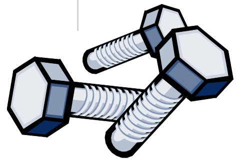

What You Already Know Does Matter

Expertise and Electronic Performance Support Systems

by Frank Nguyen

Have you ever lost one of the small screws that hold your eyeglasses together? Perhaps the only thing that is more frustrating than looking for that tiny bit of hardware among the thousands of strands of plush carpet in your living room is trying to reinstall it. Handling the microscopic screw requires the dexterity of a surgeon, and securing it requires tools that few people keep handy. I personally have sacrificed many layers of skin trying to twist those little screws using the wrong end of a butter knife, the back side of a key, or any other convenient instrument within reach. Ultimately, after several minutes of futility, I give up, extract my precision screwdriver set from the back of the closet, and finish the task within seconds.

Have you ever witnessed multiday marathon training interventions applied to a performance problem that could have readily been solved with a simple job aid or communication? Has anyone in your organization ever introduced a new concept or tool only to find that "killer app" inappropriately applied to every single performance problem thereafter?

As in the case of the screw and screwdriver, we are often tempted to apply the tools and interventions that are convenient or familiar to us. Unfortunately, we may waste valuable time and resources doing so. Even worse, when the incorrect interventions are applied, the performance problem may persist. To efficiently solve performance problems, human performance technologists must be able to analyze the business environment and conditions to determine whether a particular performance problem requires an eyeglass screw, a 10-inch bolt, or perhaps even a nail.

One important factor to consider when analyzing a performance problem is the performer's level of expertise. Numerous research studies have found that certain rich instructional methods and media may enhance learning for novice performers, but they actually depress learning as performers become more advanced (Clark, Nguyen, & Sweller, 2006; Kalyuga, Chandler, & Sweller, 1998, 2000, 2001; Mayer & Gallini, 1990; McNamara, Kintsch, Songer, & Kintsch, 1996; Van den Broek, Tzeng, Risden, Trabasso, & Basche, 2001). As a result, although certain instructional design practices are valid for novices, they should be altered or even completely eliminated for experts. This phenomenon is known as the *expertise-reversal effect* (Kalyuga, Ayres, Chandler, & Sweller, 2003).

Guidelines for Using EPSS

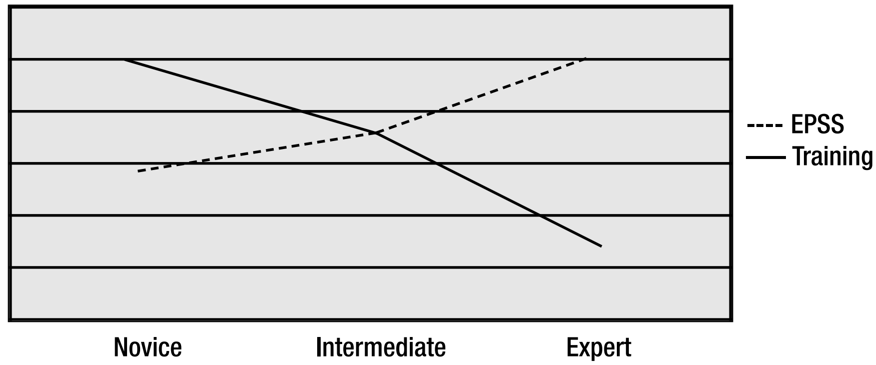

Figure 1. Expertise Reversal Applied to EPSS and Training Interventions.

Though the expertise-reversal effect has been empirically correlated with particular instructional design methods, it may also be applied to another common information intervention: Electronic Performance Support Systems (EPSS). Rather than focusing on delivering information up front, as with training, performance support systems seek to provide employees with "individualized online access to the full range of… systems to permit job performance" (Gery, 1991, p. 21). Using EPSS, we can provide employees with the information and tools that they need to do their job, on the job. This article outlines two important guidelines that should be considered when implementing EPSS while paying particular attention to your performers' level of expertise.

