

ERIN CARRAHER · RYAN E. SMITH

WITH PETER DELISLE

LEADING



COLLABORATIVE



ARCHITECTURAL



PRACTICE



ILLUSTRATIONS BY CHRISTOPHER HENDERSON

WILEY



# LEADING COLLABORATIVE ARCHITECTURAL PRACTICE

By Erin Carragher and Ryan E. Smith  
with Peter DeLisle

Illustrations by Christopher Henderson

WILEY

This book is printed on acid-free paper.

Copyright © 2017 by John Wiley & Sons, Inc. All rights reserved.

Published by John Wiley & Sons, Inc., Hoboken, New Jersey

Published simultaneously in Canada

No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, scanning, or otherwise, except as permitted under Section 107 or 108 of the 1976 United States Copyright Act, without either the prior written permission of the Publisher, or authorization through payment of the appropriate per-copy fee to the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923, (978) 750-8400, fax (978) 646-8600, or on the web at [www.copyright.com](http://www.copyright.com). Requests to the Publisher for permission should be addressed to the Permissions Department, John Wiley & Sons, Inc., 111 River Street, Hoboken, NJ 07030, (201) 748-6011, fax (201) 748-6008, or online at [www.wiley.com/go/permissions](http://www.wiley.com/go/permissions).

**Limit of Liability/Disclaimer of Warranty:** While the publisher and author have used their best efforts in preparing this book, they make no representations or warranties with the respect to the accuracy or completeness of the contents of this book and specifically disclaim any implied warranties of merchantability or fitness for a particular purpose. No warranty may be created or extended by sales representatives or written sales materials. The advice and strategies contained herein may not be suitable for your situation. You should consult with a professional where appropriate. Neither the publisher nor the author shall be liable for damages arising herefrom.

For general information about our other products and services, please contact our Customer Care Department within the United States at (800) 762-2974, outside the United States at (317) 572-3993 or fax (317) 572-4002.

Wiley publishes in a variety of print and electronic formats and by print-on-demand. Some material included with standard print versions of this book may not be included in e-books or in print-on-demand. If this book refers to media such as a CD or DVD that is not included in the version you purchased, you may download this material at <http://booksupport.wiley.com>. For more information about Wiley products, visit [www.wiley.com](http://www.wiley.com).

Cover design: Wiley

Cover illustrations: Christopher Henderson

***Library of Congress Cataloging-in-Publication Data:***

Names: Smith, Ryan E., author. | Carraher, Erin, 1979- author. | DeLisle, Peter, 1949-

Title: Leading collaborative architectural practice / by Erin Carraher and Ryan E. Smith with Peter DeLisle ; illustrations by Christopher Henderson.

Description: Hoboken: Wiley, 2017. | Includes bibliographical references and index.

Identifiers: LCCN 2016046385 | ISBN 9781119169246 (hardback) | ISBN 9781119169260 (epub)

Subjects: LCSH: Architectural practice. | Construction industry. | BISAC: ARCHITECTURE / Professional Practice.

Classification: LCC NA1995 .S65 2017 | DDC 720.1—dc23 LC record available at <https://lccn.loc.gov/2016046385>

# Contents

---

## Foreword vi

## Acknowledgments ix

## Introduction xiii

- Leadership and Collaboration xiii
- Conceptual Framework xiv
- Why Collaborate? xiv
- How This Book Is Structured xv
- Who Should Read This Book? xvi

## **PART 1**

### COLLABORATION IN CONTEXT 1

#### **Chapter 1**

##### Collaboration in Practice 3

- The Changing Landscape of Architectural Practice 3
- The Rise of Integrated and Collaborative Project Delivery 6
- Mutually Beneficial Collaboration 11
- Leadership and Followership 15
- The Promise versus Reality of Integrated Project Delivery—Interview with Renée Cheng 17*

#### **Chapter 2**

##### Collaborative Project Delivery Tools 19

- Traditional versus Collaborative Project Delivery 19
- Collaborative Design-Bid-Build 20
- Collaborative CM at-Risk 22
- Collaborative Design-Build 24
- Multi-Party Agreements 25
- Integrated Project Delivery and Collaboration 27
- The Value of Collaboration 28
- When Not to Collaborate 30
- Case Study Excerpt: Wayne N. Aspinall Federal Building & U.S. Courthouse 31*

#### **Chapter 3**

##### Creating Collaborative Environments 39

- Collaborative Infrastructure 39
- Physical Space 39
- Social Structures 42
- Training and Support 43
- Technology Tools 44
- Leaders' Roles 47
- Collaboration Takes Commitment, Not Contracts—Interview with Stephen Van Dyck 48*

## **PART 2**

### COLLABORATION TOOLS AND TACTICS 53

#### **Chapter 4**

##### Building Collaborative Teams 55

- Assembling and Organizing Teams 55
- Selection of Team Members 56
- Diversity and Inclusion in Teams 61
- Organizing Teams 62
- Coordination among Subteams 64
- Developing Team Culture 66
- Case Study Excerpt: Odegaard Library Renovation 68*

#### **Chapter 5**

##### Maintaining Collaborative Teams 77

- Project Team Size 77
- Cross-Functional Teams 79
- Stability of Teams 80
- Assessment 83
- Coaching and Feedback 84
- Collaborative from the Start—A Conversation with Clare Olsen and Caryn Brause 84*

## **Chapter 6**

### **Development Stages 87**

- Stages of Team Development 87
- Forming 87
- Storming 88
- Norming 89
- Performing 90
- Adjourning 90
- Team Development Model 91
- Case Study Excerpt: Global Center for Health and Innovation 92*

## **Chapter 7**

### **Team Behaviors 101**

- Negative Team Behavior 101
- Fear of Conflict 103
- Lack of Commitment 103
- Lack of Accountability 104
- Inattention to Results 104
- Loss of Trust 105
- Effective Team Behaviors 106
- Situational Team Organization 107
- Collective Decision Making 107
- Case Study: Allegheny Health Network Health + Wellness Pavilion 108*

## **Chapter 8**

### **Collaboration Tools 119**

- Rational versus Intuitive Processes 119
- Lean Strategies 119
- Lean Tools 120
- Choosing by Advantages 122
- A3 Reports 123
- Decision Matrix 124
- Decision Tree 125
- Ishikawa (Fishbone) Diagram 125
- BIM Scorecard 126
- Case Study: Alta Bates Summit Medical Center 127*

## **PART 3**

### **LEADERSHIP EFFECTIVENESS 135**

## **Chapter 9**

### **Leadership Effectiveness 137**

- Foundations of Leadership 137

- Trait versus Behavior 138
- Ability 138
- Awareness 139
- Commitment 139
- Conscious/Competent 140
- Leading Together—Interview with Patricia Rhee 141*

## **Chapter 10**

### **Leadership Development 145**

- Farm Gate Model 145
- Interpersonal Awareness 147
- Individual Awareness Tools 148
- Team Awareness Tools 149
- Case Study Excerpt: Bullitt Center 149*

## **Chapter 11**

### **Leadership Stages of Development 157**

- Guildhall Model 157
- Development Stages 158
- Combined Development Model 159
- Case Study Excerpt: ASU Memorial Union 159*

## **Chapter 12**

### **Task-Relationship Behavior 169**

- Leader in Development 169
- Direction and Feedback 169
- Stage Assessment 171
- Task-Relationship 172
- Practice-Based Scenario: The Story of Frank and Denise 174*

