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Closing the Contextual and Chronological Gap: A Design and Development Study of a Systematic Tool for the Selection of Learning and Performance Support Interventions

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CLOSING THE CONTEXTUAL AND CHRONOLOGICAL GAP: A DESIGN AND DEVELOPMENT STUDY OF A SYSTEMATIC TOOL FOR THE SELECTION OF LEARNING AND PERFORMANCE SUPPORT INTERVENTIONS

by

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ABSTRACT

CLOSING THE CONTEXTUAL AND CHRONOLOGICAL GAP: A DESIGN AND DEVELOPMENT STUDY OF A SYSTEMATIC TOOL FOR THE SELECTION OF LEARNING AND PERFORMANCE SUPPORT INTERVENTIONS

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Old Dominion University, 2021
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Gaps in human performance resulting from a lack of skills and knowledge require solutions – interventions. The process of selecting the most effective intervention (solution) for closing a skills and knowledge gap—such as classroom training, e-Learning, Structured on-the-job Training (SOJT), or job-aid—is a fundamental and vital practice for Human Performance Technology (HPT) practitioners. Unlike other activities in the Performance Improvement/HPT (PI/HPT) model, the activity of intervention selection is ambiguous. Meaning, there is currently no systematic process or tool in place for selecting learning and performance-improvement solutions that is reflective of the learning science. Consequently, the critical activity of intervention selection is often more art than science, especially in contrast to other phases of the PI/HPT model.

HPT is, first and foremost, a technology. HPT practitioners apply scientific and organized knowledge to practical ends using rigorous inquiry to provide initial evidence of possible interventions for performance gaps (Stolovitch, 2015). The results-driven approach of HPT empowers performance-improvement practitioners to select and design interventions that are beyond the scope of traditional classroom training. The ambiguity of the intervention selection

process presents a persistent challenge for HPT practitioners when selecting between learning and performance-support solutions as well as determining specific modalities for delivery.

The United States Coast Guard have been exemplar practitioners of HPT for over two decades, but the need for a systematic intervention selection methodology persisted. To address the need for a new process, a systematic decision-aid tool was developed called the Learning Intervention Type and Modality (LITAM) tool. The tool was designed to integrate seminal literature and research in the learning science field relative to train-to-memory decisions, and modalities of instruction. The LITAM tool was put through rigorous field-testing and evaluations, which validated that these new methods for generating performance intervention recommendations were both accurate and effectual. This paper shares the factors and implications for systematizing the intervention selection process for closing human performance gaps.

This dissertation is dedicated to those who realize the fundamental principle that you should engage your brain before you engage your weapon. – Jim Mattis, USMC

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It is amazing what you can accomplish if you don't care who gets the credit. – Harry S. Truman. Therefore, I would like to express my deepest appreciation to those who supported me unconditionally, without prejudice, and to the finish line – my family. To my amazing wife, Yolanda, and my beautiful daughters, Alysha and Alayna, no words can account for my appreciation of your love, support, and sacrifice. I can only hope that I can love and support you with your dreams as you have done for me.

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NOMENCLATURE

Abstraction – The cognitive process in which the learner isolates a common feature or relationship observed in something(s).

Cognitive Apprenticeship – A constructivist approach to learning whereby someone who has mastered a task engages in and directs the learning of an apprentice to collaboratively demonstrate performance through observation, modeling and reflective practice.

Cognitive Schema – Cognitive framework, or structure, that organizes and interprets information in long-term memory for future recall and application.

Complex Learning – The integration of cognitive, psychomotor, and affective domains of learning, combined to execute specific, complex performance tasks.

Context of Performance – Where and how the learned information will be performed. This is used to ensure instructional decisions reflect the target performance environment.

Contextual analysis – Analysis of the conditions where performance tasks are accomplished.

Discrimination – The process of recognition and understanding of the differences between subjects.

Environmental analysis – Analysis of the environment where performance tasks are accomplished.

Experiential Learning – Learning that takes place through direct experience and through reflection on associated task performance.

Exportable Training Teams – In person training that is conducted by a mobile, or exportable, training team that is not restricted to a single classroom.

Facilitated Online Training (FOT) – Virtual training that is facilitated by an instructor and is often comprised of a combination of synchronous and asynchronous activities.

Generalization – The process of deriving concept, judgment, principle, or theory from a limited number of specific incidents and applying it more widely.

Human Performance Technology (HPT) – The systematic and scientific approach to improving human and organizational performance.

Instructional Systems Design (ISD) – The systematic process of assessing, designing, and developing instructional systems and experiences for the purpose of changing human behavior.

Learner analysis – This is conducted as part of the front-end analysis and defines the target population of users of for an intervention.

Long Term Memory – The phase or type of memory responsible for the storage of information for an extended period of time.

Needs assessment and analysis – This is conducted as part of performance analysis and serves to define, assess, and compare current state of performance with the desired state. Subsequently, the needs analysis identifies the cause(s) for the discrepancy between current and desired state.

Performance Analysis – Terminology used to describe the breadth of HPT analyses used to assess and improve human and organizational performance.

Resident Training (RES) – Training that is conducted in the classroom.

Situated learning – Learning that takes place in the same contextual location as where it will be applied. Foundational to complex learning and cognitive apprenticeship.

Self-Pace e-Learning (SPeL) – An autonomous training experience that is delivered online and allows to learner to control the pace of instruction.

Short Term Memory – A system for temporary storing and managing information required to carry out complex cognitive tasks; also known as working memory.

Structured on-the-Job Training (SOJT) – Approach to training that is designed to create learning experiences within the context of the target job environment.

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CHAPTER 1

INTRODUCTION

Having its foundation in instructional systems design (ISD), the field of human performance technology (HPT) began to emerge as a distinct discipline when early practitioners altered their focus from individual behavior to the output of behavior: accomplishments. Gilbert (1978) characterized the focus on behavior as a fundamental error and posited that the value of accomplishments is greater than the sum of the behaviors used to produce them. Some of the early performance improvement (PI) pioneers, who were influenced significantly by behaviorism and programmed instruction, reassessed the relevance of training after well-designed instruction failed to improve individual and organizational performance (Pershing, 2006). Consequently, "human performance technology (HPT) evolved with the shift from a focus on behavior to accomplishments – the valuable products of behavior" (Binder, 2017, p. 20).

HPT is, first and foremost, a technology, and it involves applying scientific and organized knowledge to practical ends using rigorous inquiry to provide initial evidence of possible interventions for performance gaps (Stolovitch, 2015). The results-driven approach of HPT empowers performance improvement practitioners to select and design interventions that are beyond the scope of traditional training. Accordingly, the Performance Improvement/Human Performance Technology (PI/HPT) model, developed by Van Tiem, Moseley, & Dessinger (2012), provides a distinct phase for the purpose of intervention selection but leaves the process of doing so at the discretion of the practitioner.

The United States Coast Guard (USCG) have been exemplar practitioners of HPT for over two decades, but unlike the other activities in the PI/HPT model, the intervention selection process has remained unsystematic. To address the need for a new technology, a new systematic intervention selection decision-aid tool was designed called the Learning Intervention Type and Modality (LITAM) tool. The tool was designed to integrate seminal literature and research in the learning science field relative to train-to-memory decisions, and modalities of instruction. This study leveraged a series of iterative research procedures in order to develop, test, and validate the LITAM tool in order to offer USCG PI professionals a new and systematic means of selecting performance interventions.

Intervention Selection and the PI/HPT Model

The developers of the PI/HPT model contended that it is up to the PI practitioner to select or design the most appropriate interventions based on their knowledge of performance improvement theory and best practices, as well as familiarity with the attributes of the specific organization (Zaguri & Gal, 2016). This is not to imply that the PI/HPT model is inadequate; rather, it is the use of the model in the context of a situation that leaves the process of intervention selection to the discretion of the PI practitioner. It is important to note that, for the purposes of this study, any mention or reference to the PI/HPT model refers to that of Van Tiem et al. (2012), rather than HPT models in general.

An intervention is another name for a solution or set of solutions, usually a combination of tools and techniques, which directly affect the potential for solving performance gaps (Biech, 2008). For PI practitioners, interventions are measured, cognizant actions that facilitate change in performance. Interventions are solutions that are selected, designed, and developed to solve performance problems or address promising opportunities and challenges (Langdon et al., 1999). Accordingly, intervention selection is the process of identifying and recommending the most appropriate solutions to successfully resolving performance problems, opportunities, or challenges. Although the criticality of intervention selection is reflected through its distinct phase in the PI/HPT model, there is "no easy method for selecting possible interventions or solutions to performance problems or opportunities" (Van Tiem et al., 2012, p. 197).

When closing a skills and knowledge gap, intervention selection is the culmination of a performance analysis and also serves as the impetus for design and development actions; consequently, it lies at a critical intersection between HPT and ISD. The intervention selection process involves connecting the root causes identified during the performance analysis with potential solutions to be systematically designed, developed, and implemented (Bernardez et al., 2009). The transition from performance analysis to intervention selection, design, and development is not simply a progression of PI phases; it reflects a theoretical shift from diagnosis to remedy. The process of identifying performance gaps, and their respective root causes, is both systematic and methodical—but the activity of intervention selection is not; intervention selection remains an imperfect and ambiguous endeavor (Stolovitch, 2004).

The ambiguity of the intervention selection process presents a persistent challenge for performance improvement practitioners in determining the appropriate intervention for a gap (need) in performance. This challenge is particularly difficult when the gap in performance is the result of a lack of skills and knowledge. A gap in skills and knowledge often implies that some type of instructional intervention is appropriate, normally in the form of training. However, this is not always the case, as some skills and knowledge gaps can be adequately addressed with the use of performance support tools such as job-aids, Electronic Performance Support Systems (EPSS), or, mobile applications. This makes intervention selection even more challenging because solutions for skills and knowledge gaps are not limited to training interventions.

Still, training is often selected as the de facto intervention. This occurs sometimes because of familiarity (Medsker, 2006) but also because the focus can be mistakenly placed upon individual behavior, instead of the output of behavior—accomplishments. Being accomplishment-based reinforces the idea that the purpose is performance and results, not training and behavioral change (Binder, 2017; Gilbert, 1978; Harless, 1994; Rossett, 2009; Swanson, 1999). Intervention selection decisions, within the framework of HPT, should reflect an emphasis on performance outputs so that assumptions are avoided and intervention selection efforts are economized toward arriving at target performance. Being results-oriented, a fundamental element to the practice of HPT, challenges practitioners and organizations to think differently regarding how performance gaps can be most efficiently addressed. HPT equips practitioners to explore beyond the horizon of training as the single mechanism by which skills and knowledge gaps can be closed.

The process of intervention selection has become increasingly difficult for performance improvement practitioners who specialize in designing both instructional (learning) and noninstructional (performance support) interventions. Both learning and performance support interventions can often address the same gap in skills and knowledge (Molenda & Russell, 2006), so the decision to select one or the other becomes complex, contentious, and habitually unmethodical. This quandary can make the intervention selection process even more multifaceted due to the possibility that multiple interventions may be appropriate, as one might serve in continuum with the other (Rossett & Schafer, 2007). As discussed, selecting the appropriate intervention for a performance gap is an imperfect practice, and there is currently a lack of tools for USCG HPT practitioners designed specifically to help facilitate such a decision.

To address the lack of systematic tools for practitioners in the USCG, this study offers a new tool designed specifically for the activity of intervention selection when closing a skills and knowledge gap. In doing so, the tool was field tested by U.S. Coast Guard HPT practitioners responsible for conducting intervention selection as a means of identifying appropriate solutions for performance problems across the workforce. The U.S. Coast Guard utilizes the PI/HPT model framework as a means of reducing dependency on training, but the activity of intervention selection has remained disjointed and unsystematic. Thus, the purpose of this research study was to develop and test a systematic intervention selection tool for closing skills and knowledge gaps, thereby providing Coast Guard performance improvement practitioners a new and systematic means of choosing learning and performance support solutions.

Background and Context

The U.S. Coast Guard (USCG) maintains a significant training system (TRASYS) as a means of preparing USCG members for critical missions around the globe. In doing so, a few critical questions are addressed during intervention selection to ascertain and prepare the most appropriate training and performance support experiences possible. The first question is normally how best to decide between learning and performance support options (classroom training, e-Learning, job-aids, etc.) when a skill and knowledge (S/K) gap is identified. For the USCG Training System (TRASYS), this question is typically reduced to the "train/no-train" decision. The "train/no-train" decision results in either a learning (training) intervention or a performance support (no-train) solution. What is problematic is that this critical decision often results from a process that is antiquated and inadequate.

Like many traditional training organizations, the USCG has operated on the premise that all skills and knowledge performance problems were the result of poor training and that more training was the solution. Over 20 years ago, the USCG adopted the practice of Human Performance Technology (HPT), in large part to correct the flawed assumptions associated with training. HPT has remained an integral part of the USCG TRASYS, and the PI/HPT (Van Tiem et al., 2012) model serves as the framework for all organizational HPT activities. Not only does the PI/HPT model provide the conceptual framework for addressing organizational problems, it also serves as a procedural road map for how practitioners analyze performance problems, identify gaps, determine causation, and select appropriate solutions.

Even though the Coast Guard embraces the principles of HPT, a bias for classroom training remains. For example, during the calendar year (Jan–Dec) of 2020, of the 237 formal training courses offered by the USCG TRASYS, approximately 180 are categorized as classroom training and only 57 are categorized as advanced distributed learning (ADL) courses (Modernized Ready Learning Initiative, 2019). ADL is an approach to developing learning interventions that leverages the latest learning science, available IT technologies (i.e., software, hardware, networks) and electronic media to support learning and performance at the moment of need, as determined by the learner. For example, at the time HPT was being implemented in the USCG, the TRASYS adopted the DoD's ADL model (in principle, if not practice) to expand modes of delivery beyond the classroom. One of the primary aims of the ADL initiative was to reduce the overall reliance on classroom instruction. This approach was also adopted in the hopes of being used in concert with classroom training to provide blended solutions. As part of the ADL initiative, the USCG offers self-paced e-Learning (SPeL) courses, as well as facilitated online training (FOT) courses as options, but the TRASYS still leans heavily upon classroom training.

Consequently, the second question is how best to deliver skills and knowledge interventions to the workforce. Put another way, when a learning or performance support intervention is needed, what is the best modality of delivery? For example, when a learning intervention (training) is selected, ambiguity remains as to which mode of delivery is most appropriate to meet the learner at the moment of need, when and where they need to access learning. The process of deciding between classroom training, structured on-the-job training (SOJT), or one of the USCG TRASYS ADL options remains challenging. Similarly, if a performance support intervention (job-aid) is selected, uncertainty lingers as to how best to decide between USCG TRASYS options such as a paper job-aid, digital support tool, EPSS, or mobile application.

Despite over two decades of hard work in both HPT and ADL practice, the USCG still produces unnecessary training and displays an overreliance on classroom training—though recent efforts initiated by FORCECOM (i.e., modernized ready learning) have focused on reversing those trends. The focus on selecting interventions based on what is best for learning and performance, and making those solutions available on-demand to a distributed workforce, is simply good stewardship of the USCG's human capital. This study and the integration of a new systematic intervention selection tool was an integral and early step in transforming the USCG TRASYS into a 21st century learning organization.

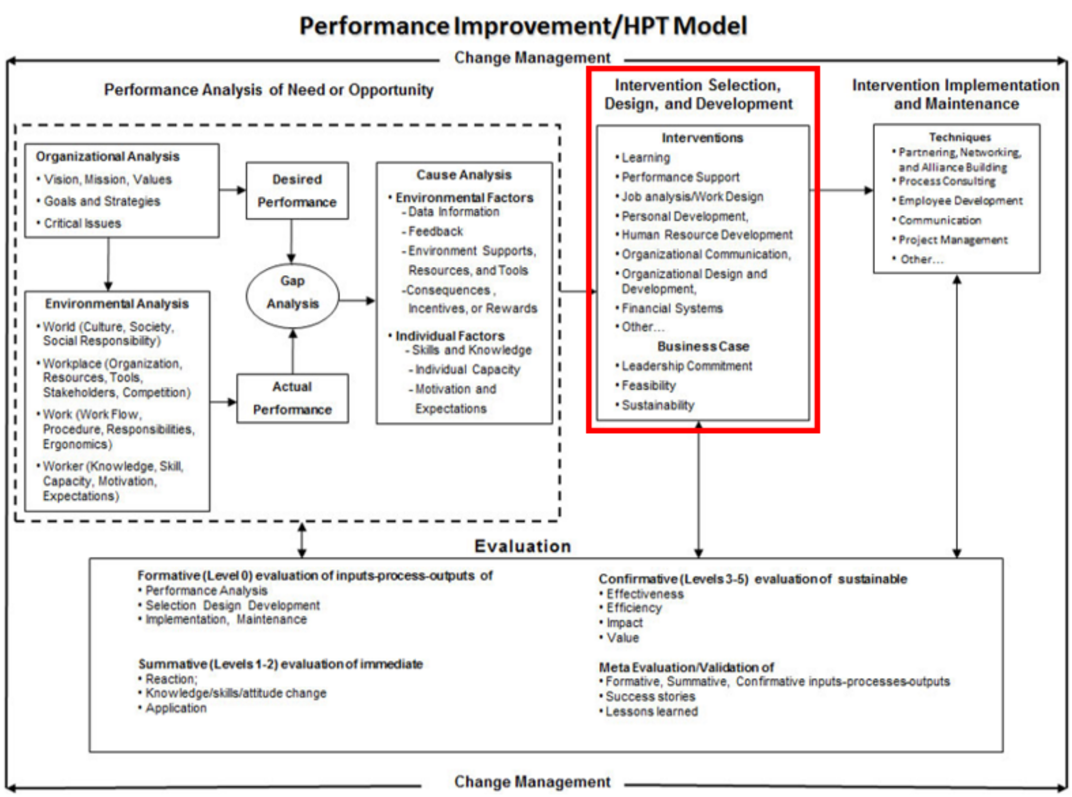
Conceptual Framework of the Study

The conceptual framework of the study begins within the performance improvement/human performance technology (PI/HPT) model (Van Tiem et al., 2012), as adopted by the International Society of Performance Improvement (ISPI). The PI/HPT model (see Figure 1) "represents a unifying process that helps accomplish successful change, create resiliency and sustainability, and make things better in the workplace" (Dessinger et al., 2012, p. 10). Additionally, the PI/HPT model provides a systematic process for performance improvement that begins with a performance analysis, arrives at intervention selection and design, and culminates with the evaluation of the collective impact on performance.

Within the PI/HPT model is four interrelated phases in support of change management. The focus of this study is centered within the *Intervention Selection, Design, and Development* phase of the PI/HPT model which offers a list of potential interventions for closing gaps in human performance. In order to fully conceptualize how the *Intervention Selection, Design and Development* phase is to be leveraged in alignment with causes of performance deficiencies, it is advantageous to recognize how the model incorporates intervention selection relative to other phases. Intervention selection occurs only after a performance analysis identifies a need or opportunity.

Figure 1

PI/HPT Model



PI/HPT Model. Adapted from *Fundamentals of Performance Improvement: Optimizing Results Through People, Processes, and Organizations*, by D.M. Van Tiem, J.L. Moseley, and J.C. Dessinger, 2012.

It is within the first phase of the PI/HPT model called *Performance Analysis of Need or Opportunity* which informs when and how the *Intervention Selection, Design, and Development* phase is best optimized. The "performance analysis involves gathering data that enables the analyst to identify gaps in performance which, if narrowed or closed, would contribute to accomplishing the strategic goals of the organization" (Molenda & Pershing, 2004, p. 28). Guerra-Lopez (2003) emphasized that the focus on analysis, when applied to performance improvement as the initial step, assures that what is being analyzed are in fact needs. This approach allows performance analysts the opportunity to align root problems with their respective causes prior to intervention selection and design, which consequently improves the likelihood of successful implementation and measurable impact.

The first phase (performance analysis) of the PI/HPT model culminates with a cause analysis of the performance gaps and consequently provides two categorical choices for which the performance gaps may be classified: environmental factors and individual factors. Environmental factors that affect performance include elements such as access to information, feedback, resources, tools, incentives, and rewards. The model also provides a category for individual factors such as motivation and expectations, individual capacity, and skills and knowledge. The focus of this study is specifically on performance gaps related to individual skills and knowledge. A cause analysis that reveals that a performance gap is the result of an individual's lack of skills and knowledge infers that a performer does not have the cognitive preparation, affective reasoning, or psycho-motor experience required to perform a task.

Once a cause analysis determines that a performance gap is the result of individual factors such as a lack of skills and knowledge, the practitioner subsequently transitions to the next phase of *Intervention Selection, Design, and Development*. It is within the *Intervention*

Selection, Design, and Development phase that the study is conceptually centered. The challenge of intervention selection can be more clearly defined by examining the list of potential interventions itemized in the model. The PI/HPT model provides a systematic process for arriving at the *intervention selection, design, and development* (ISDD) phase and subsequently provides a list of potential interventions to include learning and performance support.

The ISDD phase incorporates a very comprehensive set of tasks that are usually disseminated among a variety of professionals from both instructional systems design and human performance technology. The initial step in this phase, and the focus of this study, is intervention selection, which is the most imperative element because of subsequent and consequential actions that follow the selection of the solution. Moreover, the selection of the intervention often provides the optimal, and potentially singular, opportunity to ensure that the intervention selected aligns with the findings of the cause analysis. Alignment between the solution and the findings of the cause analysis is critical, particularly when the cause of the performance gap is the result of a lack of skills and knowledge. Within the framework of the PI/HPT model and the ISDD phase, this study specifically focused upon intervention selection aimed at closing skills and knowledge gaps.

A skills and knowledge gap generally indicates that some type of performance intervention is appropriate. The dichotomy that prevails is whether the skills and knowledge gap is best addressed with a learning (training) intervention, or a performance support (job-aid) intervention, or both. It is worth noting that the most recent PI/HPT model (2012) lists learning and performance support interventions as distinctive solutions; this is an advancement upon previous versions (2000, 2004) of the PI/HPT, in which learning and performance support were collectively categorized as performance support and theoretically encompassed both training and non-training interventions.

Statement of the Problem

The field of performance improvement has evolved beyond traditional thinking in that only instructional (learning) interventions can close a skills and knowledge gap, and now it is broadly recognized that noninstructional (performance support) interventions may provide just as much utility for closing such gaps (Zaguri & Gal, 2016). The PI/HPT model includes a list of potential intervention types that is not to be considered all-inclusive because offering a myriad list of interventions is unrealistic and potentially counterproductive. The list of intervention types offered in the PI/HPT model is reflective of the evolution of HPT as a unique and diverse discipline, as well as common usage in the field by practitioners (Van Tiem, 2004). However, in terms of intervention types, "learning" and "performance support" are the only listed options directly associated with skills and knowledge gaps. This dichotomy is indicative of the challenges that predominate the intervention selection process and is amplified in the absence of further guidance as to which path is more appropriate. The decision regarding which conduit is more appropriate, learning or performance support, is not to be trivialized because of the consequential impact it has upon the design, development, and implementation necessities that result from the decision.

The challenge of selecting between learning and performance support can be conceptualized through the lens of information that supports target performance as well as how best to store such information. Joe Harless (1994) promulgated a dichotomy of potential paths for closing skills and knowledge gaps: train to memory or job-aid; these options are aligned respectively with current intervention options of learning and performance support. The decision regarding which path is most appropriate is based on logic as to whether the information supporting performance should be stored internally in long-term memory, or externally, such as a job-aid (Bichelmeyer, 1999).

The dichotomy of deciding between internal storage (long-term memory) and external storage (performance support) is fundamental to the intervention selection process because of the impact the decision has upon the modality of intervention delivery. Closing a skills and knowledge gap might involve a spectrum of different learning interventions, such as classroom instruction, SOJT, SPeL, or FOT. However, the selection of the appropriate intervention within that spectrum of training options begins with first confirming that learning, versus performance support, is appropriate. Conversely, the same principle applies when selecting the most appropriate performance support options, such as job-aids or EPSS, after first confirming that performance support is appropriate.

Beyond the dichotomy of learning and performance support is the reality that both may be appropriate—as one may serve in continuum of the other. When dealing with complex performance tasks with dire consequences of error, performance may be best optimized with on-demand cognitive support following the training experience. Rossett (2000) suggested that the ability to design instructional programs that result in long-term memory is necessary for achieving worthy performance, but it may be leveraged better with a continuum of cognitive support. Rosset’s sentiment reinforces the notion that multiple or blended interventions may be appropriate and that intervention selection may be the most critical and consequential step in closing performance gaps.

The resulting dilemma is particularly problematic for HPT practitioners involved with intervention selection who recognize that training, or instruction, should be treated like surgery—as a last resort (Mager, 1997), and that performance support interventions can potentially address skills and knowledge gaps just as adequately. Currently, there is no validated tool within the USCG that is both systematic and reflective of the performance improvement literature, which helps to facilitate the decision as to which type of intervention is most appropriate: learning (training) or performance support (job-aid). Additionally, and beyond the dichotomy of learning and performance support, there is no systematic tool within the USCG that helps PI professionals select the appropriate intervention, such as classroom instruction, self-paced online learning, EPSS, or facilitated virtual training.

As a result, performance improvement professionals engage in intervention selection decisions based upon influential factors that can be more cultural and political than technical. Much of the literature describes intervention selection as a practice that reflects practitioners' experience or expertise (Bernardez et al., 2009; Langdon & Whiteside, 2012; Pershing, 2006; Van Tiem, 2004) but is void of a systematic process beyond that of a solutions checklist, feasibility matrix, or alignment guidance. Because of the ambiguity that endures with the intervention selection process, USCG performance improvement professionals are subject to default back to what they are most comfortable recommending, which is often training. In the *Handbook of Human Performance Technology*, Karen Medsker (2006) conveyed that there are four reasons why PI practitioners are so comfortable with training recommendations (2006):

1. Many HPT practitioners are or were specialists in learning and teaching, including instructional design, training, and education; they are often experts in designing, developing, implementing, and evaluating instruction.
2. A large body of research informs sound instructional strategies and practices.

3. Both managers and other HPT clients often prefer instruction as a method for improving performance because it is familiar and easily conceptualized as a solution.
4. Instruction is truly needed in many situations, such as changing business needs, new technologies in the workplace, and worker mobility.

Familiarity levels with training, or specific types of training, such as classroom instruction or virtual training, may unconsciously influence the solution selection process. Familiarity does not imply that PI practitioners cannot be subjective—rather that familiarity becomes more influential in the absence of a systematic process. Therefore, performance improvement professionals are subject to making intervention recommendations to stakeholders that are more a reflection of education and experience than the literature on learning science or human performance improvement (Langdon & Whiteside, 2012; Rothwell et al., 2012).

Purpose of the Study

Intervention selection is a deliberate and purposeful act that should include decision variables that support the successful application of competencies into the workplace and facilitate change in performance (Rothwell et al., 2012). Determining the appropriate type of intervention is an imperfect practice; accordingly, there is currently a lack of performance improvement tools within the USCG TRASYS to help facilitate such selections. The performance and cause analysis activities of the PI/HPT model can effectively determine that a performance gap is consequential to a lack of skills and knowledge, but with little guidance after. Organizational processes provide a list of what interventions “could” be selected, but no systematic process currently exists for USCG practitioners to explain what intervention “should” be selected.

Although the literature on intervention selection is rich, it is scarce with regard to systematic processes to help performance improvement practitioners select specific solutions based upon contextual variables. The lack of systematic tools within the USCG TRASYS regarding the intervention selection process provides an opportunity to develop, test, and evaluate a new tool for practitioners. This study directly addressed this void in the USCG by fielding the LITAM tool with active practitioners while still in the design and development phase, so that iterative and pragmatic feedback could influence the development of the tool. Consequently, the findings from the research informed the development of the LITAM tool to a state of practical utility and thereby offering the USCG performance improvement field a new and systematic approach for implementation.

Thus, the purpose of this developmental research study was to design, develop, and test a systematic intervention selection tool for closing skills and knowledge gaps, thereby providing U.S. Coast Guard performance improvement practitioners a new and systematic means of choosing learning and performance support solutions. Furthermore, I utilized a design and development research approach to generate the different types of data needed to inform tool development through three distinct phases. In the first phase of the study, I used the data to validate the systematic components of the tool. In the second phase, I determined the usability of the tool, and, in the third phase, I used the data to examine tool efficacy and effectiveness. The three phases in the study were guided by the following research questions:

Phase 1: Tool development and improvement of systematic components

1. How can the LITAM tool be improved, relative to the components and questions used to guide the intervention selection process, to be more intuitive and effective?

Phase 2: Tool usability and interfacing

2. What are the strengths and weaknesses of the usability experience when using the LITAM tool?
3. What interfacing (interaction with tool buttons and navigation options) difficulties exist and how can the tool be more intuitive?

Phase 3: Tool efficacy and effectiveness

4. How effective is the LITAM tool?

Significance of the Study

HPT practitioners are generally considered agents of change. As such, they must constantly find more efficient means of practice. At the core of HPT is the systematic practice of identifying performance problems, providing appropriate solutions, and consequently managing implementation and change, but some activities remain more art than science. Although the process of arriving at the ISDD phase is quite systematic, the actual activity of intervention selection is not (Stolovitch, 2004, 2015). An intervention selection process that is not systematic can result in arbitrary or biased selections, leaving practitioners to rely on their education and experience.

A tool that is designed specifically for systematically conducting intervention selection will help fill the void for practitioners, specifically Coast Guard performance improvement practitioners. Richey and Klein (2007) posited that design and development research provides a means of addressing these types of problems through well-honored research strategies within our collective repertories. In the process of developing and testing the efficacy of the tool within the USCG TRASYS, in this study, I conveyed data concerning the practice of intervention selection amongst USCG practitioners, which has remained an ambiguous process over the years. In addition, the study served as an example for other researchers to use when pursuing the design and development of HPT/ISD tools aimed at making practice more efficient.

CHAPTER 2

LITERATURE REVIEW

HPT is a systematic approach to improving productivity and competence. It uses a set of methods and procedures and a strategy for solving problems to realize opportunities related to the performance of people (International Society for Performance Improvement, 2020). The HPT approach stresses the use of a rigorous analysis of present and desired levels of performance, identifies the causes for the performance gap, offers a wide range of interventions with which to improve performance, guides the change management process, and evaluates the results. HPT is both theory and systems based, and it can be defined as a systemic and systematic process for assessing and analyzing performance gaps; planning improvements in performance; selecting, designing, and developing efficient, effective, and ethically justifiable interventions to close performance gaps; implementing the interventions; and evaluating all levels of results (Kaufman, 1992; Stolovitch & Keeps, 1999).

Although intervention selection is only one element of performance improvement, it is at the point of intervention selection in which closure of a diagnostic need can start to be realized. Some of the early PI models were more conceptual than procedural, but it is within the essence of those early concepts that the field has taken shape and from which it could be communicated to other practitioners. The evolution of HPT models is emblematic of theoretical advancements in the field, influenced by scientific research, and representative of practitioners' best practices. As HPT models became more prescriptive over the years, so too has the activity of intervention selection as a distinct occurrence, with some models being more succinct than others.

Accordingly, in this literature review, I will examine the evolution of the PI/HPT model as well as several models and concepts that were instrumental in shaping the current PI/HPT model (Van Tiem et al., 2012) as adopted by the ISPI. The USCG TRASYS uses the PI/HPT model as a systematic framework for solving performance problems in the workforce; therefore, this review will specifically address dynamics within the PI/HPT that are particular to USCG practitioners. Next, the literature will examine the specifics of the options within the intervention selection, design, and development phase of the model for closing skills and knowledge gaps. Finally, I will examine the literature on the dichotomy between learning and performance support solutions which informed the development of a new systematic intervention selection tool.

