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A Practitioner’s Guide for Designing Performance Support Systems

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ABSTRACT

The general human performance technology model provides practitioners with a process to analyze performance problems and select the appropriate intervention. When it comes to electronic performance support systems (EPSS), no clear and concise model currently exists to guide practitioners. This article offers an EPSS design model that can be readily applied by human performance technologists to address their customer’s performance problems.
The voice on the other end of the phone line says, “I believe my customer’s problem could benefit from a performance support system. Unfortunately, I’m not sure where to begin. Can you help?”

As organizations seek to reduce the time and cost associated with training, this type of phone call has become increasingly common. Organizations are looking more at non-instructional interventions like electronic performance support systems (EPSS) to provide employees with the information they need in increasingly faster ways. Unfortunately, despite the potential for EPSS to help mitigate performance problems, many practitioners are not sure which systems would be best suited to solving their current issue or sometimes even where to start.

The general human performance technology model available at [http://www.ispi.org/services/whatshptmodel.pdf](http://www.ispi.org/services/whatshptmodel.pdf) provides practitioners with a process to analyze performance problems and select the appropriate intervention. However, once an intervention is selected, the HPT model typically relies upon the processes, technologies, and best practices within each particular domain to guide the design and development of the selected intervention. For instance, when training is selected as part of the intervention portfolio, a practitioner may rely on the ADDIE model or other competing models from the instructional design domain.

When it comes to electronic performance support, no clear and concise model to guide the practitioner currently exists. Models from other domains could certainly be applied to EPSS. For instance, Witt & Wager (1994) compared the EPSS design process to the general ADDIE model from instructional design. Raybould (2000) introduced the Performance Support Mapping® Methodology. While this approach is quite robust and heavily emphasizes analysis, mapping, and carefully-designed performance support interfaces, it is unfortunately not yet widely known or adopted by practitioners. As Fischer & Horn (1997) noted, “without tools that
are primarily EPSS tools and with no clear methodology for building them...EPSS will be limited to an approach.”

**Practitioner’s Guide for Designing EPSS**

This article will attempt to address this perceived gap. Figure 1 illustrates a model that the authors have developed, applied, and refined over the course of working with various customers and performance problems at a Fortune 100 company. The goal of this model is not to be comprehensive and all encompassing. Instead, the intent is to provide a model that human performance technologists can readily apply in the design and development of performance support systems. Where it is possible, actual instruments and templates (identified in Figure 1 with darker boxes) will be provided so that practitioners can use and adapt these tools to their particular organization’s needs and performance problems.

![Figure 1. A Practitioner’s Model for Designing EPSS.](image-url)
Phase 1: Performance Analysis

Conduct HPT Analysis

In the first phase of solving any human performance problem, a performance analysis should be completed. Some common tools for analyzing performance include organizational, environmental, workflow, task, and gap analyses. The appropriate combination of these analyses will paint a clear picture of the performance problem to be addressed. Since this article is focused on performance support systems, we will not attempt to address the general topic of performance analysis in detail. More information on this topic can be found at the ISPI HPT Institute located at http://www.ispi.org/hpt_institute or publications such as First Things Fast (Rossett, 1998).

Select EPSS Intervention

According to Gilbert’s (1978) Behavioral Engineering Model (BEM) the root cause of a performance problem falls into one or a combination of six categories: data, resources, incentives, knowledge, capacity, and motives. Chevalier (2003) updated the language of the Gilbert model to better reflect the terminology used in today’s performance analysis as is shown in Figure 2. Placing the root cause(s) into these categories simplifies the intervention selection process by clearly articulating the type of problem that has been encountered. An EPSS intervention is most commonly associated with solving problems with a root in the information category but can also be used to supplement interventions in any of the other five categories.
Carr (1992) mentions five guidelines for the selection of an EPSS as an intervention: 1) “Skilled performers spend significant amounts of time helping and correcting unskilled performers”, 2) “A lot of documentation exists, so that employees must do extensive searches in order to find the right information”, 3) ”Neophyte workers must begin to perform effectively and training is either impractical or unavailable”, 4) “Individual technicians, specialists, managers, or other performers need to be guided through complex processes”, 5) “Teams of technicians, specialists, managers, or other performers need to be guided through a complex process” (p.37).

