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Integrating Project Delivery



WILEY

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Foreword

By William McDonough

FAIA, Int. FRIBA

What we have come to call integrated project delivery is really about how we think about and frame the things we do best when we work together. It is, in effect, the art of marshaling collective intelligence, creativity, and imagination, and advancing that composition toward highly effective outcomes—buildings that support the cultures of human and ecological health and continuously improve over time.

I've found that a values-first approach to project design is the best way to harness collective intelligence and drive continuous improvement. Vision and values set a positive course for projects and effectively organize creative, collaborative work toward long-term goals. Often, however, businesses put a handful of metrics first and let all the other parts of their plan follow, with less-than-optimal results. Projects driven mainly by a few metrics tend to limit their promise on a relentless focus on meeting benchmarks and not enough on quality and innovation. The specific metric targets can become so consuming that larger guiding principles of positive behavior get lost. Plus, many current metrics tend to measure effectiveness by decrease—lower CO₂ emissions, fewer cubic tons of pollutants—rather than by the increase of positive effects, such as more energy sent back to the grid, more water purified on-site or more personal benefit for a building's inhabitants or the community within which it resides.

The distinction is especially important at this point in history when “high-performance” is frequently defined by doing less harm or “getting down to zero.” To be sure, zero emissions, zero pollutants, and zero workplace health damage are laudable, widely shared goals. The orientation to zero grew out of important, real concerns on the part of business leaders for worker health and safety: a desire to create an environment that encourages employees to always be vigilant. In many companies with advanced safety protocols, workers are encouraged to act if they see unsafe conditions, with no fear of retribution. CEOs love zeros when they come before “accidents” and “spills.” Increasingly, business leaders and organizations devoted to sustainability are striving for zero waste and zero carbon. And we applaud them. But when we talk to business leaders about new projects, we propose that zero become not a culminating point but a midpoint in a process of innovation and improvement, a pivot from doing less bad to doing a lot more good.

Vision and values make that pivot possible. In practice, we can start with values and principles drawn directly from the mission of clients and the specifics of place; they focus, frame, and organize the work we do together. If a CEO wants to build a safe workplace, we might encourage her to consider building one that not only does no harm but improves her employees' health, the health of the community in which the company operates, and the health of all the customers touched by the business. Such a workplace is not just optimal, it's exemplary.

As advocated in this book, positive engagement guided the integrated design and construction of the team we led for a new building at NASA's Ames Research Center in Silicon Valley, a 50,000 square-foot, beyond-state-of-the-art facility known as Sustainability Base—a name echoing

and honoring Tranquility Base, site of the first moon landing. NASA is nothing if not positive and ambitious—one does not get to the moon on metrics alone—and right from the start the Sustainability Base project team declared its intention to design an environment that fully supports human and planetary well-being. That clearly stated value defined and organized the project's goals, strategies, and tactics as well as the ongoing collaborative research of some of the world's best scientists, engineers, and technicians. The result has been characterized as the highest-performing government building in America, delivered on schedule within a normal federal budget. Lawrence Berkeley National Laboratory's Stephen Selkowitz has called Sustainability Base a "genius building" due to its integration of collective intelligence and commitment to continuous improvement over time.

We live in an age of constant metrics. Recently, a corporate sustainability director of a Fortune 100 company pointed out to me that some \$9 billion was spent in 2012 on "sustainability consulting." He noted the irony that we are watching the scorekeepers. Why are we benchmarking metrics rather than investing our time and energy in collective improvisation and innovation? That is the field of integrated project delivery. Think about it like a game. Statistics are exciting for some, but most of us are excited by the actual game. On the field of play, we act as a team, improvising at high speed toward a common goal. Detailed metrics of kicks and yards and hits are secondary to the quality of the game itself and the success in achieving the goal of winning the game—for the great satisfaction that it brings to people who are dedicated to the purposeful hard work. The purpose of the team's effort is to know how to play and improvise and to support each other and keep moving toward the goal. That's why people watch the game, and that is why the hard work of playing is fun.