## **Chapter 13**

### **Cognitive Styles 179**

- Understanding Cognition 179
- Adaptive Problem Solving 182
- Innovative Problem Solving 182
- Bridgers as Leaders 184
- Adaptive and Innovative Team Cultures 185
- Reflective Environments 185
- Case Study Excerpt: The Center for Building Energy Science & Engineering (Building 661) 187*

## **Chapter 14**

### **Leadership Styles 197**

- Authoritarian/Autocratic 197

Participative/Democratic 198  
Delegative/Free Reign 198  
Style-to-Situation 199  
Positive and Negative Reinforcement 200  
Task and Relationship 202  
*Leadership in Development—Rick del Monte and  
Fred Perrell* 203

## **PART 4**

### **COMMUNICATION AND CONFLICT 207**

#### **Chapter 15**

##### **Communication Fundamentals 209**

Components of Communication 209  
Barriers to Communication 211  
Listening and Feedback 212  
Verbal and Nonverbal Communication 213  
*Communication Assessment* 216

#### **Chapter 16**

##### **Johari Window Model 221**

Open Self 221  
Hidden Self 221  
Blind Self 222  
Unknown Self 222  
*Self-Awareness Assessment* 223

#### **Chapter 17**

##### **Feedback and Motivation 225**

Steps to Constructive Feedback 225  
Feedback Style 226  
Maslow's Theory 227  
Herzberg's Theory 228  
Adequate Resources 229  
The Motivation Process 229  
Modes of Motivation 231  
Motivation to Innovation 232  
*Motivation and Maintenance* 233

#### **Chapter 18**

##### **Conflict Management 235**

Healthy Conflict 235  
Conflict Management Styles 236  
Conflict Management Model 239

Conflict Management Leadership 241  
*Conflict Management and Resolution* 242

## **PART 5**

### **LEADERSHIP IN PRACTICE 249**

#### **Chapter 19**

##### **The Value of Inclusion 251**

The Changing Workforce 252  
Diversity and Creativity 253  
Empathy 254  
Generational Traits 254  
Gender and Leadership 259  
Race and Leadership 263  
*Building Leaders and Design/  
Build—Interview with Emilie  
Taylor Welty* 264

#### **Chapter 20**

##### **Leadership and Change 271**

Foundations of Innovation 272  
Complex Environments 274  
Strategic Leadership 274  
Change Management 276  
Social Leadership 277  
Thought Leadership 278  
*Case Study Excerpt: Girl Scouts of Utah Summer  
Cabins* 279

#### **Chapter 21**

##### **Practice Leadership 287**

Culture and Organization 287  
Practice Management Components 288  
Managing Meetings 289  
Structure and Business Models 290  
The Leadership Cycle 291  
Training and Development 293  
*Reflective Practice—Interview with  
Z Smith* 294

#### **Conclusion**

##### **Toward a More Collaborative Practice 299**

#### **Bibliography 301**

#### **Index 311**

# Foreword: Integrative Practice— Enabling Adaptive, Collaborative Design

---

It was the winter of 2010. Our forty-person design and consultant team had just finished an early, fast-paced design phase for a large project in the midwestern United States on a grueling schedule. We were in the midst of a month-long process of transitioning our work to a design-build team who would execute construction documents and build the project. The newly selected facade fabricators were in our offices, having just flown 2,000 miles to Seattle so we could explain the project's design intent.

As we gathered around a laptop and projector in our workspace, we approached the meeting in a different way than we had ever done before—instead of showing drawings and renderings explaining the concept, we shared the underlying logic and algorithm that produced the idea. We demonstrated how the result changed as we modified the input parameters. We told them that what we had documented was simply a moment in time, not a finished solution. We asked for the fabricators' insight

and expertise to refine the construction logic and resulting details.

Over the next two hours, we had one of the more exciting design conversations I can remember in my professional career. It's not overstating to say that there was palpable excitement in the room. Everyone sensed an opportunity to contribute to improving the design. It was clear from the dialog amongst this newly formed team that we had accomplished in one short meeting what many project teams fail to ever achieve: We had established trust.

The historically segmented and adversarial owner-architect-contractor triangle is transforming rapidly. Today, the pace and scale of this shift in our industry is fundamentally changing the way we interact, share, and deliver ideas. A new generation of leaders has emerged with a renewed outlook on the value proposition of design and construction services. Emerging methods of working that enable more cohesive and integrated



delivery are allowing project teams to leverage their collective expertise to achieve better results in less time within tightening budgets.

Navigating this evolving landscape and making the most of these conditions requires a broad understanding of the major challenges and the key ingredients for success. *Leading Collaborative Architectural Practice* is the industry's first guide to collaboration in this new age. It is an unparalleled orchestration of leading experts, case studies, and historical frameworks assembled to enable the modern practitioner to deeply engage and effectively lead in this new collaborative world.

In this era, large, multidisciplinary teams are successfully executing complex projects with accelerated schedules and stringent budgets thanks to new leadership, technologies, and teaming structures. Contributors to the design and construction process are interconnected like never before by shared project databases, linked information models, and digital networks. Amongst all of these new means and methods for designing and delivering buildings, the single most significant tool is *a new form of collaboration enabled by trust*.

There were three significant changes in the delivery environment contributing to transforming our collective landscape that I witnessed in that 2010 meeting in Seattle that made that day so emblematic of this shift in practice: new contractual terms of engagement of design teams, the evolving tools and technologies of delivery, and new approaches to project leadership. They are all interrelated and somewhat codependent, but looking at them individually helps clarify the role that each fills in the larger picture.

The most obvious fundamental change affected the basis of the relationship: triggered by a new contractual arrangement, the terms of engagement between designer and builder were no longer adversarial. An early design package led by a broad consultant team was transitioning to a

design-build team responsible for completing the project. The traditional design-to-construction handoff with all its requisite inaccuracies, liability, and finger pointing was non-existent. In this arrangement, designers and builders worked together toward a common goal, where the values of both design quality and construction cost and logistics were shared as targets for success. The craftsmen—whose tools and hands would shape the ultimate building—were engaged in the dialogue during the design phase. The architects—whose design concept was driven by a series of critical performance, construction, and aesthetic criteria—were interested in how the means of craft could improve the design. Both entities were committed to working together toward common goals. This overlap of concept and craft, service and product, architect and builder was enabled by the team's collaborative engagement.

But the integration of design and construction expertise can only get us so far. New tools and technologies are becoming instrumental in the successful operation of multidisciplinary project teams. Vast quantities of information can be modeled, organized, and accessed by a wide array of users. Simulation of critical building performance objectives and construction sequencing are informing design in ways never before possible. Cloud-based collaboration platforms are connecting disparate team members in real-time within complex four-dimensional environments. Designers, now liberated from many repetitive tasks by automated tools, are able to interact with key collaborators at a more frequent rate and assimilate their input to inform intelligent models. Dynamic design platforms are becoming the new norm amongst teams, where flexible, relationship-based digital interfaces allow a more fluid and informed design process.

The most powerful of these tools are enabling designers to create new interfaces of interaction.