Guideline 1: Vary Interventions as Users Gain Expertise

Vary the volume of performance support and associated training interventions as users gain expertise. Though it would be ideal to completely eliminate upfront training interventions and provide novice performers with embedded, on-the-job tools exclusively, such an approach could have undesirable if not catastrophic consequences. For example, imagine if a novice pilot took the controls on your next airline trip with no training but a bevy of performance support tools in the cockpit. Would you sit back and enjoy your flight while the pilot researched how to land the plane? Imagine if a computer technician arrived at your office fresh out of the human resources office with no technical training, armed with an array of EPSS tools. How quickly would the technician be able to resolve your issue?

The reality is that, although EPSS can vastly improve the performance for novice users (Nguyen, Klein, & Sullivan, 2005), use of the support content typically requires some prerequisite knowledge, which should be delivered through upfront training or education programs. In addition, certain performance support systems are so complex that they require training before the performer may even use the system.

Conversely, how often have you heard an employee complain "the class was a waste of time; I did not learn anything new"? Organizations may be wasting precious resources by sending experts to training when these individuals already know the majority of the information delivered in training courses. These performers have already mastered the critical, foundational objectives of a content area and may be more interested in finding information that would help them solve a more advanced, immediate problem. Supporting the performance and personal growth of such experts would be better served through EPSSs that allow them to search for relevant information and possibly even share their knowledge with peers, novices, and intermediate performers.

Figure 1 illustrates the notion that upfront training should comprise a more significant portion of the information interventions provided to novice performers, compared to associated EPSSs. As implied by the expertise-reversal effect, the quantity of training could be decreased as users gain experience and knowledge. Meanwhile, the quantity of performance support systems should be increased to provide more advanced performers access to larger databases as they increase the scope and complexity of their work.

Guideline 2: Vary the Type of System Based on User Expertise

Vary the type of EPSS offered to users based on their level of expertise. Have you ever pressed the infamous F1 help key on your keyboard while using a software application, only to find yourself thinking that you need help finding information in the help system? Have you ever searched for information on the Internet and found yourself sifting through thousands of irrelevant results looking for the proverbial needle in a haystack? A research study conducted by Spool (2001) found that users located relevant content 55% of the time on their first search attempt. Spool noted that the "more times users searched, the less likely they were to find what they wanted" (Spool, 2001, p. 1). In fact, users who searched twice found relevant content only 38% of the time; those who searched three or more times never located the correct support information (Spool, 2001). Nguyen and colleagues (2005) also found that novice users provided with more advanced, integrated types of EPSS used these systems two to three times more than a search engine and were 4%–10% more accurate on task performance.

Figure 2 explains the various categories of performance support systems and examples of each type (Gery, 1995). The three types of systems vary the level of integration between the EPSS and the performer's workspace. External systems are completely separate from the workspace and, therefore, require the performer to stop working, go to the EPSS, search for and locate relevant support information, learn the information, and then return to work. Extrinsic systems integrate with the workspace so that users do not have to search for relevant information, but the EPSS still sends the user to an outside system to learn and master the support content. Intrinsic systems integrate the information or support mechanism directly into the workspace itself, thereby reducing load on the performer.

Type	Definition	Examples
External	Performance support that is not integrated into the users' workspace that "requires a worker to break the work context entirely."	•Help Desk •Job Aids •Manuals •Search Engines
Extrinsic	"Performance support that is integrated with the system, but is not in the primary workspace."	•Context-Sensitive Help •Online Help
Intrinsic	"Performance support that is inherent to the system itself. It's so well integrated that, to workers, it's part of the system. "	•Human Factors Engineering •User-Centered Design •Wizards

Figure 2. Types of EPSS (Source: Gery, 1995, p. 51).

Figure 3 illustrates the notion that the majority of performance support systems provided to novice performers should be comprised of intrinsic and extrinsic systems: those that are tightly integrated with their workspace. Any external systems that would require the novice user to disrupt his or her workflow to search for information should be minimized as much as possible. By doing this, the amount of time and cognitive resources that the performer must expend to search for and learn relevant support content can be minimized. In addition, the frequency of system use would likely increase and the quality of performance improve.