Ladd (1993) developed a checklist like the one shown in Table 1 to assist in determining if EPSS was right for the performance problem identified in the analysis.
Is Performance Support Right for your Organization?
Check the items that apply to your organization. Your organization is a candidate for the use of electronic performance support if you check three or more items in the first section or four or more items in the second section.

**Section 1: Internal Pressures and Situations**
- □ The training budget is being cut
- □ The organization is downsizing
- □ Employees have received a corporate mandate to improve quality
- □ The company is committed to improving productivity
- □ The company is deploying a large-scale new-business activity or rolling out new software
- □ Employees work in different geographic locations
- □ Employees use computers to do their jobs, or they have access to computers
- □ There is a high rate of turnover.

**Section 2: Employee Needs and Descriptions**
- □ Varied skill levels are required to perform job-related tasks.
- □ Employees have diverse learning styles
- □ Employees perform a variety of tasks that require training or support
- □ To do their jobs, employees need access to experts.
- □ Senior managers consider the training and support of employees in job-related tasks important.
- □ Training must be divided into separate modules for each skill being taught.
- □ After training ends, employees can’t remember all of the new information required to do their jobs.
- □ Employees are expected to learn while completing tasks.
- □ Job-specific information must be accessible during the performance of tasks.

*Table 1. Is Performance Support Right for your Organization (Adapted from Ladd, 1993, p. 24).*

EPSS are best suited for tasks that are not done frequently. They are most effective when they are implemented in the context of the work itself. Research shows that adult learners retain information better when it is related to their personal experience and is applied to a context they are familiar with (Knowles, 1984; Caffarella, 1994; MacKeracher, 1996; and Daley, 1998).

EPSS are also a better fit with non-critical tasks and objectives as well as associating them with tasks or processes that are not frequently performed. The selection of an EPSS as an intervention to solve the problem or need identified in the performance analysis is more likely to succeed if the human performance technologist adheres to the simple principles previously stated.

*Measure Performance Problem*
The time and cost associated with some interventions, like EPSS, often require strong management and/or organizational support. One of the best ways to ensure that the project is properly funded and supported is to identify key performance measures against which the success of the intervention can be measured. These measures can be financial (improved sales, reduced operating costs), organizational performance (employee retention, satisfaction), or individual performance (reduced errors, decrease in workflow cycle time). Ideally, the measures that you choose should be ones that are directly related to the performance problem that you are trying to solve, impact the organization in a meaningful way, and are valued by the customer. A baseline of these measures should be taken during Phase 1 to allow you to calculate the impact that the EPSS intervention has made after implementation. This can be attained by identifying the key indicators and measuring them longitudinally throughout the process beginning prior to the implementation of the intervention.

Webb (1999) identified 4 key factors in calculating ROI of a system. These included isolating your data from other variables, limiting the number of key metrics to avoid saturation, converting the data collected into money, and measuring the same indicators before and after the project. The metrics selected can measure value in a number of ways but the most useful is generally a financial indicator shown in dollars. Some example indicators are located in Figure 3. The final metrics selected should be understood and ratified by the key stakeholders of the project.
Phase 2: EPSS Analysis

Once EPSS has been selected as an intervention it is important to conduct a more specific needs assessment directly related to the EPSS. This assessment will provide critical information
that is a key to the high-level design that is a result of Phase 3. This assessment information is also important in pinpointing the exact need of the customers to guarantee that the EPSS is properly outfitted to mitigate their performance problem.