The emergence of visual scripting has empowered architects—once sidelined from the opaque world of software design—to craft their tools from the ground up. No longer are designers subservient to the tools given to them by the software industry. The tools are built for infinite expansion and customization, allowing the design process to include the making of the design tools themselves. The savviest teams are integrating digital tools in their design process as the fundamental generators of design, offering the parameters of algorithmic modeling to their team of experts to inform the core ideas of their work. In the most successful cases, these same tools are shepherding design data from early conception through the ultimate fabrication of componentry, reestablishing the continuum of creation that was the hallmark of the master builder.

Neither the new terms of engagement nor the emerging tools of the trade can be effective without appropriate leadership. The last fifteen years have seen the emergence of a new generation of vanguards who embrace collaborative design in powerful ways. These leaders are characterized by a few key attributes that differentiate them from

their predecessors. They share a common commitment to enabling a performance-based design process where experts from across the supply-chain are meaningfully engaged in the development of design solutions. They acknowledge that successful design is a collaborative, cross-disciplinary effort. They see their role as the primary curators of an interwoven and dynamic collaborative environment.

In this new world, napkin-sketchers and their teams of drafters have been discarded in favor of a dynamic orchestration of adaptive, collective design processes that challenge entrenched, contentious project delivery models through changes in attitude and action in order to solve complex problems. Adaptive leaders have begun to emerge as those who provoke positive change and cultivate an environment of optimism, creativity, and potential. The emerging models of collective execution enable diverse teams of talented individuals to achieve what may never before have been possible.

Stephen Van Dyck  
Partner, LMN Architects

# Acknowledgments

---

This book is the result of a collaborative process that has spanned several years and would not have been possible without the efforts of many research assistants or the generosity of the design professionals who have shared their thoughts and work.

We would like to thank our editors and their team at Wiley—Helen Castle, Amanda Shettleton, Amy Odum, Calver Lezama, and Kalli Schulte—as well as the executive editor Margaret Cummins and vice president and publisher Amanda Miller for their support of this project.

Our research began through a grant from the American Institute of Architects Center for Integrated Practice, led at the time by Markku Allison. We would also like to thank Matt Welker, who supported and later led the management of the work for the AIA.

The University of Utah College of Architecture + Planning hosted many events, and its leadership provided continued encouragement during the course of this project. In particular, we would like to thank Keith Diaz Moore, Brenda Scheer, Keith Bartholomew, Mira Locher, and Prescott Muir for their support.

Members of the AIA Utah chapter participated in a number of charrettes during the early development stages of this work. Special thanks to Heather Wilsom, AIA Utah executive director, Jeanne

Jackson, 2015 AIA Utah president, and RK Stewart, 2007 AIA president, for their mentoring and feedback on this and other projects.

The wealth of knowledge that leadership consultant Peter DeLisle brought to the project from his lifelong study of the topic was instrumental in shaping the project. His work with the AIA Dallas Emerging Leaders Program and AEC Knowledge on the topic of leadership development for architects has been broadly adapted for this book.

Christopher Henderson of Rexx Studio brought the concepts to life with his fantastic illustrations. His work in distilling a cohesive visual message from our complicated scribbles and scattered thoughts was critical in not only the final appearance but also the content of this book.

Many of the case studies and interviews originated out of a conference held in Salt Lake City, Utah in 2013 for the Center for Integrated Practice that brought together leaders in collaborative practice to share their work. We would like to thank David Scheer, co-chair of the conference, Kathleen Simpson, AIA staff liaison to the CIP, and Heather Wilson, executive director of AIA Utah, who were all part of making this event a success.

Jörg Rügemer, associate professor of architecture at the University of Utah, was an early contributor to the AIA resource, and several student research assistants have tirelessly worked on the project over

the years. They include Morgan Williams, Brennan Alldredge, Marin Smith, Matthew Reeves, Michael Hoehn, and Diego Garrido.

We would like to thank the vanguard of architects, engineers, owners, consultants, and thought leaders who have shared their experience with collaborative project delivery. We have learned much from their work and hope you will, too.

Renée Cheng, professor and associate dean of research at the University of Minnesota, provided her thoughts on the state of IPD and collaboration based on over a decade of in-depth research. She generously allowed us to adapt one of the case studies from her work for the GSA—*Integration at its Finest: Success in High-Performance Building Design and Project Delivery in the Federal Sector* (Cheng, 2015)—for this book.

Stephen Van Dyck, partner at LMN Architects, spoke with us about the firm’s innovative Tech Studio model and taking on a leadership role in a 150-person firm before turning forty. He also shared his thoughts on the power of collaboration to develop innovative solutions that lead to better buildings for clients and the importance of knowledge sharing and research in both an interview as well as the book’s foreword.

Emilie Taylor Welty, professor of practice at Tulane University and design/build manager at Tulane’s City Center, spoke to us about the relationship between design/build and building designers, as well as what it’s like to be a woman on the construction site.

CEO Fred Perpall and chief design officer Rick del Monte of The Beck Group presented their respective stories about becoming leaders and their organization’s innovative leadership development program that addresses the holistic needs of future leaders at multiple stages in their careers.

Z Smith, principal and director of sustainability and performance at Eskew+Dumez+Ripple in New

Orleans, discussed the importance of firms investing in and disseminating research in order to increase their competitive advantage in the profession.

Patricia Rhee, Partner at Ehrlich Yanai Rhee Chaney Architects, spoke about the role of gender in leadership and the importance of interpersonal relationships for collaborative firm culture and developing long-term industry partnerships in design-build projects.

Caryn Brause, assistant professor at the University of Massachusetts Amherst and author of *Designer’s Field Guide to Collaboration*, and Clare Olsen, associate professor at Cal Poly San Luis Obispo and coauthor of *Collaborations in Architecture and Engineering*, engaged in a discussion about their research on collaborative teams in practice as well as the need for architecture education to teach leadership and collaboration skills.

Key contributors to the case studies include:

**Alta Bates Summit Medical Center**—Dudley Campbell and Eric Ubersax, the Devenney Group LTD

**ASU Memorial Union**—Daniel Hoffman, Tim Keil, Christiana Moss, and Chris Alt, StudioMA

**Building 661**—David Riz, Kieran Timberlake; Bevan Mace, Balfour Beatty; and John Bechtel, The Pennsylvania State University

**Bullitt Center**—Brian Court, The Miller Hull Partnership

**Global Center for Health and Innovation**—Scott Crawford and Stephen van Dyck, LMN Architects

**Odegaard Library Renovation**—Sian Roberts, The Miller Hull Partnership; Steve Tatge, University of Washington; and Rob Wamaca, Mortenson Construction

**Pittsburgh Medical Mall**—Brian Skripac and  
Ron Dellaria, CannonDesign

**Trefoil Ranch Cabins**—Lisa Hardin-Reynolds,  
Girl Scouts of Utah; Jörg Rügemer and  
Erin Carraher, the Integrated Technology  
in Architecture Center at the University  
of Utah; and Kip Apostol, Euclid Timber  
Frame LLC

**Wayne N. Aspinall Federal Building and US  
Courthouse**—Renée Cheng, University

of Minnesota; Roger Chang, Westlake  
Reed Leskosky; and Todd Berry, The  
Beck Group

Finally, and most important, we would like to  
express our appreciation to our respective families  
who have supported us always, particularly during  
the past four years while our work kept us away from  
them at times. Lindsey, Preston, Calvin, Simon,  
Annie, and Norman, Larry, Claudia, Amy, and  
Lara—thank you!