The quest to create a building and a landscape that energetically support life led to a cascade of innovations. The Sustainability Base's self-monitoring system is so smart it knows precisely how much energy each inhabitant is using and predicts energy needs based on weather and work patterns; it can anticipate the building's thermal characteristics days in advance with great precision. Advanced daylighting fully illuminates the building up to 320 days a year, while a system of louvered windows provides continuous flows of fresh air. Water will be maintained in closed loop systems, purified to drinking quality for continual reuse or leaving the site after rainfall at the same rate, volume, and cleanliness as natural flows. In time, the building will use only renewable energy and will send its surplus back to the grid.

One might expect such a high-tech building to be extremely costly, but all the base building systems were produced within the budget set for a federal building. In keeping with NASA's guidelines, special systems that the design group wished to incorporate had to be offset by monetary benefits (for example, in energy consumption) so the extra investment could be recouped within a 7-to-10-year payback period. Those extras totaled only 6 percent of the budget, all with documented payback periods.

The outcome of our values-first, integrated approach was especially pleasing to NASA. Dr. Steve Zornetzer, the associate director of Ames Research Center and the project leader, noted that "the collaborative process yielded a highly sustainable and beautiful design—optimized for building performance and representative of our values I see this as a prototype of a twenty-first-century building. This is the way we're going to have to think about building in the future."

Sustainability Base was designed and structured for continuous quality improvement, and research into its operations is ongoing. The scientists and engineers who work there fully enjoy the fact that the work of progress is always a work in progress. They know the project will meet and surpass its goals,

which, by definition, makes complete sense, when aspiration of continuous improvement is the goal. That is a good approach to integrated project delivery, too. Striving for positive goals and continuous improvement creates abundant opportunities for designers, engineers, contractors, and owners to fruitfully collaborate throughout the design and construction process. Let's seize those moments, strive together, and make every building we create an inspiring contribution to the health and well-being of our planet.

William McDonough is a globally recognized leader in sustainable development. McDonough is trained as an architect, yet his interests and influence range widely, and he works at scales from the global to the molecular. *Time* magazine recognized him as a "Hero for the Planet," noting: "His utopianism is grounded in a unified philosophy that—in demonstrable and practical ways—is changing the design of the world."

In 1996, McDonough received the Presidential Award for Sustainable Development, and in 2003 he earned the first U.S. EPA Presidential Green Chemistry Challenge Award for his work with Shaw Industries. In 2004, he received the National Design Award for exemplary achievement in the field of environmental design. McDonough is the architect of many recognized flagships of sustainable design, including the Ford Rouge truck plant in Michigan; the Adam Joseph Lewis Center for Environmental Studies at Oberlin College; and NASA's Sustainability Base, one of the most innovative facilities in the federal portfolio. He was the founding chair of the World Economic Forum's Meta-Council on the Circular Economy (2014–2016).

Foreword

By Phillip G. Bernstein

FAIA, RIBA, LEED® AP, VP Strategic Industry Relations, Autodesk, Inc.

Twelve years ago, an otherwise obscure industry association of institutional owners called the Construction Users Roundtable (CURT) gathered representatives of their building supply chain—architects, engineers, builders, facilities managers, and technology vendors—to ask what seemed to be a simple question: Why are construction documents so inadequate for purposes of construction? The well-understood litany of woes plagued many of the projects undertaken by this very experienced group of clients, who had focused their concerns on one of the more fraught exchanges in every project: the transfer of design intent to construction execution. After much discussion and further soul-searching, the CURT team concluded that the challenges of working drawings were just symptoms of a larger pathology characterized by “lack of cooperation and poor information integration.”* And rather than suggest that the supply chain itself was responsible, they declared that it was in fact they themselves who could best catalyze the changes necessary to optimize construction. Writing in what is now their well-known white paper:

The goal of everyone in the industry should be better, faster, more capable project delivery created by fully integrated, collaborative teams. Owners must be the ones to drive this change, by leading the creation of collaborative, cross-functional teams comprised of design, construction, and facility management professionals.

