

## **CHAPTER 1 TOPICS**

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# 1

## Expertise in the Global Economy

*An expert is a man who has made all the mistakes that can  
be made in a very narrow field*

NEILS BOHR

**WHAT IS AN EXPERT?** How do people become experts? Is expertise a matter of talent or learning? What types of expertise are most needed in the new global economy? How can instructional professionals make use of what we know about experts to build more effective learning environments? This chapter sets the stage for the book by summarizing what we know about expert performance and why effective training programs are critical to organizations facing the competitive pressures of a growing global pool of expertise.

### The Value of Expertise

If you have taken an airplane trip, consulted a medical professional, used computer systems, or attended a professional ball game or a concert, you have benefited from expertise! In fact, few

of us would get through a normal week were it not for the varied expertise that provides the infrastructure for our many daily activities. This is a book about expertise—specifically how to grow and deploy expertise most effectively to achieve organizational goals.

There is a large untapped reservoir of knowledge about how novices become experts and how that transition can be facilitated through training and other workplace solutions. In fact, as I write this third edition of *Building Expertise*, the research on expertise has grown sufficiently to warrant a new forty-two-chapter book: *Cambridge Handbook of Expertise and Expert Performance*, published in 2006! Knowledge about expertise is untapped in part because much of the recent research on human learning and expertise is buried in academic resources such as the *Cambridge Handbook* not routinely accessed by practitioners.

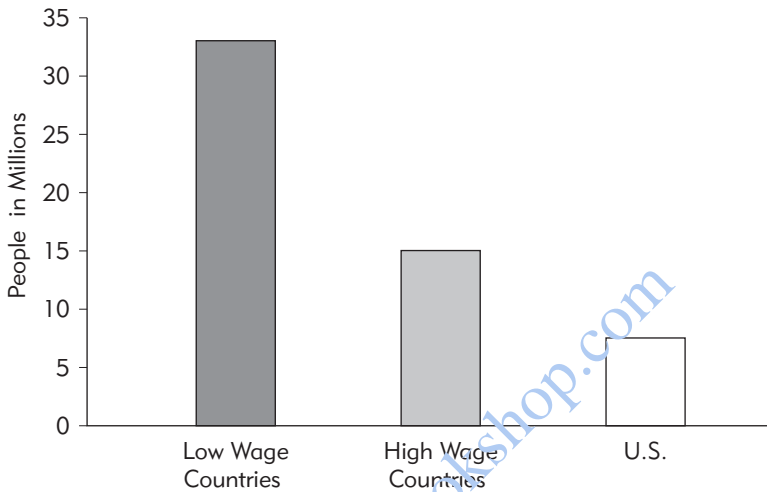
Instructional professionals like you who are responsible for the growth of expertise in your organization can benefit from this research. In other words, you need expertise on expertise. My objective in this book is to summarize the research and psychology about what we currently know about growing and leveraging expertise in organizational settings.

## **The Challenge of Global Expertise**

Workers in developed countries face increasing global competition for expertise. Uhalde and Strohl (2006) estimate as many as forty million American jobs, equivalent to nearly a third of the U.S. labor force are theoretically vulnerable to off shoring. The expanding global pool for the type of higher level skills that have historically been the province of developed nations comes from the BRIC (Brazil, Russia, India, and China) supply chain. Since the turn of the century, 1.5 billion people from China, India and countries from the former Soviet bloc have joined the global labor force. Data from a 2005 McKinsey report summarized in Figure 1.1 show young professionals from low-wage countries, including engineers, finance analysts and accountants, and

**Figure 1.1. Young Professionals in the Global Talent Pool, 2005**

From McKinsey, 2005



generalists with university degrees make up the largest segment in the global talent pool. And foreign skilled professionals will continue to be inexpensive for several decades to come making some forms of expertise in Western workforces less competitive.

An organization's ability to innovate becomes the competitive edge in a global economy. "The need to innovate is growing stronger as innovation comes closer to being the sole means to survive and prosper in highly competitive and globalised economies" (David & Foray, 2003, p. 22). Therefore a recurrent theme in this book is the psychology of expertise—especially adaptive expertise that is the basis for creative and critical thinking.

## What Is an Expert?

According to Wikipedia (2007), an expert is "someone widely recognized as a reliable source of technique or skill whose faculty for judging or deciding rightly, justly, or wisely is accorded

authority and status by the public or their peers. An expert, more generally, is a person with extensive knowledge or ability in a particular area of study". Wikipedia, one of a growing cadre of open-access software, did not exist at the writing of the second edition of this book and illustrates one way that expertise can be deployed through the Web 2.0.