Progression of PI/HPT Model

The conceptual framework of the study is through the lens of the PI/HPT model (Van Tiem et al., 2012), particularly through the Intervention Selection, Design, and Development (ISDD) phase; therefore, it is critical to examine how the model has evolved to its current state, including understanding the chronological developments related to intervention selection. Models have always been an integral part of HPT; they have served as a mechanism by which practitioners share concepts, procedures, or theories with other practitioners. Wilmoth et al. (2014) shared that the primary rationale for modeling is to advance the ability of the practitioner, when looking at any complex activity, to conceptualize a myriad of causal relationships and chart them in some manner that can be communicated to others.

According to Richey et al. (2010), the term “model” implies a visual representation of reality presented with a degree of structure and order. More importantly, models help advance the field as a whole by providing visual expressions of how practitioners conceive human performance, as well as the necessary and systematic mechanisms for PI optimization. The ability to visualize and then communicate the process logic to others is ultimately the defining measurement of any HPT model's efficacy. It is through the evolution of HPT models that one can appreciate how integral activities within HPT, such as causal analysis, intervention selection, or evaluation, have become more meticulous and absolute; this is a direct consequence of practitioners informing other practitioners through model sharing.

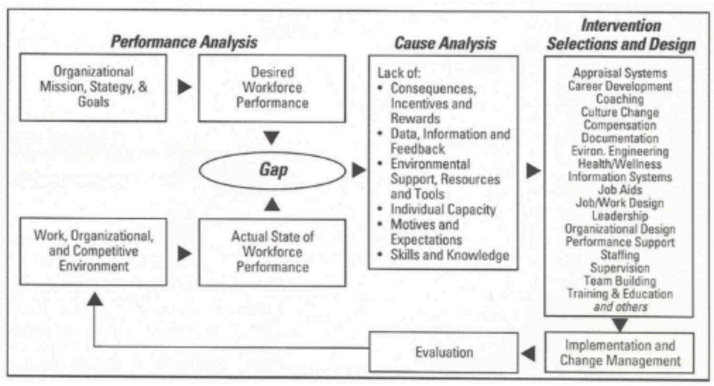
Performance improvement models began to emerge once HPT evolved as a unique discipline of study following a paradigm shift from a focus on instruction to a focus on performance. HPT, as an autonomous and distinct field, was orienting itself toward outcomes, vice means, and, consequently, many of the early HPT models reflected this paradigm shift. Robert Mager (1997), an early protagonist for HPT, shared that "instruction was our magic bullet, probably because instructing was our goal. But no longer. Now performance is the target! The focus has shifted from instruction (a process) to performance (the desired outcomes of the process)" (p. 12). This paradigm shift gained momentum when early advocates for performance improvement, in the 1970s, began to convey that instruction was not a cure all for performance improvement (Chyung, 2008; Rosenberg et al., 1999).

Van Tiem et al. introduced their first HPT model approximately two decades ago (2001), but it was not the original. William Deterline and Marc Rosenberg developed the original HPT model (see Figure 2), and the ISPI published it in 1992 to visually represent the steps needed to function as a PT practitioner and accomplish performance improvements in the workplace (Van Tiem et al., 2004). Deterline and Rosenberg's (1992) model was the first to be formerly called the HPT model. Although a few models emerged in the decades prior to Deterline and Rosenberg's HPT model, ones that clearly expressed the notions of performance improvement, all were presented with names that reflected a particular approach to improving performance (e.g., Behavior Engineering Model, Nine Performance Variables Model, Organizational

Elements Model). Because Deterline and Rosenberg's model reflected many of the influential models and concepts that advanced the field of performance improvement as a whole, and because of a shift in terminology within the field, their model was presented as the original HPT model.

Figure 2

Deterline and Rosenberg's HPT Model



Sourced from HPT Treasures (Deterline & Rosenberg, 1992)

Rosenberg and Deterline (1992) shared that HPT was a systematic combination of three fundamental processes: performance analysis, cause analysis, and intervention selection. Accordingly, these three foundational HPT elements were the core elements of their original HPT model. A fundamental principle of Deterline and Rosenberg's model, and an element of frequent emulation moving forward in the field, was the prioritization of identifying the performance gap. Rosenberg and Deterline (1992) posited that central to the importance of identifying performance deficiencies was the comparison between the desired state of performance and the actual state of performance—as it currently exists.

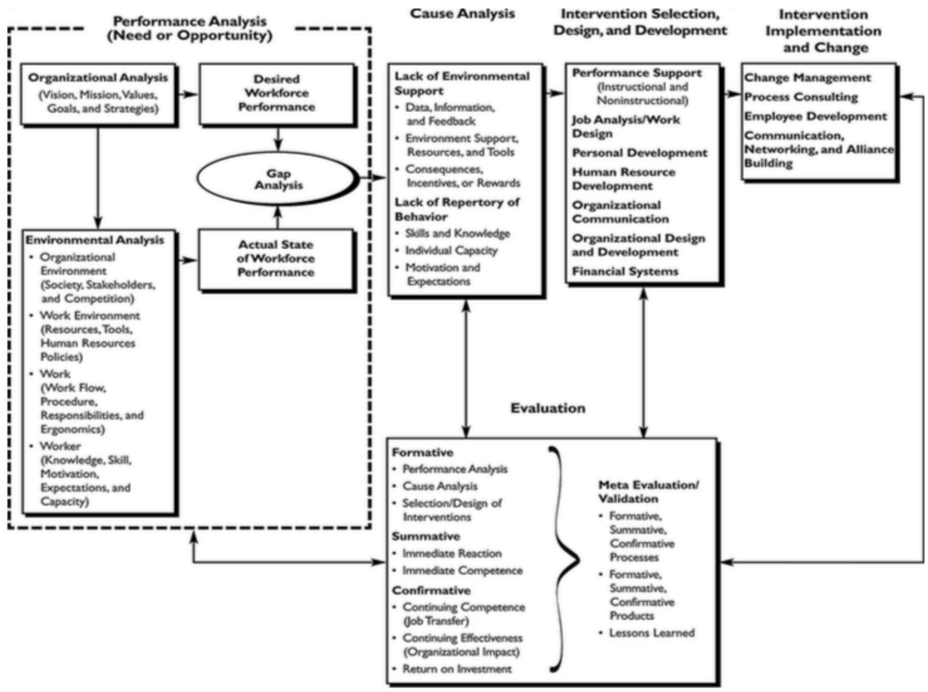
In addition to the emphasis on the performance analysis, the Deterline and Rosenberg model adopted Thomas Gilbert's (1978) performance components as elements of cause analysis, which would have a direct and consequential impact on how interventions were to be selected.

Collectively, the performance and cause analyses would directly affect intervention selection options. As such, they made intervention selection a succinct and fundamental activity in the HPT process. Deterline and Rosenberg proposed a list of potential interventions and embedded the change management concept. By reverse engineering change management back to performance analysis, they completed a systematic loop in the model. The list of potential interventions included a few options related to skills and knowledge gaps such as job-aids, performance support, and training and education; most of which would be modified in some manner with subsequent HPT models.

Based on substantial changes in the performance improvement field, Van Tiem et al. updated Deterline and Rosenberg's HPT model (1992) for both the 2001 and 2004 (Figure 3) versions of the HPT model (Dessinger et al., 2012). The decision to replace the Deterline and Rosenberg HPT model was adjudicated by Roger Addison, the director of performance technology at ISPI during this period. Building upon the foundational stages (i.e., performance analysis, cause analysis, and intervention selection), as codified by Deterline and Rosenberg, Van Tiem et al. advanced the HPT model by making key activities more robust. Three distinguishable elements evolved from Deterline and Rosenberg's model to Van Tiem et al.'s early models (2001, 2004), who subsequently made the model their own through adopting advancements in the field.

Figure 3

2004 PI/HPT Model



Source. From *Fundamentals of Performance Technology: A Guide to Improving People, Process, and Performance* by D.M. Van Tiem, J.L. Moseley, and J. C. Dessinger, 2004, p. 3. Reprinted with permission of John Wiley & Sons, Inc.

Sourced from Dessinger, J., Moseley, J, & Van Tiem, D. (2012). Performance Improvement/HPT Model: Guiding the Process. *Performance Improvement, 51*(3), 10-17.

First, Van Tiem et al. (2012) matured the cause analysis phase so that it reflected the dichotomy between environmental and individual factors potentially impacting performance. Additionally, Van Tiem et al. (2012) advanced a more robust conception of evaluation by including discrete elements of formative, summative, and confirmative evaluations, which succinctly depicted where each major activity within the model was to be assessed. Third, Van Tiem et al. modified the intervention selection, design, and development phase to reflect two types of performance support: instructional and noninstructional.

Use of the term performance support in the model was substantial and intentional because it was reflective of an evolution in the field. Furthermore, there has always been some lingering debate about the purpose of performance support as it relates to closing skills and knowledge gaps. Is the purpose of performance support to help users accomplish a particular task or help them become generally more skilled or knowledgeable (McManus & Rossett, 2006)? That question is a central theme within the study and is addressed more succinctly in this literature review.

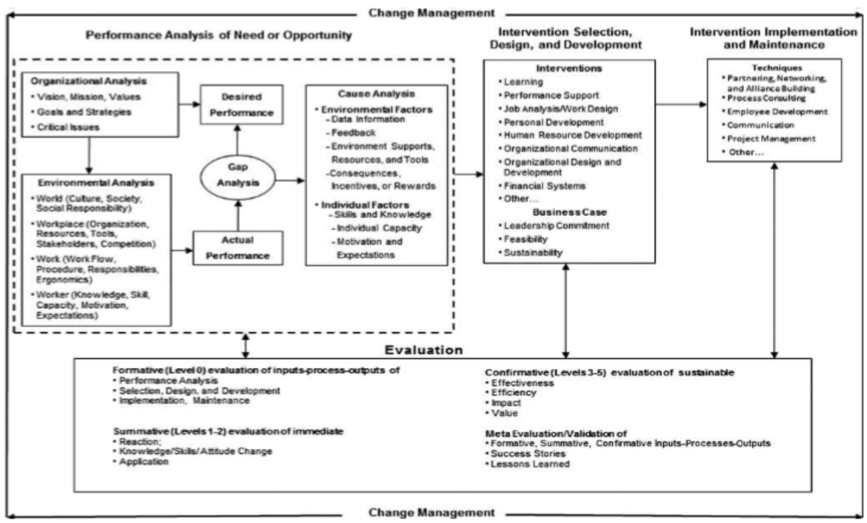
The performance support approach was a considerable change from Deterline and Rosenberg's model, which offered three options for skills and knowledge gaps: job-aids, performance support, and training and education. This change reflected a shift in the field during that period in that performance was clearly the aim of practitioners, versus training, and it was important that the HPT model employed language that echoed the paradigm shift. Additionally, by including the option for instructional or noninstructional performance support, it provided the practitioners the latitude needed to leverage their own judgment based upon education and experience.

2012 PI/HPT Model

The 2012 changes to the model were based on research and input from practitioners in the field (Dessinger et al., 2012). Subsequently, the title progressed from *human performance technology (HPT) model* to *performance improvement/human performance technology model* (PI/HPT) to better reflect current terminology in the field and language advocated by practitioners. The PI/HPT model characterized a unifying approach by practitioners that helps accomplish successful change, create resiliency and sustainability, and optimize the workplace. The 2012 model (Figure 4) advanced the construct that performance deficiencies may be opportunities as well as problems, highlighted the relationship that change management has with all phases and activities, and added the concepts of feasibility and sustainability.

Figure 4

2012 PI/HPT Model



Source. From Fundamentals of Performance Improvement: Optimizing Results Through People, Processes, and Organizations, by D.M. Van Tiem, J.L. Moseley, and J.C. Dessinger, 2012. Reprinted with permission of John Wiley & Sons, Inc.

Sourced from *Fundamentals of Performance Improvement: Optimizing Results Through People, Processes, and Organizations*, by D.M. Van Tiem, J.L. Moseley, and J.C. Dessinger (2012).

The 2012 changes are visually subtle yet conceptually transformational. The 2012 PI/HPT model is still organized in system-based phases that should be followed linearly as well as iteratively. However, a major change to the PI/HPT model is change itself; change management now encompasses each and every activity of the performance improvement process. Additionally, a new and unique aspect of the PI/HPT model is the holistic integration of evaluation into all phases of the performance improvement process (Dessinger et al., 2012). The 2012 model articulates this integration by spreading the evaluation phase across the bottom of the model so that the connection is made both conceptually and visually.

Another subtle yet consequential change to the 2012 model lies within the options provided within the Intervention Selection, Design, and Development stage. The 2012 PI/HPT model suggests eight broad types of interventions: learning, performance support, job analysis and work design, personal development, human resource development, organizational communication, organizational design and development, and financial systems. The list of intervention offered by Van Tiem et al. (2012) in the model is not all inclusive; rather, the items represent some of the most common, helpful, and innovative intervention types utilized by practitioners. Van Tiem et al. (2000, 2012) comprised their list of interventions by researching intervention literature, particularly Gayeski (1998), Hale (1993), Hutchinson and Stein (1998), Langdon and Whiteside (1997), and Stolovitch and Keeps (1999). It is worth noting that this is the first time any of the models have specifically used the term, learning. This was a meaningful shift from the previous HPT model (2004), which was void of any reference to training, education, or learning as potential solutions for closing skills and knowledge gaps. Dessinger et al. (2012) promoted caution when using their model and shared that "as a procedural model, the PI/HPT model can only provide guidance" (p. 13).

The current PI/HPT model can be perceived as a culminating exemplar that evolved during the paradigm shift, one that reflects a half century of research and practice. The value of HPT models can be measured by the level of utility they serve to practitioners. Consequently, it is important to examine how certain legacy models serve utility to the field now, even if indirectly, as the best parts of many legacy models are reflected within individual phases of the current PI/HPT model. Therefore, to look under the hood of the PI/HPT model is to bring to light decades of theoretical progression in the field in order to reconceptualize how we have arrived at our current state of practice.

The current PI/HPT model has four distinct phases: performance analysis; intervention selection, design, and development; intervention implementation and maintenance; and evaluation. Each phase is unique in that it conveys key activities to be accomplished autonomously; yet each phase is interconnected and dependent upon each other for success. For example, intervention selection is completely dependent upon performance analysis for solution alignment. Langdon et al. (1999) conjectured that good intervention selection commences with good performance analysis. Each phase has an independent, yet systematic impact on the ultimate goal of the model: change management. This study is specifically centered upon the activities and principles within the intervention selection, design, and development phase. Furthermore, because the USCG uses the PI/HPT model as a means of helping to determine when training (learning) is absolutely needed, this study examined the literature on the dichotomy between learning and performance support in order to determine when either is more appropriate.

Intervention Selection, Design, and Development

Once a gap in performance, and its corresponding cause, has been identified, a practitioner can effectively engage in intervention selection, design, and development. The *intervention, selection, design, and development phase* facilitates a theoretical and practical shift from diagnosis to treatment in the form of solutions. Because interventions are solutions for performance problems and opportunity, they are considered a cornerstone of performance technology (Langdon, 1997). Interventions should be selected, designed, and developed based on desired outcomes, impacts, value, costs, and benefits to the organization (Van Tiem et al., 2012); therefore, this phase involves a holistic conception of the performance paradigm to achieve alignment between problem and solution.

Stolovitch (2015) stated that “HPT practitioners base many of their interventions on principles they consider fundamental truths (p. 37). Spitzer (1992) established some of the early intervention selection principles still referenced today and suggested 11 core principles designed to enhance the successful selection of interventions. Spitzer’s recommendations (see Table 1) involved making selection decisions that were practical for an organization and delineated the context in which they would be implemented. Collectively, Spitzer's 11 selection principles offer a holistic approach that transcends immediate gratification or idealistic approaches because implementation and change management factors are succinctly included.

Table 1

Spitzer's 11 Core Principles for Selecting Interventions

Choose interventions that
1. are based upon a comprehensive understanding of the situation,
2. are carefully targeted,
3. are sponsor-based and supported,
4. employ a team approach,
5. are cost sensitive,
6. align directly with organizational priorities,
7. are well investigated and weighed against options,
8. are powerful,
9. are sustainable,
10. take implementation into consideration, and
11. take an iterative approach to design, development, and implementation.

Sourced from Spitzer, D. R. (1999). The design and development of high-impact interventions.

Spitzer (1999) also provided a task list (see Table 2) specifically for designing and developing performance interventions. Spitzer offered six critical steps for the selection and design of potential interventions and provided five additional steps for a development team to take action upon a design plan—consequently bridging the gap between intervention design and development. Spitzer's 11 step process (1999) was unique in that it went beyond theoretical principles as procedural steps were provided, bridging intervention selection through development. Spitzer's model was also unique in that it provided discrete steps for both design and development; this is often where the transition (hand-off) occurs between performance technologist and instructional designer, when and if they are not one in the same. The combination of lists, offered by Spitzer (1999), is both practical and comprehensive because it addresses intervention selection, design, development, and implementation holistically—as does the current PI/HPT model.

Table 2

Spitzer's Critical Steps for the Design and Development of Interventions

Steps to Design Performance Interventions
1. Review/expand analysis
2. Identify intervention objectives
3. Identify/prioritize requirements
4. Select intervention components
5. Prepare a high-level intervention design
6. Complete a detailed intervention plan
Steps to Develop Performance Interventions
1. Select the development team
2. Prepare the development plan
3. Develop and test the prototype
4. Revise the development plan
5. Produce the final intervention materials

Sourced from Spitzer, D. R. (1999). The design and development of high-impact interventions.

A fundamental challenge within the intervention selection, design, and development phase is selecting a specific intervention based upon the results of the cause analysis. The notion that potential interventions should reflect causation of the performance gap, hence improving the likelihood of intervention success, has been expressed consistently in the evolution of PI/HPT models (Van Tiem et al., 2001, 2004, 2012). The relationship between causation and intervention is prominently conveyed in the current PI/HPT model (2012), both literally and conceptually.

James Pershing (2006) defined an intervention as a "course of action taken to improve performance" (p. 12). The required course of action for improving performance was captured in the performance improvement model, in which he detailed a systematic approach that included a series of analyses to ensure intervention selection and implementation success. Pershing's process included a perception analysis, performance analysis, and a feasibility (intervention) analysis; all three analyses were to be conducted within an iterative element of evaluation and feedback to ensure strategic alignment is achieved prior to selecting an intervention. Pershing's work also included a feasibility decision matrix worksheet, which provides performance technologists with a pragmatic tool for comparing intervention variables with potential risks, which resulted in risk-index data to be considered prior to implementation.

Pershing (2006) purported that "interventions are designed and developed to respond to specific needs, which are gaps between where an organization is and where it seeks to be in the future" (p. 13). Pershing's approach placed an emphasis on aligning interventions with findings from the gap analysis so that intervention selection becomes an informed choice, based on data, one strategically aligned with both causes and desired outcomes. Pershing's performance improvement process is relatively distinctive in that it promotes the importance of analyzing potential interventions through a feasibility analysis before any design measures are taken. Pershing's cautious approach to selecting interventions is reflected in other PI tools, such as Bernardez et al.'s (2009) *Solutions Alignment Problems: Early Warning Checklist*, which allows the performance technologist to review potential solutions through the optics of warning indicators.

To assist with the challenge of selecting the appropriate intervention, Van Tiem et al. (2012) provided a Performance Support Tool (PST): Intervention Selector (Figure 5) as a means of helping practitioners conduct intervention selection. Although the PST: Intervention Selector does not systematically arrive at a specific intervention(s), because there is still an enduring level of subjectivity, the PST does advance the practice of intervention selection in that it provides declarative steps to assist the performance technologist with the activity. The PST provides a documentable process that can be easily captured and conveyed with stakeholders. Additionally, the transparent nature of the PST serves the practitioner well by promoting client engagement and buy-in with regard to solution selection, as potential interventions can be reviewed and selected together.

Figure 5

Van Tiem, Moseley, and Dessinger's Performance Support Tool (PST)

Performance Support Tool (PST):
Intervention Selector

Directions: Identify a maximum of 10–15 possible interventions and rank or prioritize these interventions.

Learning Interventions

- ☐ Knowledge management
- ☐ Organizational learning
- ☐ Learning management system
- ☐ Content management system
- ☐ Education/training
- ☐ Self-directed learning
- ☐ On-the-job learning
- ☐ Just-in-time learning
- ☐ Action learning
- ☐ Blended learning
- ☐ Technical and nontechnical learning
- ☐ Social learning
- ☐ Interactive learning technologies
- ☐ Enterprise learning
- ☐ Classroom learning
- ☐ Distance/distributed learning
- ☐ Online/e-learning
- ☐ Wikis, avatars, and more
- ☐ Games/simulations

Performance Support Interventions

- ☐ Performance support tools (PSTs) or job aids
- ☐ Electronic performance support systems (EPSS)
- ☐ Documentation and standards
- ☐ Expert systems

Sourced from Fundamentals of Performance Improvement: Optimizing Results Through People, Processes, and Organizations, by D.M. Van Tiem, J.L. Moseley, and J.C. Dessinger (2012).

The PST: Intervention Selector offered by Van Tiem et al. (2012) has been the exception, not the rule. The literature has been quite limited on detailed systematic approaches for intervention selection (Zaguri & Gal, 2016). Many models and processes discussed in the literature approach intervention selection advocate for the relevance of performance analysis, consequently offering potential causes, and finally suggesting a general list of potential interventions (Stolovitch, 2004; 2015). Although the literature on systematic intervention selection models is limited, the fundamental principles of the activity are as consequential as any other within the PI/HPT model.

Research focused on validating the key stages of the PI/HPT model found a lack of schema guiding how interventions are selected (Kang, 2012). Following a content analysis of 30 HPT case studies, Kang (2012) found the process of aligning performance gap causes and interventions is not a simple and straightforward process. It is a complicated and iterative process; therefore, the relationships between performance causes and interventions selected are sometimes inexplicit. Kang's perspective is consistent with the literature in that determining the appropriate type of intervention is an imperfect practice, and there is currently a lack of performance improvement (PI) tools that help to facilitate such a decision.

The relationship between causation and intervention selection continues to be ambiguous when the cause analysis determines the performance gap is the result of a lack of skills and knowledge. The intervention selection, design, and development phase, as well as the PST: Intervention Selector, offer two types of interventions for closing skills and knowledge gaps: learning and performance support. Delineating between the two types of interventions has momentous implications, as one suggests that learning, or training is required, and the other implies that performance support, or some type of job-aid will suffice.

Closing Skills and Knowledge Gaps

As discussed, the intervention selection, design, and development phase offers two options for closing skills and knowledge gaps: learning and performance support. The challenge for practitioners is selecting between one or the other. Consequently, the LITAM tool was designed to specifically address this critical decision. In doing so, a review of the literature was conducted which revealed seven influential concepts to be operationalized when making the selection between learning and performance support. The following concepts will be discussed chronologically, but all have been integrated into the intervention selection process for the tool.

1. Gilbert (1978): Delineation between Environmental and Individual Levels
2. Harless (1994): Internal versus External Information Storage
3. Gustafson (2000): Black Box and Glass Box Objectives
4. Rossett and Schafer (2007): Context of Performance
5. Gottfredson and Mosher (2010): Five Moments of Learning Needs
6. Gal and Nachmias (2012): Learning as a Consequence of Performance
7. Zaguri and Gal (2016): Audience and Process Types

Learning, also referred to as training, is a general term used by practitioners related to any effort aimed at fostering the development of skills and knowledge through the intentional arrangement of specifications, experiences, and conditions. Within this context, learning and training have become synonymous, both of which have the desired impact of changing human behavior. Stolovitch and Keeps (2002) referred to the aim of training as equipping learners to perform consistently with minimal support.

Performance support is a general term for a body of solutions not arranged with the same instructional integrity needed for learning but with the same desired effect of improving performance on the job. Performance support, commonly referred to as job-aids, often provide the information needed in support of worthy performance, without having to formally train to long-term memory. The performance support approach unlocks the possibility of providing real-time support to employees as they perform their job rather than sending them to formal learning events disconnected from the work (Lanese & Nguyen, 2012).

1. Gilbert: Delineation between Environmental and Individual Levels

The cause of performance problems in the workplace was the central framework behind Thomas Gilbert's behavioral engineering model (BEM). Gilbert's BEM (1978) purported that performance deficiencies could be attributed to either environmental factors that result in a lack of external support, or individual factors that correlate with a lack of repertory of behavior. The BEM was two-dimensional, in which it placed six elements that influence performance into two categories: individual and environmental. Environmental elements included data, instruments, and incentives, whereas individual elements included knowledge, capacity, and motives. The core elements of the BEM serve as the principle causes of deficiencies in the current PI/HPT model.

Figure 6

Thomas Gilbert's Behavioral Engineering Model

	Information	Instrumentation	Motivation
Environmental Supports	**Data**	**Instruments**	**Incentives**
Person's Repertory Of behavior	**Knowledge**	**Capacity**	**Motives**

Sourced from *Human Competence. Engineering Worthy Performance*, by Thomas Gilbert (1978), p. 88, New York: McGraw-Hill.

Gilbert (1978) shared that the BEM (Figure 6) was to serve as an outline for performance troubleshooting by beginning with the first element of environmental influences (data) and addressing the remainder of the elements in sequential order. Gilbert (1978) offered that focusing on the first three elements would most likely lead to improved performance, as "the environment is easier to manipulate than peoples' repertoires" (p. 86). Since Gilbert's original contention, multiple studies have affirmed the assertion that environmental components hold the greatest leverage—in contrast to individual factors—when working on performance problems (Dean, 1994; Frank et al., 2000; Ripley, 2003).

Gilbert did not suggest that knowledge, capacity, or motives were less important, rather that performance interventions that influence data, tools, and incentives more often addressed the root causes of performance problems and therefore interventions aimed at such could close performance gaps more efficiently (Chevalier, 2006). It is also worth noting that Gilbert's BEM was one of the first in which knowledge (and skills) were specifically referenced as individual factors influencing performance. Gilbert's delineation between environmental and individual factors would become instrumental as to how practitioners approached intervention selection; in that, although the concepts of information and knowledge are synonymous, they are also unique to the domain in which they exist—extrinsic and intrinsic—respectively.

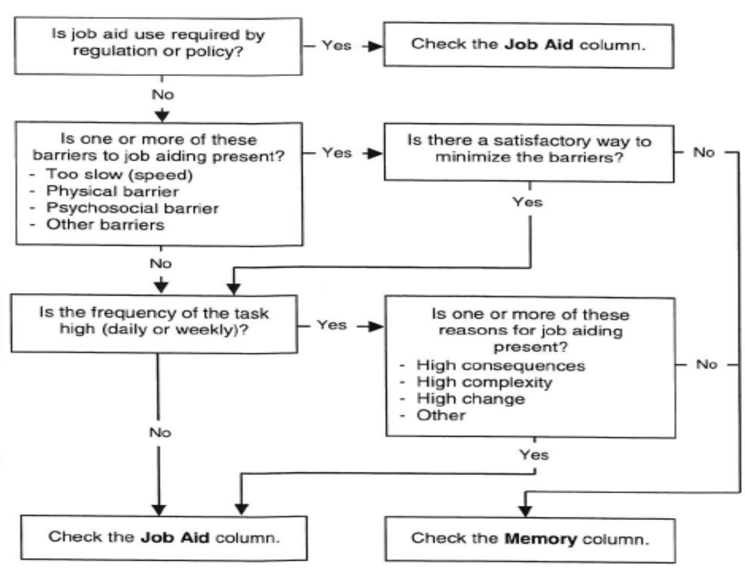
The dichotomy of levels offered by Gilbert's BEM, environmental or individual, also influenced how intervention selection could be categorized. Although information and knowledge are often grouped together, Gilbert posited that information exists at the environmental level, whereas knowledge exists within individual repertoire. This dichotomy corresponds with the challenge of determining what is more appropriate for a skills and knowledge gap, performance support (information) or learning (knowledge). Gilbert outlined how information is manipulated at the environmental level, whereas knowledge is affected at the individual level. Gilbert (1978) stated that information should be addressed first when troubleshooting performance problems because manipulating environmental factors is easier than manipulating individual factors, which often include training. Therefore, the dichotomy between learning and performance support can be leveraged by determining which level, environmental or individual, can be most efficiently influenced.

2. Harless: Internal versus External Information Storage

The work of Joe Harless addresses this dichotomy as profoundly as anyone in the literature. Harless was an early advocate of performance interventions that directly addressed performance gaps resulting from skills and knowledge beyond traditional training. In 1994, Harless created his accomplishment-based curriculum development system*,* which included a new tool (Figure 7) and, consequently, a new dichotomy for addressing skills and knowledge gaps by ultimately determining whether information related to skills and knowledge needed to be stored in "memory" (internally) or in a "job-aid" (externally). The new dichotomy of "train to memory" or "job-aid" would become transformational in the field because there was now a completely new theoretical approach, and methodology, for addressing skills and knowledge gaps beyond instruction. It is worth noting that the terminology, train to memory or job-aid, is still commonly used within the USCG TRASYS at the time of this study.

Figure 7

Harless Train to Memory (TTM) vs. Job-Aid Decision Tool



Sourced from *Accomplishment-Based Curriculum Development system*, by Joe Harless (1994), Newnan, GA: Harless Performance Guild.

Harless built upon the dichotomy originally conveyed by Gilbert (1978) in that not all information/knowledge gaps were to be addressed with training. The alternative to training offered by Harless reflected a paradigm shift that was occurring in the field of performance technology; respectively, there was now a methodology to help practitioners make intervention decisions. The Harless methodology was also affirmation that not all knowledge gaps were to be addressed with an intervention that involved the storage of information in long-term memory for future recall—and, concurrently, confirmation that not all causes responded to training.

At the core of the dichotomy presented by Harless (1994) is the necessity to distinguish between conditions appropriate for information giving, such as a job-aid, and conditions appropriate for learning. According to Molenda and Russel (2006), information consists of facts, news, comments, and similar representations of knowledge, but receivers of information are not responsible for measurable objectives, specific actions, or performance as a result of receiving information. Information is much different from instruction, yet information is normally the center of training content. Stolovitch and Keeps (2011) posited that "telling ain't training" (p. 178), implying that offering information that is void of instructional integrity—such as poorly designed e-Learning—is simply a technology-based information session.

3. Gustafson: Black Box and Glass Box Objectives

Gustafson (2000) addressed the dichotomy by recommending that practitioners first determine whether the goal is "black box"—that is, supporting performance without intentionally increasing the user's skills, or "glass box"—that is, intentionally increasing a user's independent skills and knowledge. Gustafson (2000) noted that "designers must decide to what degree, if at all, its (intervention) goal is to make users more knowledgeable and skilled" (p. 6). Therefore, the dichotomy between learning and performance support becomes a matter of whether or not skill/knowledge development is desired if competency can be reached otherwise.

If the black box objective is selected, it is feasible to create a performance support system that has as its sole objective of getting the task done efficiently and correctly without making the user more competent. Conversely, if the clear box objective is selected, the goal is for the performer to become more competent rather than just getting the job done correctly. Hence, skill and knowledge development becomes an objective of the clear box approach. Moreover, Gustafson (2000) suggested that a performance support system designed with a clear box objective often addresses the need for training. Ultimately, the black box versus clear box objective places the emphases for the practitioner on determining to what extent skill and knowledge development is required when reaching performance competency.

