



even if you can figure out where you're going and find a map to get you there, that may not be the best thing to do.

Forging ahead without detailed specifications to guide you obviously requires innovation, new actions. We take this

In knowledge work, often you can best manage by not enforcing a detailed, in-advance set of objectives, even when you could. Time spent planning what you want to do will be better spent actually doing, trying something you haven't thought out in detail, so you can quickly incorporate what you learn from the experience in the next attempt.

more traditional management models if they want to create economic value in this new century.

We call this approach *artful making*. "Artful," because it derives from the theory and practice of collaborative art and requires an artist-like attitude from managers and team members. "Making," because it requires that you conceive of your work as altering or combining materials into a form, for a purpose.² Materials thus treated become something new, something they would not become without the intervention of a maker. This definition usually points to work that changes physical materials, iron ore and charcoal into steel, for instance. But the work and management we're considering don't always do that. Instead they mostly operate in imagination, in the realm of knowledge and ideas. While artful making improves any thing that exhibits interdependency among its parts, we're not primarily concerned with heating metal and beating it into shapes. We're more concerned with strategies, product designs, or software—new things that groups create by thinking, talking, and collaborating.

ARTFUL MAKING

Any activity that involves creating something entirely new requires artful making. Whenever you have no blueprint to tell you in detail what to do, you must work artfully. A successful response to an unexpected move by a competitor requires artful

activity; so does handling a sudden problem caused by a supplier. An artful manager operates without the safety net of a detailed specification, guiding a team or organization when no one knows exactly where it's going.

In the 21st Century, it's a simple fact that you often don't know where you're going when you start a journey. A manager who needs to be handed a clear set of objectives or a process specification is only half a manager (and not the most important half). To know where you're going by the time you start, that's an amazing luxury and you probably can't afford it. Anyway, if you think you know where you're going, you're probably wrong. The need to innovate, to make midcourse corrections, and to adapt to changing conditions are the main features of a growing part of daily work.

Many people in business admit that parts of their work are "more art than science." What they often mean, alas, is that they don't understand those parts. "Art" used in a business context usually refers to something done by "talented" or "creative" people who are not quite trustworthy, who do work that resists reasonable description. There's often a disparaging implication that art-like processes are immature, that they have not yet evolved to incorporate the obviously superior methods of science. The premise that underlies this point of view equates progress with the development of reliable, rules-based procedures to replace flaky, unreliable, art-based processes. We reject this premise.

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Our close examination of art-based processes shows that they're understandable and reliable, capable of sophisticated innovation at levels many "scientific" business processes can't achieve. A theatre company, for instance, consistently delivers a valuable, innovative product under the pressure of a very firm deadline (opening night, eight o'clock curtain). The product, a play, executes again and again with great precision, incorporating significant innovations every time, but finishing within 30 seconds of the same length every time. And although art-based processes realize the full capabilities of talented



workers and can benefit from great worker talent, by no means do they require exceptional or especially creative individuals. Nor does great individual talent ensure a valuable outcome. A company of exceptionally talented big stars can (and often will) create a less effective play than one made up of ordinarily talented artists who have, through hard work, learned how to collaborate. Business history too provides numerous examples of underdog upstarts out-collaborating and out-executing companies with much better resources; and few (if any) companies have ever worshiped more devoutly at the altar of raw individual talent than Enron, one of the most spectacular corporate failures in history.³

As we will show, underlying structural similarities in costs make theatre rehearsal and other collaborative art processes better models for knowledge work than more rules-based, scientific processes. The key to understanding these similarities is something we call *cheap and rapid iteration*.

HOW CHEAP AND RAPID ITERATION CHANGES EVERYTHING

The *cost of iteration*—the cost of reconfiguring a process and then running it again—significantly impacts the way we work. Reconfiguring an auto assembly process can involve buying and installing new equipment, which can be pretty expensive. So, automakers usually do a lot of planning before they commit to a configuration. They don't want to have to reconfigure very often. They try to “Get it right the first time.”

On the other hand, some software development processes are designed nowadays so that they can be reconfigured cheaply and quickly. Developers generate new versions of a software system as often as needed. Technologies that allow new versions to be rebuilt easily keep the cost of iteration low. When enabling technologies help keep the cost of iteration low, we don't need to worry as much about getting it right the first time. Instead, we can try things, learn from them, then reconfigure and try again. Because it doesn't cost much to

iterate, the value of doing is greater than the value of thinking about how to do. Cheap and rapid iteration allows us to substitute experience for planning. Rather than “Get it right the first time,” our battle cry becomes “Make it great before the deadline.”

Management researchers often talk about cheap and rapid iteration as cheap and rapid *experimentation*. The ability to run experiments cheaply and quickly is an important benefit, for example, allow automakers to run virtual crash-testing experiments to determine the safety implications of many car body structures, more than they could afford to test with actual cars.⁴ But experimentation, though important, is only part of what is achieved by cheap and rapid iteration. If you think and talk about iteration as experimentation, low cost of iteration seems to make business more like science. Its broader effect, though, is to make business more like art.