# Introduction

---

## Leadership and Collaboration

In a world where technology, project structures, contracts, and construction processes are becoming ever more complex, teams helmed by collaborative leaders are emerging as an alternative to separate parties who guard their individual interests. The teams themselves must be carefully structured in order to support effective behavior, develop innovative solutions, and deliver successful outcomes. To do so requires leadership—collaborative leadership—from architects and other project stakeholders.

Leadership and collaboration may at first seem to be contradictory terms. How can architects and design professionals lead and collaborate at the same time? The traditional concept of leadership as a top-down, authoritative structure is re-examined in this book relative to today’s evolving collaborative project delivery models and innovative forms of practice.

*Who leads project teams when architects, contractors, and owners equally share risks and rewards?*

*What role do leaders play in championing change and innovation?*

*How can leaders and team members learn to better understand and communicate with one another?*

As leadership is reexamined to allow for a more situational approach, so too does the book question the concept of collaboration as it may typically be used in practice. Beyond merely “working together,” collaboration as defined in this book is a much deeper commitment to a respectful, co-creative process that includes a multiplicity of people, processes, and tools that allow for each project team to more effectively, efficiently, and elegantly respond to the changing needs of today’s practice environment.

Though every project, firm, and designer is unique, *Leading Collaborative Architectural Practice* aims to provide the first comprehensive resource for design professionals currently engaged in collaborative practice as well as those interested in doing so. Leadership and collaboration are explored at a fundamental level, best practices from other fields are translated into practical tools and tactics that design professionals can use, and successful collaborative projects illustrate the challenges and rewards of applying these principles in practice.

The authors are licensed architects, academics, researchers, and leadership consultants who collectively bring their diverse perspectives to each topic. Additionally, unique case studies and interviews with thought leaders in the field are interwoven through the book and are available in their full form in the supplemental resources.

## Conceptual Framework

This book takes as a fundamental principle that regardless of the delivery method and technologies used on a project, architects must develop the interpersonal skills that define influential leaders in other industries. Today's ever increasing economic, social, and environmental pressures on projects demand that architects lead collaborative teams in order to address the complex programs, specialized project types, and social conditions that are prevalent in today's world.

The lessons contained herein aim to codify existing models of leadership theory, interpersonal skills, and communication techniques from other disciplines, distil best practices from successful precedents, and re-examine status quo processes through the lens of the social and behavioral sciences. In short, *Convergence* aims at having a calibrated depth across a breadth of subjects focusing on leadership and collaboration. These topics are applicable to leaders, team members, and practices of all sizes working across a variety of new construction and major renovation project types who are interested in joining the movement toward more collaborative practices.

There are many models of leadership and collaboration theory on the market today often differentiated by catchy names and relatable metaphors—all one needs to do is pass by an airport bookstore or browse the headlines of any business blog to find them. Rather than ascribe to one model, the authors have chosen to structure this resource around the commonly held, fundamental principles of leadership and collaboration as well as their application to the building industry.

## Why Collaborate?

Collaborative teams almost always contribute to successful project outcomes and innovation. Those that do not fail to do so because of

one or more dysfunctional behaviors that are easily remedied.

Our research has shown that having multiple eyes on a project solution helps teams avoid major errors. Collaborative teams offer more opportunities for new ideas that advance innovation. This is due to the diversity of members' backgrounds and prior experiences before joining the team. Finally, collaborative work environments encourage people to be self-motivated, self-assured, and satisfied with their jobs.

If collaboration is so valuable, why then are all teams not structured this way? Because it takes adaptive leadership to promote and support collaboration as a viable alternative to the status quo who are willing to invest in shaping a new culture within practice.

Contemporary leaders must be collaborative leaders rather than the authoritative or dictatorial leaders that helmed companies of the past. A collaborative leader has an ability, awareness, and commitment to lead project teams to work together to accomplish their goals. A collaborative leader may in fact not even be just one person but rather a collective of influencers from various firms who work together to fulfill project and organizational objectives and assume leadership responsibilities at appropriate points in the process.

This book builds off of a multi-year research and development project as well as an associated conference held in Salt Lake City, Utah in the fall of 2013 sponsored by and produced for the American Institute of Architects (AIA) to educate its members on collaborative project teams working in integrated models of practice. It joins other resources in documenting existing projects that model successful collaboration practices and providing translatable frameworks for those who believe that collaboration is a valuable resource in the design process.



## How This Book Is Structured

The book is organized in five parts that present the history and contemporary conditions that shape today's building industry, the tools and tactics needed to develop and foster collaboration amongst various project stakeholders, and an exploration of the changing nature of the workforce, emerging technologies, and innovative business models that will impact the future of our practice. Each of the parts is briefly outlined below.

### Part 1: Collaboration in Context

Part 1 provides the historical and contextual factors that contributed to the expedited rise of collaborative practice and Building Information Modeling (BIM). Additionally, common project delivery types are explored relative to the roles and responsibilities of each team member as well as strategies for making these processes more collaborative. Finally, the steps needed to create a physical environment that fosters collaboration and innovation are presented with an emphasis on structuring and sizing teams appropriately for the task at hand.

This part will also review the strategies, tactics, and best practices associated with collaborative project delivery in the building industry such as Integrated Project Delivery, BIM, and lean construction techniques. Guidelines will be presented for when, why, and how to use these strategies for collaborative project delivery.

### Part 2: Collaboration Tools and Tactics

Part 2 discusses team culture as a factor of each member's unique problem-solving style (i.e., cognitive style), which is critical to bridging between disparate working styles that invariably occur on any team.

Once established, all teams progress through a number of stages of development. A better understanding of how to constructively navigate these stages and address team dysfunctions that may arise along the way. With this understanding, architects will be better able to determine how their project team is currently operating and what is required to achieve greater success.

### Part 3: Leadership Effectiveness

This section is concerned with the effectiveness of architects as leaders in project teams. It will introduce the three primary concepts of leadership—ability, awareness, and commitment—and allow readers to explore their own leadership traits (or lack thereof). Leadership styles will be outlined in order to allow readers to reflect upon their own approach and to understand what skills they need to develop to increase their influence on project teams.

Additionally, this section will review the developmental stages of design professionals and the associated interpersonal and leadership skills they should have in each range. Once understood, this information will help designers advance themselves and others by responding uniquely to the person or project at hand.

### Part 4: Communication and Conflict

Part 4 discusses communication strategies and tactics that can aid leaders in influencing project delivery teams, including verbal and nonverbal methods of communication as well as ways of providing effective feedback. Feedback strategies, along with their methods and tactics, will be presented to identify and address potential barriers to motivation.

The section will review human motivation, or why people do things based on their needs and wants, which is essential for leaders to understand what and how to best reward and/or coach team

members toward more positive practices. Finally, the section covers effective strategies to move teams toward greater productivity through better communication and effective conflict resolution.

## **Part 5: Leadership in Practice**

While previous sections of this book examined the forces that shaped contemporary crisis in architectural practice brought about by a history of disciplinary isolation and the development of a contentious, risk-adverse industry, Part 5 looks more broadly at the workforce and practice of tomorrow. This section will address how the changing demographics of the workforce will impact firm recruiting strategies and corporate culture; how architects can use different types of leadership to strategically address complex societal forces in order to respond to and succeed in a changing market; and how firms can consider adapting or changing the structure of their practice in order to best address current and future needs.