4. Rossett and Schafer: Context of Performance

The distinction between performance support and learning was also clarified by Allison Rosset and Lisa Schafer (2007). Rosset and Shafer (Table 3) posited that performance support is "a repository for information, processes, and perspectives that inform and guide planning and action" (p. 2). Conversely, learning is not performance support as it is a planned experience that enables individuals to acquire skills and knowledge to advance the capacity for performance (Rosset & Shafer, 2007). Additionally, Rossett and Schafer (2007) provided detailed guidance as to when performance support is, and is not, appropriate.

Table 3

Conditions for Using Performance Support

The use of performance support is appropriate when the following occurs:
1. Performance is infrequent.
2. The situation is complex, has multiple steps, or has multiple attributes.
3. The consequences of errors are high.
4. Performance depends upon a large body of information.
5. Performance is dependent upon information/procedures that change frequently.
6. Performance can be improved through employee self-assessment and correction.
7. There is high turnover, and the task can be codified.
8. There is little time and few resources for training and development.
Do not use performance support when the following occurs:
1. Aided performance would damage performer credibility.
2. Speed is required.
3. Novel or unpredictable circumstances are likely.
4. Smooth and fluid performance is a top priority.
5. Users lack reading or listening skills.
6. Employees are not motivated.

Sourced from Rossett, A., & Schafer, L. (2007). Job-aids and performance support.

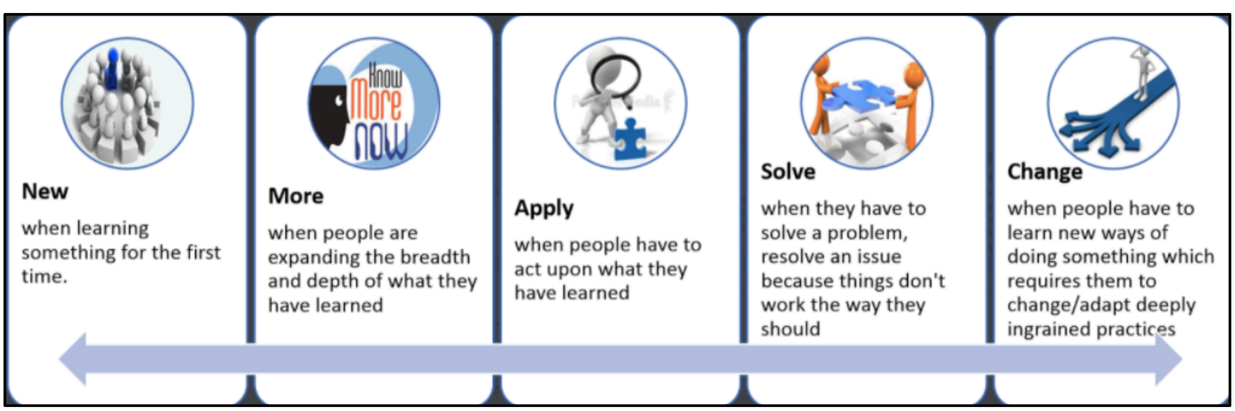
In providing a detailed set of conditions for the appropriate use of performance support, Rossett and Schafer indirectly offered a set of conditions for when learning is more appropriate. For example, if it is determined that speed is required, or that novel or unpredictable circumstances are likely, a learning intervention is more appropriate for such conditions. The detailed set of conditions offered by Rossett and Schafer (2007) advanced upon the work of Harless (1994) who offered similar guidance when making the train to memory versus job-aid decision, but with much less specificity. In addition to Rossett and Schafer offering a more comprehensive list, they did so through the framework of the context of performance. Meaning, the focus is on the conditions of performance rather than conditions of learning. Therefore, the selection between learning and performance support is contextualized within the actual conditions of performance which is powerful because of the implications it has upon intervention implementation and efficacy.

5. Gottfredson and Mosher: Five Moments of Learning Needs

Some concepts have been better than others in helping to contextualize the relationship between learning and performance support. The dynamic relationship between learning and performance support was succinctly illustrated and rationalized by Gottfredson and Mosher. Gottfredson and Mosher (2010) referenced learning in context through the five moments of need model. The five moment of need model (Figure 8) details five moments, or situations, that span the spectrum of learning and performance support opportunities that performers may encounter when arriving at competency. The first two moments of need in the model refer to traditional learning situations: (a) learning for the first time, and (b) learning more. The subsequent three moments relate to situations in which learning occurs in the context of performance, often during the job when skills and knowledge are required in real time: (c) applying knowledge at point of performance, (d) change in the work environment, and (e) solving unanticipated problems.

Figure 8

Gottfredson and Mosher's Five Moments of Need



Sourced from *Innovative performance support strategies and practices for learning in the workflow*, by Gottfredson, C., & Mosher, B. (2010), New York: McGraw-Hill.

Gottfredson and Mosher's (2010) model provides a conceptual framework for an organizational learning ecosystem that addresses the full spectrum of potential learning occasions. The first two moments infer that a traditional instructional intervention is appropriate, such as classroom training or e-Learning, whereas the subsequent three moments of need infer that performance support may be more appropriate—as learning may become a secondary consequence of performance. The model is conveyed as a performance continuum; learning in the first two moments of need is supplemented, maintained, and synthesized through the use of performance support in subsequent moments. More precisely, selecting the appropriate type (learning or performance support) of intervention for a skills and knowledge gap is contingent upon identifying the precise moment of need.

6. Gal and Nachmias: Learning as a Consequence of Performance

Learning can be described as a range of experiences or events designed to help individuals acquire new skills and knowledge. Stolovitch and Yapi (1997) characterized learning as a change in cognitive structures that results in the potential for behavior change. While learning interventions are intentional efforts designed to promote behavioral change, some fail to promote transfer back on the job for a myriad of reasons. Conversely, performance support solutions are designed primarily to improve performance, but research shows that learning occurs as a consequence of using performance support in the workplace. Gal and Nachmias (2011, 2012), found evidence to support the use of performance support in the workplace as in lieu of training.

The ability of performers to retain information and skills following a performance support experience was supported empirically in the research conducted by Gal & Nachmias (2011). It was established that when a performance-based training (PBT) program utilizes a performance support system in lieu of traditional training sessions, the performance support system provides both effective and efficient learning outcomes, exceeding those of traditional methods. Gal and Nachmias's (2011, 2012) findings challenged the assertion that removing workers from their job for training was advantageous. Moreover, Gal and Nachmias conveyed that learning as a consequence of performance was just as impactful as learning in preparation for performance.

7. Zaguri and Gal: Audience and Process Types

More recently, Zaguri and Gal (2016) introduced a new model (Figure 9) for performance intervention selection. The author's intervention selection model, HPT intervention selection model (360-degree approach), is specifically for selecting performance interventions related to gaps resulting from skills and knowledge deficiencies. Zaguri and Gal's intervention selection model does this by distinguishing between two axes during the intervention decision-making process: audience type and process type.

The 360-degree approach advances on research by Gal and Nachmias (2011, 2012), who found empirical support for the use of performance support systems (PSS) in the workplace as learning interventions in lieu of training. Gal and Nachmias's (2011, 2012) findings challenged the belief that sending workers to training programs was needed to improve skills and knowledge back on the job. Consequently, Zaguri and Gal (2016) revisited the dichotomy originally professed by Thomas Gilbert (1978), in that gaps in skills in knowledge can be addressed with interventions beyond training and that well-designed performance support systems (PSS) can serve as both performance aids and learning interventions.

Figure 9

Zaguri and Gal 360 Model

TABLE 1	INTERVENTION SELECTION MODEL (360-DEGREE APPROACH TO SUPPORT PERFORMANCE HPT)		
	AUDIENCE		
PROCESSES TYPE	LEARNER	INTERMEDIATE	EXPERT
Frequent	Learning	Performance Support	No Intervention
Rare	No Intervention	Performance Support	Performance Support
Complex/High Risk	PBT (Performance Based Training)	Learning	Performance Support

Sourced from *An Optimization of Human Performance Technology Intervention Selection Model: A 360-Degree Approach to Support Performance*. Performance Improvement, 55(6), 25-31, by Zaguri, Y., & Gal, E. (2016).

Zaguri and Gal (2016) posited that skills and knowledge acquired by traditional learning constitute the basis of competency demonstrated in application, trouble shooting, and variation to change. The HPT intervention selection (360-degree approach) model advocates for leveraging the full potential of performance support systems whenever appropriate because performance-support systems have the potential to enable the full learning ecosystem, as described in the five moments of need model, by leveraging learning opportunities with just-in-time guidance and information (Zaguri & Gal, 2016).

Summary

Intervention selection, design, and development is arguably the least methodical of all the PI/HPT model phases. Although many influential concepts, as discussed herein, offer a framework to follow, they all decentralize their capacity to automatically select one intervention over another. Likewise, the USCG TRASYS continues to make intervention selection decisions without leveraging a systematic process that reflects influential concepts in the literature. This study integrates the most influential concepts in an effort to systematize the intervention selection process. Subsequently, the following concepts were utilized as the foundation for building a new intervention selection tool.

1. Gilbert (1978): The delineation between data (information) as influenced by the environment and knowledge as influenced by individual repertoire.
2. Harless (1994): Advocacy for the external storage of information (that supports performance), in some type of job-aid, versus internally in long-term memory.
3. Gustafson (2000): Clarification of black box versus glass box objective, and the determination if skill development is needed if performance is readily achieved without it.
4. Rossett and Schaffer (2007): Use of conditions to determine when the application of performance support is appropriate for the context of performance.
5. Gottfredson & Mosher (2010): The *5 Moments of Need* model as a continuum for deciding between learning and performance support.
6. Gal & Nachmias (2011): Efficacy of performance support for learning in lieu of training.
7. Zaguri and Gal (2016): The *360 Degree Approach* for the selection of learning versus performance support through the lens of audience (learner experience level) and process type (complexity).

The literature review provided two important outcomes: (a) a deeper understanding of how the PI/HPT has evolved to the current state to include the dynamics within the intervention selection, design, and development phase, and (b) an informed body of influence for the design of a new and systematic HPT intervention selection tool. Consequently, the culmination of the literature review transitioned into the beginning of a new and systematic intervention selection tool called the Learning Intervention Type and Modality (LITAM) tool. The specifics of the LITAM tool and the factors utilized to systematize the intervention selection process for closing skills and knowledge gaps are presented in the next chapter.

CHAPTER 3

TOOL DESIGN

This chapter will present the design of the Learning Intervention Type and Modality (LITAM) decision-aid tool. In this section, I will discuss the factors used to make critical intervention selection decisions, as well as how the tool systematizes the decision-making process. Furthermore, this chapter will discuss how the literature influenced the design of the tool as well as how organizational-level modality decisions can be systematized through the context of performance.

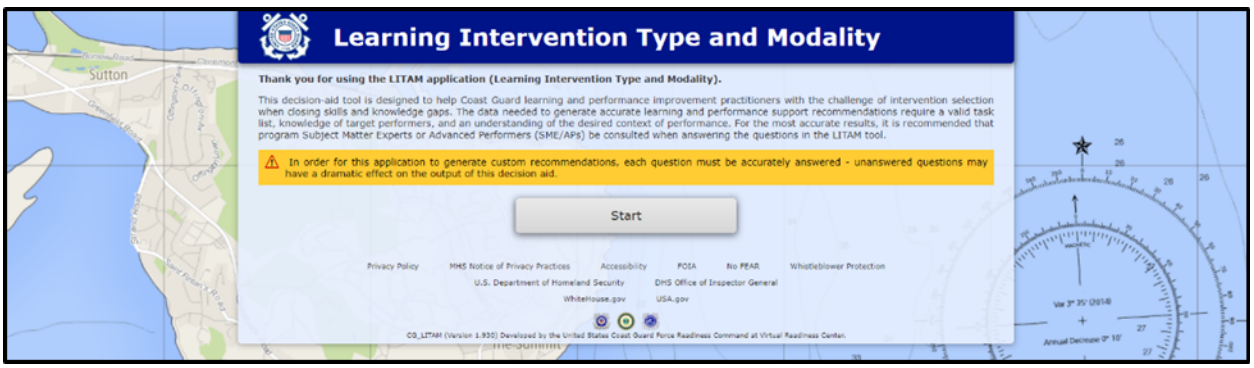
The design of the LITAM tool occurred following an exhaustive literature review which identified a set of concepts that could be used for systematizing the intervention selection process. The literature included very few HPT processes that focused specifically on the activity of intervention selection; accordingly, many HPT models focused on the importance of selecting an appropriate intervention rather than how to make selection decisions. Although there were some intervention selection processes that offered potential solutions that could be selected, there were none that suggested what should be selected.

The U.S. Coast Guard (USCG) have been an exemplar practitioner of HPT for over two decades, but the need for a systematic intervention selection tool persists. Therefore, the necessity to embed elements of HPT and learning science into a systematic intervention selection tool was the impetus for the design of the LITAM tool. The LITAM tool uses an integration of influential concepts as decision factors for intervention selection.

The LITAM tool was constructed specifically for USCG HPT practitioners who have a foundational knowledge of critical theories related to human performance improvement, adult learning (andragogy), and instructional design. As the end users of the tool, USCG HPT practitioners generally have a graduate-level education in HPT or instructional systems design and serve as analysts or designers who specialize in identifying and closing human performance gaps that involve skills and knowledge. Furthermore, the LITAM tool (Figure 10) is web-based, so USCG HPT practitioners can access the tool from anywhere on the USCG network. In this chapter, I will discuss the factors that influenced the design of the tool and how the tool was constructed to make critical intervention selection decisions.

Figure 10

Learning Intervention Type and Modality (LITAM) Decision-Aid Tool



Note: Screenshot of opening page of the LITAM tool in the web application.

Demand Signal

Training is expensive and resource intense. Organizations that have provisional limitations must be certain that training is truly needed so that constrained resources are allocated efficiently; therefore, training, like surgery, should be treated as a last resort (Mager, 1997). In doing so, a determination has to be made as to what is actually needed to improve human performance when closing a skills and knowledge gap. Although the terms of information and knowledge are often synonymous, they are distinct. Gilbert (1978) posited that information exists at the environmental level, whereas knowledge exists within individual repertoire. This dichotomy is addressed in the first, and most consequential, decision point of the LITAM tool by first determining what is more appropriate for a skills and knowledge gap, learning (training), or performance support (job-aid).

The work of Joe Harless (1994) provided us with a theoretical framework for information storage and suggested that information storage in human memory is seldom needed when a job-aid suffices. Consequently, Harless provided the field of HPT with a new dichotomy for addressing skills and knowledge gaps by determining whether information related to skills and knowledge needs to be stored in "long-term memory" (internally) or in a "job-aid" (externally). Gustafson (2000) addressed this dichotomy by recommending that practitioners first determine if the goal is "black box"—that is, supporting performance without intentionally increasing the user's skills—or "glass box"—that is, intentionally increasing a user's independent skills and knowledge.

The consideration of interventions beyond training unlocks the possibility of providing real-time performance support to employees as they perform their job rather than sending them to formal training events disconnected from the work (Lanese & Nguyen, 2012). Taking a systematic approach to determining when training is actually needed allows decision-makers to allocate resources accordingly with the confidence of knowing that training is only utilized when performance support (job-aid) is not sufficient.

When training is truly needed, the process of selecting the optimal modality for instruction becomes critical for achieving learning outcomes. For example, selecting the most effective means of delivering training became a critical concern when the COVID-19 pandemic affected the USCG classroom training program in 2020. Because of a need to limit resident (classroom) instruction, learning objectives that were previously delivered in the classroom had to be reexamined to determine what was suitable for other modalities of instruction, particularly online instruction, in an effort to reduce the classroom training footprint.

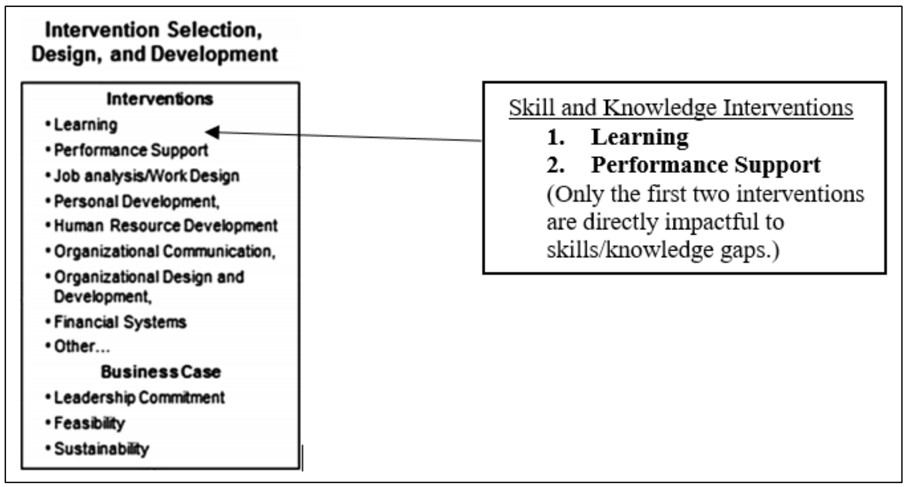
During the COVID-19 pandemic in a period spanning from April 2020 through April 2021, the USCG TRASYS successfully deployed approximately 60 of their resident (RES) training programs to online environments. This evolution poses the question moving forward: what is truly the best modality for instruction? The LITAM tool provides a systematic methodology for determining which learning objectives need to be delivered in traditional classroom (resident instruction) environments and which objectives can be delivered via online modalities, such as SPeL or FOT. Additionally, the tool provides recommendations for each performance task on the intervention selection summary report, which offers the optimal modality of instruction for each task, such as SPeL, RES, FOT, or SOJT. The tool makes such recommendations based upon organizational options, context of the performance environment, the experience and expertise of the learners, and the behavioral domain (cognitive, affective, psycho-motor) of the performance task.

Framework

The framework for the LITAM tool was based on the foundations of the PI/HPT model (Van Tiem et al., 2012), as adopted by the ISPI. The PI/HPT model "represents a unifying process that helps accomplish successful change, create resiliency and sustainability, and make things better in the workplace" (Dessinger et al., 2012, p. 10). Specifically, the LITAM tool is an abstraction of the intervention selection, design, and development (ISD&D) stage (Figure 11) of the PI/HPT model; the tool isolates a particular activity from the model and precisely addresses the performance gaps resulting from skills and knowledge gaps. The ISD&D phase offers several types of performance interventions, but only the first two are related to closing skills and knowledge gaps: (a) learning and (b) performance support. The LITAM tool was designed to systematize the critical delineation between the need for learning (training) versus performance support (job-aid).

Figure 11

Intervention Selection, Design, and Development Stage of the PI/HPT Model



PI/HPT Model. Adapted from *Fundamentals of Performance Improvement: Optimizing Results Through People, Processes, and Organizations*, by D.M. Van Tiem, J.L. Moseley, and J.C. Dessinger, 2012.

The tool's design was also a result of the author's professional experience with performance-intervention projects as an instructional designer. When an analysis validates that performance in the workplace is less than optimal because of a lack of training, selecting the appropriate type of learning intervention (solution) to close a skills and knowledge gap with a target population of performers is relative to the design of the intervention and the learning components used within the solution.

The initiation of the tool was also reflective of previous research investigating how USCG practitioners select interventions. Research (Knapp, 2019) found that most intervention-selection decisions in the USCG Training System (TRASYS), even those made by experts, were reflective of practitioner preferences and inclinations, and that systematic models or tools were seldom utilized. Additionally, Knapp found a lack of standardization for the selection of interventions across the USCG TRASYS, as indicated by the finding that over 20 different methodologies were reportedly being used by practitioners in the field. The lack of standardized and systematic processes across the enterprise supported the need for the integration of more data-driven tools into critical TRASYS decisions. Extensive research was conducted to determine whether a commercial off the shelf tool already existed that systematized the intervention selection process. Nothing has been developed of this nature previously.

One of the implications from the research findings was that the USCG TRASYS could benefit from more data-driven decision-aid systems, such as the LITAM tool. The need for more data-driven decision systems was central to the summation of the research findings conveyed by McAfee and Brynjolfsson (2017) in *Machine Platform Crowd: Harnessing our Digital Future*. When McAfee and Brynjolfsson (2017) examined over 100 empirical studies and directly compared the predictions of human experts and data-driven systems, the researchers found overwhelming support for the use of data-driven systems. McAfee and Brynjolfsson (2017) could only locate a weak tendency in six comparisons in favor of the experts, and they posited that, when a systematic model can be created and tested, it tends to perform as well as, or better than, human experts making similar decisions.

Design Influences

The initial intent in creating the LITAM tool was to build upon the foundations of the HPT model offered by Van Tiem et al. (2001, 2004, 2012), who persistently conveyed the activity of intervention selection as a succinct and pivotal activity of performance improvement. Additionally, the LITAM tool was designed to integrate seminal research in the field related to the train versus performance support (job-aid) decision and modalities of instruction.

The LITAM tool specifically addresses skills and knowledge gaps by first deciding whether learning (training) or performance support (job-aid) is more appropriate, and then determining which intervention would be most effectual by examining when and where performance occurs. Van Tiem et al. (2012) suggested that it is up to the practitioner to select or design the most appropriate intervention based on the PT's knowledge of performance improvement theory and best practices, as well as being familiar with the attributes of the specific organization. The approach suggested by Van Tiem et al. (2012) is reflected in the design of LITAM tool as the intervention type (learning or performance support) decision is influenced by the HPT literature (Table 4) while the modality decision is influenced by organizational and contextual dynamics. As discussed in the literature review, the LITAM tool leverages the following concepts for making the intervention type (learning versus performance support) decision.

Table 4

LITAM Tool Influential Concepts

Intervention Type (Learning or Performance Support) Influences Concepts		
#	Author(s)	Influential Concept
1	Gilbert (1978)	Environmental or Individual Level Influence
2	Harless (1994)	Long-term Memory or External Information Storage
3	Gustafson (2000)	Black Box and Glass Box Objectives
4	Rossett and Schafer (2007)	Context of Performance
5	Gottfredson and Mosher (2010)	Five Moments of Learning Needs
6	Gal and Nachmias (2012)	Learning as a Consequence of Performance
7	Zaguri and Gal (2016)	Audience and Process Types

Note: Linear conception of LITAM tool influences.

Decision Points

The LITAM tool is a web-based application designed to provide USCG HPT practitioners with a means of systematically conducting the vital activity of intervention selection. The LITAM tool systematically arrives at four critical decision points. Decision point 1 determines if training is the appropriate solution. Decision point 2 recommends a specific type of job-aid if performance support was identified. Decision point 3 determines if synchronous or asynchronous learning is more appropriate as a means of refining a set of modality options. Decision point 4 recommends a specific learning modality if a learning intervention was selected at decision point 1. Although there are four decision points in the tool, decision point 1 (type) and decision point 4 (modality) serve the greatest utility to the end user. The four decision points are listed in the same sequence in which they are presented in the tool.

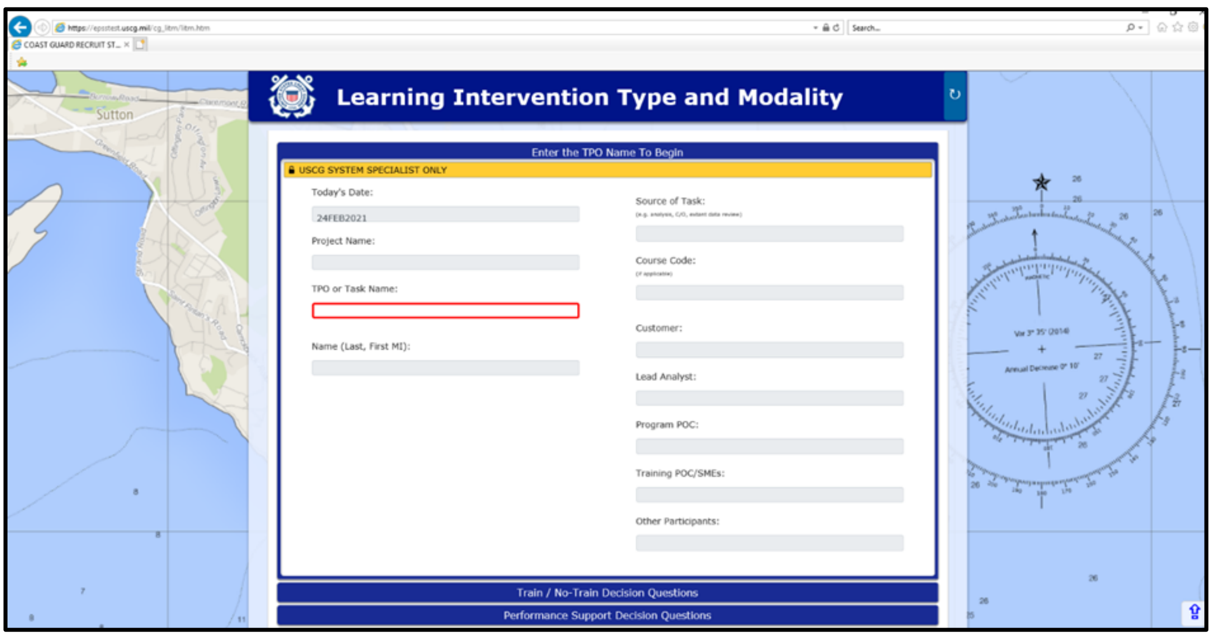
1. Train or job-aid decision
2. Performance support recommendation
3. Synchronous/asynchronous decision
4. Modality of instruction decision

Each decision point utilizes a series of questions through dynamic-decision paths, which affect potential selections through the progression of all four decision points. For example, if the decision to train has been made, resulting in a synchronous determination, the remaining questions about modality of instruction will be channeled upon selecting the most appropriate synchronous training solution. Examples of such training solutions are FOT, SOJT, or classroom (resident) instruction. The same dynamic principle applies, regardless of whether the user is selecting an asynchronous intervention or performance support when the job-aid determination is made.

The LITAM tool process begins when the user enters project-specific data into the opening page (Figure 12) of the tool. The accuracy and completeness of the administrative data entered on the opening page is critical because it is conveyed on the intervention-selection summary report, which is part of the tool's systematic output. The opening page of the tool also includes information that is fundamental for placing the tool's selections in context with the particulars of the project.

Figure 12

Learning Intervention Type and Modality (LITAM) Project Data Entry Page



Note: Opening page of tool used for entering project information.

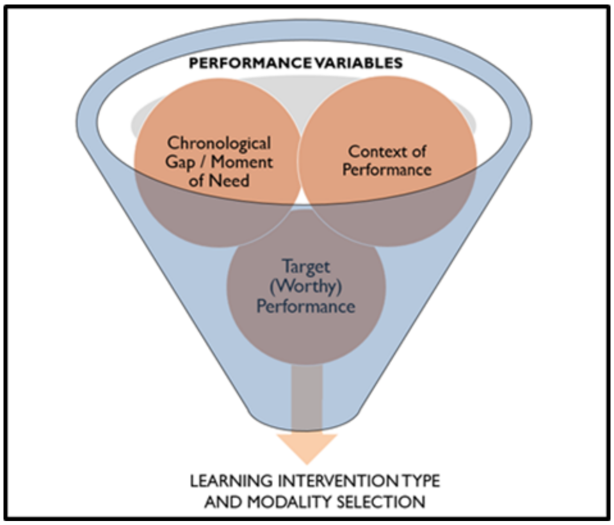
The systematic nature of the tool makes appropriate data critical; poor inputs may result in poor outputs. For the LITAM tool to generate a valid intervention recommendation, three vital elements of data are required to ensure accurate selections:

1. Target performance at the task level
2. Context of the performance environment, to include target population
3. Performers' moment of need

These three performance variables (Figure 13) are critical to the intervention-selection process, particularly for selecting an intervention that closes the contextual and chronological gaps that often persist with traditional training interventions.

Figure 13

Learning Intervention Type and Modality (LITAM) Performance Variables



Note: Conceptual model of performance variables affecting intervention selection

Decision Factors

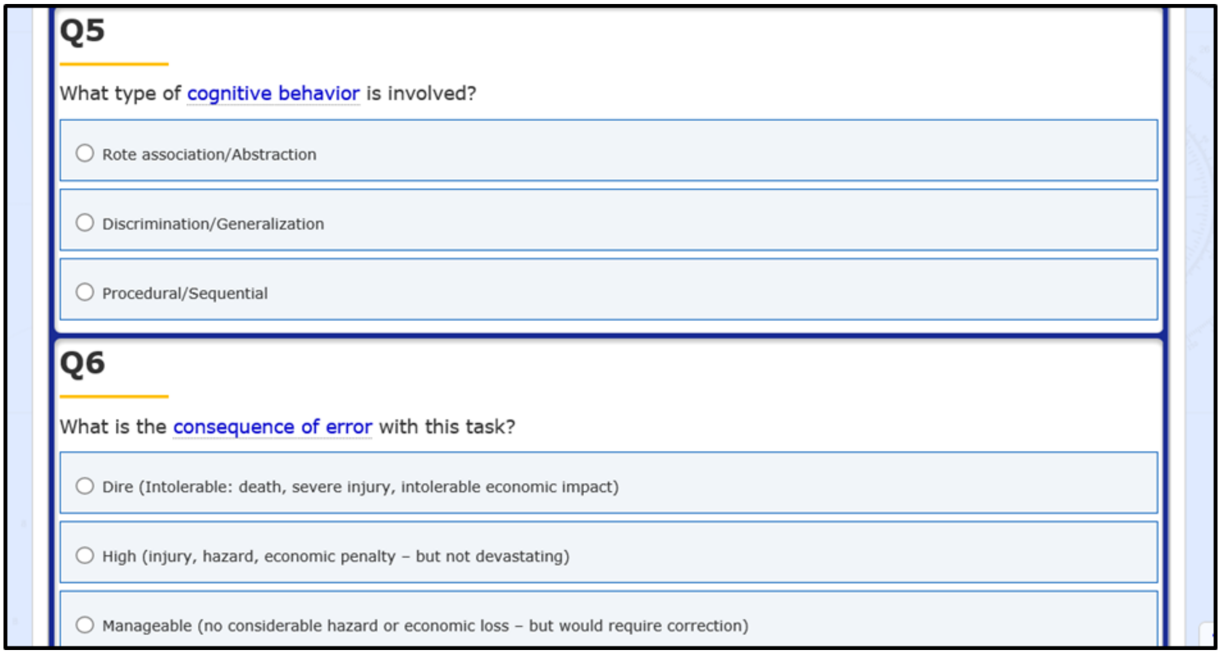
All selections generated by the LITAM tool are made at the task level; therefore, having data from some type of performance analysis is vital. After entering the administrative components of a project into the opening page, the LITAM tool begins with decision point 1—the learning/performance support decision. The learning or performance support dichotomy is conveyed in the LITAM tool with the terms, Train (learning) and Job-aid (performance support) for the purpose of simplicity. The train/job-aid decision utilizes several factors related to the dichotomy of whether information supporting a skills and knowledge gap needs to be stored internally in long-term memory or externally in some type of performance support. The train versus job-aid dichotomy is the most consequential decision in the tool as it impacts all subsequent decisions. The train/ job-aid selection is determined by a series of questions that reflect the following influential concepts that evolved from the literature review:

1. Gilbert (1978): The delineation between data (information) as influenced by the environment and knowledge as influenced by individual repertoire.
2. Harless (1994): Advocacy for the external storage of information (that supports performance), in some type of job-aid, versus internally in long-term memory.
3. Gustafson (2000): Clarification of black box versus glass box objective, and the determination if skill development is needed if performance is readily achieved without it.
4. Rossett and Schaffer (2007): Use of conditions to determine when the application of performance support is appropriate for the context of performance.
5. Gottfredson & Mosher (2010): The *5 Moments of Need* model as a continuum for deciding between learning and performance support.
6. Gal & Nachmias (2011): Efficacy of performance support for learning in lieu of training.
7. Zaguri and Gal (2016): The *360 Degree Approach* for the selection of learning versus performance support through the lens of audience (learner experience level) and process type (complexity).