CURT’s manifesto galvanized the U.S. construction industry by further declaring that integrated project structure, open information sharing, and building information modeling (BIM) were the key components of their vision for a radically revised way of delivering projects that performed.

These demands for radical change emerged as the industry was becoming aware of other process disruptions about which there was interest but little certainty. Concepts like Lean (a Japanese manufacturing strategy) and project alliance delivery (from Australia’s infrastructure industry) promised new methods of optimization and decision making. Desktop computing was becoming powerful enough that the change from computer-aided design (CAD) software to BIM looked at least possible, if not likely. In fact, the putative collaborative transparency of BIM—where everyone had access to three-dimensional information—intimated some change in project delivery approaches and was often conflated with an emergent idea of “integrated project design.” Was BIM a technology, a process or a delivery method? The supply chain really hadn’t worked out what any of these things meant, or even what to call what is now well-known as integrated project delivery (IPD).

*Collaboration, Integrated Information and the Project Life cycle in Building Design, Construction and Operation, CURT WP-1202 (August 2004).

For an otherwise slow-moving supply chain, change came rapidly after CURT's white paper. By 2007 IPD had emerged as a distinct delivery typology joining the pantheon of hard bid, construction management, and design/build, moving in parallel with the rapid digitization of building. Various industry associations were floating provisional contract prototypes, and forward-thinking owners had begun to organize and execute early projects based on principles of IPD. In a market largely characterized by painfully incremental project-by-project improvements, IPD was a sea change in both approach and attitude. Analog information gives way to digital, transactional contracts to relational, and scopes of service and delivery objectives move from lowest bid to commitment to outcomes. For the first time, building process is focused exclusively on getting results rather than lowest first cost.

That premise is at the heart of this book, written by innovators operating at the intersection of theory and practice, technology, and delivery. Designed as a technically rigorous but accessible reference guide to both the motivations and protocols of IPD, the authors have inverted the traditional relationship of process and product and embrace the idea that integrated delivery means putting the clear objective of a high-quality, high-performing building as the highest aspiration of any project, and simultaneously obliterating the commoditized exchanges of consideration that denominate almost every transaction in the supply chain.

This change is much more significant than the evolution of IPD as "the next big thing" in project delivery typology. Normative practice draws a strong distinction between the performance standards for designers (who provide a "service" through professional judgment) and builders (who deliver a "product" based on information that is a result of designer services). The authors turn that construct largely on its head though a fundamental premise that underlies this entire book: the project team must, in its entirety, focus on delivering a *valuable* product to the owner, and not simply fulfill the minimum requirements so often seen in typical projects and delivery models. And there are systematic procedures and techniques by which that singular focus on value can be achieved, documented in great detail herein.

It is often argued that typical industry approaches achieve that same goal when project teams are "high functioning" and collaboration is both expected and achieved. It is almost impossible to predict, however, when a typical project might reach this lofty goal, and most agree that more often than not it isn't reached. Project performance and liability statistics support this conclusion, and stories about wildly successful construction projects are far outnumbered by tales of woe. As this text makes clear, delivering a valuable building means establishing clear goals and processes for achieving that outcome, aligning the interests of the team with that of the building itself, and using tools that support both prediction (necessary to make commitments of performance) and collaboration (necessary to provide absolute information clarity).

But how to get this done? Like BIM, the industry has latched upon the buzzword *integration* as a potential strategy. But having witnessed (and, in some cases, attempted to assist) the industry's embrace of BIM, it's clear to me that fundamental innovations in our industry need both exemplars and roadmaps. This text is designed to accomplish both through detailed procedural explanations and case studies demonstrating the implementation of those procedures. Both narrative and reference guide, it describes both the underlying theory and practice of integration, accessible to all the players of the supply chain. CURT would be astonished at what their original provocation has wrought.