## **Additional Resources**

There are a number of additional resources that are available via the Wiley online portal that supplement the content in the book itself ([www.wiley.com/go/leadingarchpractice](http://www.wiley.com/go/leadingarchpractice)). These include full case studies of projects that exemplify the potential of collaborative project delivery, exercises to conduct individually or in groups that build collaboration, communication, and leadership skills, and quizzes that test comprehension of the topics presented as well as provide opportunities for continuing education credit.

## **Who Should Read This Book?**

Existing leadership and collaboration texts are extensive in nonarchitectural fields but almost nonexistent within the profession. There is a significant gap in the market for both how the existing body of knowledge developed by business and management professionals on leadership and collaboration can be translated and applied in design and construction practices. *Leading Collaborative Architectural Practice* provides this much-needed content and is applicable to anyone engaged in the education or practice of designing and constructing buildings.

The presentation of the material is grounded in practical examples of firms of all sizes working across a variety of new construction and major renovation project types who are leading the movement toward more collaborative practices. *Leading Collaborative Architectural Practice* distinguishes itself from traditional leadership texts by providing in depth case studies as well as hands-on exercises that allow architects, owners, and contractors to put these principles into practice.

As the larger AEC industry emerges from the economic downturn brought about by the 2008 Recession, the time is ripe to engage in a dialog about how to build more resilient business models and practices. These issues will be at the forefront of discussions regarding collaborative practice as it continues to prove more humane, economically feasible, less litigious, and more successful than established models currently in place.

## PART 1

---

# COLLABORATION IN CONTEXT

Part 1, “Collaboration in Context,” presents the historical and contemporary factors that affect architectural practice, collaborative versions of the most common project delivery

types, the value of collaboration (as well as addressing times when it is not appropriate), and outlines the factors needed to create a culture of collaboration in teams and organizations.



## Collaboration in Practice

### The Changing Landscape of Architectural Practice

Over time, the process of designing and constructing buildings has transformed from a holistic master builder model in which all aspects of the design and construction process are orchestrated by one individual, to the fractured landscape of the early twenty-first century, in which industry professionals are hampered by archaic procurement models and disincentivized from working together for fear of litigation. The causes of this devolution are varied, but the resulting state of practice is one of inefficiency, with architects facing constant value engineering to meet project budgets, poor coordination, and disintegration between parties in the construction document phase (Figure 1-1). The result is most often excessive change orders and requests for information, which breed constant anxiety on the part of the client over exceeding the project budget and schedule. All of these contribute to delays, compromises, and the failure of most projects to fulfill their full potential (AIA/AIA CC, 2009). In the midst of this chaos, architects are losing revenue and relevance at an alarming rate.

Welcome alternatives to these siloed, contentious, and risk-adverse practices have emerged with the rise of Building Information Modeling (BIM) and the development of collaborative contract structures in the early 2000s. These structures showed how the creation of joint partnerships between key stakeholders—owners, architects, and contractors at a minimum—who share both the risk and reward for a project’s success could incentivize an integrated delivery approach. Analysts projected that the industry-wide adoption of such collaborative tools—as with any paradigm-shifting change—would be slow and gradual.

However, economic, societal, and technological agents of disruption brought about by the Great Recession of 2008 accelerated this timeline. The future of practice (and to some extent the current state) is now one in which collaborative teams work together for the success of the project as a whole rather than prioritizing their own interests. This significant and necessary cultural shift requires that training and best practices be developed not only to help architects through the transition but also to foster ongoing collaboration and innovation.

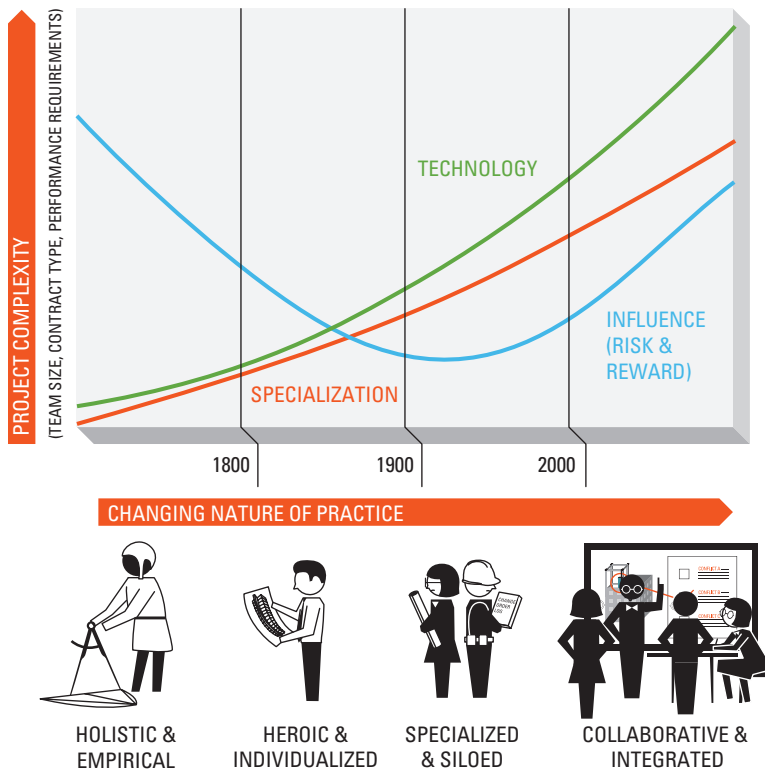


Figure 1-1 Culture of practice over time

The American Institute of Architects has been a leading voice in the national conversation regarding integrated and collaborative project delivery, calling for an industry-wide change. It developed *Integrated Project Delivery* (IPD) as one possible project delivery model that promotes a collaborative approach. The AIA also published a series of robust resources addressing the technical and procedural nature of IPD that have been widely utilized: *Integrated Project Delivery: A Working Definition* (AIA CC/McGraw-Hill, 2007); *Integrated Project Delivery: A Guide* (AIA/AIA CC, 2007); *Experiences in Collaboration: On the Path to IPD* (AIA CC/AIA, 2009); *IPD: Case Studies* (AIA/AIA MN, 2010); and *IPD: Updated Working Definition* (AIA/AIA CC, 2014).

In 2008 the AIA published a series of contract documents to provide three approaches to integrated delivery:

1. Transitional forms that are modeled after existing construction manager agreements (including owner–contractor, owner–architect, and general conditions contracts);
2. Multi-party agreements that create a single agreement that parties can use for IPD projects; and
3. The single purpose entity (SPE) contract that creates an LLC comprised of key stakeholders for the purposes of the project, which demonstrates the most robust engagement with this project delivery model.