As discussed, the LITAM tool utilizes a series of queries (Figure 14) that reflect the factors for each decision point. For each query in the tool, there is a contained set of options that affects the direction of the selection path within each decision point. To arrive at the appropriate selection, the responses to the queries must accurately reflect the dynamics of the performance variables at the task level, with an emphasis on the outcome of performance—the accomplishment.

Figure 14

Snapshot of Queries Posed in the LITAM Tool

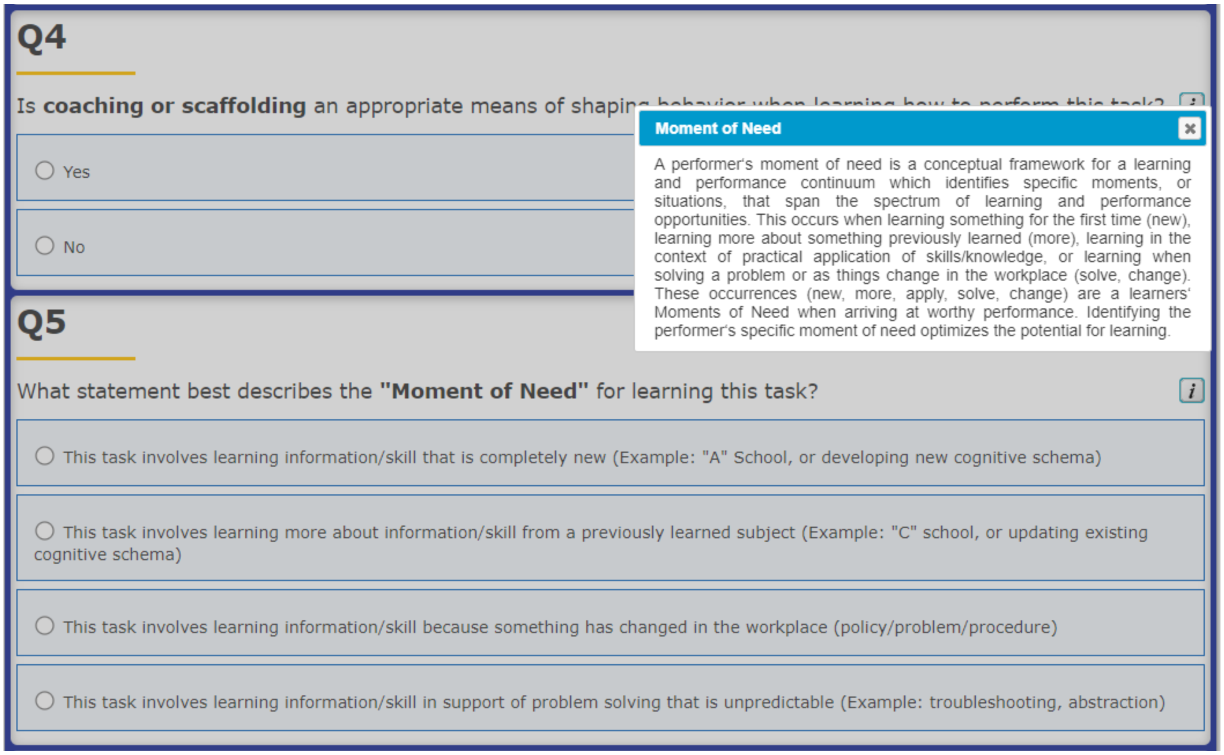


Note: Questions displayed are from decision point 1.

Because the LITAM utilizes a series of complex factors and questions, it provides 'info' help buttons that can be accessed to the right of the question. By clicking on the 'i' (info) icon, users will be presented with a definition or an explanation in order to answer the questions appropriately. An example of an info help button in support of the 'moment of need' concept is presented in Figure 15.

Figure 15

Example of Information Support Buttons



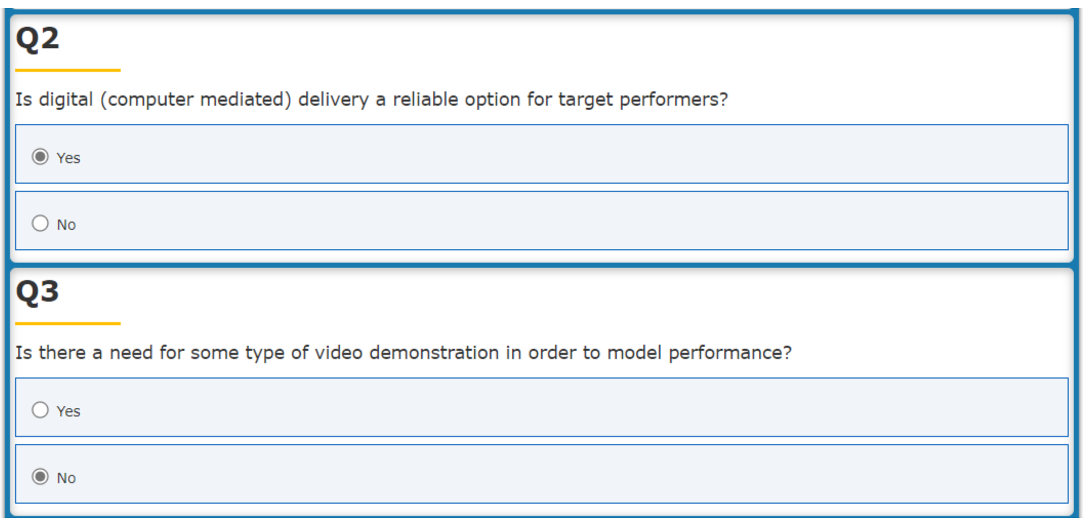
Note: Information provided in support of the moment of need concept.

Decision point 2 determines what type of performance support is appropriate for each task. The value of decision point 2 is applicable to the train/job-aid selection. In the event that a job-aid selection is determined, the LITAM tool selects a specific performance-support (job-aid) intervention. Even if a train selection is identified in decision point 1, the LITAM tool still generates a performance support alternative. Training interventions are often expensive and resource intense; consequently, decision makers are usually left with an impractical option for addressing performance deficiencies. The LITAM tool ultimately provides a performance-support alternative for every task, thereby leaving decision makers with a broader—and (often times) more practical—set of options for improving performance.

Decision point 2 is designed to select a specific performance-support (job-aid) solution. The potential outputs and factors in decision point 2 are reflective of the options available from the USCG TRASYS as well as the researcher's experience with performance support projects. The LITAM tool determines whether performance support needs to be in paper or digital form, requires expert decision-making capacity, and necessitates mobile delivery. Two of the questions from decision point 2 are captured in Figure 16.

Figure 16

Queries Posed in Support of Decision Point 2

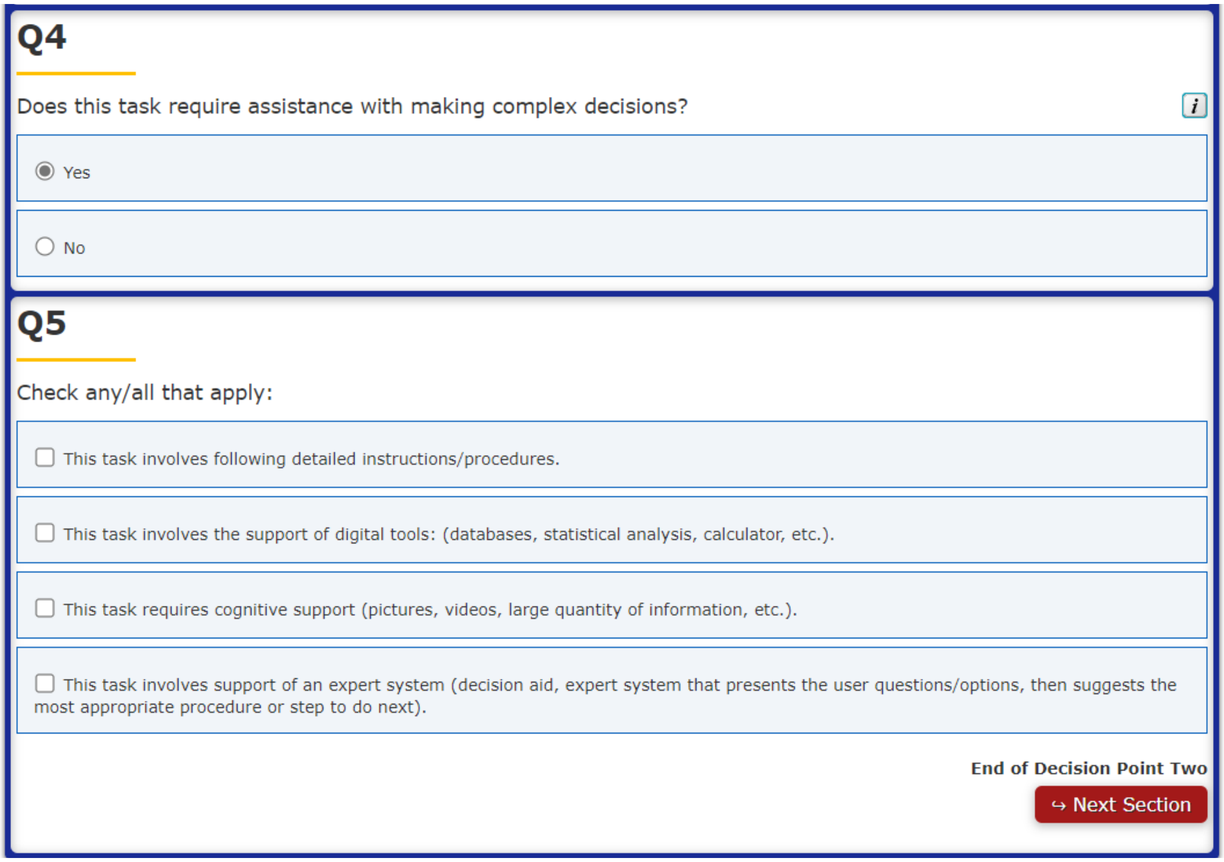


Note: Questions displayed are from decision point 2.

Additionally, decision point 2 takes a holistic view in determining whether an EPSS is justified. The LITAM tool does this by quantifying the responses for all the performance tasks from a specific project through a set of EPSS criterion. The criterion for the selection of an EPSS is conveyed through statements that reflect EPSS components as captured in Figure 17.

Figure 17

EPSS Criterion Components



Note: Statements reflect internal components of an EPSS.

Ultimately, the performance-support recommendation for decision point 2 is determined by the following factors:

1. Digital vs. analog delivery feasibility
2. Quantity of steps and content (information) supporting the task
3. Need for performance modeling (demonstration of task)
4. Complexity of task and need for decision-making support
5. Mobility of performers under normal task conditions
6. Context of the performance environment

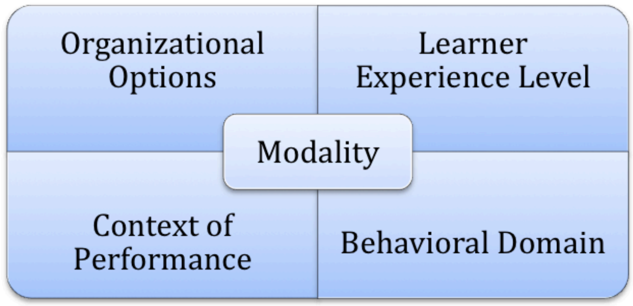
Before establishing the appropriate potential modality of instruction, decision point 3 determines whether each task is best delivered synchronously or asynchronously. Doing so provides a recommendation for selecting instructional strategies and concurrently narrows the options of potential interventions. Some instructional solutions are typically synchronous in nature, such as classroom (resident) instruction, whereas other solutions are normally designed for asynchronous delivery, such as SPeL. By first determining whether task-level instruction is best presented synchronously or asynchronously, the options for the modality of instruction decision (decision point 4) are centered upon methods that support synchronicity discernment and benefits. The synchronous/asynchronous decision point utilizes the following factors:

1. Complexity of the task
2. Need for safety oversight or physical supervision
3. Conditions and need for collaboration with others—teamwork
4. Need for coaching or scaffolding
5. Experience and expertise (level) of the target performer
6. Performers' "moment of need"
7. Potential need for accessing learning support, anytime/anywhere

Finally, decision point 4, the modality of instruction decision, provides a specific learning intervention for a skills and knowledge gap. Like decision point 2 and 3, the potential outputs and factors are reflective of organizational options available from the USCG TRASYS as well as the researcher's experience with closing skills and knowledge gaps. Collectively, the modality decision (Figure 18) leverages some of the same influences used in decision point 1, such as context of performance and behavioral complexity, with the understanding of what organizational learning options are available.

Figure 18

Organizational Influences for Modality Decision



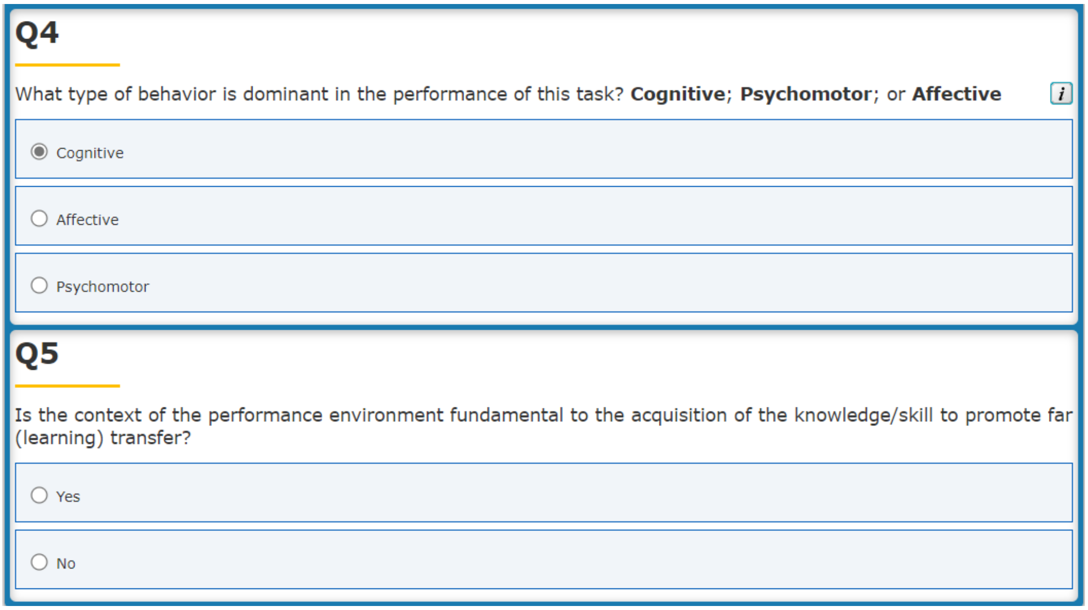
Note: The four quadrants collectively influence modality selection.

The modality of instruction selection is only presented if training was selected during decision point 1. Decision point 4 generates a selection from a defined set of options in the USCG TRASYS repertoire of learning solutions. The training interventions offered through the TRASYS include classroom (resident) instruction, FOT, SOTG, exportable (mobile) training teams (known as ETT), and SPeL. Therefore, decision point 4 recommends the most effective of these five learning solutions. The LITAM tool closes the transfer gap, from training to application, by examining the desired context of performance, feasibility to learn in the same environment in which performance will occur, experience level of performer, and the type of behavioral domain.

With each of the four selection points in the tool, users are presented a series of queries that address the aforementioned factors. To determine the appropriate queries, the LITAM tool utilizes a series of consequential decision paths for each of the four critical selections. The responses to the queries affect the navigation within a decision path and, ultimately, the selection for that decision point.

Figure 19

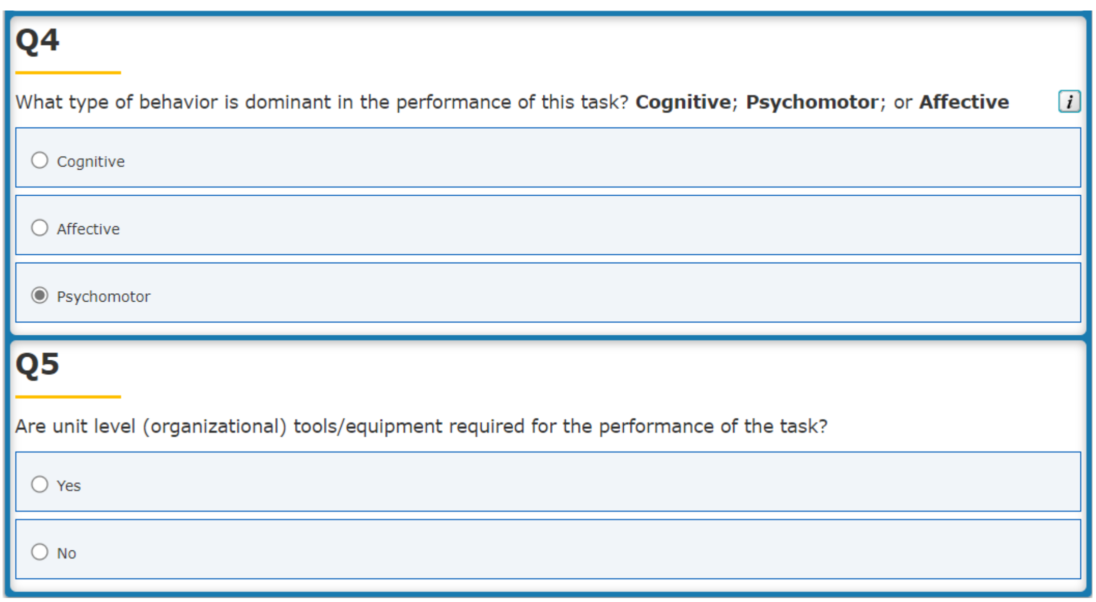
Example 1 of Dynamic Options Related to Response Selection



Note: Question 5 reflects dynamic branching and is the consequence of the selection of 'cognitive' for question 4.

Figure 20

Example 2 of Dynamic Options Related to Response Selection



Note: Question 5 reflects dynamic branching and is the consequence of the selection of 'psychomotor' for question 4.

Furthermore, the LITAM tool is adaptive, so user options are dynamically reactive and unique to the responses of each previous query. This allows the LITAM tool to generate tailored selections for each task based upon user responses. Figure 19 illustrates how the tool provides different options based on responses to queries. In Figure 19 (above), the LITAM tool displays a specific question 5 (Q5) based on the selection of ‘cognitive’ for question 4 (Q4), whereas Figure 20 (above) presents a different question 5 (Q5) that is relative to the selection of ‘psychomotor’ for question 4 (Q4).

Once all of the required data have been entered into the LITAM tool, a summary report is generated that provides specific recommendations for each decision point related to each task entered into the tool. The summary report (Figure 21) is also designed to serve as a consulting tool for sharing intervention selection results with project members and stakeholders.

Figure 21

LITAM Tool Intervention Selection Summary Report

Results

Intervention Selection Summary

RTO Main Engine Propulsion Analysis					13NOV2020
Totals: TPO: 7 Train To Memory: 6 No-train (PS): 1			**Prepared by:** Name: Knapp, James Training POC/SMEs: Mrs. Need help now Other Participants: Ms. All options failed		
TPO	**NAME**	**DECISION POINT 1: TRAIN/NO-TRAIN**	**DECISION POINT 2: PERFORMANCE AID**	**DECISION POINT 3: SYNCHRONOUS/ASYNCHRONOUS**	**DECISION POINT 4: MODALITY OF DELIVERY**
1	Identify faulty manifold defects.	TRAIN	Digital Support Tool (DST) | N/A	SYNCHRONOUS	RESIDENT TRNG
2	Extract manifold from engine heads	TRAIN	PAPER | N/A	SYNCHRONOUS	RESIDENT TRNG
3	Clean engine rings	TRAIN	PAPER | N/A	ASYNCHRONOUS	EPSS w/Instruction
4	Report findings from engine maintenance	TRAIN	Digital Support Tool (DST) | N/A	SYNCHRONOUS	FOT
5	Dtermine spark and combustion feasibility	N0-TRAIN (PS)	Digital Support Tool (DST) | MOBILE	N/A	N/A

Note: Snapshot of summary report following all task data entered into the tool.

Contextual and Chronological Gaps

The LITAM tool is designed to close the contextual and chronological gap associated with learning- and performance-support interventions. A fundamental principle in the design of the LITAM tool is that it is better to have a learned workforce than a trained workforce. That is, the outcome (learning and performance) of an experience is more important than the training episode itself. Training is often episodic, whereas learning can be ubiquitous and persistent. This is not to imply that training is not fundamental, but rather that training that does not address the context of performance (where) and learners' moment of need (when) is less optimal for the necessity of learning transfer back on the job.

The focus is on learning. Learning, by definition, is a persisting change in knowledge, skill, attitude, and overall capacity for performance as a result of experience. Training and other intervention types can be thought of as experiences designed to promote learning. To put learning first is to recognize the primacy of the learning experience in making decisions related to a whole host of instructional choices, especially intervention type and modality selections. Therefore, the selection of interventions (solutions) should be based upon the premise that it is ultimately more important to have a learned workforce than a trained workforce—thus supporting the critical nature of the USCG mission, which requires far-transfer and adaptability during dynamic situations.

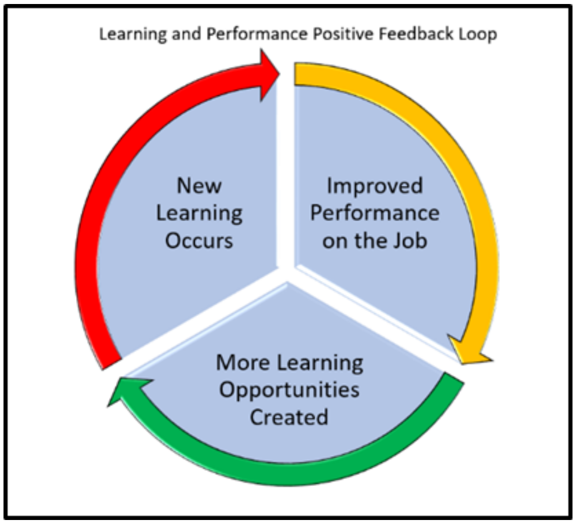
A learning experience is a contextual phenomenon—the where, when, how, and with whom of a learning experience shapes the occurrence. Learning and context are therefore inseparable. To be more effective, a learning experience should be contextualized within the framework of where, when, how, and with whom the new skills or knowledge will be applied on the job. For far too long, the focus has been on delivering instruction in the classroom or how best to replicate the classroom in an online learning environment. Both of these focuses are void of the target context for job performance.

Tessmer and Richey (1997) suggested that context has a complex and powerful influence on successful performance-based learning, and yet is largely ignored—or at the least deemphasized—in most instructional models. Moreover, Tessmer and Richey (1997) posited that a lack of contextual consideration is the reason many instructional interventions fail over time. A focus on learning in context closes the (learning) transfer gap between skill acquisition and skill application because learning occurs in the same context in which it is to be applied. This emphasis on contextual learning ensures that the where, when, how, and with whom that so fundamentally define the experience are fully comprehended before a specific type of experience or intervention is selected.

The LITAM tool also aims to close the chronological gap associated with training by focusing on learners' moment of need. This concept has been expressed many ways, to include "point of performance," "on-demand," or "just-in-time," but the premise is the same. Learning is often most impactful when a job situation demands the application of skills or knowledge in real time to solve a real problem.

Figure 22

Learning and Performance Positive Feedback Loop



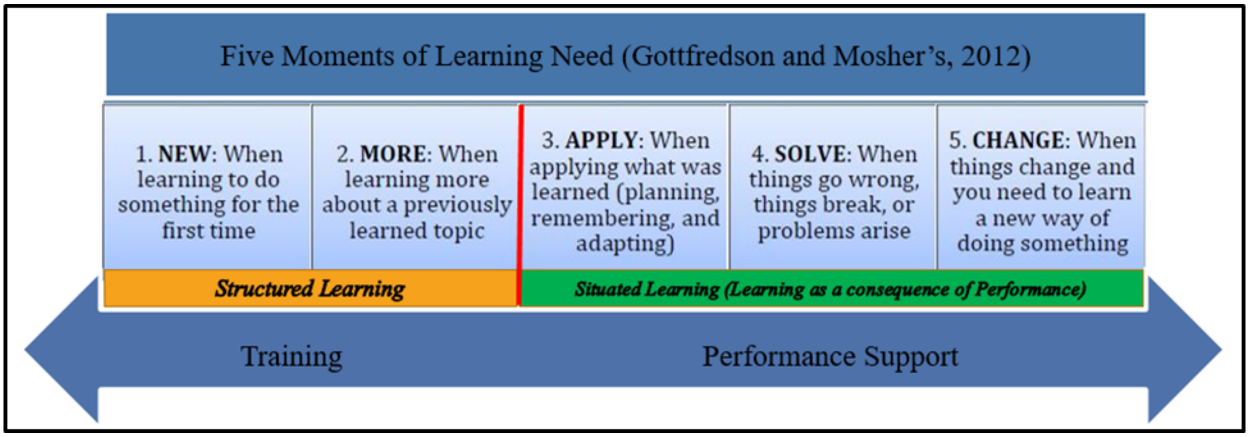
Note: Conceptual model of learning and performance positive feedback loop.

When learning support is made available at the point of performance, the chronological gap between learning and application is diminished, as learning immediately becomes inherent to performance. Furthermore, learning at the moment of need not only makes the learning experience more meaningful, it produces a dynamic in which performance produces situated learning outcomes (learning occurs as a secondary consequence of performance). This dynamic creates a positive feedback loop (Figure 22) in which learning informs performance and performance promotes learning.

The concept of the moment of need is significantly consequential to intervention selection and the dichotomy between learning and performance support. The dynamic relationship between learning and performance support was advanced through the work of Gottfredson and Mosher's five learning moments of need model (Figure 23). The model details five moments (situations) that span the spectrum of learning- and performance-support opportunities that performers might encounter when arriving at competency.

Figure 23

Knapp's Integrated Five Moments of Learning Need



Note: Adapted from *Innovative performance support strategies and practices for learning in the workflow*, by Gottfredson, C., & Mosher, B. (2010), New York: McGraw-Hill. The five moments of need model is conceptually merged with the Knapp's conception of structured learning versus situated learning.

The first two moments of need in the model refer to traditional learning situations: new learning for the first time, and then learning more. The subsequent three moments relate to situations in which learning occurs in the context of performance, often during the job when skills and knowledge are required in real time. These moments involve applying knowledge at the point of performance; solving unanticipated problems; and affecting change in the work environment. Using the moments of need framework suggests that training may be more appropriate for the first two moments (new learning and more learning), whereas performance support may be appropriate for the subsequent three moments (applying knowledge, changing situations, and solving problems).

The moments of need framework is often reduced to the time of performance; however, context is still critical to understanding the chronological gap. A moment of need is often influenced by the dynamics of the performance environment; the where, how, and with whom significantly influences the when. A focus on a particular moment of need promotes the selection of customizable learning- and performance-support interventions that can be readily accessed when the need arises and in the context of performance. To close the chronological gap, interventions should be considered through the moments of need framework, as influenced by the context of performance, so that the design of learning experiences becomes so intimately connected with real performance that they become virtually synonymous.

Summary

The purpose of this chapter was to present the LITAM tool and provide details as to how the tool was designed and constructed. In doing so, I examined the literature that was most influential upon the tool in a manner related to the domain of intervention selection it affected most. Additionally, I conveyed the factors that are utilized within the four decision points, as well as general functionality and output features of the tool. In subsequent chapters, I will discuss further developments and evaluation of the LITAM tool using multiple research methods spanning three distinct phases.

CHAPTER 4

METHODOLOGY AND FINDINGS

In this study, I aimed to develop and evaluate a systematic decision-aid tool designed for the selection of interventions within the framework of the PI/HPT model. As discussed in Chapter 2, a primary concern for HPT practitioners is the selection of interventions with the potential to close skills and knowledge gaps. Prior to this study, there was no systematic tool available for USCG HPT practitioners for selecting learning and performance support interventions aimed at closing skills and knowledge performance gaps. This void was problematic across the Coast Guard Training System (TRASYS), which relies heavily upon the principles of HPT and has trusted in the expertise of their practitioners to address the void. Therefore, the purpose of this study was to develop and evaluate a systematic tool that can guide USCG HPT practitioners, including performance analysts, instructional systems specialists, and HPT consultants, in identifying and selecting optimal interventions in a manner that reflects the fundamental principles of learning science and performance improvement.

Research Design

To do so, I utilized a design and development research approach. Design and development research is innately grounded at the practitioner level because of the focus on formative development and evaluation procedures. Design and development research is an approach to research advanced by Dr. Rita Richey and Dr. James Klein that is specific to the fields of instructional design and performance improvement. Although there are other design-based research approaches, this research approach was selected because of the emphasis on the development process.

Richey and Klein (2007) suggested ‘that there is a distinction between doing design and development and studying the process” (p. 8). Design and development research, as with other research endeavors, lends to the ability to leverage findings in practical application. Design and development research accomplishes this endeavor by categorizing research into two types of studies: (1) product and tool research, and (2) model research. Because this study focused on the development of a new tool, the research literature advanced by Richey and Klein (2007) specific to product and tool development provided the framework needed to answer the research questions.

Richey and Klein (2005) shared that the crux of design and development research is to systematically examine our tools, products, and models to provide reliable and usable information to both practitioners and theorists alike. Given the characteristics of this study, I selected a design and development research approach, as much of the data are to be optimized during real-time practical application. This approach is classified as scientific research; however, it is intricately connected to real-world practice, which creates a loop in which practice informs research, and research, in turn, informs practice (Richey & Klein, 2005).

The contextual nature of this type of study provided an optimal environment for the use of design and development research procedures and created the opportunity to substantially expand the organizational knowledge base by reaching beyond the traditional foundations of teaching and learning research (Richey & Klein, 2005). Design and development researchers are often “in a position to directly impact the work of practitioners because of the propensity of these researchers to situate their studies in natural work settings and to address the pressing problems of the workplace” (Richey & Klein, 2007, p. 14). The design of this study aligns with the premise that research situated in the natural setting of ISD and HPT practitioners can leverage best practices and consequently advance current theoretical assumptions by generating and testing hypotheses through application.

Design and development research aims to create knowledge for the field grounded in data systematically derived from practice (Richey & Klein, 2005). The need for data derived from a natural work setting was a strong fit for the context targeted for the study, as well as the core principles associated with this approach to research. Design and development research is further categorized as either Type 1 or Type 2, or more recently as research on “Product and Tool Design and Development” or “Design and Development Models.” Because the aim of this study was on the development and efficacy of an HPT tool, I contend that this study best fits into the category of Type I research also known as product and tool design and development.

Context

This study took place within the context of the Coast Guard Training System (TRASYS), specifically within the workplace of many of the organization’s leading HPT practitioners and instructional designers. The Coast Guard TRASYS is responsible for conducting all performance analyses across the enterprise, as well as the development of all learning and performance support solutions resulting from analyses. Prominent leaders in design and development research have persistently asserted that this type of study is appropriate for research conducted within the natural work setting of practitioners (Richey, 1997; Richey & Klein, 2005, 2007; Richey et al., 2004). This type of context offers the intervention selection challenges that the LITAM tool was designed to systematize, as well the experts and practitioners needed to test and evaluate the new tool.