The data for the EPSS analysis can be gathered through surveys, observations, collection of the company’s operational data, or any of a number of data gathering methods. This article will include one recommendation of how the analysis can be administered. Customization of this method is recommended to match unique situations. Figure 4 provides an example of a simplified instrument to gather the assessment data. A precursor survey may be administered prior to utilizing the instrument in order to understand the general audience. Once again timeliness of the assessment rollup and completion of the analysis is important in maintaining a quality relationship with your customer.
<table>
<thead>
<tr>
<th>Item</th>
<th>Question</th>
<th>Options</th>
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| 1    | What is your primary job role? (select one)                              | Modify this list of job roles to your organization. Examples include:  
  - Engineer  
  - Manager  
  - Technician |
| 2    | If you have questions while you are on the factory floor, what do you usually do to find answers to your question? (select one item) | This question examines your organization’s cultural norms and the extent of change that may be required. Examples include:  
  - Ask a fellow employee for help  
  - Ask my supervisor  
  - Ask a trainer  
  - Lookup information in a printed manual  
  - Lookup information on the intranet |
| 3    | Which of the following information sources would you find most useful while you are working on the job (select all that apply)? | Modify this list to include the types of content that your employees have or could have available on-the-job.  
  - Best known methods from employees and experts at other sites  
  - Business process documents  
  - Steps on how to repair equipment  
  - Steps on how to use software applications  
  - Training materials |
| 4    | Support information can be delivered to you in a number of ways. Rank the list below with (1) being the manner in which you would prefer to locate support information, (4) being the least preferable. | Modify this list to include the ways in which support content can be delivered to employees on-the-job.  
  - Dedicated computer kiosks  
  - Paper-based job aids  
  - Wireless laptops  
  - Wireless PDA or tablet PC’s |
| 5    | Which tasks do you perform frequently that require the most amount of time, effort or difficulty to complete? | This could be an open-ended text field or a list of tasks performed by the target audience. |

*Figure 4.* Simplified EPSS Needs Assessment Template.

**Conduct Quantitative Assessment**

The sample size for the assessment should be sufficient to understand the need clearly but not too large that the data rollup becomes overbearing. We recommend limiting the sample to no less than 10 and no more than 30 performers. This means that for large populations the sample should be carefully selected to be random yet representative of the target audience. The job roles of the individuals selected in the sample may include end users, managers, peer trainers, and others depending on the intended use of the system.
Conduct Qualitative Assessment

Data collected as part of the quantitative needs assessment can often reveal worker preferences, environmental conditions and trends. However, the data does not typically explain why these conditions may exist. To better understand these results, a performance technologist can use qualitative research methods. This can be easily conducted using interviews, focus groups, job observations or other methods. This follow-up is a deterrent to costly defects that can occur in the development phase if the design does not match the true user need.

When the final assessment is complete and that data has been placed in a meaningful summary document, it should be validated by the key stakeholders prior to moving into the succeeding phases of the project. The metrics collected during Phase 1 should also be reviewed as a reminder of what the success of the project will be measured against.

Phase 3: EPSS Design

After collecting the requisite analysis information, the next phase in the performance support design process is to use this data to inform the design of the EPSS. As shown in Figure 1, the design phase includes four steps: selecting the type(s) of EPSS to deploy, designing a high-level architecture, developing a detailed design, and validating these design products with the customer.

Select EPSS Type

Arguably the most important yet most often neglected step in the EPSS design process is the careful and deliberate selection of the appropriate type of performance support system. It is also important to note that, in certain circumstances, human performance technologists may choose to implement more than one type of system. While more research needs to be conducted
in the future, some guidelines and empirical studies currently exist to guide practitioners in this selection process.

Figure 5 defines the three categories of performance support systems proposed by Gloria Gery (1995). These three types of EPSS differ in the level of integration between the support system and the users’ work interface. For instance, external systems have minimal integration and therefore require the learner to stop what they are doing, find information in the EPSS, learn it, and then return to the task at hand. Meanwhile, intrinsic systems are so integrated into the work interface itself that users do not have to interrupt their workflow to learn. “They simply feel that they are just doing the work” (Gery, 1995, p.51).

<table>
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<tr>
<th>Type</th>
<th>Definition</th>
<th>Examples</th>
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| 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 5. Types of Electronic Performance Support Systems. (Adapted from Gery, 1995, p.51)

Gery implicitly suggests that the more integrated a performance support system is to the work interface, the better it is. In fact, she provides practitioners with the goal to integrate “as much as 80% of the require performance support as intrinsic” with the remaining percentage equally allocated to extrinsic and external solutions (Gery, 1995, p.53). Raybould confirms this notion by arguing that “[a]s support moves further from the tool and requires more time off the job it becomes less powerful” (Raybould, 2000, p.35). These assertions have been partially
validated by more recent empirical research by Nguyen, Klein & Sullivan (2005). They found that users provided with intrinsic and extrinsic performance support performed significantly better on a software procedure than a control group that was not provided with an EPSS. In addition, the intrinsic users accessed their EPSS 1.5 times more than the control group, while the extrinsic users accessed their EPSS 3 times more often.