Despite its promise, most practitioners have been slow to adopt IPD in the fullest sense, struggling to justify its value over traditional practice, to understand how to integrate the approach into existing practice structures, and to anticipate what the ramifications might be to changing the status quo (AIA CC/AIA, 2009). In 2008, a group of early adopters, made up of owners, architects, and contractors, gathered at a symposium conducted by the AIA California Chapter to share their practical experience. Although very few had participated in a “full” IPD project, all were engaged in integrated forms of project delivery and identified the following characteristics and structures that define Integrated Project Delivery:

### Characteristics

- Results in efficiency and reduces redundancy
- Gets the right information to the right people at the right time
- Results in more accurate cost estimating earlier in the design process
- Decreases the risk of construction delays and additional costs
- Values people over technology
- Is unique to each project and team
- Is not appropriate in all situations

### Structures

- Requires the right people
- Requires that all parties buy into the process
- Relies on trust
- Requires the owner’s direct involvement throughout the entire process
- Requires a clear understanding of the process by all parties

- Requires clearly defined goals for the project and for all parties
- Requires leadership and structure
- Requires technical excellence
- Requires clear roles and responsibilities for each team member
- Requires a clear definition of risks and rewards
- Requires investment in team building, not just team assembling
- Often requires training to shift team members into a collaborative mindset
- Requires continuous education as new members join the team
- Requires transparency
- Results in personal rewards such as ownership and enjoyment of the process in addition to financial rewards
- Requires starting with “who” before “how”
- Requires a plan of action be developed at the beginning of the process by the key stakeholders collectively
- Requires clear decision-making processes and rules of engagement
- Requires regular, frequent meetings by the key stakeholders
- Requires personal, face-to-face communication
- Requires careful listening and asking questions
- Requires addressing issues and concerns in real time (AIA CC/AIA, 2009)

With such a list of clearly beneficial qualities and requirements, the question remains, why have there been so few projects that implement IPD holistically? The answer is that collaboration is simple in theory but difficult in practice. It is not easy for any industry to make the shift to a collaborative

approach and maintain the energy required to collaborate well over time, especially in one with as long a history of contention as that of the design and construction industry.

Collaboration has long been seen as either requiring the magical convergence of an ideal group of people or as hindering the “lone genius” model of traditional architectural mythology. It is, however, a skill set that can be taught and developed. Such skills, including leadership, collaboration, trust, and communication, need to be understood by architects in a way that provides both a conceptual grounding as well as the practical tools necessary for implementation. Although collaboration is rewarding when done well, it is not easy.

## The Rise of Integrated and Collaborative Project Delivery

*Effectively structured, trust-based collaboration encourages parties to focus on project outcomes rather than their individual goals. Without trust-based collaboration, IPD will falter and participants will remain in the adverse and antagonistic relationships that plague the construction industry today. IPD promises better outcomes, but outcomes will not change unless the people responsible for delivering those outcomes change.*

(AIA CC, 2007)

A collaborative practice is distinguished from that of a typical, multiperson office by the intentional integration of diverse voices and expertise in all stages of the design process. Although architecture is by nature almost never a solitary act due to the size and complexity of its products, traditional models of practice and education have conditioned

architects to develop a singular voice. The real fear in collaborating is that we and our work will be mediocre; a race toward the lowest common denominator, and with it, irrelevance; we will be seen as just one more designer among designers. The truth, of course, is by not collaborating architects become marginalized. Not knowing how to effectively collaborate will lead to their irrelevance” (Deutsch, 2014).

A defensive posture led to architecture being surpassed in significance by numerous allied fields such as engineering and manufacturing, which had long since streamlined their development and fabrication processes with great success. In 2004, Stephen Kieran and James Timberlake published *Refabricating Architecture: How Manufacturing Methodologies Are Poised to Transform Building Construction* (Kieran and Timberlake, 2004). The book challenged architects to recognize the current state of affairs and called for a radical rethinking of the ways in which buildings were made, through the adoption of advanced technology such as mass customization and information management tools. It called for integration, not segregation, in the process of making buildings: “The first act of design in this world beyond the old equilibrium is the redesign of the relations among those responsible for the making of things.” They posit that in an integrated model of practice, the “intelligence of all relevant disciplines is used as a collective source of inspiration and constraint” (Kieran and Timberlake, 2004, 13). The central tool that allows for such a model to work is what they called the “IT/software enabler.”

Although the authors do not mention BIM specifically in their book, the idea of a digital tool that supports the shared flow of information, instantaneous communication, and the interconnection of all disciplines is clearly outlined. Later that year, Phil Bernstein and Jon Pittman, in a white paper



written for Autodesk Building Solutions, echoed Kieran and Timberlake's call for the profession to cease operating in a model of discrete resource-intensive and inherently inefficient phases of design and construction. They proposed BIM as the tool to enable such collaboration (Bernstein and Pittman, 2004).

Bernstein and Pittman cite the sixfold greater investment in technology by the manufacturing industry as compared to that made by architecture and construction during the same time frame, as well as the increasingly competitive global market as indicators of the industry's lack of advancement. They argue that allied fields had "turned long ago to model-based digital design processes based on data that supported engineering analysis, bill-of-material generation, cost modeling, production planning, supply-chain integration, and eventually computer-driven fabrication on the factory floor," and were exerting a competitive pressure that the AEC industry could no longer ignore (Bernstein and Pittman, 2004). While these lessons were not lost on AEC stakeholders, the nature of the building industry—where project teams focus their efforts on the realization of a single, unique product and rarely work together more than once—made any effort to create more continuity difficult (Bernstein and Pittman, 2004).

Sharing of digital information prior to BIM was rare due to the lack of trust between architects, engineers, and contractors; the intermittent nature of technological implementation in practice; the lack of confidence in the accuracy of digital information transferred from one platform and discipline to another; and the lack of incentive (or more accurately the disincentive) for any party to take on more than their contractually obligated role in the process for fear of increased risk. Such an environment was ripe for disruption.

The introduction of BIM represented even more of a technological paradigm shift than the earlier transition from paper to CAD, because it also affected the social nature of practice, requiring new standards, workflows, and means of communication (Bernstein and Pittman, 2004). Even after BIM began to become more commonly known, design professionals struggled to understand how to harness its full potential. "[I]t is clear that there are many views as to what BIM is. Incorrectly seen as a technological solution to CAD integration, BIM places the effective use and exchange of 'information' at its heart. As a result, BIM will have an impact on most areas of business management and operation. It will revolutionise methods of working and fundamentally redefine the relationships between construction professionals. It will challenge current thinking on contracts and insurance and most importantly, it will support the integration of the design and construction teams" (NBS, 2011).

Bernstein and Pittman predicted that industry-wide adoption of BIM would be a slow process, prodded along by outside influence from clients and incentive-based contracts (2004). A year-long examination by the AIA in 2006 resulted in the *Report on Integrated Practice*, which foregrounded the need for the profession to address the changing needs of clients and society through alternative modes of project delivery, not just through technology. The report overview begins with a statement by 2002–2007 AIA vice-president and Miller/Hull partner Norman Strong: "Technological evolution coupled with owner demand for better, faster, less costly construction projects and more effective processes are driving change in the construction industry. These changes are revolutionary in nature. They will transform practice as we know it today." He concludes with the statement: "Together we have a very small window to change the trajectory

of the profession, and to best ensure its continued relevance” (Broshar et al., 2006).

The model of integrated practice was put forward as a “future perfect vision” where

[A]ll communications throughout the process are clear, concise, open, transparent, and trusting; where designers have full understanding of the ramifications of their decisions at the time the decisions are made; where facilities managers, end users, contractors and suppliers are all involved at the start of the design process; where processes are outcome driven and decisions are not made solely on first cost basis; where risk and reward are value-based, appropriately balanced among all team members over the life of a project; and where the profession delivers higher quality design that is sustainable and responsive (Broshar et al., 2006).