Here's why: Before you can crash test virtual cars, you must create virtual cars. Cheap and rapid iteration lets you test cars more cheaply, but it also lets you create them more cheaply, and in many more forms. The creation of things to test—in scientific terms, the generation of hypotheses—is a fundamentally creative act. In many business situations, the hypothesis, problem, or opportunity is not well-defined, nor does it present itself tidily formed; you must therefore create it. Even when a problem or opportunity appears well-defined, often you can benefit from conceiving it in a new form. The form you conceive for it—the idea of it you have—will determine how (and how well) you solve it. Cheap and rapid experimentation lets you try new forms; cheap and rapid artful iteration helps you create new forms to try.

Artful making (which includes agile software development, theatre rehearsal, some business strategy creation, and much of other knowledge work) is a process for creating form out of disorganized materials. Collaborating artists, using the human brain as their principal technology and ideas as their principal material, work with a very low cost of iteration. They try some-

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thing and then try it again a different way, constantly reconceiving ambiguous circumstances and variable materials into coherent and valuable outputs.

Artful making differs from what we call *industrial making*, which emphasizes the importance of detailed planning, as well as tightly specified objectives, processes, and products. Its principles are familiar: Pull apart planning and production to specialize each; create a blueprint or specification, then conform to it; don't do anything before you know you can do everything; "Get it right the first time." When industrial makers conform to plans and specifications, they say their products and processes have "quality." The principles of industrial making are so embedded in business thinking that they're transparent and we don't notice them. We apply them reflexively; they are "The way we do things." But, as we shall see, industrial methods can distort reality and smother innovation. Artful and industrial making are distinct approaches and each must be applied in the appropriate conditions.

It's important to recognize that artful and industrial making are not mutually exclusive. Artful making doesn't replace industrial making. Artful making should not be applied everywhere, nor should industrial making. They complement each other and often can be used in combination. Complementary doesn't mean interchangeable, though. As opportunities for artful making multiply with the expansion of the knowledge work sector of business, managers and other workers must be careful not to attempt to solve artistic problems with industrial methods, and vice versa.

THE HISTORY AND ORIGINS OF THIS BOOK

The collaboration that led to this book began with a telephone call in 1998. Rob (a business professor) asked Lee (a theatre professor) to repeat a story he'd told when Rob was his student at Swarthmore in the early 1980s. The story was about different ways of controlling human action. When he called,

Rob was trying to understand why control mechanisms that work well for physical activities seem to work less well for knowledge work. Lee recognized some of the issues from conversations with his son, Sean (then an engineer/manager at Allied Signal); they had been casually wondering how to apply principles of theatre improvisation to the reluctance of engineers to look beyond the back of the book for solutions to new problems. A subsequent series of increasingly energetic conversations between Rob and Lee turned to broader issues of how highly skilled people engaged in creative activities might be managed (or "directed," as Lee put it).

We were surprised to discover common patterns and structures in our separate domains. Rob talked about software development; Lee talked about play making. But the issues sounded oddly, and increasingly, similar. Some recent ideas and methods in software development, especially in the so-called "agile" community, seemed almost identical to theatre methods. As this became more obvious, an idea dawned on business professor Rob: *These artists are much better at this than we are.* Managers and management students don't understand how to create on cue, how to innovate reliably on a deadline, something theatre companies do all the time.

We quickly noticed something else. As Rob tried to understand how theatre ensembles innovate in rehearsal, he kept missing the point; or so it seemed to Lee. Now, missing the point isn't an entirely new experience for Rob, but there was more to this problem than intellectual density. As Rob listened and tried to repeat back what he heard, Lee and the artists at the People's Light and Theatre Company gradually took on an aspect of polite rather than interested attention. Eyes glazed and conversation grew desultory. Rob's management language didn't accommodate the theatre's idea of work. An example will help illustrate what we mean.

Early in this research, thinking about cheap and rapid iteration as a way of working, we found ourselves talking about

iterative structure (trying and trying again), an unusual notion of supervision and control, and getting a lot of things “wrong” on the way to high-quality choices. More important than these structural similarities, though, are other factors that emerge when we view these examples through an artful lens: the importance of individuals’ efforts to release themselves from restraining preconceptions and inhibiting circumstances; the intensity and interdependency of these collaborations; the understanding of “wrong” choices as advances rather than setbacks; the sense of the emerging product as something better and more interesting than anything a single person could have preconceived, greater than the sum of its parts; an unpredictable result that in retrospect seems inevitable.

Here lies the most important reason for managers to understand the methods of collaborative artists. It’s not that traditional managers can’t notice and emulate things like an iterative process structure. But to capture the full power of such processes requires understanding at a different level. It requires turning the focus knob of a figurative microscope to bring into the foreground, not the external symptoms and discrete *parts* that our industrial metaphors predispose us to notice, but rather those *qualities* of work that artists know and use. If we don’t shift our focus this way, we risk reproducing the surface features of successful knowledge work without capturing its essence.