Ethical Considerations and Researcher Positionality

Although no specific private information was gathered during this study, great care was taken to protect the confidentiality of the participants and to ensure full transparency of the study. Prior to any data collection, I obtained authorization and consent from multiple offices related to the research project. First, an official Memorandum of Endorsement was received from USCG Force Readiness Command Training (FC-T). Next, I obtained approval from the Old Dominion University (ODU) Institutional Review Board (Appendix P). Additionally, I obtained study approval from the USCG IRB and received informed consent from every participant for all three phases of the study (Appendix O).

Because I am also an instructional designer within the Coast Guard command in which this study took place, I made conscious efforts to diminish researcher biases and ensure no personal opinions or previous experiences affected data collections and analyses. It is also worth noting, for full bias transparency, that, at the core of this study, is the fact that research is centered upon the validation and testing of a tool in which I invested a significant amount of time and effort designing and developing.

That bias could have posed a significant threat to the trustworthiness of the data and therefore was considered a potentially significant limitation to the study. Another bias that could have contaminated this study included researcher opinion of participants and inconsistencies related to education and training backgrounds. Moreover, a potential bias was the recognition that not all practitioners were advocates for systematizing the intervention selection process; doing so might diminish the autonomy that so many experienced practitioners have become accustomed to. Persistent reflection of these biases took place over the duration of the study, and

I consciously considered the degree to which these might be eliminated and was of frequent disclosure in the field journal that was utilized for the duration of the study.

Limitations

The research design was intended to capture the development and evaluation of the tool in real time; concurrently the aim was to refine and advance a tool that could provide impact to the field. The data captured in the research helped to inform the void in the literature concerning intervention selection while advancing the LITAM tool to a point in which it could be successfully vetted and disseminated for practitioners. The intent was not to generate findings that are generalizable to a broader field of practitioners beyond the Coast Guard: but, it is expected that some of the findings will be applicable to any organization practicing HPT and dealing with the challenges of intervention selection. Accordingly, the localized context of use (Baaki & Tracey, 2019) for the LITAM tool is within the USCG TRASYS; thus, findings for this study relative to the implications of this intervention may be particular for the context in which the solution was designed for.

Three Phase Approach

This study utilized a design that spanned three distinct phases, with a particular set of objectives and methods for each. As such, each phase incorporated research methodologies specific to the research questions driving the investigation. It is not uncommon for a design and development research project to utilize multiple research methodologies with different designs being used across different phases of the project (Richey et al., 2005). *In Design and Development Research*, Richey and Klein (2007) offered a series of study design examples specifically for instructional systems tool and product research.

A three phase approach was selected for this study after a review of design and development research literature revealed how multiphase designs were impactful for generating the data needed to inform tool development and evaluation. In *Design and Development Research*, Richey and Klein (2007) analyzed seven examples of research studies designed specifically for product and tool research. In all of the examples, a multiphase design approach was utilized because of the complex nature of the studies and the need to address specific concerns such as validity, inferences, and efficacy. More specifically, Richey and Klein (2007) offered that a three phase approach to tool development research is advantageous for facilitating changes in a tool, confirmation of the assumption that the tool is appropriate for both novice and experienced users, and identification of the constraints of daily practice that may impact tool use and effectiveness. Each phase of this study was designed to generate the data needed to inform the subsequent phase. In doing so, the findings from each phase provided updates for the development of the tool prior to execution of the subsequent. The overarching research phases, aims, and strategies were as follows:

1. Phase One: Development and confirmation of the tool's systematic variables using an expert review panel.
2. Phase Two: Tool field test (try-out) for usability and interfacing with practitioners in a natural work setting.
3. Phase Three: Evaluation of tool efficacy and effectiveness with target practitioners using active analysis cases requiring intervention selection.

Instruments and Protocols

In this study, I used a combination of qualitative and quantitative methods. Accordingly, I designed a series of instruments and protocols in support of the research strategies. There was a total of eight different research instruments and protocols used in the study; six were instruments and two were protocols. All instruments and protocols were thoroughly examined prior to deployment and data collection through an iterative process between the researcher and a review team. More specifically, a review team of four experts, all active practitioners and members of the ISPI, content-validated the instruments and protocols. Three of the experts were performance technologists with the Coast Guard, all with at least 10 years of experience, and the fourth expert was from outside of the Coast Guard, to provide feedback from a perspective independent of the organization.

The content of the instruments was designed to reflect the aim of the research questions and the objectives of each research phase. Once the questions for a specific instrument were drafted, it was shared with the review team for content validity. Each instrument underwent multiple iterations until the review team was satisfied with the content and efficacy of the questions used. Content validity was the focus of the review team because all of the participants would be purposefully selected for the study based upon skill and experience, thereby restricting the number of total participants across the workforce. A field journal was also utilized for the duration of the study which allowed for reflexive notes during critical elements of research. Additionally, all instruments and protocols were designed to protect subject anonymity through the use of a participant identification tracking system.

All instruments and protocols were originally drafted in Microsoft Word prior to electronic conversion and deployment via a secure digital survey distribution platform. Likewise, I conducted all interviews and focus groups through a secure digital collaboration platform called Defense Collaboration Services (DCS). The decision to go completely virtual for all required participant engagements was made at a point in time in which the COVID-19 pandemic significantly affected my ability to reach participants, many of whom were working from home due to COVID remote working protocols. The use of virtual technology for participant engagement was also in alignment with guidance from the university IRB, which emphasized the paramount importance of participant safety during the pandemic.

I also selected the virtual approach because of the confidence that the target participants would have an elevated degree of computer literacy, with electronic surveys and questionnaires, as well as consistent access to the internet for interviews and focus groups. Many of the participants were located in different regions throughout the United States, so the use of virtual platforms provided an additional layer of transparency and consistency, as every participant was engaged with the same means.

Procedures and Findings

I will explain the procedures used in this study in a manner that represents how data were collected, analyzed, and subsequently integrated into the development of the tool at the end of each phase. More specifically, in this chapter, I will present the procedures and findings together from each phase because they were executed chronologically. This chronological approach will convey how the LITAM tool evolved progressively through three phases of evaluation and testing. Therefore, each phase of the study will generally be presented as follows:

1. Participants
2. Procedures
3. Data collection
4. Data analysis
5. Findings
6. Revisions to tool

Phase One: (Round 1) Expert Review Panel

Round I

The aim of Phase One was to review and confirm the systematic components in the tool that impact decision outputs. To do so, in Phase One, I utilized a three-round expert review panel to evaluate, revise, and validate the LITAM tool by a panel of the subject matter experts (SMEs). Each of the three rounds of the expert panel was designed to improve the tool incrementally before conducting user testing (Phase Two) and field evaluation (Phase Three).

An expert review panel is a frequently used method within design and development research, specifically for product and tool development. Use of the expert review panel was a critical element to this study because of the influence they would have on the components within the tool and the questions posed to the users of the tool. More specifically, the expert review panel was asked to evaluate the factors used for decision making within the LITAM tool and then subsequently asked how best to deliver those factors as questions posed to end users. Therefore, the selection of the participants for the expert review panel was extremely critical and consequential because of the impact they would have on the foundational structure of the tool.

Round I: Participants

I used purposeful sampling to select the participants of the expert panel. Participation was criterion based and thus came from a pool of experts who had expertise in three categories: HPT, instructional systems design, and USCG training systems. This approach to selecting the participants involves identifying and selecting individuals who are especially knowledgeable about or experienced with a phenomenon of interest (Creswell & Plano Clark, 2011). The experts selected were to be recognized experts within the Coast Guard TRASYS and were to have at least 20 years of experience in the three categories. After identifying a small pool (six to eight) of potential experts, I selected four expert panelists based on expertise related to intervention selection and availability to participate for the duration of Phase One (approximately 6 weeks). A summary (Table 5) is provided relative to expert panelist experience and background.

Table 5

Expert Review Panel Experience and Background

Experience and Background of SME Panel			
SME#	**Years of Exp**	**Education**	**Areas of Primary Expertise**
1	25	M.S.Ed.	HPT and Systems Integration
2	20	M.S.Ed.	Training Systems Development and Evaluation
3	30	Ph.D.	HPT Analysis and Consultation
4	32	Ed.D.	Performance Analysis and ISD Coaching

Note: Linear depiction of SME panel.

Round I: Procedures

As discussed, use of an expert review panel for model, product, and tool development is a common method within design and development research as a means for attaining expert consultation and analysis (Richey & Klein, 2007). I collected data from the expert panel through multiple means over three rounds in an effort to triangulate. Triangulation is a common strategy for ensuring trustworthiness that involves using multiple forms of evidence at various points of inquiry (Hays & Singh, 2012).

Round I of the expert panel began with a packet emailed to each of the four SMEs. The packet included (a) an introductory letter, (b) procedures for Round I, (c) the research study's statement of the problem and literature review, (d) a brief background on the design of the LITAM decision-aid tool, which included the individual components of the tool that impact the selections for each decision point in the tool, (e) a job-task analysis (JTA) with a validated task list to be entered into the LITAM tool, and (f) an intranet link to a functional prototype of the LITAM in the form of a web-based application.

The purpose of Phase One was to answer the following research question:

1. How can the LITAM tool be improved, relative to the components and questions used to guide the intervention selection process, to be more intuitive and effective?

Round I: Data Collection

The subject matter experts (SMEs) were given 1 week to complete the Round I procedures, which required them to enter a set of performance tasks (10) from a JTA into the LITAM tool to experience how the tool performs. Once confirmation was received that all four SMEs completed the Round 1 procedures, I scheduled individual interviews. I conducted all interviews using the DCS platform.

I recorded SME interviews via the DCS platform and then transcribed them verbatim. I transcribed all interviews within 1 day of the interview and then subsequently deleted the recordings. I presented the individual responses from the interviews in narrative form next to each question for the interviewees to review for accuracy. Next, I categorized the SME responses in a table format so that the responses could be compared linearly by question and participant. This format facilitated qualitative analysis of the SME responses and the identification of changes to be made to the LITAM tool.

Round I: Data Analysis

Through the data analysis approach, I had a two-pronged agenda: (a) identify emerging themes to be considered as changes to the tool, and (b) identify isolated commentary that justified changes to the tool. Both agendas were operationalized within the framework of the research question for Phase One, which centered upon examining the decision factors used in the tool and how best to present them for utilization. Because the participants for Phase One were recognized SMEs, I considered their feedback authoritative—even if some commentary was isolated. More explicitly, even if only one of the four experts identified something in their feedback that could improve the tool, it was carefully measured for implementation because of their level of expertise within the context of this study.

I analyzed the qualitative data through an initial open coding process, which allowed for participant responses to be isolated from the data (Creswell, 2012; Hays & Singh, 2012). Codes that were captured from this analysis emerged from the use of a well-defined codebook (Appendix J), as they were successively used to support a secondary coding process. I then utilized an axial coding approach to further isolate participant responses that were revealed during the initial coding process. This approach provided for the capture of more relevant feedback and potential changes to the tool, as emergent themes came to light. Once complete, the transcriptions were shared with another performance analysts (within USCG TRASYS) for another round(s) of coding to confirm/contrast themes that originally emerged. Following the secondary review, emergent themes were confirmed and are conveyed in the findings.

Round I: Findings

The Round I interviews provided insight as to expert reactions to a new tool and their general sense of skepticism, or openness, and to systematizing a process (intervention selection) with which they were intimate. This was the first formal introduction of the LITAM tool to an audience beyond that of the researcher's work team; therefore, the responses captured during the data collection were the first formal evaluation of the tool. I referenced the expert responses provided in this section by participant identification (ID) number.

The comments below are related to research question #1 concerning the components of the tool, as multiple themes emerged as potential changes to the LITAM tool, including the following:

1. Duplication of data entry efforts
2. Lack of intuitiveness in early prototype
3. *Moment of need* variable
4. *Frequency of performance* variable
5. *Performance from memory at stimuli* variable
6. *Cognitive, affective, psycho-motor* variable

This first open-ended question during the interview examined the SMEs' first impression of the tool. The first impression responses provide context as to their general reactions to the new tool and their respective positionality. In general, the responses were positive and reflected the novelty of the tool. More specifically, Expert #4 noted that "my initial impression was that the tool was easy to use and branched smoothly. However, I had to enter some of the task data twice, because when I used the back arrow, the information was lost" (Lines 72 to 74). Of similar note, Expert #2 commented that "I liked the tool. The way it flowed was good" (Line 26).

The first exposure was not as positive for the other two experts. Expert #1 commented the following:

> Too many clicks. Made me wonder if there's a way to consolidate decisions in the logic flow either within each decision point or by crossing them over; seeking contextual linkage for the reuse of previous selections. The course data entry on page 1 seemed to be turned off and made me wonder if I'm doing something wrong. I couldn't save my results either; gone forever. (Lines 1 to 5)

The lack of intuitiveness was also a concern for Expert #3, who commented that the "info button is not working and stuck on first page, but may be due to prototype nature of LITAM" (Lines 50 to 51). Although the focus on the Round I Expert Panel was not on interfacing and navigation, as that is the focus of Phase Two, I recorded all relevant feedback and reexamined it for potential changes.

An immediate theme that emerged from the experts was the need to reduce duplicating efforts. Experts 1 and 4 both provided early feedback concerning having to enter the same information multiple times throughout the tool. This feedback was critical to making the tool more user friendly in an effort to reduce the probability of "click fatigue," which could consequently affect the efficacy of the tool.

Use of Systematic Variables

Much of the feedback captured during the interviews was unremarkable, but several key topics emerged that answered the research question for Phase One and subsequently influenced the development of the tool. There were a few systematic variables that the expert panel expressed concern about. The first variable that experts questioned was the *learning moments of need* variable (Gottfredson & Mosher, 2010) which is used in decision point 3 of the LITAM tool to determine whether an intervention needs to be synchronous or asynchronous. Expert #4 noted that "assuming the target users do not understand learning jargon, phrases such as 'moment of need' and 'scaffolding' will be misunderstood" (Lines 75 to 76). Expert #1 expressed a similar concern, who frankly shared "I'm not familiar with the 'moment of need' concept. I'd need to go look it up before I used the tool again" (Lines 6 to 7).

The experts expressed comparable unease with the systematic variable of *frequency of performance*, which is used within decision point 1 of the tool to determine whether the intervention needs to be training or performance support. Expert #2 commented that "frequency of performance may not be perceived by all users in the same way, and that definitive parameters should be used to define the concept more succinctly" (Lines 37 to 38). Likewise, Expert #3 shared that "frequency of performance options are not as I recall with Harless approach, may throw some off balance" (Lines 56 to 57).

Another systematic variable of concern was *performance from memory at initial stimuli*, which is also used within decision point 1 of the tool to determine whether the intervention needs to be training or performance support. Multiple experts expressed concern regarding the use of this variable and how it might affect the propensity for training selections. Expert #1 commented that "this concept is confusing and not sure how that impacts the use of job-aids" (Lines 12 to 13). Expert #2 expressed even greater concern by noting the following:

> Performance from memory at initial stimuli—this concept is not completely obvious for me. Even when I read the potential selections it is not clear. I think it is referring to the allowance for time upon stimuli to response, but that is not clear. Must be a more concise way to convey this concept. (Lines 33 to 36)

One of the challenges with collecting data from participants was that every participant experiences the LITAM tool in a different way. The tool has dynamic question paths, meaning that a user is presented certain questions based upon certain responses—and users do not generally select the same responses. Therefore, some users are exposed to options that others are not. This is often the situation for decision point 4, which makes the modality of instruction selection. This decision has two unique decision paths based upon the synchronous/asynchronous decision (decision point 3). When addressing the systematic variables for a training intervention, experts expressed concern with a primary variable. More specifically, experts expressed concern with the systematic variable that requires the user to select whether the task is primarily cognitive, affective, or psycho-motor.

Expert #2 noted that sometimes “there is overlap with a task with concern to cognitive, affective, or psycho-motor” (Lines 48 to 49). To the same point, Expert #3 shared that “maybe not everything fits so neatly in those three boxes” (Line 63). When Expert #4 addressed the same systematic variable, it was noted that “cognitive, affective, and psycho-motor are often referred to by practitioners as KSA—that is, knowledge, skills, and attitudes” (Lines 78 to 79). To the same point, Expert #4 commented that “as performance technologists, it is imperative to speak the language of those we serve” (Lines 79 to 80).

The challenge of using systematic variables in the LITAM tool is multidimensional: (a) What components should be used, and (b) how best to convey the use of components to users. As expected, the expert review panel offered recommendations as how best to articulate the systematic variables for others to consider. The comments below are related to research question #1 concerning the articulation of systematic components in the tool as multiple themes and powerful recommendations were captured.

Articulation of Systematic Variables

The *moment of need* concept was one that troubled two of the experts. It was more of an unfamiliarity with the literature than it was skepticism of the theory itself. To provide clarity for the utility of the *moment of need* variable, Expert #2 suggested that “instead of posing questions relative to each ‘moment,’ present the user with declarative statements as options that explains what each moment is with examples” (Lines 39 to 41). Expert #4 echoed the same sentiments and suggested that “an example for each moment of need would be extremely powerful, even if the concept is new to the user” (Lines 84 to 85).

The expert review panel also conveyed unease with how the *frequency of performance* variable was utilized. Unlike *moment of need*, all of the experts were quite intimate with the frequency of the performance variable, as it has been part of the Joe Harless methodology, which has been embraced by the USCG Training System (TRASYS) for decades. The concern was that use of the concept in the LITAM tool is nuanced, relative to what has traditionally been used in the Harless job-aids. For example, Expert #3 commented that "frequency idea was not clear—good three items to select from, but not aligned with the JTA scale of 5 choices. The JTA scale for high, which is weekly, should be two or more times per week" (Lines 57 to 59). The same concern was expressed by Expert #1, who pointed out that "the frequency of performance options were different than current JTA/FEA metrics" (Line 14). Expert #1 went on to say the following:

> Using a set of options that reflect current methodologies may put the user at ease because of familiarity with options. Most analysts are very intimate with the job-aids from SOP Volume 2, so using current the frequency metrics from the DIF (difficulty, importance, frequency) could be an easy fix. (Lines 14 to 18)

Decision point 1 in the LITAM tool makes the train versus job-aid determination. To do so, the tool determines when performance from memory is truly needed. The importance is not that something is trained to memory; rather, it is more important that something can be performed from memory (D. Craft, personal communication, August 17, 2019). How best to arrive at performance competency is what HPT addresses. To make this determination, the tool uses the *performance from memory at initial stimuli* variable.

The *performance from memory at initial stimuli* variable was concerning to some of the experts because of the language used in the questions. The expert panel offered multiple ways forward to make the variable less confusing. Expert #4 suggested asking "when could a job-aid be used from the initial step of the task" (Lines 86 to 87). Addressing the same dynamic, Expert #3 went a bit further by commenting the following:

> Performed from memory at initial stimuli. I actually like the phrasing, but think it may be cumbersome to target population to use or apply. The wording could probably be simplified to either: a) Are there psycho-social barriers for use of a job-aid?, b) Job environment reasons that would prohibit use of a job-aid?, or, c) Could a job-aid be used to guide performance? (Lines 66 to 71)

Another theme of concern from the expert review panel was the use of the *cognitive, affective, and psycho-motor* variables. As noted, the expert panel expressed concern, as these terms are akin to knowledge, skills, and attitudes, which is commonly used in the field. It is also worth noting that the same concern was expressed in my field journal because of user familiarity, or lack thereof, with the language. Multiple panelists suggested ensuring the language is clear, such as Expert #1, who suggested making a "reference that equates cognitive, psycho-motor, and affective to KSAs" (Line 13). Likewise, Expert #3 suggested "rewriting the question so that KSAs are used as well for context" (Line 65).

In addition to the emergent themes that influenced changes to the tool, there were some singular comments from the experts that were powerful enough to consider implementing. For example, Expert #1 conjectured the following:

> In the Synchronous/Asynchronous Decision Questions section, Q4, Q5, and Q6 seem to be asking about learning issues and not performance like all the other questions. Would like to see them turned around so they were pointed toward the requirements of the OTJ performance if possible. (Lines 19 to 22)

With regard to the key concepts for each question in the tool, Expert #2 held the position that "the words highlighted in blue in the questions all need a definition buttons added for information. The end users of this tool may not be an ISD or probably have any background in instructional design" (Lines 30 to 32). Those sentiments were similar to those of Expert #4, who stated that "I would either change the terms mentioned in question 2 (subjectivity of steps changing) to lay terms or provide an explanation similar to what you provided for the responses to the question inquiring about consequences of error" (Lines 81 to 83).

Finally, a succinct, but powerful observation from Expert #3 concerned the delineation between types of cognitive behavior posed in a question (abstraction, discrimination, procedural) and the potential for multifaceted behaviors within a single task. Expert #3 suggested that the question be rephrased to include the following "What is the dominant cognitive behavior?" (Lines 61 to 62). All of the aforementioned comments were considered for integration into the LITAM tool, where applicable. A list of all changes made to the LITAM tool following Round I of the expert panel are listed below.

The comments discussed in this chapter were not all hyper-critical in nature; some feedback provided encouragement for further use of the tool. More specifically, Expert #4 summarized his interview by adding the following:

> All the questions and factors made sense to me and seemed appropriate. BZ!
>
> I cannot think of any questions or factors that should be added. I believe Joe Harless would have perceived your tool to cover the vital areas of his model. The outcomes of your model based on my input matched my expectation of what interventions would be effective. (Lines 89 to 92)

The commentary from Expert #4, related to Harless methodologies, was noteworthy because the work of Harless was scrutinized immensely during the literature review and served as a prevailing influence on the design of the LITAM tool.

Round I: Tool Revisions from Feedback

Collectively, the expert review panel provided over 100 years of experience. Their insights were extremely enlightening, and every expert recommendation was considered for tool integration. Moreover, the feedback from the expert review panel answered the first research question with succinct changes made to the tool. The summarized data were incorporated into the comprehensive list of changes included below, which were shared with the expert panel for final review.

Table 6

Tool Revision List: SME Round I

Revisions to LITAM Following SME Round I Data Analysis	
Change #	Change/Update Description
1	Unlocked the data entry option on the opening page.
2	Added prescriptive parameters to the question examining the “subjectivity of step change” within each task.
3	Adjusted the “frequency of performance question” to reflect the parameters from the Harless FEA methodology.
4	Adjusted the “cognitive behavior” question, which now reads to determine “What is the dominant cognitive behavior associated with this task?”
5	Adjusted the “performance from initial stimuli” question so that it reads more clearly as “performance from memory at initial stimuli” with a detailed narrative provided via the information icon.

Revisions to LITAM Following SME Round I Data Analysis	
Change #	Change/Update Description
6	The following explanations have been provided to explain the three types of cognitive behavior options for Q5 (decision point 1) and can be found by using the "i" to the right of the query. **Abstraction** – Cognitive process of isolating, or abstracting, characteristics or features from something (idea/concept/policy) to increase the propensity for application elsewhere. **Discrimination/Generalization**. – Ability to recognize/delineate differences among comparative sets. To do so, facilitate the capacity to make generalized inferences across the same sets. **Procedural/Sequential** – Following a prescriptive set of procedures/steps in which the sequence assumes other cognitive processes (abstraction/discrimination) have already been mastered.
7	The last question in decision point 2 (Performance Support) had four options that were asked as questions, but are now read as statements to be selected as such.
8	The "moment of need question" had four options that were asked as questions, but are now read as statements to be selected as such.
9	All "moment of need' statements have examples available.
10	A theoretical explanation of the moment of need was available through an information icon.
11	Multiple questions in this decision point (4, 5, and 6) were written for the context of a potential learning environment and were restructured so that the focus of the query is placed upon the context of performance.
12	An "i" information icon has been provided to explain the scaffolding concept presented in question 4 of decision point 3 (Synch/Asynch) and is as follows. **Scaffolding** - Method that enables a learner to solve a problem, carry out a task, or achieve a goal through a gradual shedding of outside assistance.
13	The indoctrination question was rewritten as follows to provide more clarity. Is organizational indoctrination/acculturation fundamental to the learning experience? That is, is the context in which something is learned just as important as what is learned—learning and context are inseparable.
14	The indoctrination question was rewritten as follows to provide more clarity. Is organizational indoctrination/acculturation fundamental to the learning experience? That is, is the context in which something is learned just as important as what is learned—learning and context are inseparable.
15	The "cognitive, psycho-motor, affective" question was rewritten to include a direct association with "knowledge, skills, and attitudes (KSA)" and a detailed explanation of each domain is available through an information icon.
16	Removed all blue text and made them black and bold to identify key terms in questions.
17	Removed all words written as placeholder in early prototype.
18	Several additional instructional term definitions (e.g. scaffolding, coaching, context, level 2s, etc.) were added to be accessed via an information icon next to their respective questions.

Revisions to LITAM Following SME Round I Data Analysis	
Change #	Change/Update Description
19	Added guidance concerning the use of SME/APs.in the opening banner that reads as follows: This decision-aid tool is designed to help USCG learning and performance improvement practitioners with the challenge of intervention selection when closing skills and knowledge gaps. The data needed to generate accurate learning and performance support recommendations require a valid task list, knowledge of target performers, and an understanding of the desired context of performance. For the most accurate results, it is recommended that program SME/APs be consulted when answering the questions in the LITAM tool.

Phase One: (Round 2) Expert Review Panel

The aim of Round 1 was to review and confirm the systematic components in the LITAM tool and determine how best to present those components for users of the tool. To do so, in Round 1, I utilized interviews with the expert review panel to uncover their perceptions of the tool as well as their recommendations for improvement. Following qualitative analysis from the interviews, I identified a series of changes and immediately integrated them into the LITAM tool. I then updated the LITAM tool used in Round II of the expert review panel based on the Round I findings.

Round 2: Participants

The same four members of the expert review panel from Round 1 participated in Round 2.

Round 2: Procedures

Round 2 of the expert review comprised another packet sent electronically by email to the four SMEs including (a) a letter with the remaining deadlines in the expert panel review schedule and a brief background on the development of the tool components, (b) a link to an electronic questionnaire to be completed examining the individual components of the tool, (c) a summary of the feedback from Round I, and (d) a web link to a revised and functional prototype of the tool so SMEs could interact with the tool as needed. Having the ability to interface with a functional prototype of the tool, as needed, assisted with conceptualizing how the individual components were utilized in the tool.

As with Round 1, the focus was to generate data to answer the first research question (below) of the study, as well as identify any potential improvements to the tool.

1. How can the LITAM tool be improved, relative to the components and questions used to guide the intervention selection process, to be more intuitive and effective?

I gave the panel of experts unrestricted access to the updated LITAM tool. As with Round I, I gave the SMEs a task list from an inactive analysis (JTA) to be entered into the tool. I provided the task list to be entered into the tool separately, in addition to the full JTA report for review, as needed. As with the Round I procedures, the focus was on the questions used in the tool, as well as the factors and terminology utilized within. All tasks were to be entered into the tool and a final intervention selection summary report was to be generated. Once experts finished using the LITAM tool, they proceeded to the Round 2 electronic survey questionnaire, which was the source of data for Round II.

Round 2: Data Collection

I gave the SMEs 1 week to complete the Round 2 procedures, which centered upon completing an online questionnaire after the use of the LITAM tool. The questionnaire employed a modified Likert scale approach, with an Agree–Disagree scale using (a) strongly agree, (b) agree, (c) neither agree or disagree, (d) disagree, and (e) strongly disagree to respond to each item. The questionnaire (Appendix B) included items that addressed the systematic variables within the tool, as well as perceived confidence with the outputs (intervention selection) of the tool.

The questionnaire also addressed some functionality elements of the tool to better understand the full user experience with the tool. In addition to the Likert scale questions, the questionnaire provided the opportunity for open commentary from the experts on any subject related to their experience with the tool. Because this study contained research questions relating to expert perception, a survey instrument was developed to gather quantitative and qualitative data (Creswell, 2015) regarding the degree to which participants agree with the components and functionality of the tool. The SMEs had unrestricted access to the LITAM in an effort to broaden their experience with the tool. Changes to the tool that resulted from SME feedback, were implemented prior to the next round with the expert panel.

Round 2: Data Analysis

The SME responses from the questionnaire were tabulated and categorized by question and participant. Likewise, I catalogued the open-ended question commentary by respondent name. I then tabulated the quantitative data from the questionnaire administered in Round 2 and entered them into a spreadsheet in preparation for the statistical analysis. Prior to utilization of SPSS software, the quantitative data underwent a secondary review to ensure tabulation accuracy. The secondary review was conducted by a member of an evaluation (learning impact) team who did not participate in the research and is intimate with statistical analysis. Next, I entered the verified results tabulated from the spreadsheet into the SPSS software for statistical analysis. I then analyzed quantitative data using descriptive statistics (mode, mean, and median), and measures of variability (variance, range, and standard deviation). I implemented all revisions from Round 2 prior to Round 3.

Round 2: Findings

The Round 2 questionnaire examined three different areas of concern: usability, effectiveness of questions used, and confidence with results. Because of the experts' vast amount of expertise and experience, it was paramount that their perceptions were captured during development of the LITAM tool. To gain insight into the perceived practicality and confidence in the components of the tool, I analyzed and interpreted the responses from the reflective questionnaire.

The components of the LITAM tool all refer to the variables used in the tool and their application for the purpose of intervention selection. Table 7 summarizes the participants' perceptions with regard to the usability of the tool. Generally speaking, the usability of the tool was perceived to be practical. Experts reported positive perceptions to the usefulness of the tool, with specifically strong reactions to the intuitiveness of the tool (mean = 4.5). The remaining items related to usefulness were more varied, but still with means all above average.

Table 7

Survey Results for LITAM Usability Items

Survey Items	n	Mean	SD	Max	Min
1. Use of the LITAM tool is intuitive.	4	4.5	0.5	5	4
2. The guidance provided in the tool is sufficient for USCG practitioners (ISS, analysts, training specialist/managers, etc.).	4	4.25	0.43	5	4
3. The progression through the four decision points in the tool is a logical flow.	4	4.25	0.43	5	4
4. The selections generated in the summary report were easy to understand.	4	3.25	0.83	4	2
* 5 = Strongly Agree, 4 = Agree, 3 = Neither Agree nor Disagree, 2 = Disagree, 1 = Strongly Disagree					

Note: Results taken from the expert review panel Round 2 questionnaire

Other survey items focused on the effectiveness of the questions. All items related to the use of factors, and questions received positive responses from the SMEs, as only strongly agree or agree was recorded. Looking at the items (Table 8) specific to the efficacy of the tool questions, the expert panel reported strong agreement (mean = 4.75) with minimal deviation (*SD* = 0.43). Likewise, a mean score of 4.75 was reported when specifically addressing the importance of the factors (systematic variables) used in the tool. The responses to the Round 2 survey items related to effective factors and questions aligned with the data from Round 1, which were generally positive and in support of the systematic variables used in the tool.

Table 8

Survey Results for LITAM Effectiveness of Question Items

Survey Items	n	Mean	SD	Max	Min
1. The LITAM tool posed an appropriate amount of questions to generate the selections.	4	4.75	0.43	5	4
2. The LITAM tool posed effective questions to generate the selections.	4	4.25	0.43	5	4
3. The LITAM tool used important factors to generate selections.	4	4.75	0.43	5	4
* 5 = Strongly Agree, 4 = Agree, 3 = Neither Agree nor Disagree, 2 = Disagree, 1 = Strongly Disagree					

Note: Results taken from expert review panel Round 2 questionnaire

It was important to optimize the opportunity for expert feedback early in the study with regard to their perceived confidence with the intervention selections of the LITAM tool. Expert feedback was critical because their perceptions on the effectiveness of the systematic selections would provide an element of validation for keeping or altering the components used to generate those selections. Round 2 of the expert panel provided the second opportunity for the expert review panel to enter data from a performance analysis into the LITAM tool to generate intervention selections. As such, the following data reflect the perceptions of an expert panel who used the LITAM tool on multiple occasions with different performance analyses. Overall, the participants responded with positive perceptions of the tool's ability to generate accurate selections. More specifically, when the experts were asked to report on their level of confidence in sharing the LITAM selections with stakeholders, two experts selected strongly agreed and two selected agreed, for a mean score of 4.50. Very similar data were reported for the remaining items (Table 9), as all items reported a mean of 4.0 or higher.