Through technology, the communication barriers between silos would be demolished, allowing practices and projects to achieve their full potential. This revolutionary change promised to free architects from the burden of documentation and allow for greater focus on design (Broshar et al., 2006).

Presenting arguments for the benefits of BIM, architect and educator Daniel Friedman wrote that “the true potential of this technology in practice (for architects) presupposes deeper collaboration among all parties to the contract. That means dynamic hierarchies, joint authorship, and shared risks, responsibilities, and rewards—and we expect subsequent changes in the contract language to reflect these new relationships” (Broshar et al., 2006). Thom Mayne, in his report essay “Change or Perish,” warned architects: “You need to prepare yourself for a profession you’re not going to recognize a decade from now, that the next generation is going to occupy” (Mayne, 2006). Asked to revisit his statement in 2009, Mayne stated that the changes to

practice were proving even more extreme than he had predicted.

Today I would think that you couldn’t even run a practice without having advanced performance techniques for understanding the way your projects operate within functional terms, within environmental terms, within technological terms, and for looking at the development of a project in the early stages, the cost models that are connected to extremely precise performance objectives. It’s not evolutionary . . . our clients expect this. And, given current economic conditions and the way the relationship with subcontractors and our engineers has evolved, a huge amount of these people already are advanced in these areas and also have expectations of receiving 3D drawings and not normative drawings (Smith, 2009).

In 2007, the AIA National and AIA California Council published *Integrated Project Delivery: A Guide*, which outlined the ways IPD could be utilized in practice. It cited inefficiencies in the construction industry resulting in up to 30 percent waste, the lack of interoperability among AEC stakeholders costing the industry almost \$16 billion annually, and the worst performance of any non-agricultural industry since 1964—construction productivity having decreased while all other industries increased over 200 percent during the same time frame—as clear proof that the old ways would no longer suffice (AIA/AIA CC, 2007).

This *IPD Guide* provided the first definition of IPD as a “project delivery approach that integrates people, systems, business structures and practices into a process that collaboratively harnesses the talents and insights of all participants to optimize project results, increase value to the owner, reduce waste, and maximize efficiency through all phases of design, fabrication, and construction”

(AIA/AIA CC, 2007). It offered the notion that principles of IPD could be applied in multiple contract structures but that all projects claiming to be integrated included *highly effective collaboration* among the key stakeholders—owner, architect, and contractor—over the entirety of a project.

IPD leverages early contributions of knowledge and expertise through utilization of new technologies, allowing all team members to better realize their highest potentials while expanding the value they provide throughout the project lifecycle. At the core of an integrated project are collaborative, integrated and productive teams composed of key project participants. Building upon early contributions of individual expertise, these teams are guided by principles of trust, transparent processes, effective collaboration, open information sharing, team success tied to project success, shared risk and reward, value-based decision making, and utilization of full technological capabilities and support (AIA/AIA CC, 2007).

The Great Recession had a marked impact on the accelerated adoption of BIM. A 2008 report titled *Building Information Modeling (BIM): Transforming Design and Construction to Achieve Greater Industry Productivity* found that in the face of the economic downturn, BIM adoption was expected to rise significantly as experienced users were able to differentiate themselves within the extremely competitive market by bringing added value and efficiency to their clients (McGraw-Hill Construction, 2008).

Between 2007 and 2012, the adoption of BIM increased by 75 percent, with approximately 90 percent of medium and large firms reporting the use of such tools (McGraw-Hill, 2014). In 2014, Patrick

MacLeamy, CEO of HOK and chairman of buildingSMART International, referenced the undeniable force that BIM had become by stating that “those who practice in the old way are soon going to find themselves without work. Either change, get with the program, or go out of business.” He goes on to state that the next great evolution in the industry will be aligning collaborative relationships between key stakeholders with the transfer and flow of information between these parties (McGraw-Hill, 2014).

MacLeamy had been an early advocate for IPD, particularly with regard to its ability to address the increasing cost and complexity of making design changes in a project over time by shifting the bulk of coordination efforts to earlier in a project’s timeline. Consciously or unconsciously referencing a 1976 diagram drawn by Boyd Paulson in the *Journal of the Construction Division*,<sup>1</sup> MacLeamy sketched a set of relationships between time, complexity, influence, and cost in a construction project during a 2004 meeting that have become known as the MacLeamy curve (Figure 1-2).

In 2014, the AIA and AIA California Council released an updated report on IPD in order to distinguish it from other forms of project delivery,

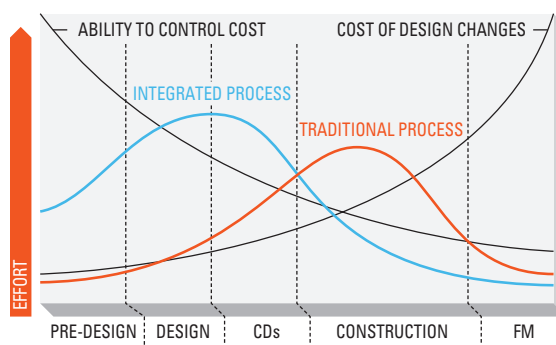


Figure 1-2 MacLeamy curve

<sup>1</sup> See [www.danieldavis.com/papers/boyd.pdf](http://www.danieldavis.com/papers/boyd.pdf).

sometimes referred to as “IPD lite” or “IPD-ish,” that had begun to become popular alternatives to a “true IPD” project. The refined definition states:

Integrated Project Delivery (IPD) is a project delivery method that integrates people, systems, business structures and practices into a process that collaboratively harnesses the talents and insights of all participants to reduce waste and optimize efficiency through all phases of design, fabrication and construction. The Integrated Project Delivery method contains, at a minimum, all of the following elements:

- Continuous involvement of owner and key designers and builders from early design through project completion.

- Business interests aligned through shared risk/reward, including financial gain at risk that is dependent upon project outcomes.
- Joint project control by owner and key designers and builders.
- A multiparty agreement or equal interlocking agreements.
- Limited liability among owner and key designers and builders (AIA/AIA CC, 2014).

At the core of this model (Figure 1-3) is the creation of a project team that shares financial risk and reward through the creation of a multiparty contract and a commitment by all parties to create a shared culture of joint decision making that foregrounds what is best for the project rather