While the economic collapse of 2008 likely slowed what would have otherwise been a much more rapid embrace, today IPD is a viable option for many projects where traditional delivery methods would yield suboptimal results, and project teams are properly prepared for its challenges, demands,

and benefits. Like sustainability and BIM, the concept has become hip, and many designers and builders claim to have “been doing IPD for years.” This is both charming and dangerous inasmuch as it speaks to both the potency of IPD and its related brand value. But without careful ground rules and proper procedural platforms, IPD may never escape the delicate stage of emergent innovations in their relative infancy. The text that follows is a definitive reference for those who see the processes that create buildings as deserving of modern, high-performance methodologies that best realize the tremendous value that buildings create for our society.

Phil Bernstein, FAIA, is a Vice President for Strategic Industry Relations at Autodesk, where he is responsible for the company's future vision and strategy for technology as well as cultivating the firm's relationships with strategic industry leaders and associations. Formerly a principal with Pelli Clarke Pelli Architects, he teaches Professional Practice at Yale, where he received both his BA and his MArch. He is co-editor of *Building (in) the Future: Recasting Labor in Architecture and BIM in Academia*, a senior fellow of the Design Futures Council, and former chair of the AIA National Contract Documents Committee.

Preface

"It is extension of application that discloses inadequacy of a theory, and need for revision, or even new theory. Again, without theory, there is nothing to revise. Without theory, experience has no meaning. Without theory, one has no questions to ask. Hence without theory, there is no learning."

—W. Edwards Deming

WHAT THIS BOOK IS ABOUT

The ideas and practices presented in this book are different than what most people think and do to design and build projects today. These different practices are needed because project teams need a strategy and a set of actions that allow them to overcome the challenges of the current "divide and conquer" approach to designing and building projects. Buildings have become more technically complex, the regulations that need to be considered more multifaceted, and the social and business expectations and pressures more intense. The increased technical complexity and the multifaceted regulatory constraints require the inclusion of experts that understand the specific technical systems to project teams. This increased specialization has led to fragmented project delivery, in part because the project management tools used on many projects are good at dividing the work up into chunks but less good at making sure that everyone's work fits together. The increased business and social pressures on building performance, however, demand a strategy to overcome this fragmentation, a strategy to integrate project teams and their work. That is why this book about integrating the delivery of building projects is needed now.

Because the practices for integrating project delivery are new, they can seem difficult. They certainly require different attitudes, skills, and behaviors. The new game is a plus-sum—not a zero-sum—game. The project team becomes a virtual enterprise. Companies become business partners rather than entities that cooperate when it serves their interests. People stop working in silos and exchange information frequently instead of periodically. This accelerates as experts learn that they can trust each other, which makes it possible for them to truly collaborate. Trust requires companies to operate open-book and people to admit mistakes, lack of confidence, and uncertainty. It also requires a culture that doesn't punish those who are honest. Project team members must work very hard to stay on the same page to be aligned in their work. Everyone on an integrated team commits to working in this new way, to give it their best. It's appropriate and necessary that this commitment extend to sharing risk of failure and rewards for great performance.

This is why we always recommend using a contract that supports integration. We believe that this new method of project delivery is better precisely because it requires agreement to business terms that do not allow project participants to "succeed" on their own. All partners, whether they are the

owner, a designer, or a constructor, know that they can only succeed or fall short together. In this way, an integrated project delivery (IPD) agreement goes a long way to solving the “motivation” problem that plagues well-intentioned efforts to improve performance. Everyone on an integrated team, from the owner representatives to the workers who put the work in place, needs to know what it means to integrate their efforts.

This book explains a system we believe will enable people with different expertise and experience to consistently create valuable high-performance buildings. Our starting point is a recognition that the architectural and building systems and components of modern facilities are interdependent and must be integrated in design and construction to perform well. We explain theory and describe it in practice for each element of integration.