Table 9

Survey Results for LITAM Confidence with Results Items

Survey Items	n	Mean	SD	Max	Min
1. Based upon the performance tasks you entered into the LITAM tool, the selections made were appropriate.	4	4.0	0.71	5	3
2. The LITAM tool generated selections I would feel confident sharing with stakeholders.	4	4.5	0.50	5	4
3. The tool provides a valid means of selecting interventions for skills and knowledge gaps.	4	4.5	0.50	5	4
4. The selections generated in the summary report aligned with my intuitions/expectations for the tasks.	4	4.0	0.0	4	4
* 5 = Strongly Agree, 4 = Agree, 3 = Neither Agree nor Disagree, 2 = Disagree, 1 = Strongly Disagree					

Note: Results taken from expert review panel Round 2 questionnaire

In addition to the survey items in the questionnaire, I provided the participants with an opportunity to provide feedback on anything related to their experience with the tool. All of the participants provided feedback; some of the feedback was positive, whereas other elements were highly critical. The positive commentary aligned with the data from Rounds 1 and 2, whereas the critical elements promoted reflection and further analysis for potential changes. The confidence level in the results produced by the LITAM tool perceived by the expert panel was a concern going into this part of the study and was noted in the field journal as an element of apprehension for the study. Some of the key comments from the expert panel are captured below.

Expert #1 was still quite concerned about the use of the *moment of need* variable. He specifically noted that the “moment of need explanation is still confusing; could be clearer” (Lines 94 to 95). Expert #4 expressed the same type of concern with that variable, as well as the scaffolding variable, but went on to recommend a “glossary for some terms that may not be clear, such as “scaffolding,” and “moment of need” (Lines 130 to 131). Expert #3 went a step further in addressing the use of variables in a question by suggesting that “perhaps the question could be whether scaffolding is appropriate or acceptable means of shaping behavior" (Lines 110 to 111).

The experts closed their commentary by offering sentiments of satisfaction with the overall direction of the tool. Expert #1 specifically mentioned "great tool, great process, great project!" (Line 95). Similarly, Expert #3 closed by saying "overall great job—and I am more confident in the results than what I saw in the JTA recommendations—and of course, these results from the LITAM were more thorough" (Lines 125 to 126). The positive commentary revealed that the experts were balanced in their evaluation in that they conveyed some level of affirmation while still offering layers of critical feedback for improvement.

In summary, the collective results from Round 2 provided an indication that the experience of the expert review panel was positive. The data indicated that participants found the LITAM to be intuitive, including appropriate factors and effective questions, and they were confident in the selections generated. Although the expert review panel expressed a certain level of confidence with the tool, they included a myriad and extensive list of recommendations within the open commentary portion of the questionnaire. I analyzed those recommendations for applicability, and the final list of changes made to the LITAM following Round 2 is listed below. I integrated all of the changes listed into the LITAM prior to Round 3.

Table 10

Tool Revision List: SME Round II

Revisions to LITAM Following SME Round 2 Data Analysis	
Change #	Change/Update Description
1	In decision point 2 (PS), participants continued to comment on how the question tabs "fly in and out." In Decision Point 2 (Performance Support), the amount of "fly in/out" activity was reduced. This occurs as a consequence of the dynamic branching that is involved, but static questions were restructured so that the amount of dynamic "fly in/out" activity of questions was minimized.

Revisions to LITAM Following SME Round 2 Data Analysis	
Change #	Change/Update Description
2	In decision point 4 (Modality), the occurrence of having additional, or improperly sequenced, questions prompted after the “next” button was removed. This is a consequence of some of the responses not resetting after task completion, but the problem was remedied.
3	A glossary was added to the menu on the opening page and will remain available during use of the tool. The glossary will serve as a reference point for all definitions and concepts that may benefit from further details when answering the LITAM questions. The glossary will initially be populated with the information currently available in the “i” info boxes and will be populated with additional information as the tool evolves.
4	A “Help” function was added to the new menu on the initial dashboard of the tool. The help function will explain certain protocols and functionalities of the tool, such as an overview of the decision points, to help orient how the user progresses. More help items can be added to this function, as validated through user testing.
5	A glitch was repaired for question 2 of decision point 3 (synch/asynch), which prevents an improper response to the safety query. No longer should the user be prompted with “is text-based one way guidance sufficient?” after selecting no for safety concerns.
6	The collaboration/team based question for decision point 3 (Synch/Asynch) has been rewritten to be more concise. The old and new versions are below. -*Old*: Does performance of the task involve collaboration with others? Team based or organizational development? -*New*: Does performance of this task normally involve collaboration with others or performed as part of a team?
7	To help further explain the collaboration/team-based question for decision point 3 (Synch/Asynch), an “i” icon has been added with the following verbiage. “i”: This task is not normally performed autonomously; rather it is completed as part of a team effort involving communications/collaboration with others.
8	The coaching/scaffolding question for decision point 3 (Synch/Asynch) has been rewritten to be more concise. The old and new versions are below. -Old: Is coaching or scaffolding involved with the task? -New: Is coaching or scaffolding an appropriate means of shaping behavior when learning how to perform this task?
9	To help further explain the coaching/scaffolding question for decision point 3 (Synch/Asynch), additional information/examples have been added to the “i” icon with the following verbiage. -“i” added: Example: Journeyman provides oversight to the performance of the apprentice as needed until worthy performance is achieved. The process normally involves a greater amount of coaching in the beginning, but assistance is gradually reduced as the apprentice becomes more competent.

Revisions to LITAM Following SME Round 2 Data Analysis	
Change #	Change/Update Description
10	To address confusion around the "need to access learning support on demand, anytime/anywhere" question in decision point 3, an "i" icon has been added with the following verbiage. "i": On Demand (anytime/anywhere) learning support is justified in conditions in which the need for support when performing a task often cannot wait for future learning opportunities; performance of the task regularly involves solving a problem of a critical nature that demands anytime/anywhere access to learning support.
11	Question 7 in decision point 1 (TTM/PS) about the need to perform from memory has been reworded to be less confusing. Additionally the responses have expanded from 2–4 and include options that specifically address when performance support might be facilitated. The new questions and responses are as follows: New question: Q7—What level of "Performance from Memory" is required for this task? New responses: 1. All of the steps of the task need to be performed from memory through task completion. (TTM) 2. The initial steps of the task need to be performed from memory upon stimuli, but subsequent steps can be supported with performance support. (TTM) 3. Performance from memory upon stimuli is not critical, but barriers preclude the use of performance support (physical, social, speed). (PS) 4. Performance from memory upon stimuli is not critical, use of a job-aid is feasible. (PS).
12	Confusion around the moment of need concept used in decision point 3, Question 5 (Moment of need question) has been updated with the following verbiage. New Verbiage: A performer's moment of need is a conceptual framework for a learning and performance continuum that identifies specific moments, or situations, that span the spectrum of learning and performance opportunities. This occurs when learning something for the first time (new), learning more about something previously learned (more), learning in the context of practical application of skills/knowledge (apply), or learning when solving a problem or as things change in the workplace (solve, change). These occurrences (new, more, apply, solve, change) are a learners' moments of need when arriving at worthy performance. Identifying the performer's specific moment of need optimizes the potential for learning.
13	All of the "I" info boxes that previously populated to the right of the question have been updated so that all info boxes will now populate in the center of the user screen.
14	Numerous spelling, punctuation, and grammatical errors were corrected as a result of the expert review.

Phase One: (Round 3) Expert Review Panel

The aim of Round 3 was to establish consensus on the overall design and components of the tool from the experts based on tool revisions resulting from the data collected in Rounds 1

and 2. Round 3 was the last opportunity to ask the expert panel to scrutinize the tool and to make final recommendations on the way forward. Their final opinions and guidance would affect future development of the LITAM tool, as well as the direction of the study.
Furthermore, the aim was to achieve some level of confirmation for the use of the tool prior to moving into Phase Two, which was to focus on usability and interfacing. By improving the internal components of the tool in Phase One, participants in Phase Two could focus on functionality and effectiveness.

Round 3: Participants

The same four members of the expert review panel from Round 1 participated in Round 2.

Round 3: Procedures

Round 3 consisted of one final packet sent via email to each of the panel experts which included (a) Round 2 statistical analysis and summarized results, (b) a link to a revised and functional prototype of the LITAM tool, (c) a letter with a summary of all changes implemented into the LITAM tool, and (d) a questionnaire to be answered. The questions for the SMEs to respond to were as follows:

1. What was your overall experience with the tool?
2. What are the benefits, relative to other processes for intervention selection, of using the LITAM tool?
3. What do you perceive to be as barriers, if any, to the use of this tool?
4. What specific changes, if any, would you make to the Intervention Selection Summary Report to make it more effectual and user friendly?
5. What final changes, if any, would you recommend to the tool?

6. Do you perceive that the selections generated by the LITAM tool are systematic and reflect principles of learning and performance improvement? Please respond with Yes or No.
7. Can you agree to the use of the LITAM tool and do you recommend it for further use. Please respond with Yes or No.
8. Please provide any additional comments, if needed, related to the use of the LITAM tool.

Round 3: Data Collection

I gave the SMEs 1 week to complete the Round 2 procedures, which required them to engage with the updated LITAM tool prior to answering the questions. I collected the individual responses from the questionnaire and reviewed them for completion, particularly the questions requiring the SMEs to take a firm position on the way forward. Next, I categorized the SME responses in a table format so that responses could be compared linearly by question and participant. This format facilitated the qualitative analysis of the SME responses and the identification of changes to be made to the LITAM tool.

Round 3: Data Analysis

The data analysis approach had multiple objectives: (a) identify emerging themes to be considered as changes to the tool; (b) identify isolated, but critical, commentary that justified changes to the tool; and (c) determine whether there is consensus from the experts on future use of the model. I operationalized all objectives within the framework of the research question for Phase One, which centered upon examining and improving the tool prior to field-testing and evaluation.

I analyzed qualitative data through a cyclic coding process in which open, secondary, and axial techniques were used, respectively, until emergent themes and trends became evident. I captured the codes and themes that emerged through a well-defined codebook. It is important to note that the axial coding approach helped to further scrutinize participant responses that were first isolated during the initial coding cycles. This approach provided for the capture of more potential changes to the tool, as emergent themes came to light.

Round 3: Findings

The Round 3 responses directly addressed the questionnaire items for that round, but were also a reflection of the expert panel's general reaction to the tool having had access to it during an approximate 6-week period. Therefore, in reviewing the responses for Round 3, it was important to recognize feedback concerning elements beyond the scope of the questions, as that would be the last opportunity to capture formal data from the expert review panel. The findings for Round 3 are presented in relation to their corresponding question item.

What Was Your Overall Experience With the Tool?

The first question posed to the expert panel aimed to capture the general experience of each participant after multiple (approximately 6) weeks using the tool. Although the feedback was generally positive, two of the panelists made comments concerning the amount of rigor, and "clicks," that were involved in generating a recommendation. Expert #1 commented that "I anticipated rigor because of the number of questions and so forced myself to complete each TPO. In other words I ignored my own impatience as a trade-off for a good benefit at the end" (Lines 132 to 133). Commenting on the same concern, Expert #4 noted that the tool was "easy to use by second or third task being entered" (Line 209). Although these comments did not initiate an immediate change to the tool, it made me more conscious of the potential for "click fatigue" and caused me to seek opportunities to make the tool more efficient and less burdensome as the study moved forward.

The expert review panel also provided a few comments that provided some indication as to their overall assessment of the tool. Expert #2 was brief, but noted that "use of the tool shows marked improvement over the first time I used it" (Line 152). Of similar note, Expert #3 summarized by saying "excellent – interesting, elegant and appreciate seeing the improvements made through the review process" (Lines 181 to 182). All four members of the expert panel asserted their recognition of the improvements made to the LITAM tool during Phase One of the study. Such recognition from the expert panel was remarkable, as improvement was the primary purpose of Phase One and at the core of the research question driving the expert review panel.

What Are the Benefits, Relative to Other Processes for Intervention Selection, of Using the LITAM Tool?

The responses to the second question indirectly compared the LITAM tool to the traditional (legacy) approach to intervention selection used by the USCG, which has traditionally been embedded within the Joe Harless (1994) front-end analysis (FEA) methodology. Each expert provided unique comments, but the common themes were confidence, automation, and comprehensiveness. For example, Expert #1 suggested that it "will serve the same purpose as the DIF only with more accurate recommendations; should invoke higher levels of confidence for users" (Lines 139 to 140). Likewise, Expert #2 commented that "this seems to take into consideration elements not asked in the current model. The DIF does take into account most of these questions" (Lines 153 to 154). Similarly, Expert #4 made a brief note of "quick results due to rapid and easy response system" (Line 210). Finally, Expert #3 provided a unique comparison by summarizing that the LITAM tool "takes more variables into account and combines train/no-train; performance aid, synchronous/asynchronous and modality—all in one tool. I'm not aware of another comprehensive model/tool/system that attempts this" (Lines 183 to 185).

What Do You Perceive to Be as Barriers, If Any, to the Use of This Tool?

The expert review panel consisted of senior-level executives and practitioners who understood the USCG HPT program holistically; therefore, they were in a distinctive position to provide guidance for the way forward with regard to organizational and cultural barriers. Their responses consisted of one primary concern, or barrier, that emerged from each. All four of the expert panelist made reference to the need for experienced (qualified) practitioners, or additional training, because of the complexity of the concepts within the tool. For example, Expert #4 posited that it "would likely require job-aid or resident training, similar to CDC" (Line 211). Relatedly, Expert #1 succinctly suggested that users "MUST be a qualified practitioner to use the tool" (Line 141). Expert #3 took a similar position, but noted a consequence of not addressing the barrier by signifying that it "may be a challenge in the tradeoff among maintaining the fidelity, providing detailed explanations of unfamiliar terms/concepts, and keeping the process streamlined among target audience users" (Lines 186 to 188).

This feedback, although nuanced through the verbiage used, was consistent with earlier data from the expert panel, which revealed that some of the components (moment of need, scaffolding, etc.) of the tool, although valuable, needed explanations for optimal utility. The revision/update list provided at the end of each round/phase will reveal that broadening the explanation of key components of the tool was a persistent theme from beginning to end until a thorough reference (glossary) page was built into the tool to account for potential misunderstandings.

What Specific Changes, If Any, Would You Make to the Intervention Selection Summary Report to Make It More Effectual and User Friendly and What Final Changes, If Any, Would You Recommend to the Tool?

Questions four and five were broad, open-ended questions designed to elicit change recommendations to the tool prior to Phase Two. The responses were limited in scope, with only a single theme to account for—or need for additional explanations of key terms used in the questions. Although the expert panel agreed to the use of the components in the tool, they continued to express concern with ensuring these key terms and concepts have explanations readily available. As previously discussed, this was a persistent theme until a fully consolidated and easily accessible glossary page was integrated into the tool later in the study.

Do You Perceive That the Selections Generated by the LITAM Tool Are Systematic and Reflect Principles of Learning and Performance Improvement? Please Respond With Yes or No.

Question six was a yes or no choice, with the aim of determining some level of confirmation, or confidence, in the selections generated by the LITAM tool. All four of the expert panelists responded with "yes." The consensus reached on the outputs of the tool was in alignment with the results from the survey used in Round 2 of the expert review panel, which also provided affirmation for the selections generated by the tool.

Can You Agree to the Use of the LITAM Tool and Do You Recommend It for Further Use. Please Respond With Yes or No.

Question seven was also a yes or no query, with the aim of determining a level of confirmation on the direction for future use of the tool within the USCG. This was also potentially the most consequential question in the study because of the level of admiration and respect for the expert panelist throughout the USCG TRASYS; their guidance on the use of the tool could have had serious implications. All four of the expert panelists responded with "yes." The consensus reached for the future use of the LITAM tool provided the support needed to advance the development of the LITAM tool in subsequent phases of this study.

Please Provide Any Additional Comments, If Needed, Related to the Use of the LITAM Tool

The responses for the last open-ended were unremarkable. The experts reiterated some of their previous concerns, but provided nothing that was not already captured for revisions. The final comments also included some favorable commentary that aligned with the general theme of the feedback from Round 3. All of the feedback data were analyzed for applicability, and the final list of changes made to the LITAM following Round 3 is listed below. All of the changes listed were integrated into the LITAM prior to Phase Two.

Table 11

Tool Revision List: SME Round III

Revisions to LITAM Following SME Round 3 Data Analysis	
Change #	Change/Update Description
1	Made clarifications of the language used for Question 4 of decision point (Modality of Instruction). The following verbiage is now used to help discriminate between types of behavior when answering this question. The question now reads: "What type of behavior is dominant in the performance of this task?" Cognitive, Psychomotor, or Affective
2	The spacing has been repaired on the "i" icon so that it is consistent with other text in the tool. The spacing appeared not to be fluid and consistent throughout the narrative. Sometimes it looked normal (relatively close) and sometimes it had large spacing, which looked awkward. This has been corrected.
3	Decision point 1 (TTM/NT) Question 4 that referred to task speed was changed. The verbiage of "second" was changed to "second**s**." This was just to emphasize that it is not limited to a single second.
4	Decision point 2 (Performance Support) Question 3 was rephrased. I replaced the jargon of "performance modeling" and just used "video demonstration." The question now reads as follows: Is there a need for some type of video demonstration in order to model performance?
5	Decision point 3 (Synch/Asynch) Question 5 moment of need had the responses altered. The responses to the question were repackaged so they are no longer additional questions; rather, they are declarative statements to be selected. The four options now read as follows: What is the "moment of need" for learning this task?

Revisions to LITAM Following SME Round 3 Data Analysis	
Change #	Change/Update Description
	○ This task involves learning information/content that is completely new (Example: "A" school, or developing new cognitive schema)? ○ This task involves learning more about information/content from a previously learned subject (Example: "C" school, or updating existing cognitive schema)? ○ This task involves learning information/content because something has changed in the workplace (policy/problem/procedure)? ○ This task involves learning information/content in support of problem-solving that is unpredictable (Example: troubleshooting, abstraction)?
6	Decision point 2 (Performance Support) Question 6 involved the use of inappropriate subject/verb combinations (does/performer). I updated the sentence to read as follows: Do the majority of the target performers/users have access to mobile technology?
7	Decision point 4 (Modality of Instruction) Question 1 for current level of expertise was updated. The spacing inaccuracy was corrected so there is appropriate spacing between responses between intermediate and journeyman so that potential responses are readily recognized and selectable.
8	Countless spelling and grammatical errors were identified as well by the SMEs, which had a direct impact on the clarity and efficacy of the questions in the tool.

Phase Two: Field Try-out

The aim of Phase Two was to field-test the updated LITAM tool with practitioners. All changes reflective of Phase One with the expert review panel were implemented prior to beginning Phase Two. With the tool components confirmed by the expert panel, this phase provided an opportunity to conduct a field test to determine the usability and interfacing capacity of the tool using ISD and HPT practitioners within the workplace environment. Because the core structure of the tool was examined in Phase One, the focus shifted to how the tool interfaces and overall usability. The aim of the tool is to be as intuitive as feasible; therefore, field testing analyzed how practitioners engage the tool, the ease of use, the comfort level with interfacing, and potential challenges.

Usability and interfacing concerns were evaluated with a field try-out within the natural work settings of practitioners. The field try-out approach is a practice of formative evaluation that serves to inform changes during iterative design and development cycles (Richey & Klein, 2007). This type of approach allowed me to observe (virtually) and record exactly what interfacing elements of the tool were intuitive and what parts were troublesome. Additionally, this setting allowed for natural interaction between participants, which is how the tool was designed to be engaged. The conditions of the field try-out provided an optimal platform for collecting data, as the tool was designed to be used within the normal workplace of the participants.

Phase Two: Participants

I used purposeful sampling to select three teams of practitioners (four per team), who had experience in both ISD and HPT. All participants were selected from within the USCG training system to conduct the try-out. I selected the participants from different analysis (HPT) and development (instructional solutions) offices from within the USCG Training System (TRASYS). I selected the participants based upon their experience with selecting interventions following a performance analysis. The background and experience of the participants was critical to generating the data needed for making appropriate formative alterations to the tool related to user interface and practicality (Creswell & Plano Clark, 2011).

Of the 12 participants for Phase Two, 9 were government civilians, whereas 3 were active-duty service members (USCG). The participant teams used in Phase Two were not randomly assembled for the purpose of the try-out; rather, the participants were already part of a team working on projects involving intervention selection. Therefore, each team was quite familiar with each other, as well as the analysis projects used for the procedures. This approach provided the relevancy needed to generate practical feedback from their experiences.

Phase Two: Procedures

As with Phase One, all procedures for Phase Two were executed virtually using the Defense Collaboration Services (DCS), which is a secure and virtual meeting platform for government and Department of Defense (DOD) agencies. To support Phase Two requirements, I identified three front-end analysis (FEA) projects (one per team) so that the participants were entering practical data from a valid performance analysis, as the LITAM tool was designed. I used FEAs because they provided for an optimal data set required by the LITAM tool, and they are a type of performance analysis with which all of the participants were familiar. Therefore, the participants could focus upon the usability and interfacing elements of the tool and not the particulars of the analysis they used.

I scheduled virtual meetings with each of the three teams so that a specific date and time was identified for each team to use the LITAM tool with their respective projects. Each session was held live with the participants so that I could observe (virtually) all interactions between team members and the tool. Each team used their analysis project with the LITAM tool so they could generate an intervention selection report upon conclusion of the session. I directed the participants to rotate occasionally so that all team participants had an opportunity to interface with the LITAM tool directly.

The LITAM tool is a web-based application that is accessible through the participants' computer workstations while on the USCG secure network. This allowed me to directly observe the tool being used through virtual screen sharing, as well as observe all team participants involved. I repeated this procedure until all three teams (12 participants) had an opportunity to use the tool for their respective projects while I observed. Concurrently, this approach provided an opportunity to discuss the outputs of the intervention selection process, as generated by the

LITAM tool, as well as participants' general experiences with the tool. The purpose of Phase Two was to answer the following research questions:

1) What are the strengths and weaknesses of the usability experience when using the intervention selection tool?
2) What interfacing (interaction with tool buttons and navigation options) difficulties exist and how can the tool be more intuitive?

Phase Two: Data Collection

Phase Two utilized three distinct data collection activities: focus groups, observations, and surveys. All three data collection strategies were applied to each of the three try-out sessions. First, I used an observation checklist (Appendix E) during each live session, which outlined 19 different elements of functionality. More specifically, with the observation checklist, I aimed to collect data on functionality elements such as screen design, usability, and interfacing. I categorized the items in the observation checklist relative to chronological use before, during, and after participant usage. Much of the checklist was confirmative in nature (functioned/did not function), but they also allowed for field notes to be drafted relative to each observation item. Ultimately, the observation instrument served as a LITAM tool functionality checklist so that usability and navigation data could be collected for each try-out.

Next, I conducted a focus group session (virtually) with each team following their try-out session. The focus groups were conducted in similar fashion to the semi structured interviews, as I had a concise set of questions, but they allowed for divergence, providing it was relative and constructive. The aim of the focus groups was to collect qualitative data directly from the participants following their engagement with the tool while the experience is fresh in their mind. I recorded the focus group sessions via the DCS platform and then transcribed verbatim.

Appendix D includes the focus group protocol and questions for this part of the study. I transcribed all focus group sessions within 1 day of the try-out, and I subsequently deleted the recordings. The individual responses from the focus groups were captured in narrative form next to each question and reviewed for accuracy. Next, I categorized the participant responses in a table format so that the responses could be compared linearly by question and participant. This format helped facilitate the qualitative analysis process and the identification of changes to be made to the LITAM tool.

Finally, I sent a survey questionnaire to participants following each team try-out. I gave the participants 1 week to complete the survey. The technical concerns with the tool, specifically related to usability and interfacing, suggested using a survey questionnaire with a modified Likert scale approach with an Agree-Disagree scale of (a) strongly agree, (b) agree, (c) neither agree or disagree, (d) disagree, and (e) strongly disagree to respond to each item. The survey questionnaire directly addressed technical concerns by itemizing the key functionality and navigation components of the tool. Survey items addressed the degree to which participants agree/disagree with specific usability and interfacing statements covering the categories of screen design, navigation, and intuitiveness. I drafted the survey (Appendix F) in Microsoft Word and converted it digitally using survey software (milSurvey). I electronically disseminated the survey participation link through the Coast Guard email network. Collectively, the three data collection approaches were aimed at achieving triangularization, which is a common strategy for ensuring trustworthiness that involves using multiple forms of evidence at various points of inquiry (Hays & Singh, 2012).

Phase Two: Data Analysis

I recorded and subsequently transcribed the focus group sessions using commercial software. Using the transcripts, I conducted a qualitative analysis in similar fashion to the semi structured interviews. I analyzed the open-ended questions from the focus group using coding techniques to identify emerging themes and trends to be considered in the development of the tool. More specifically, I analyzed the qualitative data from the discussions using open-coding procedures, which were further refined by secondary and axial coding techniques. The themes that ultimately emerged were considered as potential changes to be made to the LITAM tool.

The observation checklists were utilized to confirm certain operations within the tool design were functioning properly and allowed for a smooth and intuitive experience for the user. Because much of the checklist is confirmative in nature (functioned/did not function), I focused the analysis on areas in which certain functionalities did not occur as designed. I tabulated all discrepancies and quantified them to identify trends across multiple try-outs. To do so, I tabulated the results from all observation checklists on a spreadsheet and categorized them by team try-out and checklist items. The spreadsheet of discrepancies provided the means necessary to accurately analyze across different try-out sessions and also facilitated the ability to conduct comparative analysis with the other data collection strategies used in Phase Two.

I tabulated the quantitative data from the survey questionnaire administered in Phase Two and entered them into an Excel spreadsheet in preparation for statistical analysis. Prior to utilization of SPSS software, the quantitative data underwent a secondary review to ensure tabulation accuracy. The secondary review was conducted by a member of an evaluation (learning impact) team who did not participate in the research and is intimate with statistical analysis. Next, I entered the results tabulated for each survey item into SPSS software for analysis, and I analyzed the quantitative data using descriptive statistics (mode, mean, and median) and measures of variability (variance, range, and standard deviation). I compared the results from the statistical analysis with the results of the observation checklists and the qualitative feedback collected during the focus group, which all covered similar usability and navigation components. Collectively, the three data collection approaches were aimed at generating the feedback necessary for making potential design and development adjustments and to make the tool as user friendly as possible.

Phase Two: Findings

Focus Groups

The results of the try-outs reflected the opportunism and problems with the LITAM tool. A primary objective for the field try-outs was to hear directly from practitioners for whom the tool was designed. Therefore, I conducted focus groups after each team had an opportunity to try out the LITAM tool. In preparation for the focus groups, I encouraged the participants to take notes during their try-out in preparation for the focus groups. The notes taken by the participants became points of discussion during the focus groups. Consequently, an analysis of the focus group's transcripts yielded multiple themes to be considered toward the development of the tool:

1. Easy to use
2. Transitioning between decision points
3. Need to store data internally
4. Revising no-train terminology
5. Recommended for other practitioners

Easy to Use. A primary theme from the participants was that the tool was very easy to use. When discussing user experience in the focus groups, eight of the twelve participants made reference to the tool's ease of use. For example, participant #5 commented that it "was a very user friendly tool and provided a really easy way to collect data" (Line 219). Similarly, participant #6 found that it was "very intuitive, and once familiar with the questions you can move through it quickly (Line 220). Participant #15 also made reference to the intuitiveness of the tool and stated "Very good. I thought it was intuitive and after about the third task, it really started to go much faster. I got a little confused at the end about entering another TPO, but I figured it out (Lines 357 to 359).

Transitioning Between Decision Points. Although participants found the tool intuitive and easy to use, they were quite critical concerning the tool's navigation constraints. More specifically, a trend that emerged was user frustration with navigation constraints between decision points. The LITAM tool was designed to progress forward through the four decision points; unfortunately, the tool did not allow users to go backward, which caused frustration among users. Participant #9 summarized the experience by saying "Solid tool, intuitive. A few quirks with no way to go back and change something or review your answers later" (Lines 281 to 282). The same frustration was echoed by Participant #5, who commented "My overall experience with the tool was positive, but needed the opportunity to return to a section to change a answer in a previous section" (Lines 252 to 253). The consequence of this navigation constraint was explained by Participant #6, who found the following:

> No issues with moving from one section to the next. Not being able to revisit a second time once complete was only an issue once after realizing an answer was mis-clicked right as I was moving to the next section and could not go back and revise. (Lines 225 to 227)

Need to Store Data Internally. Another usability feature that emerged from the analysis was the LITAM tool's inability to store information. Meaning, the responses from one decision point did not automatically populate in other places in the tool involving the same data. Similarly, the LITAM did not store entry data once an intervention selection summary report was generated. Both aspects of data usage emerged as concerns from participants.

Participant #14 summarized their frustration by noting the following:

> Seemed like I answered the same question a few times. Maybe there is a way to store those seemed like I answered the same question a few times. Maybe not. I could see how some might get fatigued with so many questions. (Lines 343 to 345)

The participants shared a concern with regard to larger projects and the need to store data so that the tool could be utilized over multiple days without concern of losing data and progress. For example, participant #6 stated the following:

> When I log in, being able to pull up previous intervention determinations would be helpful. We were able to finish 14 tasks in approximately 3 hours 15 minutes. For an analysis with 50+ tasks, it may require the use of the LITAM tool over the course of a few days. Being able to save and pick back up where I left off in a new session on a new day would be ideal. (Lines 256 to 260)

Use of No-Train Terminology. Another trend that emerged from the analysis was the no-train terminology and the impact it might have when working with external project stakeholders. Although the no-train terminology was commonly understood among the participants, they expressed concern as to how it might be received by others not familiar with 'Harless' terminology. For example, Participant #7 expressed concern by sharing "Not sure about using the term 'no-train'. I would be concerned about sharing that with a customer. Maybe the no-train decision should be labeled as job-aid" (Lines 235 to 237). Other participants conveyed their own potential misunderstanding of the term, such as participant #14, who revealed the following:

> Not sure if I got the no-train thing at first. Does that mean nothing? Does that mean the same as job-aid? We always recommend something with the DIF. Should we say no-train if we are still recommending job-aid? That part was not clear. (Lines 349 to 351)

The concern about using the no-train term was summarized with a recommendation for the way forward by participant #9, who stated the following:

> I would also change the output of train/no-train to train/ job-aid. We as analysts understand the difference in the former but our clients may not understand that no-train doesn't mean we don't get anything. It would clarify the output and remove some conceptions that the client may not understand. (Lines 277 to 280)

Recommendation with Guidance. The focus group revealed trends that were both affirmative and highly critical. With respect to the mixed feedback, I asked the participants if they would recommend the tool to other practitioners. Overall, the trend was strongly affirmative, ten of the twelve participants openly stated they would recommend the LITAM tool to others. In addition to participant endorsement of the tool, four participants provided additional context for their recommendations, such as participant #6, who commented, "I look forward to using the LITAM application for future analyses. This is exactly what we need in order to provide specific, data-driven justification for recommended interventions" (Lines 265 to 267). Participant #9 also provided some context with their recommendation by stating "I would say useful but caution people that the output is only a recommendation and should not be taken as for lack of a better term - law" (Lines 319 to 320).

