely about NASA. Ed and Larry teach in Columbia University's Information and Knowledge Strategy program, and all three authors currently serve as senior advisers to the Project Management Institute. We've drawn from our networks to interview experts from a wide variety of organizations and sectors who have challenged and broadened our thinking, and we shared individual anecdotes about work with a variety of organizations.

During Ed's tenure at NASA, the entities he led that were tasked with building project management capability evolved. The initial Program/Project Management Initiative, founded in the wake of the space shuttle *Challenger* accident, focused primarily on training and developing individual competence. The subsequent NASA Academy of Program/Project Leadership, which later became today's NASA Academy of Program/Project & Engineering Leadership, expanded the scope of activity to address team learning and knowledge effectiveness at the individual, team, and organizational levels. For the sake of simplicity, we will refer to all of these as "the NASA project academy" throughout the book.

There is no all-encompassing definition of a project academy. Around the same time that Ed was establishing one at NASA in the mid-1990s, other organizations including Shell, Rolls Royce,

Siemens, and Fujitsu were setting up their own academies.[2] Many shared common high-level goals such as promoting consistency in project management capability across their organizations, but each organization's approach and offerings varied widely. NASA's project academy evolved over roughly a decade from a project management training program for individuals to a diversified learning organization that provided a range of services to support project teams and promote knowledge sharing across the organization. We will go into detail about the project academy's offerings in several chapters.

We begin in the first chapter by focusing on knowledge. What types and categories of knowledge prove most critical to project success? We'll explore the social nature of knowledge and the implications for teams and organizations. A decade ago, NASA underwent a significant enterprise-level transformation of its approach to knowledge. This came in response to stakeholder pressure on NASA to improve its ability to share knowledge openly across the agency. The hidden challenge that many organizations face is addressing the social factors that inhibit this flow of knowledge.

Learning is the other side of the coin from knowledge: it is an activity whereby knowledge is specifically taught and transferred to others. Most organizations emphasize learning at an individual level, which is insufficient in a context that demands team learning and organizational infrastructure and support. Chapter 2 looks at the ways NASA developed and expanded opportunities for learning at the individual, team, and organizational levels.

Chapter 3 will examine how NASA used stories to present and develop new ideas and transfer existing ideas to its workforce of civil servants and contractors. Venues for stories included *ASK Magazine*, a practitioner-based publication devoted to knowledge and innovation, and live forums dedicated to sharing new ideas from within and outside of NASA. We will go into detail as to how, after a great deal of skepticism, stories became an accepted and very potent tool for

sharing knowledge at NASA. Other organizations have had success using stories in a similar fashion.

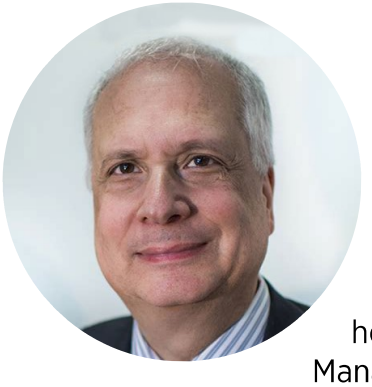
Efforts to improve knowledge sharing and learning cannot be successful unless the organization values and recognizes the importance of these activities. This understanding comes from the culture of the organization. Chapter 4 explores what it takes to develop a knowledge-based culture. We will discuss some of the dynamics that helped contribute to this at NASA as well as exploring other organizations that have addressed this issue.

Since project work is done in teams, the composition, dynamics, and knowledge capabilities of teams are critical to success. Project performance takes place at the team level. Chapter 5 addresses these issues and examines how NASA revamped its approach to enhancing team performance to meet the extraordinary demands of its projects.

Projects are increasingly global, and the International Space Station is one of the most ambitious and successful projects in history. Chapter 6 begins with the challenge of developing a partnership in order to facilitate this project. NASA's work with other countries, especially Russia, was difficult due to international politics as well as cultural and organizational differences. The space station serves as a case study of overcoming political, cultural, and organizational differences in the name of advancing knowledge to benefit humanity.

We conclude by synthesizing lessons about the linkages between knowledge and projects, and by looking to the future of learning as technologies such as artificial intelligence begin to reshape the future of work. As we write this during the COVID-19 global pandemic, the need for international collaboration to tackle the world's most pressing challenges has never been more urgent. The social dimension of knowledge and the need for people to collaborate will remain constant even as projects become increasingly complex and pose technical challenges that we can't anticipate today.

Meet the authors of *The Smart Mission*



Edward J. Hoffman, currently CEO of Knowledge Strategies, LLC, and Senior Lecturer at Columbia University, was NASA's first Chief Knowledge Officer and founder of the NASA Academy of Program/Project and Engineering Leadership (APPEL). Following the Columbia shuttle failure, he led the team that designed the Strategic Management and Governance Handbook. He is the coauthor of *Shared Voyage: Learning and Unlearning from Remarkable Projects.*

Matthew Kohut, former major communication advisor to NASA, is coauthor of *Compelling People: The Hidden Qualities That Make Us Influential*, named one of Amazon's Best Business Books of 2013.

Laurence Prusak, former strategy consultant to Hoffman at NASA, is Senior Lecturer in the Information and Knowledge Strategy graduate program at Columbia University and the coauthor of *Working Knowledge*, a widely cited text about how knowledge works in organizations, and other books.

EVERY MISSION SHOULD BE A SMART MISSION.*

The project is the basic unit of work in many industries. Software applications, antiviral vaccines, launch-ready spacecraft: all were produced by a team and managed as a project. Project management emphasizes control, processes, and tools—but, according to *The Smart Mission,* that is not the right way to run a project. Human skills and expertise, not technical tools, are what make projects successful. Projects run on knowledge. This paradigm-shifting book —by three project management experts, all of whom have decades of experience at NASA and elsewhere—challenges the conventional wisdom on project management, focusing on the human dimension: learning, collaboration, teaming, communication, and culture.

Get started with *The Smart Mission* today.

- Get a 20% discount at PenguinRandomHouse.com with code BIGIDEA20
- For corporate sales: mitpress_sales@mit.edu
- For corporate webinars & events: mitpress-books@mit.edu

"Every mission should be a Smart Mission. NASA has paid high costs to learn these lessons, and Ed Hoffman, Matthew Kohut, and Larry Prusak have distilled and refined them as tools for any program or project."
—Peter Temes*, President, Institute for Innovation in Large Organizations; author of *The Power of Purpose, The Just War*, and *We the People*

"This book is about people (often a missing ingredient), knowledge, and the grand value of stories....and oh yes, projects too. The three authors gave me more concrete advice on leading people, knowledge, and projects in this book than I could have ever learned from hiring an outside consultant for a year."
—E. LaVerne Johnson, Founder, President and CEO, International Institute for Learning, Inc.

"Every leader who leads and manages teams should read *The Smart Mission*. It explains the intangibles of successful knowledge organizations in a tangible way. The authors master the art of explaining how people culture, process, and relationships drive the successes and failures of projects. The book helped me to gain clarity and focus about the challenges we try to solve in our organization."
—Susann Roth, Chief of Knowledge Management, Asian Development Bank