Our goal has been to write something of value for both experienced practitioners and students of the industry. It is our intention and hope to help readers understand four things:

1. What the elements of integration are.
2. How they interconnect.
3. Why they are all necessary.
4. How they have been and can be put into practice.

The book focuses mostly on design and construction. This is not to say that the use and operations phase of buildings is not as important. After all, buildings are designed and constructed to be used. However, without design and construction, there is no building to use and operate. We believe that the concepts we present are also useful to orchestrate the operations and repurposing phases of buildings, although the specifics and the examples would be different. While the examples throughout the book are from building projects, we believe that the concepts apply to other types of facilities, such as infrastructure and industrial projects.

HARDER WITHOUT A MAP

Everyone needs a map when venturing into unfamiliar territory. We wish we had had one when we started out. Now we do and offer that here, convinced that this will help advocates for integration, coaches, and leaders describe a complete system to project team members. Why do we think this? Because we’ve seen people on almost every project team struggle to understand why and how they can improve outcomes through integration. While most people we’ve met, especially the owner’s team, are not satisfied with the way things are done now, they know what these are and how to do them. People with industry experience new to integrated delivery have only done things the old, fragmented way. Our sense is that most teams have tried to implement various techniques, methods, and software tools, especially building information modeling (BIM), without knowing how to plan, collaborate, and share their knowledge as partners. The industry culture of starting to work before looking at work processes, making do (Howell & Ballard, 1997; Koskela, 2004; Macomber & Howell, 2004), and attributing blame for failures undermines team learning and continuous improvement. Worst of all, the focus on reducing cost has short-circuited honest efforts to understand customer value well enough so it can be translated into tangible project objectives. It’s no wonder the industry continually falls short in delivering what the customer really wanted.

Many, if not all, of the real-life examples in this book came about because a few people understood collaboration and were willing to show others. They encountered resistance and succeeded in overcoming it through education and persuasion. In many cases, the owner's project manager had to force the issue and make it clear that the only good option for doubters was to genuinely try to work differently or go to work on a conventional project.

We have chosen to describe what teams have done and achieved without describing the drama behind the scenes so that we could connect their experiences and accomplishments to the entire Simple Framework and its elements—the map we made—in just enough detail so that our map could be useful. Although we expect adoption of integrated practices to be challenging for some time, we are confident that the map the Simple Framework provides will make this easier and lead to much better outcomes.

HOW THIS BOOK IS ORGANIZED

We have tried to answer one or two big questions in each chapter, as shown in Table P.1.

TABLE P.1 Chapter Questions

Chapter	Title	Question
1	What Would Make Us Proud?	What do we want to do and what can we do?
2	Transitioning to Integrated Project Delivery: The Owner's Experience	What do owners who have used IPD think about what they can do to improve outcomes?
3	A Simple Framework	What is the roadmap, the strategy to successfully produce a high-performance building?
4	Defining High-Performing Buildings	What is a high-performing building?
5	Achieving Highly Valuable Buildings	What makes a high-value building?
6	Integrating the Building's Systems	How can systems be integrated to achieve a high-performing building?
7	Integrating Process Knowledge	How can process knowledge be integrated?
8	Integrating the Project Organization	What is an integrated project organization, and how is it created?
9	Leading Integrated Project Teams	What is an integrated project delivery team, and how do you create, lead, and manage one?
10	Integrating Project Information	What does it mean to integrate project information, why is this so important, and how can we do this?
11	Managing with Metrics	How do we define and uphold the client's value goals for their unique high-performing building over the course of a project?
12	Visualizing and Simulating Building Performance	How do we enable stakeholders to visualize and understand how their building will perform through every step of design, long before it is built?
13	Collaborating in an Integrated Project	What does it mean to collaborate in an integrated project?
14	Co-locating to Improve Performance	How can we leverage co-location to improve behaviors and outcomes?