For years, Toyota has provided tours of its plants to executives from other companies, fully exposing and explaining the famous Toyota Production System. Many of these executives have returned to their own companies determined to reproduce the system faithfully. They count the same things, espouse the same principles, and so on. But as Toyota seems to realize, very few of their visitors come away with a true understanding about what is different about their system. Hence Toyota has little fear that their methods will be used successfully to compete with them.

We want to help you see business processes through an artful making lens that looks beyond the surface features of artful collaboration to tap into the kind of on-cue innovation that theatre companies achieve routinely. To accomplish this, we

introduce a framework for organizing our thinking, for establishing new categories that we use to conceptualize productive activities and performance.

THE FOUR QUALITIES OF ARTFUL MAKING (AN ARTFUL FRAMEWORK)

What did “We have play” mean at the end of that *Streetcar* rehearsal? Was the work done? Rehearsals over? No. Two and a half more weeks of rehearsal and a couple of previews remained before opening night. And then, since there’s no way to package a play, put it on a shelf, and bring it out for performance, the company would make it again for each night of the run.

When the actor said, “We have play,” he meant that the cast’s work of making an ensemble, a working group whose product is greater than the sum of its parts, had achieved its first success. The new thing in the room was *Ensemble*, one of the four qualities of artful making, and the most important step in creating the work of theatre art we call a play.

Here are the four qualities that we propose for artful making, each followed by a preliminary definition. These essential features of artful making, their relationships with each other, and their applications to work will emerge as we go along. In the body of the book, we’ll discuss them all, and at the book’s end we’ll use them to gather up an understanding of artful making that will come together as a conception of work and working, a way to think about what you do.¹²

- **Release**—The first (and perhaps the most counter-intuitive) quality of artful making, essential to the other qualities. A method of control that accepts wide variation within known parameters. Release contrasts with *restraint*, the usual method of industrial control.
- **Collaboration**—The quality exhibited by conversation, in language and behavior, during which each party, released from vanity, inhibition, and preconceptions,

treats the contributions of other parties as material to make with, not as positions to argue with, so that new and unpredictable ideas emerge.

- **Ensemble**—The quality exhibited by the work of a group dedicated to collaboration in which individual members relinquish sovereignty over their work and thus create something none could have made alone: a whole greater than the sum of its parts.
- **Play**—The quality exhibited by a production while it is playing for an audience; or, the quality exhibited by interaction among members of a business group, and ultimately between the group and the customer.

As we've said, these qualities require discussion before they can become tools for fashioning new ideas about work. *Play* especially requires a step-by-step approach to understanding, and a conceptual leap to the idea of the product as an interaction between maker and customer.¹³ We introduce the four qualities here so that they and the way they fit together can begin to take shape as you apply them to your situation.

UNDERSTANDING ARTFUL MAKING

In the coming chapters, we will further explain the changes an artful making lens portends in modern organizations. As we do this, we'll also answer questions that have recently been raised in areas of business where managers and workers have invented and embraced artful methods.

For example, we'll explain the specific factors and cost conditions which lead to the growing prominence of artful making at this time in history. We will identify the prerequisites that must be in place before it makes sense to take an artful making approach; in many situations, industrial making still serves very well and it would be unwise to apply artful making. We will point out similarities between evolving methods in apparently unrelated business areas and demonstrate how the artful

making metaphor conceptually unites them. We will show that artful approaches are not mysterious, or flaky or fiscally irresponsible; that they are in fact learnable, rigorous, and reliable.

In the ensuing chapters, we'll often use software development as an example of modern knowledge work. Software developers, particularly those who follow so-called "agile" practices, have wrestled extensively with the challenges of artful making; their efforts provide insight into how artful making can be successful in business. But this book is not about software development. We focus at times on agile software development because it suggests what is to come in much of knowledge work. As we shall see, the signs of change are already emerging in vastly different business areas, from strategy making to managing and financing large-scale projects and ventures.

ENDNOTES

1. Original use of this phrase to describe the materials of knowledge work was by Frederick P. Brooks, Jr. in "No Silver Bullet: Essence and Accidents of Software Engineering," *IEEE Computer*, 20, no. 4 (April 1987) pp. 10-19.

2. Personal communication with the authors, Summer 2002.

3. In fact, artistic license depends on fiscal responsibility. Only when a theatre is doing a good job on the fiscal side does it have freedom on its artistic side. If a theatre fails to balance income and expenses, it goes under. No class of business enterprise we know has more skill than some theatres at squeezing a dollar for maximum effect. That sound you hear in the hallways is the eagle screaming.

4. For example, the JavaStation rollout within Sun, a consequence of the artful events described here, was much more industrial in its approach.

5. The information in this section is drawn from Mark Cottleer and Robert D. Austin, "Sun Microsystems: Realizing the Business Value of Web Technologies" (Harvard Business School case no. 198-007, 1998).