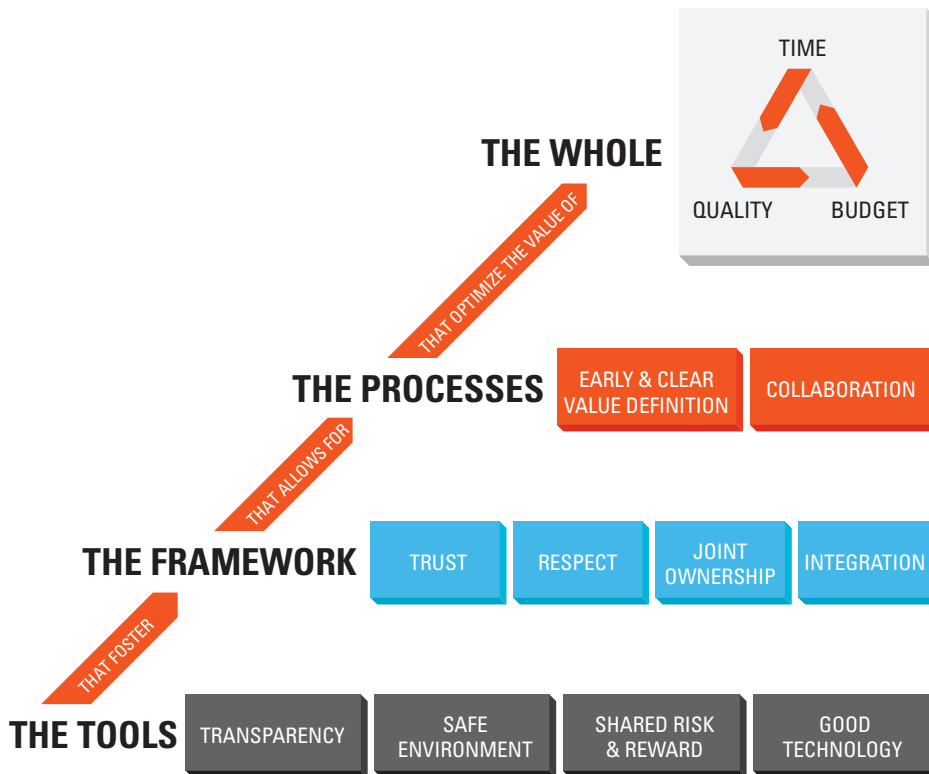


Figure 1-3 IPD fundamentals

than for one particular entity. Early integration of the key consultants and constructors leads to more accurate information and more effective decision making. Effective teams demonstrate respect, trust, and transparency, which are outlined in joint contracts but established by team leaders and sustained by members throughout the process (AIA/AIA CC, 2014). Interpersonal as well as infrastructural components were highlighted as critical to an integrated approach, each requiring equal investment.

## Mutually Beneficial Collaboration

*The most exciting groups—the ones . . . that shook the world—resulted from a mutually respectful marriage between an able leader and an assemblage of extraordinary people. Groups become great only when everyone in them, leaders and members alike, is free to be his or her absolute best.*

(Bennis and Biederman, 1997)

The relationship between leadership and collaboration is interdependent rather than conflicting as one might first imagine, especially in creative fields and complex contexts. With relatively simple technical problems that have known variables leading to a right or wrong answer, traditional top-down models of leadership can be effective. With adaptive or “wicked” problems, however, complex partnerships among diverse experts are often required (Bennis, 1999). Such collaborative teams require that the experts be brought together efficiently when and where their efforts are most needed. Each must understand their specific role as well as the overall project vision, a dance that is choreographed by the team’s leaders.

Leadership is grounded in a relationship between leaders, followers, and the common goal

they want to achieve (Bennis, 2007) (Figure 1-4). Leaders do not operate alone or exist in a vacuum. “Any person can aspire to lead. But leadership exists only with the consensus of followers,” said Warren Bennis, who is widely regarded as the father of modern leadership studies. Bennis contends that the opposite is also true—great teams always have a powerful leader. This person is not always the most technically or creatively skilled member of the team but the one who has the ability to assemble a team with the right skill sets, build consensus around a shared vision, and enable each team member to do their individual best. This more often than not means getting out of the team’s way rather than micromanaging their process. In architectural practice, the leader/team dynamic exists within the office as well as among interdisciplinary project teams.

In today’s increasingly complex society, where seemingly the only certainty is change, architects are tasked with challenging traditional disciplinary silos and hierarchical management structures. They must find new ways to critically address the complex issues of our time through coordinated collaboration with an increasingly vast array of specializations. Collaborative teams must work across disciplines and value the collective mind over the individual genius without losing their specific disciplinary expertise in the process. “Whether the task is building a global business or discovering the mysteries of the human brain, one person can’t hope to accomplish it, however gifted or energetic he or she may be. There are simply too many problems to be identified and solved, too many connections to be made” (Bennis and Biederman, 1997). Despite such calls to collaboration, society in general—and architectural practice in particular—still champions the myth of the creative genius whose singular vision drives all great work. To achieve effective collaboration, the dynamics of teams must be understood as a whole comprised of discrete parts: leader, follower,

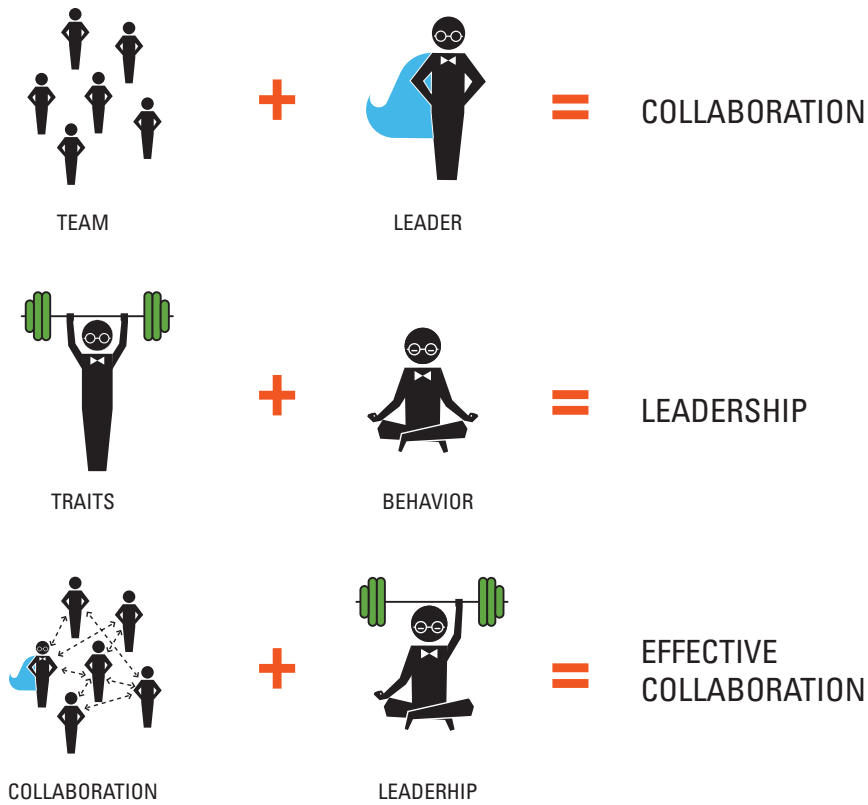


Figure 1-4 Effective collaboration

followers working together (i.e., team), and team orchestrated by leader (i.e., collaborative team).

Kieran and Timberlake put the exponential increase of complexity seen in today's practice that demands such specialization in context:

Hundreds of years ago, all of architecture could be held in the intelligence of a single maker, the master builder. Part architect, part builder, part product and building engineer, and part materials scientist, the master builder integrated all the elements of architecture in a single mind, heart, and hand. The most significant, yet troubling, legacy of modernism has been the specialization of the various elements of building once directed and harmonized by the master builder. The

multiple foci at the core of specialization have given rise to a world that is advancing while fragmenting. We applaud the advancement, but deplore a fragmentation that is no longer unavoidable and so needlessly diminishes architecture. Today, through the agency of information management tools, the architect can once again become the master builder by integrating the skills and intelligences at the core of architecture. The new master builder transforms the singular mind glorified in schools and media to a new genius of collective intelligence. Today's master architect is an amalgam of material scientist, product engineer, process engineer, user, and client who creates architecture informed by commodity and art. By recognizing commodity as