TABLE P.1 (continued)

Chapter	Title	Question
15	Managing Production as an Integrated Team	How do we manage production as an integrated project team?
16	Avoiding the Pitfalls of Traditional Contracts	Why is it so difficult to use traditional contracts to support project integration?
17	Contracting for Project Integration	How does an integrated form of agreement support integrated organization and behaviors?
18	Delivering the High-Performing Building as a Product	How can high-performing, valuable buildings be developed and delivered as a product?

GETTING THE MOST OUT OF THIS BOOK

There are at least two ways to read the book. The first is to read about integration in the order it is required, a “why and what” order. We recommend this for people who are not yet practitioners, such as college and university students or outsiders looking into the construction industry. Simply read the chapters in the sequence in which they are presented.

The second way is to follow the order in which projects become integrated, a “how and what” approach. We suspect that experienced professionals may find this easier and prefer to start with the problems they are trying to solve. Because the Simple Framework elements are connected and reinforce each other, we believe readers with experience can begin anywhere and go in whatever direction they want.

Our Journey Writing This Book

We began our journey to write this book in a conversation with the Wiley editor for the *BIM Handbook* at the 2008 Georgia Tech BIM Symposium. Writing a good book about IPD in a year shouldn’t be that difficult, we reasoned. After all, we had extensive experience using BIM, Lean construction, and IPD on projects, and considered ourselves thinkers and leaders in each of these domains.

Almost eight years later, we are now writing this preface. What happened? Why has it taken so long? There’s an old saying that goes, “Be careful what you wish for because you just might get it.” And in this case, we wished for IPD to expand and it did. It became our “day job” that squeezed out time for writing, forcing us to work in “fits and starts.” But lack of time isn’t the only reason this project has taken so long.

As we delved deeper into the subject, we realized that existing frameworks were incomplete. We initially emphasized organization, process, and behaviors, which is what very good thinkers had already done. Leaders of the American Institute of Architects California Council (AIACC) had focused on these issues in their publication *Integrated Project Delivery: Working Definition* (Eckblad et al., 2007). The authors of the paper “Managing Integrated Project Delivery” (Thomson, Darrington, Dunne, & Lichtig, 2009), published by the Construction Management Association of America (CMAA), looked at those same aspects through the lens of Lean and relational contracting.

We thought that these were insightful and very useful documents that did not need to be reinterpreted by us. In fact, we recommend the entire series of papers on IPD produced by AIACC and the CMAA paper and use them in our own practices.

We wanted to expand and go deeper using the book format. And we were very clear that we should not produce a recipe book, even for what seemed like a delicate soufflé. We decided to look at IPD from every angle. We “peeled the onion” and ended up creating an illustration we called the “IPD Universe” that contained the “Magic Formula,” which didn’t vary much after version 9 was drafted in late January 2010. All we did after that was add more horizontal swim lanes for additional pieces of the IPD puzzle; the last version (March 2012) had 14. We were pleased with arriving at the “Magic Formula,” shown in Figure P.1, even though we realized that it was a description rather than an explanation of integrated delivery.

The Magic Formula did and still does make perfect sense to us. IPD has several elements:

- *Value definition.* The first is value definition, where owner organization and user needs and constraints are understood. Understanding stakeholder values is important and reflected in setting performance goals. Owner representatives and delivery team members must turn these goals into performance objectives that can be measured qualitatively or quantitatively.
- *Framework.* Second is the framework consisting of a relational contract, an integrated organization, designing for performance within cost constraints (target value design), and creating an infrastructure of sharing information that any team member created.
- *Environment.* Third is the environment, made up of the right people—meaning people who are willing to think and work differently than on most project teams today. Leaders must be willing to ask people to leave if they can’t change, including themselves. They must be willing to use BIM to visualize and simulate performance as a team, rather than delegate that to a group of specialists. Everyone must be “in.” Team members must co-locate, to be in proximity to respond to questions and work through problems as quickly as possible. Everyone must allow others to see their work plan, progress, and issues. This transparency extends to overall team performance on scope and budget, schedule, safety, quality, and especially the current state of design, overall and in detail.
- *Interactions.* This environment inevitably produces many high-quality interactions among team members in which they exchange ideas while getting to know each other as individuals.
- *Network of knowledge.* People soon realize who knows what and whether they are willing to share their knowledge. A strong network of knowledge forms along with a network of commitments as people learn how to act as good “suppliers” and “customers” by being clear about what they need and when and what they’re capable of providing.