The participants also indicated that the LITAM tool may not be appropriate for everyone, and that a misunderstanding of the terms used in the tool could be problematic. Participant #14 recommended the tool for others, but provided guidance by asserting that "I would recommend it for other ISDers, but maybe not for everyone. If the customer used it without us, it could be confusing. Not sure about the training managers. I think a job-aid for it might be helpful" (Lines 363 to 365).

One of the trends to emerge from this part of the study was the use of the no-train terminology. It is worth noting that this same concern was recorded in my field journal more than once. The concern was that the no-train term may not be recognized by all as an alternative to a learning solution. More specifically, the concern in the journal was that those not intimate with the literature may not be familiar with the train/no-train dichotomy and that the terms *performance support* or *job-aid* may be more transparent than no-train. The findings from the focus groups confirmed that point of contention.

The purpose of the focus groups was to collect qualitative feedback from target practitioners immediately following a try-out with the LITAM tool. The data revealed multiple trends for development consideration. I then compared the findings from the focus groups with data from other Phase Two sources to identify overlapping themes and trends in an effort to achieve triangulation.

Observation Checklists

The observation checklist captured the functionality of the LITAM tool before, during, and after use. The observation checklist included 19 functional competencies related to usability, navigation, and interfacing. I recorded the functional competence of each of the items during the live (virtual) try-out sessions. I utilized one observation checklist for each team. The observation checklist primarily used a "function" or "didn't function" dichotomy, but also allowed for my observation notes. I analyzed the checklists to determine if any trends emerged across the three observations.

The observation checklist provided a direct approach to directly answering the research questions for this phase of the study, which centered upon identifying and improving the usability (interfacing and navigation) of the LITAM tool. After reviewing all three observation checklists, I identified zero "didn't function" results. More specifically, I recorded all observation competencies as "functioned" for all three try-outs. The observation checklist also included a series of comments regarding how the tool functioned. The first observation included five different comments, the second observation included seven different comments, and the third observation included nine different comments. I compared the 21 comments from the three observation checklists with each other, as well as with the findings from the focus groups.

The commentary from the observation checklists affirmed some of the previous improvements made to the tool from other data collection methods. For example, the observation checklist included multiple comments about how the users liked and benefited from the information icons that explained complex terms and concepts (e.g., scaffolding, moment of need). The observation checklists also made note of positive comments concerning the warning that was provided before users finished and transitioned to the final intervention summary report. Both of the aforementioned examples were reflective of improvements made to the LITAM tool as a consequence of other data collection activities.

The commentary recorded on the observation checklists also revealed two usability concerns that aligned with the findings from the Phase Two focus groups. First, the observation checklists included multiple references to the need to have the LITAM tool store data internally so that users could retrieve previous project data as required. Additionally, the observation checklist included multiple notes concerning the use of the term, *no-train*. The comments from the observations made note that users recommended the use of the term, *job-aid*, in place of *no-train*. Both of these findings aligned with the findings from the focus groups, which identified the same two usability elements as potentially problematic.

The findings from the observation checklist also yielded a completely novel usability concern. All of the observation checklists made reference to the participants' inquiry about going backward in the LITAM tool. More specifically, a comment was noted during each try-out observation when the users attempted or inquired about revisiting a previous decision point in the tool to revisit user responses. At this point in the study, the LITAM tool was only able to progress forward, and users could not go backward to check, or alter, their responses. This usability concern was not identified as a malfunction on any of the checklists because the design of the tool involved only progressing forward as a means of preventing users from manipulating the tool for a desired outcome. Notwithstanding the original design of the tool, this finding was noted as a potential update to the tool as the remainder of the study unfolded.

The purpose of the observation checklists was to collect quantitative and qualitative records of LITAM tool functionality before, during, and after use. The observations focused on the technical interfacing elements related to usability, navigation, and intuitiveness. The data revealed that the LITAM tool functioned as designed during each of the three try-outs while being engaged by all 12 participants. The observation data also provided affirmation for the usability results from the focus groups. Finally, the observation results yielded a novel finding concerning reverse navigation for potential integration into the development of the tool.

Survey Questionnaire

I administered the survey questionnaire to all Phase Two participants following each try-out session. I gave the participants 1 week to complete the survey. The survey utilized 25 survey items, which examined three different areas of concern: screen/user design, navigation, and practicality of use. Because the participants for Phase Two were a purposefully selected sample of the target population for users of the LITAM tool, it was paramount to capture a broad set of perceptions while the tool was still in development. To gain insight into the perceived usability and intuitiveness of the tool, I quantified the responses from the survey and analyzed them as follows.

The screen/user design items in the survey referred to the intuitiveness and ease of use of the tool. The design of an intuitive tool would support the idea of allowing a heterogeneous group of practitioners to use the tool, with little to no external support. Table 12 summarizes participants' perceptions with regard to screen/user design of the tool. Overall, the screen/user design of the tool was perceived as very practical. Participants reported positive perceptions of the design of the tool, with specifically strong reactions to elements of consistency and intuitiveness. More specifically, seven of the eight survey items had a mean score of 4.50 or greater on a 5-point Likert scale. Table 12 lists all of the mean scores and standard deviations for screen/user design items.

Table 12

Survey Results for LITAM Screen/User Design Items

Survey Items	n	Mean	SD	Max	Min
1. The texts (font, size, spacing) were understandable.	12	4.83	0.37	5	4
2. The prompts remained consistent throughout use of the tool.	12	4.75	0.43	5	4
3. The texts did not contain unnecessarily difficult words.	12	3.83	1.07	5	2
4. Tool objects (like buttons) were consistently located in the same position.	12	4.92	0.08	5	4

Survey Items	n	Mean	SD	Max	Min
5. Icon meanings were clear.	12	4.58	0.41	5	3
6. The screens were not overly cluttered with information.	12	4.50	1.11	5	3
7. The use of key concepts remained consistent.	12	4.67	0.47	5	4
8. Objects with different functions looked different on screens.	12	4.50	1.11	5	3
* 5 = Strongly Agree, 4 = Agree, 3 = Neither Agree nor Disagree, 2 = Disagree, 1 = Strongly Disagree					

Note: Results taken from the Phase Two Usability Survey

The largest part of the survey concerned the navigation element of the LITAM tool and how the user progressed in and through the four decision points. In general, the reported perceptions of the participants were that the navigation design was practical and intuitive. For example, survey items (2–7) that addressed clarity, intuitiveness, logic, and progression all received mean scores above 4.50, with standard deviations < 0.68. Conversely, the survey item (10) concerned with navigation help being readily available received a mean score of 3.75, which was significantly lower than most of the mean scores in this section of the survey.

This section of the survey also included multiple two items (11, 12) concerned with data reusability and corrections, respectively. Items 11 and 12 both received mean scores below 4.0, indicating that the participants did not strongly agree. The perceptions for item 11 (m = 3.92), concerning data reusability, align with the results from the Phase Two focus groups, which revealed a trend indicating the need for the LITAM tool to improve the capacity to store and reuse data. Likewise, the mean score for item 12 (m = 3.50), concerning adjustability of responses, aligns with the Phase Two focus group trend, which conveyed the need for the LITAM tool to be more responsive to users' requests to navigate backward to change previous responses. Table 13 lists the remainder of the mean scores and standard deviations for the navigation items.

Table 13

Survey Results for LITAM Navigation Items

Survey Items	n	Mean	SD	Max	Min
1. It was made clear when the user needed to wait because the computer was busy.	12	4.25	0.87	5	3
2. User tasks on each screen were clear.	12	4.67	0.65	5	3
3. The navigation was intuitive.	12	4.59	0.67	5	3
4. User location within the tool was clear.	12	4.67	0.47	5	4
5. The structure of the tool was logical.	12	4.75	0.62	5	4
6. Selection options were clear.	12	4.67	0.47	5	4
7. Progression through the tool was easy to understand.	12	4.92	0.08	5	4
8. User choices were clearly presented.	12	4.83	0.37	5	4
9. Selections in the tool were easy to change.	12	4.0	1.28	5	2
10. Navigation help was readily available.	12	3.75	0.87	5	3
11. Data provided by the user earlier on does not need to be retyped later.	12	3.92	0.90	5	3
12. When the user selected the wrong response, it could be easily adjusted.	12	3.50	1.0	5	2
* 5 = Strongly Agree, 4 = Agree, 3 = Neither Agree nor Disagree, 2 = Disagree, 1 = Strongly Disagree					

Note: Results taken from Phase Two Usability Survey

The last five items in the survey addressed the tool's practicality of use. It was important to collect perception data related to usability and confidence with tool components and outcomes during this stage of the research because Phase Two included the largest sample of target users in the study. Generally speaking, the participants responded positively to the tool's practicality, as all items received mean scores above 4.0. Of specific note, the participants responded with a mean score of 4.33 concerning their confidence with sharing LITAM tool selections with stakeholders. This collective indication of confidence in the tool's intervention selections aligns with the qualitative feedback from the expert review panel (Phase One), in which all expert panelists noted they were confident with sharing LITAM results with project stakeholders. Table 14 below lists all of the remaining practicality of use data.

Table 14

Survey Results for LITAM Practicality of Use Items

Survey Items	n	Mean	SD	Max	Min
1. The LITAM tool used a suitable amount of questions to produce the selected intervention.	12	4.25	1.06	5	2
2. The LITAM tool used effective questions to produce the selected interventions.	12	4.50	0.90	5	2
3. The LITAM tool generated selections for each task entered into the tool.	12	4.83	0.37	5	4
4. The LITAM tool generated selections I would feel comfortable sharing with stakeholders.	12	4.33	0.78	5	3
5. The intervention selection summary report was easy to understand.	12	4.42	1.0	5	2
* 5 = Strongly Agree, 4 = Agree, 3 = Neither Agree nor Disagree, 2 = Disagree, 1 = Strongly Disagree					

Note: Results taken from Phase Two Usability Survey

Summary

The aim of Phase Two was to examine the interfacing design of the tool to determine how intuitive and practical the tool was for using multiple methods. To do so, I used a series of field "try-outs" to collect data from target users as they engaged with the LITAM tool. Therefore, I used three data collection methods in an effort to achieve triangulation while answering the following research questions for this phase of the study.

2. What are the strengths and weaknesses of the usability experience when using the intervention selection tool?
3. What interfacing (interaction with tool buttons and navigation options) difficulties exist and how can the tool be more intuitive?

Phase Two included focus groups, observations, and surveys. I used qualitative analyses to identify themes and trends for potential development changes. Likewise, I tabulated statistical data and analyzed them for inferences. I then analyzed the results from each method individually and subsequently compared them with data from other Phase Two sources to identify overlapping findings and trends. Finally, I isolated the trends that emerged as potential developmental changes and positioned them for future tool iterations. The results from Phase Two were more confirmative, than informative; meaning, the findings conveyed that the tool was intuitive and that user experience was positive. Isolated feedback for tool improvement was retained so that it could be compared/contrasted with potential findings in Phase Three.

Phase Three: Tool Evaluation

The collective data from the first two phases of the study informed the changes needed to advance the development of the tool. Phase One of the study resulted in a series of systematic changes to the components of the tool while Phase Two validated the usability and intuitive interfacing elements of the tool. Both phases yielded significant changes to the tool in preparation for field were testing. Therefore, the purpose of Phase Three was to conduct a field evaluation to analyze the efficacy and effectiveness of the LITAM tool.

Phase Three: Participants

Purposeful sampling was also used to select the participants for the field evaluation. The aim of the evaluation was focused on tool effectiveness; therefore, target participants were selected from the principal organization with the Training System (TRASYS) normally charged with the challenge of intervention selection. Consequently, the four members of the Analysis, Consulting, and Evaluation (ACE) team became the participants for this phase of the study. All four members of the ACE team have advanced (graduate) degrees in an HPT or ISD related discipline and have extensive experience with HPT analysis projects. Collectively, the four members of the ACE team have over thirty years of experience with intervention selection as it is their job to conduct performance analyses, consult stakeholders on intervention recommendations, and evaluate for impact in the field. The ACE team is the primary organization within the USCG TRASYS for providing HPT consultation with stakeholders in the field experiencing performance problems and requesting assistance.

Phase Three: Procedures

For the evaluation phase, active projects (performance analyses) were selected from within the Coast Guard Training System (TRASYS) that were awaiting intervention selection. The Coast Guard TRASYS persistently has projects awaiting performance analyses and solution recommendations. The LITAM tool's use in this phase of the study was in alignment with the progression and context of the PI/HPT model as intervention selection was only addressed after requisite performance, gap, and cause analyses were complete. Since the LITAM tool was designed specifically for closing skills and knowledge gaps, the projects selected included validated performance task lists that were awaiting intervention selection.

The evaluation was conducted in the natural work setting of the ACE team. The participants utilized a series of three projects over a period of approximately one month. Participants had unrestricted access to the LITAM tool in the form of a web-based application available from their computer work-station. Although the tool could be downloaded and used off-line if needed, the web-based application provided additional collaborative functionalities such as saving, sharing, and printing summary reports.

The LITAM tool was incorporated into each project only after a performance task list was validated with subject matter experts (SMEs) or advanced performers (APs). The participants utilized the LITAM tool with the intention of sharing the intervention results with their project stakeholders. To do so, the participants utilized the intervention selection summary reports (Appendix H) generated by the tool. The participants repeated the process of utilizing the LITAM tool and generating intervention selection summary reports for each project in order to evaluate if the tool was ultimately producing what it was designed to do – systematically select interventions to close skills and knowledge gaps. Ultimately, Phase Three aimed to answer the final research question:

4. How effective is the intervention selection tool?

Phase Three: Data collection

Phase Three utilized three different data collection methods: evaluation log, document (content) analysis, and reflective questionnaire. Collectively, the three data collection strategies were aimed at generating the feedback and information necessary for determining the effectiveness of the tool. The data collected also informed likely final alterations to the tool as this phase would be the last formal evaluation of the tool prior to deliberation concerning future deployment of the LITAM tool. All three data collection methods were reviewed collectively following the procedures for Phase Three.

Participants were asked to maintain an evaluation log (Appendix G), developed by the researcher, for the duration of Phase Three. The aim of the evaluation log was to capture the reflections of the ACE team before, during, and directly after each utilization of the LITAM tool. The log was constructed so that participants were required to comment on critical elements relative to the tool's effectiveness such as decision point recommendations, type and modality of intervention, anticipated solutions, agreement levels with outcomes, and evaluation summary for every performance task entered into the tool. The researcher was kept abreast of all projects being utilized for Phase Three and occasional prompting was used to promote engagement with the log. The participants used a separate evaluation log for each project.

The LITAM tool was designed to produce an intervention summary report following each use (project). Once a user has successfully entered all of the data associated with a particular project, the tool generates a final report that catalogues all of the tasks entered by number with respective recommendations for the four decision points: (1) train/job-aid, (2) performance support, (3) synchronous/asynchronous, and (4) and modality of instruction. Consequently, the intervention summary report becomes the primary consulting document for HPT practitioners providing consultation to project stakeholders relative to the intervention findings generated by the tool. This report was the focus of the document (content) analysis conducted during Phase Three.

Once participants concluded all the projects identified for Phase Three of the study, and have used the LITAM tool extensively, participants completed a reflective questionnaire. The questionnaire employed a modified Likert scale approach with an Agree-Disagree scale using (a) strongly agree, (b) agree, (c) neither agree or disagree, (d) disagree, and (e) strongly disagree to respond to each item. The questionnaire (Appendix I) included 21 items that addressed the efficacy, practicality and effectiveness of the tool. The reflective questionnaire challenged participants to evaluate the tool from a holistic perspective, having used the tool for a variety of HPT projects for approximately a month. The survey questionnaire included a total of 21 examining tool efficacy, practicality, and effectiveness. The survey questionnaire was administered using the USCG milSurvey system and was completed after conclusion of the last project in the phase.

Phase Three: Data Analysis

The three-pronged approach to data collection helped to facilitate a comparative analysis across multiple means. First, the evaluation logs populated by the participants were analyzed by examining the key categories of the log such as prediction, rationale, outcome, and final comments. The categories were analyzed by tabulating the results by task and examining the degree to which user intuition (prediction) matched the final outcome of the LITAM tool. Additionally, the final comments were examined for any trends as to why the LITAM selection did or did not align with their prediction.

A copy of the intervention selection summary reports from each project were collected from all four members of the ACE team following completion. The document (content) analysis focused on the four decision points generated for each performance task entered into the tool. The intervention summary report for each project was tabulated to reveal tool propensity for selection at the four decision points with a succinct focus on the train/job-aid decision.

A spreadsheet was developed so that data from individual projects could be compiled into one collective data source. Once the data from each project was tabulated into the spreadsheet, quantitative analysis was conducted across all projects in order determine frequency distribution. More specifically, the aim was to determine if there is a tendency for the LITAM tool to select, or not select, particular solutions (SPeL, SOJT, Resident, etc.). Once all of the data from the reports were quantified for frequency, the results were compared and contrasted with results of the evaluation log.

Data collection in Phase Three culminated with a survey questionnaire completed by the participants. The reflective survey aimed at capturing holistic perceptions of the tool following a breadth of utilization covering three extensive projects. The responses to the survey questionnaire were tabulated for each survey item and were entered into SPSS software for analysis. Prior to utilization of SPSS software, the quantitative data underwent a secondary review to ensure tabulation accuracy. The secondary review was conducted by a member of an evaluation (learning impact) team who did not participate in the research and is intimate with statistical analysis. Quantitative data were analyzed using descriptive statistics (mode, mean, and median), and measures of variability (variance, range, and standard deviation). The results from the statistical analysis were also compared with the results from the other two data collection strategies.

Phase Three: Findings

The Phase Three evaluation scrutinized the degree to which the tool functioned as designed. In doing so, this phase utilized evaluation approaches to appraise levels of efficacy, practicality, and effectiveness. Evaluation strategies are commonly used within design and development research and particularly common for product and tool development (Richey & Klein, 2007). In alignment with the PI/HPT model, phase three utilized an evaluation approach that was centered upon efficacy, value, and effectiveness (Van Tiem, Moseley, & Dessinger, 2012).

Evaluation Log

The logs were maintained by all four members of the ACE team for the duration of Phase Three. Each participant completed their own individual log for each of the three projects used. For each instructional task entered into the LITAM tool, participants were asked to record their intuition for the most appropriate intervention (SPeL, SOJT, EPSS, etc.), the solution generated by the LITAM tool, and their comments on the rational of the selection. All data recorded in the evaluation was solely that of the individual participants as no team discussions were involved in completion of the logs.

The evaluation used three active HPT analysis projects awaiting intervention recommendation. Because of the confidential nature of the analyses used, no project specific data can be shared beyond the names of the three projects: (1) Active Shooter Threat Responder Analysis, (2) Marine Law Enforcement Officer Analysis, and (3) Cyber Security Literacy

Analysis. The three analyses had a total of 44 instructional tasks which were all entered into the LITAM tool by each participant. This created a total of 176 LITAM outcomes for analysis.

After analyzing and tabulating the degree to which participant's intuition aligned with the solutions generated by the LITAM tool, a broad set of frequencies emerged. Out of 176 total task entered into the LITAM tool, alignment between participant intuition and LITAM selections was found with 140 of the tasks resulting in a frequency percentage of 79.54 percent. Individual alignment frequency from the four members of the ACE team ranged from 72.72 percent to 81.81 percent. Frequency rates from the three different projects and collective percentages are found in Table 15.

Table 15

Alignment Frequency Between Participant Intuition and LITAM Selections

Participant	Analysis Project			Total	Frequency %
#	Active Shooter	Cyber Literacy	Marine Enforcement	140/176	79.54
17	6/12	5/8	21/24	32/44	72.72
18	11/12	4/8	23/24	38/44	86.36
19	9/12	6/8	21/24	36/44	81.81
20	10/12	6/8	18/24	34/44	77.27

Note: Results taken from Phase Two Usability Survey

The results from the evaluation log directly addressed the research question for this phase concerning the efficacy and effectiveness of the LITAM tool. The tool systematically generated selections for all 176 tasks entered into the tool. Furthermore, the tool generated selections that aligned with user intuition 79.54 percent. Both results are consistent with the findings from Phase Two in which selections were generated for all tasks entered into the tool (m = 4.83) and participants reported confidence in the selections generated (m = 4.33)

The 36 tasks in which alignment was not found between user intuition and LITAM selections were analyzed for potential themes and trends. The initial trend that emerged was that the verbs (behavior) used in the instructional tasks entered into the tool were not observable.

Further analysis revealed that many of these same tasks do not meet the criteria (USCG FORCECOM SOP 5) for a sound a behavior to be used in a terminal performance objective (TPO) which states that a performance objective (task) should meet four criteria:

1. Task should be observable
2. Task should be measurable
3. Task should occur in a relatively short period of time (minutes/hours)
4. Tasks should have a clearly defined beginning and end

When the TPO criteria was used to evaluate the 36 tasks in which alignment was not found, 19 of the tasks were identified as not meeting objective criteria. As a result, 52.77 percent of the tasks in which alignment was not found, could be categorized as inappropriate (per USCG SOP 5). This finding aligns with a recording in the researcher's field journal (dated May 5th, 2021) in which it was noted that there was concern about some of the analysis used for Phase Three.

The researcher's journal noted that a cursory review of the analyses used by the ACE team included some verbs that were "not instructionally sound". This finding is significant because of the systematic nature of the LITAM tool – bad inputs result in bad outputs.

Document (Content) Analysis

Phase three included a document analysis. In doing do so, the Intervention Selection Summary reports were collected from the participants. Each participant generated one summary report per project for a total of 12 Intervention Selection Summary reports to analyze. The focus of the document analysis was to identify any potential trends or tendencies within the selections generated by the LITAM tool. Therefore, the analysis examined tool propensity for selection at the two most critical decision points: Train to Memory versus Job-Aid and Modality of Instruction.

There were a total of 176 tasks to examine from the 12 Intervention Selection Summary reports. The Phase Three data revealed that the LITAM tool selected a Train-to-Memory (TTM) solution (learning) 47.15 % of the time and a Performance Support (PS) solution (job-aid) 52.85 % of the time. The Active Shooter project data revealed that 75% of the tasks were selected as TTM while Cyber Literacy and Marine Enforcement project data both revealed that the majority of the tasks were selected as PS, 66% and 62% respectively. The frequency distribution for individual participants, per project, is conveyed in Table 16.

Table 16

Distribution Frequency of LITAM Selections

Participant	Analysis Project						Totals		Distribution Frequency
#	Active Shooter		Cyber Literacy		Marine Enforcement				
	TTM	PS	TTM	PS	TTM	PS	TTM	PS	
17	5	7	6	2	7	17	18	26	TTM: **47.15%**
18	11	1	2	6	12	12	25	19	
19	10	2	1	7	9	15	20	24	
20	10	2	2	6	8	16	20	24	PS: **52.85%**
Totals:	36	12	11	21	36	60	83	93	
	75%	25%	34%	66%	38%	62%	47%	53%	

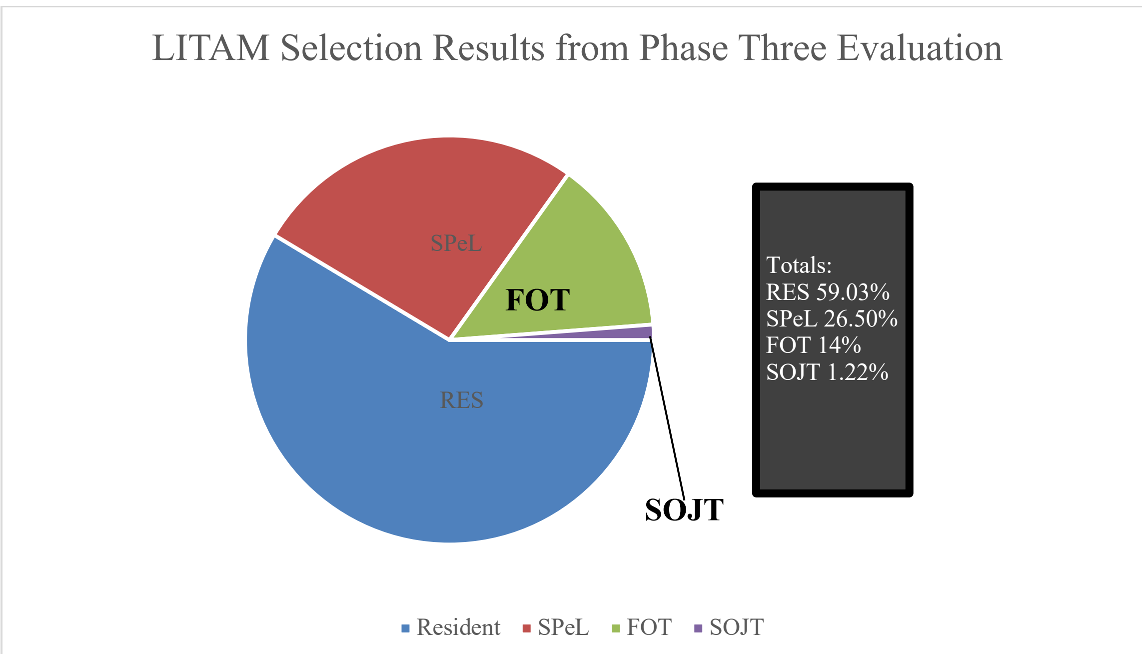
Note: Results taken from Phase Three Summary Reports

When a Train-to-Memory selection is made by the LITAM tool, a specific modality of instruction selection is also made. This selection is the second most critical decision point in the tool as this is the actual learning intervention. Therefore, the document analysis also examined the LITAM tool's propensity for selecting particular modalities of instruction. The modality of instruction possibilities in the LITAM tool include resident (classroom), Self-Paced e-Learning (SPeL), facilitated online training (FOT), exportable training teams (ETT), and structured on-the-job training (SOJT).

The Phase Three data revealed that the LITAM tool selected resident (classroom) training 59.03% of the time when a TTM determination was made. Overall, resident training was selected for 49 of 176 tasks entered into the LITAM tool for a frequency of 27.84%. The second most frequently selected modality, when a TTM determination was made, was SPeL at 26.50%. FOT was selected at 14% while SOJT selected at 1.22%. The frequency distribution for Phase Three modality of instruction selections is conveyed in Figure 24.

Figure 24

LITAM Frequency Distribution of Modalities



Note: Results taken from Phase Three Summary Reports

The findings from the document analysis addressed two concerns conveyed in the researcher's field journal (dated May 8th, 2021). First, it was noted that there was a concern that the LITAM tool might reveal a propensity for selecting training (TTM) interventions. The results from the document analysis revealed that the LITAM tool selected TTM 47% of the time while selecting PS 53% of the time. Second, it was noted that there was also a concern that the LITAM tool might reveal a propensity for selecting resident (classroom) training over other modalities. The results from the document analysis revealed that the LITAM tool selected resident 59.03% of the time when TTM was identified.

Survey Questionnaire

The survey questionnaire was administered to all Phase Three participants following use of the LITAM tool with their respective projects. Participants were given one week to complete the survey. The survey utilized 21 survey items which examined three different areas of concern: efficacy, practicality, and effectiveness. The participants for Phase Three were the four members of the Analysis, Consulting, and Evaluation (ACE) team; therefore, it was paramount to capture a broad set of perceptions as this type of team is reflective of target users for the LITAM tool. To gain insight into the perceived efficacy and effectiveness of the tool, responses from the survey were quantified and analyzed as follows.

The practicality of use items in the survey addressed some of the pragmatic concerns with systematizing a process into a web-based application such as time, resources, learning curve, and transferability. The participants' perceptions with regard to the practicality of the tool are summarized in Table 17. In general, the practicality of the tool was perceived as very strong. Participants reported positive perceptions of the practicality of the tool with specifically strong reactions to usability without extrinsic guidance, and selections that are generated expediently and appropriate for sharing with stakeholders. Overall, the five survey items had a mean score of 4.50 or greater on a 5-point Likert scale. All of the mean scores and standard deviations for practicality of use items are listed in Table 17.

Table 17

Survey Results for LITAM Tool 'Practicality of Use' Items

Survey items	n	Mean	S.d.	Max	Min
1. The LITAM tool can be used effectively by practitioners with minimal instructions (extrinsic guidance).	4	5.00	0.0	5	5
2. The time spent using the LITAM tool to generate selections was a reasonable amount of time.	4	4.75	0.50	5	4
3. The selections listed on the LITAM's Intervention Selection Summary report, for all four decision points, are readily understandable.	4	4.50	0.58	5	4
4. The Intervention Selection Summary Report, generated by the LITAM tool, is appropriate for sharing results with other stakeholders.	4	4.75	0.50	5	4
5. The amount of resources (learner analysis, environmental information, SMEs, etc.) needed to answer context and learner specific questions in the LITAM tool is reasonable.	4	4.50	0.58	5	4
* 5=Strongly Agree, 4=Agree, 3= Neither Agree nor Disagree, 2=Disagree , 1=Strongly Disagree					

Note: Results taken from Phase Three Effectiveness Survey

The next portion of the survey focused upon the efficacy of the tool. The efficacy of the tool survey items addressed the degree to which the LITAM tool performed as it was designed. The participants' perceptions with regard to the efficacy of the tool are summarized in Table 18. In general, the efficacy of the tool was perceived as quite strong. The five survey items all had a mean score of 4.25 or greater on a 5-point Likert scale indicating their agreement with the efficacy of the tool. Participants reported specifically strong reactions to accessibility, systemization, and consistency which all had mean scores of 4.75 or greater. The remainder of the mean scores and standard deviations for efficacy items are listed in Table 18.

Table 18

Survey Results for LITAM Tool 'Efficacy' Items

Survey items	n	Mean	S.d.	Max	Min
1. As a web-based application, the LITAM tool was accessible whenever needed for projects requiring intervention selection.	4	5.00	0.0	5	5
2. The LITAM tool used a systematic approach to generating intervention selections.	4	4.75	0.50	5	4

Survey items	n	Mean	S.d.	Max	Min
3. The selections generated by the LITAM tool reflected the data driven options included in each decision point in the tool.	4	4.50	0.58	5	4
4. The LITAM tool generated selections for all four decision points for every task.	4	4.25	0.50	5	4
5. The LITAM tool generated an intervention Selection Summary Report for every single task entered into the tool.	4	4.75	0.50	5	4
* 5=Strongly Agree, 4=Agree, 3= Neither Agree nor Disagree, 2=Disagree , 1=Strongly Disagree					

Note: Results taken from Phase Three Effectiveness Survey

The results from the efficacy items are aligned with the findings from the Phase Three evaluation logs. The evaluation logs captured the efficacy of the tool by quantifying the degree to which the tool generated intervention selections as designed. The logs validated the output of every single engagement with the LITAM tool by enumerating all of the intervention selections that were generated for the 176 tasks that were entered into the tool. Therefore, participant perceptions captured from the survey are supported by the quantifiable results of the evaluation logs.

The largest part of the survey addressed the effectiveness of the LITAM tool. The effectiveness items in the survey captured user perceptions concerning the value of the solutions generated by the tool. Generally speaking, participant perceptions were positive as all effectiveness items reported a mean score of 4.0 or higher. Survey items relative to user confidence and the selection of optimal results received mean scores of 4.75 or greater. The participants also reported strong agreement with tool's capacity to close skills and knowledge gaps. Incidentally, closing skills and knowledge gaps is the primary aim of the solutions generated by the LITAM tool. The remainder of the mean scores and standard deviations for effectiveness items are listed in Table 19.