However, integrated performance support solutions like intrinsic and extrinsic systems may not be possible in all circumstances or may prove too costly to build. For example, the root cause of your customer’s performance problem may be related to an off-the-shelf software application. Because the software was purchased from a vendor, the interface may be compiled in such a way to prevent modifications required by integrated EPSS. In addition, certain workers, such as those in factories, warehouses or repair centers, perform tasks that are not primarily computer-based. In fact, they may not have immediate access to computers making it inconvenient or impossible to use electronic forms of performance support. As noted by Raybould, “when a particular [EPSS] proves infeasible” practitioners may need to look at less-embedded support systems (Raybould, 2000, p.35).

Computer technologies and HPT interventions have advanced tremendously since Gery first introduced her three EPSS categories. Figure 6 provides an updated taxonomy that illustrates just some of the performance support systems that practitioners have available to them today. Again, this taxonomy is not meant to be an exhaustive list but a framework that illustrates some technologies that can be leveraged for performance support purposes. As one can see, performance technologists now enjoy more EPSS options to help mitigate a performance problem than they did fifteen years ago. To make sense of these choices, a needs assessment was recently conducted in conjunction with ASTD Benchmarking Forum companies. This study
provides insight into the particular types of EPSS that corporate employees perceive as useful and potentially effective (Nguyen, 2005). As noted earlier, though, selecting the most effective EPSS for a given performance problem may be difficult due to the lack of more substantive research currently available.

Figure 6. Taxonomy of Performance Support Systems.
Develop High-Level Architecture

Once the type (or types) of performance support systems have been selected, the next step in the process is to develop a high-level architecture. Figure 7 shows the basic components that need to be considered when designing an EPSS: the performance problem, the end user, the type of electronic device (if any) they can use to access the performance support system while on-the-job, the EPSS or work interface that they will use to access the support content, and the databases or content repositories they may have access to from the EPSS. This architecture template may be downloaded and adapted for your use from http://www.frankn.net/epss/architecture.zip.

Figure 7. Simplified EPSS Architecture Template.
The information from the analysis phase can be combined with the EPSS selection to complete this architecture diagram. In particular, the quantitative data should help inform this step. You will notice that the items from the needs assessment instrument in Figure 4 map directly to the components of the architecture diagram. Figure 8 illustrates an example of an EPSS architecture. This design addresses an equipment repair problem where technicians only had access to computer kiosks. To improve their ability to access content while working on equipment, the architecture calls for the adoption of wireless tablet computers. The needs assessment also revealed that the technicians wanted to access to manuals, training materials as well as the ability to share their knowledge among peers. As a result, the high-level design calls for an EPSS that can access a learning content management system (LCMS) and knowledge management (KM) system.

![Figure 8. EPSS Architecture Example.](image)

Upon completing an initial version of the architecture, it is not unusual to change the selected performance support systems. For example, the needs assessment data may suggest that users require access to more content repositories than the work interface can realistically support.
To accommodate this, a practitioner may choose to integrate certain content intrinsically or extrinsically in the work interface. The remaining content may be accessed externally through an FAQ or search engine.

**Develop Low-Level Design**

The next step in the process is to define in more detail the design of the performance support system. Software developers often refer to this step as *low-level* or *detailed* design. Since low-level design tends to be specific to a work interface and EPSS type, it is not possible in this article to provide a generic framework or template for this activity. Nevertheless, the goal of this activity remains the same in all situations: develop a design of sufficient detail so that a performance support development team can build or purchase a system that will address the identified performance problem.

**Validate with Customer**

As with all of the phases in the EPSS design model, the performance technologist should validate the EPSS selection, high-level and low-level design products with the customer before moving to the next phase.