VALUE DEFINITION	FRAMEWORK	ENVIRONMENT	INTERACTIONS	NETWORK OF KNOWLEDGE
<ul style="list-style-type: none"> • Enterprise Needs & Constraints • Stakeholder Values • Performance Goals • Objectives & Metrics 	<ul style="list-style-type: none"> • Relational Contract • Delivery to Target Cost • Integrated Organization • Information Infrastructure 	<ul style="list-style-type: none"> • Right People • Virtual World • Proximity • Transparency 	<ul style="list-style-type: none"> • Quantity • Quality 	<ul style="list-style-type: none"> • Connections Across Boundaries • Clarity of Customer Supplier Relationships

FIGURE P.1 The Magic Formula for integrating project delivery.

The “Magic Formula” is a coherent and concise picture of how the elements of IPD interact. However, something big was missing: the thing teams were creating for their customer. The Formula focused on everything but the product, that is, the building. If the end point was the facility, perhaps we should “pull back” from the outcome to determine how a team can achieve it. But to do that, we needed to define the type of building that people wanted and needed.

We called it the “high-performing building.” It seemed obvious that it had to be useful for the people who would work inside and visit for services. Our definition certainly would include form and aesthetics. The building should be economical to operate. If our planet is to remain habitable, the building should be constructed and run without depleting or harming the environment. It would have to meet planning and building regulations. The building would certainly have to contribute to the success of whoever paid for it, however those people or their organization defined success. That was on the outcome side. On the input/construction side, this high-quality, high-performing building would have to be built for the money and time available. Otherwise, the building would exist only in people’s minds as a need and aspiration.

We knew that all of the elements of the Magic Formula were necessary to create high-performing buildings within the constraints that all but a very few owners face. Our challenge was to find a way to explain this. We had all participated in “pull-planning” sessions in which we helped project teams make value flow by identifying and sequencing only the work needed to create something essential for the success of the project. So it was simply a question of pulling. But what should the order be? The answer came to us in a matter of minutes on September 27, 2012, when Martin Fischer grabbed a marker, walked up to a large whiteboard, and drew the Simple Framework almost exactly in the way we have described it in this book. Martin talked as he drew. The scene is artistically recreated in Figure P.2.

A high-performing building can only be achieved through a building with integrated building systems, which can only be produced through an integrated process, which depends on an integrated team with the right people, which needs integrated information, i.e., BIM+ to function effectively and efficiently. Simulation and visualization are the primary ways in which BIM+ informs the integrated team. Collaboration and co-location are the primary ways that allow the integrated team to integrate processes. Production management methods enable the productive design, fabrication, and construction of the integrated building system. Outcome metrics define the performance of the building and validate the integrated building system. All of this is supported by the appropriate agreement or framework.

At each step of the way, Martin reflected on what the best strategy, action, or tool would be to achieve the next step in the diagram. For example, integrating a building’s technical systems so that they work in concert and not against each other is the best strategy we could think of to achieve a high-performing building. This then required metrics to stipulate the desired performance of a building to measure its performance—as a whole and for the individual systems.