However, there seem to be exceptions to this rule. If you ask any software developer what tool he or she uses to help answer application development issues, they will likely cite Microsoft Developer Network or a similar vendor-support forum. In addition, arguably the most widely used performance support system in use today is an external one: the search tool Google.

As users gain expertise in their content area, they develop schemas and mental models that aid them while they search through the vast amount of content in an external performance support system. Their prior knowledge and experience allow them to more quickly identify content that may be relevant to their immediate problem. In addition, their mastery provides them with a wider breadth of terms and keywords to use to search for relevant information, while a novice may not even know where to begin.

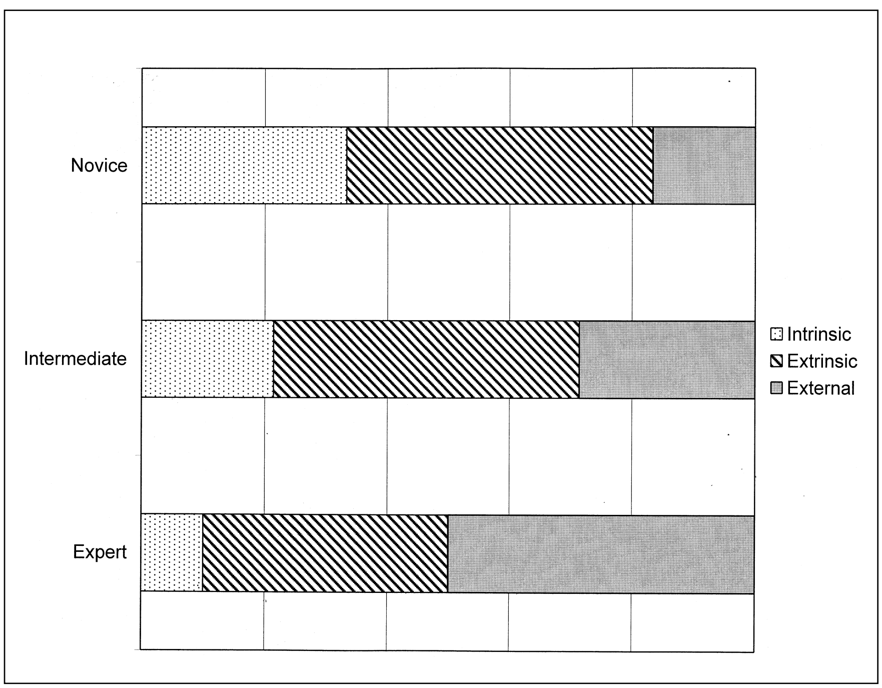

Figure 3. Expertise Reversal Applied to EPSS Types.

Although more integrated types of EPSS would likely have a positive effect on experts' performance, the increase may not be as dramatic as that seen in novice users. In other words, due to the fact that experts could likely cope with the challenges presented by external performance support systems better than novices, the benefits offered by certain intrinsic and extrinsic EPSS designs may not be justified by the additional financial costs associated with developing and implementing these more integrated systems. As illustrated in Figure 3, the amount of intrinsic and extrinsic support can be decreased for experts, while more external EPSS can be introduced into their environment.

Conclusion

Many factors must be considered when recommending interventions to solve a performance problem. One key factor to consider when recommending performance support and associated training interventions is the performers' level of expertise. Though a relatively large combination of integrated performance support systems with associated training may be appropriate for novice performers, the same may not be true for intermediate or expert performers. As suggested by the expertise-reversal effect, advanced users may perform equal or better when provided with less integrated external support systems and less upfront training. As a performance technologist, you may be able to refrain from driving a screw with the wrong end of a butter knife by using the deliberate, careful combination of these interventions.

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Frank Nguyen is a doctoral candidate focusing on performance support systems. He has managed the development and deployment of enterprise e-learning and performance support systems at Intel Corporation for the last five years. Nguyen is co-author of *Efficiency in Learning* (Jossey-Bass, 2006) and holds a master's degree in Educational Technology from Arizona State University. He may be reached at frank.nguyen@asu.edu.