Of course, expertise is not all or nothing. As one begins to learn a new set of skills, one evolves from novice through various skill levels up to expert or master performer. Table 1.1 summarizes the common labels and attributes associated with stages of expertise. As training professionals we encounter diverse levels of expertise in the course of our work. We may interview subject-matter experts who are, as the name implies, experts or even

**Table 1.1. Levels of Expertise**

<i>Level</i>	<i>An Individual Who</i>
Novice	Has minimal exposure to the field
Apprentice	Has completed a period of study beyond introductory level and is usually working in a domain under supervision
Journeyman	Can perform routine work unsupervised
Expert	Is highly regarded by peers; whose judgments are uncommonly accurate and reliable; whose performance shows both skill and economy of effort; and who can deal with unusual or tough cases
Master	Can teach others; a member of an elite group of experts whose judgments set regulations, standards or ideals

Based on Chi, 2006

master performers. Our learners are often at the novice or apprentice stages. Our training goals are often relatively modest in scope, perhaps to bring a novice closer to an apprentice level, or perhaps to teach a journeyman a new set of specialized skills or knowledge. As instructional professionals however, we are collectively responsible for the investment of close to \$60 billion a year in the United States alone devoted to the growth of the specialized expertise that makes our organizations competitive (Industry Report, 2007).

## Seven Lessons Learned About Experts

Psychologists have studied experts in a variety of domains, including sports, medicine, programming, music, and chess to see how they are different from less-skilled individuals. Here are the main lessons learned from that research:

### 1. Expertise Requires Extensive Practice

As you can see in Table 1.2 world-class experts start early in life and pursue their vocations through many years of prolonged and

**Table 1.2. Years of Practice to Achieve World-Class Performance**

<i>Domain</i>	<i>Starting Age</i>	<i>Years to International Performance</i>	<i>Age of Peak Performance</i>
Tennis	6.5	10+	18 to 20
Swimming	4.5	10	18 to 20
Piano	6	17	NA
Chess	10	14	30 to 40

Source: Ericsson, 1990

concentrated practice. While an acceptable level of performance in many tasks such as typing or tennis can be reached in a matter of a few weeks or months, high levels of expertise demand years of practice. Some of the first research focused on master-level chess players. About ten years of sustained chess practice is needed to reach master levels. In fact, from sports to music to programmers, the ten-year rule has proved pretty consistent. “Until most individuals recognize that sustained training and effort is a prerequisite for reaching expert levels of performance, they will continue to misattribute lesser achievement to the lack of natural gifts, and will thus fail to reach their own potential” (Ericsson, 2006, p. 699). In other words, while innate ability is one factor that contributes to expertise, most of us do not invest the level of practice needed to fully exploit the talents we have.

While most practice takes place on the job, as a trainer or instructional designer, you can leverage what we have learned about accelerating expertise through appropriate practice during training. For example, after twenty-five hours of study with a computer training simulator called Sherlock, learners with about two years of experience achieved a level of expertise that matched technicians with ten years of experience (Gott & Lesgold, 2000)! Acceleration of expertise can be achieved when training is designed on the basis of human psychological learning processes.

## 2. Expertise Is Domain Specific

Because someone is an expert chess player, will he or she be better prepared to solve a problem in physics? In general, the answer is no! Fields of expertise are very narrow. That’s because expertise relies on a large body of *specific* knowledge accumulated over time in memory. Master-level chess players, for example, store over 50,000 chess plays in memory (Simon & Gilmarin, 1973).

These play patterns were acquired gradually over a ten-year period. Successful programmers solve new programming problems by drawing on specific programming strategies that have worked for them in the past.

Studies of expert performers show that concrete and specific knowledge stored in memory is the basis for expertise. Each job domain will require a unique knowledge base and a specialized educational and developmental program to build it. When it comes to high levels of expertise, there are no generic or quick fixes!

### 3. Expertise Requires Deliberate Practice

Although a long period of practice is needed, not everyone who invests a great deal of practice time will achieve high proficiency levels. We are all familiar with the recreational golfer who spends many hours playing, but never really moves beyond a plateau of acceptable performance. Ericsson (2006) distinguishes between *routine practice* and *deliberate practice*. For example, he found that all expert violinists spent over fifty hours a week on music activities. But the best violinists spent more time per week on activities that had been *specifically tailored* to improve their performance. Typically, their teachers identified specific areas of need and set up practice sessions for them. “The core assumption of deliberate practice is that expert performance is acquired gradually and that effective improvement of performance requires the opportunity to find suitable training tasks that the performer can master sequentially. . . . typically monitored by a teacher or coach” (Ericsson, 2006, p. 692). Deliberate practice requires good performers to concentrate on specific skills that are just beyond their current proficiency levels.

### 4. Experts See with Different Eyes

A profession that relies on visual discrimination such as radiology provides a salient example of seeing with different eyes.

Even experienced physicians rely on the unique expertise of the radiologist to review various forms of medical imagery and provide interpretations. However, experts from all domains “see” the problems they face in their domains with different eyes than those with less experience. A programmer looking at code, a chess player viewing a mid-play board, or an orchestral conductor scanning the musical notation and hearing the symphony—all take in relevant data and represent it in ways that are unique to their expertise. As a result of their unique representations, they can choose the most appropriate strategies to solve problems or improve performance. Part of building expertise is to train the brain to “see” problems through the eyes of an expert; in other words, to build the ability to represent problems in ways that lead to effective solutions.