Once Martin drew the diagram, the steps to the high-performance building and their relationship to the Magic Formula seemed obvious. We now had our definition of success for an owner and the project team, the reason why a strong network of knowledge (an integrated organization carrying out integrated processes supported by integrated information) is needed and why the practices we observed on projects—co-locating the project team, formally defining workflows and weekly production plans,

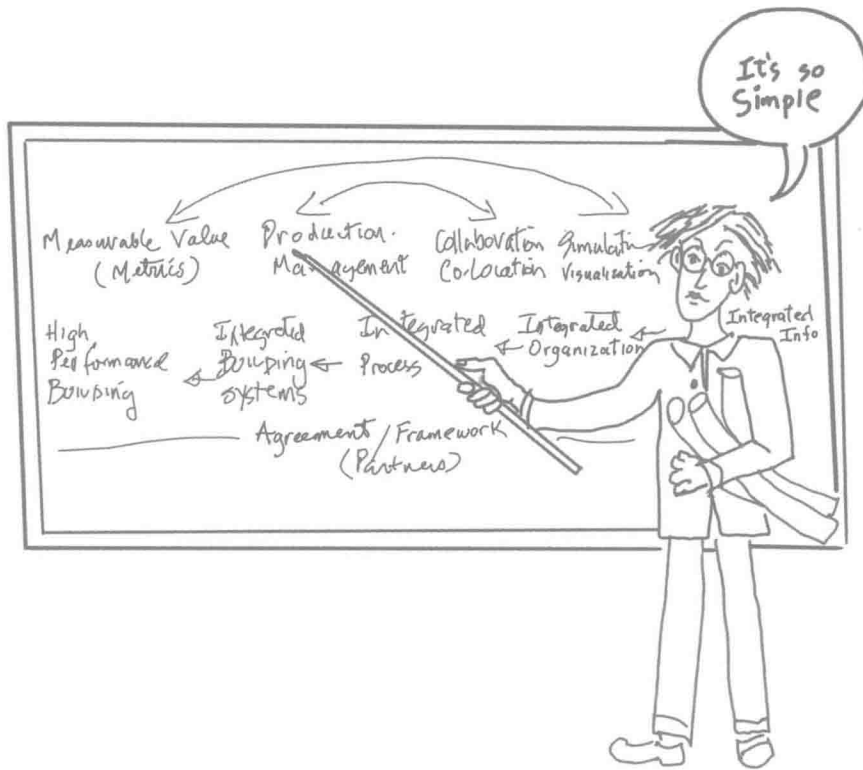


FIGURE P.2 The Simple Framework explained. Courtesy of CDReed.

creating a building information model that combines the work of many disciplines, and so on—made sense.

This Simple Framework could carry all of our thinking in a comprehensive yet comprehensible package. In this new approach, each element would be a chapter. Each chapter would follow a “standard chapter structure.” We would explain the Framework element, describe success, explain how teams can implement the element, provide real-life examples, describe how the element fit with others in the Framework, and end with a reflection on what this means for delivering high-performing buildings, looking forward. We quickly drew up a plan to finish the book within six months because we could now see what had to be done. We were incredibly optimistic and naive about writing! Explaining each piece of the Framework and finding, researching, and describing as many examples as we could turned out to be a lot more work than we ever thought. We failed to account for two critical factors: the first was that estimating time for highly iterative work is very difficult; the second was the fact that time to write became very scarce. We began to make progress, but it was agonizingly slow.

We kept at it, however. Insights kept coming, seemingly on their own when we were ready to embrace them, as with the Magic Formula and Simple Framework. We spent countless hours talking to skilled and experienced practitioners, who explained what they did and how they did it. Visionary and courageous owners shared their stories, as did others blazing trails to the future on their projects and in their companies.

We've come to see the Simple Framework as a model that could be made into a system, where each element depends on all the others and can only produce a breakthrough together but not apart. Models are like the act of planning. Their value is in preparing and orienting people so they can see, think, and act differently than they did before. All models are abstractions of reality, however. To connect the Simple Framework to actual practice, we have interspersed examples of how the principles have played out on real projects. Because individuals and teams can control and change only so much on a project, we felt it was critical that we also describe each of the Simple Framework elements and explain how they interact and contribute to integrating project delivery. That way, readers can start integrating parts of their projects wherever they find opportunity.

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