

Are we designing for expert use or just really good beginners?

Dean Hooper, Principal

HE Consulting LLC

It is a common creed within the user centered design community to design not only for first use and novice users but for “expert” users as well. A frequent example of a design principle is to provide two paths to a successful interaction; one with clear, distinct steps for the beginner user and the other with “short cuts” for expert users. The idea is that once a user gets accustomed to performing a task, they desire a way to compile a few key presses into sort of a macro function. They no longer need to know how to perform a task by incremental steps; they desire the ability to quickly “go there” and get done with it. But, are we really designing for expert users or are we just focusing on really good beginners? And if so, do we really need to pay attention to the needs of experts? This question really goes beyond semantics to be one of possible neglect.

The empirical research into expertise has yielded a pretty reliable description of the transition from novice and advanced beginner to competent practitioner to expert. I think this can best be described with a stage model; the stages being Novice, Advanced Beginner, Competent Performer, and Expert. Novice users focus on accomplishing the task. They are generally not interested in learning theory or other concepts dealing with the system of use beyond how to complete the work at hand. They rely on a serial, step-by-step approach at task completion. While they may possess good theoretical knowledge, they have difficulty applying it to the work at hand. While advanced beginners also focus on the task at hand with little interest for the finer points of the system, they have the basics of a working model of the system as a whole and they can easily and quickly perform routine tasks, but may lack the experience for recognizing novel system states.

Table 1. Use categories as outlined by Hackos & Redish (1998)¹

Competency Level	User Description
Novice	<ul style="list-style-type: none">• Focus is on accomplishing real work. Impatient with learning concepts rather than performing tasks, they rely on a serial, step-by-step process to complete work.• Good theoretical understanding; however, little if any practical experience with system.
Advanced Beginner	<ul style="list-style-type: none">• Focus is on accomplishing real work. Impatient with learning concepts rather than performing tasks.• Randomly access tasks because they lack a clear, concise working model of the system environment. Work can be inefficient because they don't understand the system.• Have the basics for developing a clear working model based on hands-on experience and/or systematic training.

¹ Hackos, JoAnn T & Redish, Janice, C. (1998). *User and Task analysis for Interface Design*. John Wiley & Sons, Inc. New York.

Competency Level	User Description
Competent Performer	<ul style="list-style-type: none"> • Can perform more complex tasks that require coordinated actions. • Willing to learn how tasks fit into a consistent mental model of the user interface as a whole. • Interested in solving simple problems by applying a conceptual framework to diagnose and correct errors.
Expert	<ul style="list-style-type: none"> • Focus on developing a comprehensive mental model of the device/patient system. • Using this model and a vast store of practical experience, they understand complex problems and quickly provide solutions. • Interested in learning about concepts and theories of system design and use. • Routine tasks are over-learned. That is, they can perform these tasks with minimal cognitive effort. • Interest in interacting with other experts.

Fully competent performers, on the other hand, have developed a good system model and can be relied upon to perform complex and/or novel tasks. They are willing to learn how tasks fit into a holistic system model. They are interested in solving simple system problems by using an accurate mental model of the whole system. They also show a desire to teach others basic concepts and help more junior personnel solve use related problems. These three “stages” of expertise account for almost all of any user population. True experts are those that focus on developing a comprehensive mental model of the entire use environment. Using this understanding and a vast store of experience, they can quickly and accurately solve the most complex problems. They have a good deal of interest in understanding the concepts and theory behind system design and use. For example, they tend to resist “black box” solutions. They desire interaction with other experts and typically accomplish this through research activities and conference participation.

Given these characteristics, it would appear that when designers purport to be focusing on expert users; they are, in reality, designing to advanced beginners. Once a user reaches a fully competent level, he or she begins to focus on how the system works, not how to perform a step by step process. I have seen this many times during user needs gathering and usability testing; when asked to provide preference for a fully manual system that every task has a step by step process for completion vs. a semi-automated system that performs many functions “under the hood,” it is common to get a bi-polar distribution of responses. That is, there appears to be 2 distinct sets of responses, one centered on a fully transparent system, the other on a “black box” solution. Novice users favor manual, step by step methods for performing work. Further investigation shows somewhat of a paradox.² That is, users who indeed are approaching or have reached expert status also tend to want systems to be transparent. They tend to resist

² This paradox is seen in studies of knowledge use during task completion in rich domains. Novices do not have the ability to apply domain knowledge to the work environment. They may lack such knowledge in the first place. Experts tend to rely on past experience with little regard for theoretical or basic knowledge of the domain to do work. Paradoxically, the result is the same, neither novices nor experts tend to apply domain knowledge to the work to any appreciable extent.

automated functions or short cuts. It naturally follows that it is the advanced beginners that desire automated tasks and short cuts while performing work. Therefore, typical methods to address “expert use” miss the boat. Experts desire transparent systems with features that allow them to collect data and perform other types of research. Indeed, I have seen this in my practice. Experts voice the need for research tools and “manual” options for more discretion in running system algorithms.

So the design environment may include a set of heuristics when designing for all levels of expertise: Novice users should have the ability to step through a task with little need for clinical knowledge. For this user population, make sure task flow is generally linear with very few decision points or options. However, as a user becomes more competent, they desire the ability to speed up the work flow by identifying short cuts or other options depending on, for one, the clinical need of the patient. They also appreciate automated features that lead to more efficient work. Highly competent users and experts, once again, generally desire a hands on approach with full control over how they treat the patient. They want to be able to have discretion as to the amount of work performed by the system in the form of automated tasks and clinical decision making. Finally, experts want the ability and flexibility to collect case data and perform other research functions. These features should be included as long as they do not interfere with the day to day use of the system by non-experts.

For example, novices and some advanced beginners desire to have an established set of diagnostics reports for, say, a pacemaker patient. Once the user achieves a certain level of expertise they desire the ability to customize the reports based on the need of the patient and/or the nature of the clinical goal. In order for the design team to meet all user needs for all levels of expertise, they must offer both functionalities when designing reports.

Most user centered design work focuses on first time use and skilled beginners. Looking at the empirically derived characteristics of more expert users, it becomes apparent that more effort needs to be given in making systems compatible with their unique needs. In the case of designing for expert users, it may be an instance of neglect, not simply a semantic argument.

HE Consulting may be contacted by:

Phone: 763 753 9922

E-mail: dean.hooper@heconsultingllc.com