## 5. Experts Can Get Stuck

While expert performance is very powerful, expertise has its down sides. For example, based on their extensive experience, experts can be inflexible; they can have trouble adapting to new problems—problems that will not be solved by the expert’s well-formed mental models. Bias is a facet of inflexibility. In presenting hematology cases or cardiology cases to medical specialists such as hematologists, cardiologists, and infectious disease specialists, Chi (2006) reports that specialists tended to generate hypotheses that corresponded to their field of expertise *whether warranted or not*. “This tendency to generate diagnoses about which they have more knowledge clearly can cause greater errors” (p. 27).

An advantage of any organization competing in a global talent pool is innovative and creative expertise. Uhalde and Strohl (2006) point to thinking and reasoning competencies including critical thinking, originality, innovation, inductive and deductive reasoning, and complex problem solving as critical to the new economy. Therefore, seeking ways to build flexible expertise that is the source of innovation is an increasingly important goal.

## 6. Expertise Grows from Two Intelligences

Bransford and his colleagues (2006) distinguish between *routine expertise* and *adaptive expertise*. Routine experts are very effective solving problems that are representative of problems in their domain. They are adept at “seeing” and efficiently solving the problem based on their domain-specific mental models. The medical experts mentioned in the previous paragraphs are examples of routine experts. In contrast, adaptive experts evolve their core competencies by venturing into new areas that require them to function as “intelligent novices.”

Cattell's (1943, 1963) concepts of crystallized and fluid intelligence align well with the distinction between routine and adaptive expertise. *Fluid intelligence* is the basis for reasoning on novel tasks or within unfamiliar contexts; in other words, it gives rise to adaptive expertise. In contrast, *crystallized intelligence* is predicated on learned skills such as mathematics and reading and is the basis for routine expertise. “In this view, crystallized abilities are essential in the development of well-organized knowledge structures that lead to expertise, while fluidization requires that learners revise existing problem-solving strategies, assemble new ones, search for new analogies, or new perspectives” (Nietfeld, Finney, Schraw, & McCrudden, 2007, p. 511).

In a test of four dominant theories of intelligence, Nietfeld and his co-authors (2007) found that the crystallized-fluid theory of intelligence best fit their data. Important for our perspective as trainers is that both crystallized and fluid abilities can be developed. The research team suggests that initial lessons should “provide background knowledge in a direct instruction format (crystallized abilities) followed by discovery or inquiry based formats enhanced with cooperative learning projects that emphasize the abstraction, transfer, and application of important classroom concepts (fluid ability)” (p. 511).

An emphasis on innovative or creative thinking as a source of competitive edge suggests the need to encourage adaptive types of expertise or fluid intelligence through education, training and organizational policies and practices. In Part III of this book, I discuss instructional approaches that support adaptive forms of expertise.

## 7. Challenging Problems Require Diverse Expertise

Because expertise tends to be extremely specific and because most problems that face large organizations are complex enough to require diverse expertise, increasingly, innovation will depend on what psychologists call *distributed cognition*. One example of distributed cognition is found in work teams. Effective teams made up of multidisciplinary experts are the key to solving many challenging problems. Accomplishments based on teamwork are more the rule than the exception. For example, contrary to the myth of the lonely scientist, most modern scientific findings today are the result of research teams working collaboratively. In the medical arena, health care depends on the effective interaction of the nurse, laboratory technician, radiologist, and primary and specialty physicians.

Distributed expertise suggests that those responsible for expertise in organizations consider not only training but other vehicles for the leveraging of diverse skills. The evolution of the Web-2 with social software such as wikis opens new channels for distributed expertise in organizations. You can deploy valuable expertise throughout your organization with knowledge management techniques that use participative technology. For example, experienced sales professionals post proposal templates and examples on the corporate website. Or experienced technicians contribute to a maintenance wiki that includes troubleshooting decision trees for unusual failures as well as stories—stories indexed to specific equipment failures.

Expertise, both routine and adaptive, is an essential asset to any organization. Training and performance improvement professionals are entrusted with designing work environments that effectively build and distribute expertise in organizations. In *Building Expertise* you will learn about research-based instructional methods that lead to organizational expertise.

## COMING NEXT

### Four Ingredients of Instruction

We've seen that expertise is the product of mental models that develop over long periods of time, with the highest levels of expertise growing out of deliberate practice. In the next chapter, I present an overview of four key components in any training program: delivery media, communication modes, instructional methods, and design architectures. Your decisions about these components will define the success of your efforts to build expertise in your organization.

### Suggested Readings

- Chi, M. T.H. (2006). Two approaches to the study of experts' characteristics. In K.A. Ericsson, N. Charness, P.J. Feltovich, & R.R. Hoffman (Eds.), *The Cambridge handbook of expertise and expert performance*. New York: Cambridge University Press.
- Ericsson, K.A., Charness, N., Feltovich, P.J., & Hoffman, R.R. (Eds.). (2006). *The Cambridge handbook of expertise and expert performance*. New York: Cambridge University Press.