**Phase 4: EPSS Develop**

Once the design for the EPSS has been completed, the next phase in the performance support design model is to use the high-level architecture and low-level design to build the system, purchase an off-the-shelf EPSS tool that meets the design requirements, or adapt an existing system to the current performance problem. As shown in Figure 1, the development phase includes at least four steps: developing or purchasing the EPSS, developing support content to be accessed from the EPSS, integrating the EPSS into the users’ work interface, and of course validating the developed performance support system with the customer.
Develop / Purchase EPSS

Where possible, it may be more cost-effective to purchase vendor-developed software packages to support your performance support system design. A relatively comprehensive list of EPSS tools is available from the EPSSCentral.info website at http://www.epsscentral.info/knowledgebase/desdev. However, it is quite common that performance support designs call for an EPSS that does not currently exist or that cannot be met by off-the-shelf software. This circumstance is particularly likely for highly-integrated performance support such as intrinsic systems. In these instances, organizations are forced to pursue a custom-developed performance support system.

Develop Content

Since extrinsic and external performance support systems rely on content stored outside of the work interface, it may be necessary to develop new content to support users on-the-job and store in a database or repository. To optimize project timing and resources, this step could be done in parallel with the preceding EPSS development step.

In certain situations, it may also be possible to leverage content stored in other systems in the environment. For instance, if the performance problem being addressed is caused by lack of knowledge or discipline in following business processes, one could look to workflow diagrams or other business process engineering documents. If the performance problem is related to software procedures, one could look to vendor-developed manuals, job aids, or simulations. Even more, a growing trend in the training world is the adoption of learning content management systems (LCMS). These systems allow training developers to chunk eLearning and instructor-led content into reusable learning objects (RLO). While the original intent of these objects is to be combined and reused for training offerings, they can also be leveraged as content
for performance support systems. By doing so, performance support content can be introduced and updated as training content is created thereby reducing overall development and maintenance costs.

*Integrate into Work Interface*

In intrinsic and extrinsic EPSS designs, it is necessary to integrate support content directly into the users’ work interface. It is sometimes helpful to consult with a usability expert, human factors engineer or industrial engineer. By doing so, the human performance technologist can determine potential problem areas, opportunities for interface redesign, and other strategic locations in the work interface to integrate performance support content. Even in external performance support designs, it may be helpful to provide a link in the users’ work interface to the EPSS. This is often seen in software applications that provide a *Help* button that launches an external search engine, frequently asked question page, or help index.

*Validate with Customer*

As in the analysis and design phases, the performance technologist should validate the developed or purchased performance support system with the customer. This step may involve a number of common tests in the software development world such as functional testing, performance testing, and user acceptance testing. Some of these tests may occur during the EPSS development phase while others may occur at the conclusion.

**Phase 5: EPSS Implement, Evaluate**

The implementation and evaluation of the EPSS occurs following the development. In reality, the foundation for both implementation and evaluation are laid long before the end of the project. The successful adoption and validation of the usefulness of the system is contingent on tying the previous phases together in this phase. In Phase 1 the metrics that will be referenced in
the evaluation were created and validated by the stakeholders. In Phase 2 the population that would use the EPSS as an intervention was identified and an assessment of their needs was performed. A sample from that audience was carefully selected to represent the population. This same sample or a small audience of choice was likely used in the functional testing of Phase 4. During the implementation portion of phase 5, emphasis must be placed on communication, training, change management, support, and marketing of the system. Each component plays an important role in the adoption of the performance support system by employees.

While it is possible and potentially valuable to evaluate the EPSS intervention using Kirkpatrick’s Level 1-4 framework, we believe that it is particularly important to determine the direct impact of the EPSS intervention on the performance problem. During Phase 1 baseline data about key performance metrics were gathered. During the evaluation portion of phase 5, this baseline data should be compared with data collected during the implementation phase and predefined intervals for some time after implementation. Success and/or failure of the system to meet the predetermined success criteria should be reported out to the key stakeholders in the form of a periodic report or a dashboard. This will not only be useful in performance management and continuous improvement of the system, it will also act as a data point for future performance analysis to determine if EPSS is the right intervention.

**Conclusion**

In the coming years, new technologies will continue to provide burgeoning opportunities to support the performance of users in innovative ways. Our understanding of the factors that influence the effectiveness of performance support systems will grow, and the field of EPSS will continue to mature. The design model introduced in this article provides a simple framework
that human performance technologists can readily apply, refine, and adapt as electronic performance support systems continue to evolve.
REFERENCES