Table 19

Survey Results for LITAM Tool 'Effectiveness' Items

Survey items	n	Mean	S.d.	Max	Min
1. The LITAM tool generated intervention selections that directly supported the behaviors described in the tasks (TPOs).	4	5.00	0.0	5	5
2. The LITAM tool generated intervention selections that were specifically aligned with performers' moments of need (when learning/performance support is needed most).	4	4.50	0.58	5	4
3. The LITAM tool generated intervention selections that were specifically aligned with the context of the performance environment relative to each task.	4	4.00	0.82	5	3
4. The LITAM tool generated intervention selections that were specifically aligned with the needs of the target audience relative to each task.	4	4.00	0.82	5	3
5. The LITAM tool generated intervention selections that directly supported the performance output (accomplishment) relative to each task.	4	4.25	0.50	5	4
6. The LITAM tool generated intervention selections I feel confident in sharing with stakeholders.	4	4.75	0.50	5	4
7. The LITAM tool generated intervention selections with the capacity needed to close skills and knowledge gaps.	4	4.75	0.50	5	4
8. The LITAM tool generated intervention selections that reflected my intuition as a performance consultant.	4	4.25	0.50	5	4
9. The LITAM tool generated intervention selections that are practical for implementation.	4	4.00	0.82	5	3
10. The LITAM tool generated optimal recommendations for the Train/No Train decision.	4	4.50	0.58	5	4
11. The LITAM tool generated optimal recommendations for the Modality of Instruction decision (Interventions for Train to Memory Tasks).	4	4.75	0.50	5	4
* 5=Strongly Agree, 4=Agree, 3= Neither Agree nor Disagree, 2=Disagree , 1=Strongly Disagree					

Note: Results taken from Phase Three Effectiveness Survey

The results from the effectiveness items in the survey are aligned with the findings of the Phase Three evaluation logs which indicated that participant intuitions were aligned with the systematic selections of the LITAM tool 79.54 % of the time. Collectively, the survey items directly addressed the research question for this phase of the study through user perceptions on the efficacy and effectiveness of the tool. Overall, the findings from the Phase Three methods supported the effectiveness of the LITAM. Furthermore, the findings from the three sources were aligned as triangulation was achieved to succinctly address the effectiveness concerns of the LITAM tool.

Summary

The findings show that the LITAM tool seems to be practical and effective in supporting HPT practitioners when selecting interventions for closing skills and knowledge gaps. The three phases of the study used a combination of formative evaluation strategies in order to gather user perspectives on the tool as to how it performs and the potential for impact across a broader field of users in the Coast Guard. It is worth noting, and quite fitting for a HPT study, that the study culminated using the same methodology as the PI/HPT model. More specifically, the study finished by conducting an evaluation which is the last stage of the PI/HPT to be used following intervention selection and implementation. The combination of evaluation methods used across multiple phases informed a series of design and developmental changes necessary to advance the LITAM tool to a state that is both practical and effective and consequently—worthy of consideration for utilization across the broader field of USCG HPT practitioners.

CHAPTER 5

SUMMARY OF OUTCOMES, DISCUSSION, AND RECOMMENDATIONS

This aim of this study was to develop and evaluate the effectiveness and potential use of a systematic intervention selection decision-aid tool. Therefore, this chapter discusses the background and purpose of the study, the methods used to answer the research questions, and the findings from a broad set of research procedures. Additionally, this chapter will discuss the implications of the findings as well as recommendations for further research.

Summary of Findings

The central purpose of this study was to advance the design and development of the Learning Intervention Type and Modality (LITAM) decision-aid tool. The study served to address a void in the USCG TRASYS in that there was no systematic methodology in place for USCG HPT practitioners. The LITAM tool was designed to succinctly address the void by offering a new and systematic means for intervention selection.

Intervention selection is a vital activity in the process of improving performance. It is the cornerstone of the change management process because the intervention is, both literally and figuratively, the solution to a problem. The literature review examined 14 different HPT models and processes; each one, directly or indirectly, addressed the use of interventions for improving performance. The value of intervention selection was conveyed consistently in the literature; conversely, the process of doing so was not.

Intervention selection is a measured and purposeful act that should include variables that support the successful application of competencies into the workplace and to facilitate change management and performance (Rothwell, Hohne, & King, 2012). Determining the appropriate type of intervention is an imperfect practice and the void in the literature facilitated the opportunity to systematize the process of selecting the most appropriate solution. The LITAM tool was developed and tested during this study to address this void in the literature. The findings and implications the LITAM tool evaluations are discussed here therein. Accordingly, this study was designed to answer the following research questions:

1. How can the LITAM tool be improved, relative to the components and questions used to guide the intervention selection process, to be more intuitive and effective?
2. What are the strengths and weaknesses of the usability experience when using the LITAM tool?
3. What interfacing (interaction with tool buttons and navigation options) difficulties exist and how can the tool be more intuitive?
4. How effective is the LITAM tool?

A design a development research approach was utilized to address the research objectives. A three-phase research approach was used with multiple rounds and procedures in each in order to generate the data needed to inform the development of the tool. Hence, the study utilized 10 different data collection means to evaluate and advance the development of the LITAM tool. This was an iterative approach to tool development that utilized a cyclical process of evaluation by collecting data, analyzing results, making tool improvements, and evaluating again. The methods and results for each phase are found in each phase's corresponding section. Overall, the study included the following phases and methods.

1. Phase One utilized an Expert Review Panel to assess the design of the LITAM tool as well the components that impact the intervention selection making process. The expert panelists used the LITAM during three rounds of procedures and provided feedback after each use. The findings from Phase One resulted in a total of 41

improvements to be made to the tool to improve the internal components of the tool. The findings were integrated for further development of the LITAM tool prior to Phase Two.

2. Phase Two employed a series of try-outs to assess the functionality and interfacing elements of the LITAM tool. Three try-out sessions were conducted and feedback was collected from participants before, during, and after each use. The findings from Phase Two validated the strengths and weaknesses of the tool's usability and provided feedback to advance interfacing and navigation intuitiveness. The data from the try-outs confirmed the usability of the tool by ensuring functionality and navigation elements were intuitive while identifying small items for corrections and updates. Overall, the confirmation of usability in Phase Two allowed Phase Three to shift the focus to efficacy and effectiveness.
3. Phase Three used a series of field-test with active projects to assess the efficacy and effectiveness of the LITAM tool. Data were collected through three different methods in order to accurately evaluate the tool within the precise context for which it was designed. The results validated the efficacy of the tool and quantified the tool's current state of effectiveness. Ultimately, the findings from the field-test advanced the final development of the tool and informed the appraisals for further use of the tool in the USCG TRASYS.

Each phase of the study included multiple approaches to formative evaluation. All of the evaluation strategies were employed in a cohesive effort to improve the capacity of the LITAM tool. This approach was taken with the understanding that the purpose of evaluation is not to prove; rather, the purpose is to improve (Guerra-López, 2008).

The findings from each individual phase, round, try-out, and test were used to inform the next. Thereby, resulting in the offering of a tool in a subsequent iteration that was just informed (advanced) from the previous iteration. This iterative approach to tool development resulted in a LITAM tool that evolved significantly during this study from a rough prototype to a polished tool that was ready for further utilization. A summary of the findings for each phase is included in Table 20.

Table 20

Summary of Findings Categorized by Phase

<table>
<tr><th>Phase</th><th>Question(s) / Focus</th><th colspan="2">Summary of Outcomes</th></tr>
<tr><td>1</td><td>Research Question#1:

Internal Components & Questions</td><td colspan="2">1. Total of 41 improvement items identified
2. Identification of opportunities to make critical component changes
a. Reduce duplicating data entry points (integrate questions collecting same data)
b. Expand item responses to reflect complex learning/performance situations
c. Increase guidance for explaining complex components and questions such as the ‘moment of need’.
3. Positive reporting of perceptions for questions used; m=4.5 (5.0 scale)
4. Positive reporting of perceptions of components used to make selection; m=4.75 (5.0 scale)</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">Research Questions# 2 & 3:

Usability and Navigation</td><td>Strengths</td><td>Weaknesses</td></tr>
<tr><td>1.Positive reporting of user interfacing experience; m=4.92 (5.0 scale)
2. Positive reporting of tool structure (logic); m=4.75 (5.0 scale)
3. Positive reporting of user navigation experience; m=4.59 (5.0 scale)</td><td>1. Inability for user to navigate backward
2. Inability to store data internally for future use.
3. Use of ‘no-train’ terminology is confusing and makes use of tool with stakeholders more difficult</td></tr>
<tr><td>3</td><td>Research Question# 4:

Level of LITAM tool Effectiveness</td><td colspan="2">1. Generated intervention selections for 100% of tasks (176/176) entered into tool
2. Selected interventions that aligned with participant intuition 79.54% of time
3. Generated a balanced set of intervention outcomes: Train-to-Memory = 47% and Performance Support = 53%
4. Resident (classroom) instruction was the most prominent tool selection at 59.03%
5. Positive reporting of user confidence in sharing selections with stakeholders; m=4.75 (5.0 scale)
6. Positive reporting of user confidence in selections as optimal solutions; m=4.75 (5.0 scale)
7. Positive reporting of user confidence in selections for closing skills and knowledge gaps ; m=4.75 (5.0 scale)</td></tr>
</table>

Note: Results taken from the findings section of each phase of the study

Discussion

The entire study occurred within the context of the Coast Guard Training System in which I have been actively employed as an instructional systems specialist for several years. Because I am a member of the USCG TRASYS and intimate with the independent culture amongst practitioners, I was conscious of the potential resistance to change because of the reduction in practitioner autonomy that could result from the systematic nature of the LITAM tool. As a result, all correspondence, both formal and informal, with participants concerning the LITAM tool reflected an indifferent approach to the advancement of the tool. This approach was taken for two reasons: (1) to be respectful of participants capacity to make sound intervention selection decisions in the absence of the LITAM tool, and (2) to optimize the opportunity for unfiltered feedback from participants which was essential to advancing the development of the tool. As a consequence, participants offered rich and impactful feedback that was often integrated into the tool. This approach resulted in an unanticipated elevated level of tool acceptance because participants could see their feedback integrated into the tool and therefore became invested in the tool's development and success.

Richey and Klein (2007) summarized this type of dynamic accurately when they noted that "in design and development research, especially in product and tool development studies, researchers are often the designers/developers. In other words, by design they go native and observe themselves" (p. 61). The degree to which I became invested in this study was not anticipated. Although I recognize the importance of taking on a research endeavor which one is passionate about, to what extent must be considered. In the case of this study, I became completely immersed in the development of the tool to the point that it created a certain type of dynamic in which it became difficult to separate myself from the study. More specifically, it was often challenging to distinguish critical feedback on the LITAM tool with criticism specific to me and my endeavors. This dynamic situation, and the need to remain as unbiased as feasible during data analysis, was addressed through strict adherence to the research methods as proposed and approved by the dissertation committee.

Implications for Practice

This study resulted in a series of outcomes that have implications upon HPT practitioners. The findings were used primarily to inform the development of the LITAM tool, but the emergence of some of the findings have broader implications. Phase One of the study was primarily centered upon finding ways to improve the components of the tool used in the decision-making process. In the process of vetting those components with the expert review panel, the data revealed that some of the more complex components required detailed explanations in order for the participants to respond accurately.

Integration of Complex Learning Theories

The findings conveyed that users were having difficulties with certain theories and models that were integrated into the LITAM tool. Those models and theories include, but not limited to, the following.

1. *Moment of Need* variable
2. *Cognitive, Affective, Psycho-motor* variable
3. *Frequency of Performance* variable
4. *Performance from Memory at Stimuli* variable

Further exploration revealed that it was not how the concepts were presented or explained; rather, it was simply a lack of familiarity. Participants were able to effectively utilize the variables once a detailed explanation was integrated into the tool, but there was a learning curve. Failure to comprehend the key concepts within the tool has implications in that a misuse of the concept could result in the selection of an inappropriate solution. The unfamiliarity amongst participants with certain concepts is a consequence of the lack of experience with both disciplines: HPT and ISD.

Lack of Experience across HPT/ISD Disciplines

The participants who were purposefully selected for this study were exceptional practitioners, but not necessarily with both HPT and ISD. Like many other training and development organizations, the participants for this study often work in teams that are systematically segregated based upon project deliverables. More specifically, some work primarily with analysis projects, such as FEAs or JTAs, while others work on design and development projects. Those who work primarily on analysis projects often become more intimate with the literature relative to HPT, while those who work primarily with design projects become more intimate with ISD literature. Seldom does the same team of practitioners work extensively in both domains. The lack of expertise across disciplines is problematic because both disciplines impact intervention selection.

The transition from front-end analysis (HPT) to intervention selection, design and development (ISD) is not simply a progression of PI/HPT model phases; it reflects a theoretical shift from diagnosis to remedy. A successful practitioner should be competent in both domains as both have the same aim – improving performance. Intervention selection is the pivotal connection, or cornerstone, between the disciplines because the intervention selection process involves connecting root causes identified during the performance analysis with potential solutions to be systematically designed, developed, and implemented (Bernardez, Guerra-López, & Kaufman, 2009).

It is paramount to recognize that HPT emerged from ISD. The field of HPT began to emerge as a distinct discipline when early pioneers recalibrated their focus from individual behavior to the output of behavior – accomplishments. Some of the early HPT pioneers, who were influenced significantly by behaviorism and programmed instruction, reassessed the relevance of training after well-designed instruction failed to improve individual and organizational performance (Pershing, 2006). Gilbert (1978) described the focus on behavior as a fundamental error and posited that the value of accomplishments is greater than the sum of behaviors used to produce them. Consequently, HPT emerged from ISD with the shift from a focus on behavior to accomplishments—the valuable products of behavior" (Binder, 2017, p. 20).

As HPT grew in popularity, so did the emphasis on teaching HPT concepts at traditional ISD graduate programs. The increased emphasis on HPT concepts and principles in ISD graduate programs is not surprising, considering the strong relationship and obvious similarities between the two fields (Fox and Klein, 2003). When Fox and Klein (2003) surveyed 101 faculty members from nine prominent ISD graduate programs concerning the integration of HPT principles, they (faculty) felt that ISD program graduates should have a broad knowledge of HPT and the performance improvement process. More recently, Hoard and Stefaniak (2016) surveyed 218 practitioners from across the country; respondents reported difficulty in achieving standards across competencies ranging from analysis through implementation. More specifically, the difficulties reported were a consequence of siloed work environments wherein organizations assign HPT professionals to work in one silo while assigning other parts of a project to instructional design professionals in another silo for design, development, and implementation activities (Hoard & Stefaniak, 2016).

Similar research has attempted to bridge the gap of competencies across the fields of ISD and HPT (Guerra, 2003; Klein & Fox, 2004; Giberson, 2010). In each instance, delineation between the disciplines remains evident as competencies often become siloed in one of the two fields. The lack of experience, and consequently expertise, across domains in not a challenge unique to USCG practitioners, but systematic tools that integrate concepts from both domains may promote interdisciplinary development.

Use of 'No-Train' Terminology

Use of the 'no-train' terminology began to emerge as a finding early in the study. Some element of concern with the term was shared by expert and novice practitioners alike. Conversely, use of the term 'train' was completely transparent and universally understood by all participants to represent some type of an instructional solution. The train versus no-train determination is the first decision point in the LITAM tool, and the most consequential as it affects all subsequent decisions. The train versus no-train decision is conveyed prominently on the intervention selection summary report which is utilized to convey the results of the LITAM tool with stakeholders.

The concept of not deferring to a training solution can be traced back to the work of Harless who posited that most skills and knowledge gaps could be addressed with some type of 'no-train' solution, usually in the form of a job-aid. Harless (1994) offered his *Accomplishment Based Curriculum Development System* which included a new decision-aid (Figure 11), and consequently, a new dichotomy for the field in addressing skills and knowledge gaps by holistically determining if information related to skills and knowledge needed to be stored in "memory" (internally) or in a "job-aid" (externally). This critical dichotomy offered by Harless is the premise that influenced decision point one in the LITAM tool and the train versus no-train selection.

Concern with the no-train terminology was evident through comments such as "not sure about using the term 'no-train', I would be concerned about sharing that with a customer" (Lines 235-236) or "not sure if I got the no-train thing at first. Does that mean nothing? Does that mean the same as job-aid. We always recommend something". (Lines 349-350) The concern with the no-train terminology is reflective of the lack of distinction between information and knowledge amongst practitioners. Not all practitioners clearly understand the distinction between knowledge and information and that lack of understanding is conveyed through their hesitation with sharing a no-train decision with stakeholders. This is problematic because PI consultants have a responsibility to convey the implications, and the theoretical rationale, of a performance gap that does not require training.

Although information and knowledge are often synonymous, the distinction is critical for HPT practitioners and has significant implications on the type of interventions to be selected. The misperception between knowledge and information was addressed by Gilbert in his BEM. Gilbert (1978) posited that information existed at the environmental level while knowledge existed within individual repertoire. This dichotomy corresponds with the dichotomy offered by Harless and is also reflected in decision point 1 of the LITAM tool. Gilbert (1978) outlined how information was to be manipulated at the environmental level while knowledge was to be impacted at the individual level.

Gustafson (2000) addressed this dichotomy by recommending that practitioners first determine if the goal is 'black box'— that is supporting performance without intentionally increasing the user's skills, or 'glass box'—that is intentionally increasing a user's independent skills and knowledge. Selecting between the two types has consequential implications, as the need for knowledge implies that training (glass box), is required while the need for information suggest that information (black box) will suffice. According to Molenda and Russel (2006), information consists of facts, news, comments, and similar representations of knowledge, but receivers of information are not responsible for measurable objectives, specific actions, or performance in the same manner as receivers of training and knowledge development. The delineation between the concepts is critical for closing skills and knowledge gaps as the train to memory decision is only appropriate for knowledge gaps, while information deficiencies are more appropriate for a no-train, or job-aid solution.

Closing Skills and Knowledge Gaps with Performance Support

The conceptual framework for this the study, the PI/HPT model, offers two types of interventions (Figure 15) for closing skills and knowledge gaps: (1) learning, and (2) performance support. This binary set of options is reflective of the HPT literature that has advanced the distinction between the need for instructional and non-instructional solutions (Gilbert, 1978; Harless, 1994; Rossett & Schafer, 2007). Just as the PI/HPT model has evolved over time (1992; 2001; 2004; 2012), so to have the terms; what once was referred to as instructional and non-instructional has evolved into learning and performance support. The concept of performance support interventions, also commonly referred to as job-aids, often provides the information needed in support of worthy performance, without having to formally train to long-term memory. The performance support approach unlocks the possibility of providing real-time support to people as they perform their job rather than sending them to formal learning events disconnected from the work. (Lanese & Ngyuen, 2012).

An illuminating finding that emerged when evaluating the effectiveness of the LITAM tool in Phase Three of the study was the frequency in which learning and performance support solutions were selected. The participants entered data into the LITAM tool for 176 performance tasks spanning three distinct analysis projects requiring intervention recommendations. The Phase Three data revealed that the LITAM tool selected a Train-to-Memory (TTM) solution (learning) 47.15 % of the time and a Performance Support (PS) solution (job-aid) 52.85 % of the time. The effectiveness of the LITAM tool provides a balance between learning and performance support solutions. Furthermore, the LITAM tool effectively demonstrated caution with concern to the selection of learning interventions and does so in concurrence with the HPT literature that advocates for the use of performance support for closing skills and knowledge gaps.

There were many models and theories (Table 4) that influenced the design of the LITAM tool. One of the most influential was that of the *Five Moments of Need* model (Gottfredson & Mosher, 2010). The *Five moment of need model* (Figure 12) provided a conceptual framework for deciding between learning and performance support by viewing learning through the framework of a performance continuum on the job. Meaning, learning in the first two moments of need (new, more) is supplemented, maintained, and synthesized through the use of performance support in subsequent moments (apply, change, solve). More precisely, selecting the appropriate type (learning or performance support) of intervention for a skills and knowledge gap is contingent upon identifying the precise moment of need.

Just as influential to the design of the LITAM tool was the *HPT Intervention Selection Model - 360-Degree Approach (*Zaguri & Gal, 2016). Zaguri and Gal's approach (Figure 13) is purposely for selecting performance interventions relative to gaps ensuing from skills and knowledge deficiencies. Zaguri and Gal's intervention selection model does this by distinguishing between two axes during the intervention decision-making process: audience type and process type. Their approach (Zaguri & Gal, 2016) is advanced on the research by Gal and Nachmias (2011; 2012) who found empirical support for the use of performance support systems (PSS) in the workplace as learning interventions in lieu of training. The results supporting the use of performance support challenged the assertion that sending workers away for training was advantageous.

Consequently, the influence of Gottfredson and Mosher (2010), as well as Zaguri and Gal (2016), resulted in the LITAM tool evaluation finding that demonstrated a desired balance between learning and performance support solutions. It is important to note that the LITAM tool is a decision-aid; therefore, the final selection of an intervention still falls upon the PI practitioner. The authors of PI/HPT model contended that there is “no easy method for selecting possible interventions or solutions to performance problems or opportunities (Van Tiem et al., p. 197). The systematizing of the intervention selection process in the LITAM was influenced through sound HPT and ISD principles and practices, which has definitive implications upon the challenge of intervention selection because it now becomes a data-driven, scientific, and results oriented process much like the other activities in the PI/HPT model.

Using the Tool’s influential Concepts in other Context

The LITAM tool was designed specifically for USCG practitioners within the context of the USCG Force Readiness Command (FORCECOM). The tool utilized a set of influential concepts from the HPT literature to make the critical intervention selection type decision – learning or performance support. The terminology of learning or performance support is USCG centric, but the concept is not; countless organizations from almost every domain deal with the challenge of determining when training is truly needed. This challenge is particularly true for organizations who have limited resources (time, money, personnel) and approach training with caution and economy of effort.

The influential concepts used in the LITAM tool are not simply applicable to the USCG or HPT driven organizations. Therefore, the principles used to design the LITAM tool for the USCG could have implications across a myriad of organizations. Practically any organization, regardless of context, could take the same set of concepts used in the LITAM tool and apply them accordingly through a series of systematic questions to make the training versus job-aid determination. Although the names of the authors may be less recognizable beyond HPT communities, the concepts are universal to the intervention decision process. The following concepts from the literature could be applied generally to almost any organization dealing with skills and knowledge gaps and struggling to determine when training is the appropriate solution.

1. Gilbert (1978): Environmental or Individual Level Influence
2. Harless (1994): Long-term Memory or External Information Storage
3. Gustafson (2000): Black Box and Glass Box Objectives
4. Rossett and Schafer (2007): Context of Performance
5. Gottfredson and Mosher (2010): Five Moments of Learning Needs
6. Gal and Nachmias (2012): Learning as a Consequence of Performance
7. Zaguri and Gal (2016): Audience and Process Types

The modality decision factors could have implications beyond the USCG as well. The LITAM tool uses a set of influential concepts to make modality decisions based upon available learning options within the organization. In doing so, the LITAM addresses the context of the performance environment, experience level of the performers, behavioral domain of instructional tasks, and the options available from the USCG TRASYS. Other than organizational options, these influences (Figure 15) are not solely germane to the USCG. Applied accordingly through a series of structured questions that reflect the context of application, these modality influences could be deployed within any organization desiring to systematize their intervention selection process.

Future Research

Design and development research is directed toward both the improvement of practice in the field and the enhancement of our knowledge base as a discipline (Richey, 1997). This study attempted to validate a systematic intervention selection tool for potential practical application in the context in which it was tested. The evaluation of the updated version of the LITAM tool suggests that its use has an impact on improving the intervention selection efforts for USCG practitioners. The study has focused on a subset of a larger picture for performance improvement opportunities. Therefore, the findings of this study point to broader areas in which future research is necessary. These areas include:

- Replication of Phase Three: Using a larger sample of participants including both expert and novice practitioners, test the effective and limitations of the tool. Additionally, the tool should be tested using a larger sample of projects that represent diverse occupations and problems in the USCG workforce in order to ensure applicability across disciplines such as search and rescue, aviation, and maritime law enforcement.
- Integration of emerging modalities: Using emerging training technologies, such as augmented reality (AR), virtual reality (VR), or blended reality (BR), integrate new modality options into the tool that reflect advances in the field. Future research is needed to determine when different types of emersion are critical for learning transfer

and the best practices for making those determinations. The best practices for making the AR/VR/BR determination can be integrated into the tool for further testing.

- Analysis of intervention implementation: Conduct an implementation and impact analysis on the intervention recommendations generated by the tool over time. This approach is the next logical step in the evaluation progression and is in keeping with the principles of the PI/HPT model which clearly provides the conceptual framework for conducting implementation and evaluation following the selection of interventions. Research would provide confirmative evaluation data on the effectiveness of the tool by examining the frequency rate in which interventions were implemented and the impact they had on the original performance problem.
- Application of system in other contexts: Using an applicable set of principles and theories used to generate interventions for other contexts, develop and test a new tool for use in industry, government, academia, or military. Although the outputs will fluctuate for each entity, the principles of systematic intervention selection can be applied by integrating the learning theories relative to the modalities of any given organization. Additionally, application of the system in other contexts would be served well to focus upon the needs of the target performers and expand, or replace, the choices of novice, journeyman, and expert currently used in the LITAM tool.
- Replication of systematic tool for other performance (gap) causes: Utilizing the full breadth of potential performance gap causes, develop and test a similar tool system for other needs. The current tool only addresses skills and knowledge gaps, but the principles of tool systemization should be applied other needs such as data, tools, incentives, capacity, and motives. This approach to design and development research

aligns with the position of Gilbert (1978) who purported that environmental causes, such as data, tools, and incentives could be more readily influenced to impact change than elements of individual repertoire.

Concluding Thoughts

HPT is change management; it is the systematic process of improving organizational and individual performance and processes. Accordingly, this study attempted to address an existing need in the USCG TRASYS using the PI/HPT model framework. First, an analysis was conducted to validate the lack of systematic intervention selection tools available for the USCG as verified by the literature review. Subsequently, a cause analysis was conducted and an intervention was designed and developed in the form of the LITAM tool. Finally, an evaluation was conducted to examine intervention efficacy and effectiveness in order to inform the future direction of the intervention and the change management process. In a sense, this study served as a microcosm for the broader change management process as it used the PI/HPT model framework to address a gap in the organization's PI process.

Gilbert posited that "technology is an orderly and sensible set of procedures for converting potential into capital" (p. 12). The findings revealed that the integration of technology into the intervention selection process for closing skills and knowledge gaps can be effectively achieved. That said, the LITAM tool was not designed to replace the human element of decision making within performance improvement. Conversely, the LITAM tool was developed to empower the decision maker by offering a systematic means of generating intervention recommendations for which the PI practitioner still has the autonomy to accept or challenge. What has changed is that the PI professional now has a means of providing intervention recommendations with the confidence of knowing that the selections were data-driven, scientific, results-oriented, and systematic—the pillars of HPT.

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APPENDIX A

LITAM STUDY EXPERT PANEL QUESTIONS

<u>Questions</u>

1. Use of the LITAM tool is intuitive.

    (a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree I strongly disagree

2. The guidance provided in the tool is sufficient for USCG practitioners (ISS, analysts, training specialist/managers, etc.).

    (a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree I strongly disagree

3. The LITAM tool posed an appropriate amount of questions to generate the selections.

    (a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree I strongly disagree

4. The progression through the four decision points in the tool is a logical flow.

    (a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree I strongly disagree

5. The LITAM tool posed effective questions to generate the selections.

    (a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree I strongly disagree

6. The LITAM tool used important factors to generate selections.

    (a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree I strongly disagree

7. Based upon the performance tasks you entered into the LITAM tool, the selections made were appropriate.

    (a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree I strongly disagree

8. The LITAM tool generated selections I would feel confident sharing with stakeholders.

    (a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree I strongly disagree

9. The tool provides a valid means of selecting interventions for skills and knowledge gaps.

    (a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree I strongly disagree

10. The selections generated in the summary report aligned with my intuitions/expectations for the tasks.

(a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree I strongly disagree

11. The selections generated in the summary report were easy to understand.

(a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree I strongly disagree

APPENDIX B

SURVEY RESULTS FOR EXPERT PANEL ROUND 2

Question		Response Options		Totals
1. Use of the LITAM tool is intuitive.		Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree		2 2 0 0 0
2. The guidance provided in the tool is sufficient for USCG practitioners (ISS, analysts, training specialist/managers, etc.).		Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree		1 3 0 0 0
3. The LITAM tool posed an appropriate amount of questions to generate the selections.		Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree		3 1 0 0 0
4. The progression through the four decision points in the tool is a logical flow.		Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree		1 3 0 0 0
5. The LITAM tool posed effective questions to generate the selections.		Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree		1 3 0 0 0

Question		Response Options		Totals
6. The LITAM tool used important factors to generate selections.		Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree		3 1 0 0 0
7. Based upon the performance tasks you entered into the LITAM tool, the selections made were appropriate.		Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree		1 2 1 0 0
8. The LITAM tool generated selections I would feel confident sharing with stakeholders.		Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree		2 2 0 0 0
9. The tool provides a valid means of selecting interventions for skills and knowledge gaps.		Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree		2 2 0 0 0
10. The selections generated in the summary report aligned with my intuitions/expectations for the tasks.		Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree		0 4 0 0 0

Question		Response Options		Totals
11. The selections generated in the summary report were easy to understand.		Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree		0 2 1 1
12. Open comments: See Qualitative page				
1. Strongly Agree 2. Agree 3. Neither Agree nor Disagree 4. Disagree 5. Strongly Disagree				

APPENDIX C

LITAM STUDY PHASE 1: EXPERT PANEL ROUND 3 QUESTIONS

Directions:

After following the procedures for round 3, please refer to the round 3 questions and answer all of the questions. Please respond to all of the questions (listed below) within one week. Again, your feedback will be critical to the advancement of the tool prior to field testing.

Questions

1. What was your overall experience with the tool?

2. What are the benefits, relative to other processes for intervention selection, of using the LITAM tool?

3. What do you perceive to be as barriers, if any, to the use of this tool?

4. What specific changes, if any, would you make to the Intervention Selection Summary Report to make it more effectual and user friendly?

4. What final changes, if any, would you recommend to the tool?

5. Do you perceive that the selections generated by the LITAM tool are systematic and reflect principles of learning and performance improvement? Please respond with Yes or No.

7. Can you agree to the use of the LITAM tool and do you recommend it for further use. Please respond with Yes or No.

8. Please provide any additional comments, if needed, relative to the use of the LITAM tool.

APPENDIX D

LITAM TOOL FIELD TRY-OUT FOCUS GROUP QUESTIONS

Try-out date/time: ______________________________
Participant ID#: ____

Focus Group Protocol

Part I: Welcome & introductions (Virtual)

Thank you for your time today. Your role in evaluating the LITAM tool is critical for the success of this organization as well as the influence you have on our performers. Your particular position on the team is unique and so are your views on how best to select and design our learning solutions. The focus of this study is on advancing the development of the LITAM tool so that it generates the most effectual intervention selections.

Introductions (Virtual)

Part II: Protocol and demonstration session (5 minutes). Build rapport, describe the study, provide additional context for development of the tool, and answer any questions.

Protocol Process

Because your responses are important, and I want to make sure to capture everything you say, I would like to record our conversation today. Do I have your permission to record this session? ***[if yes, thank the participant, let them know you may ask the question again as you start recording, and then turn on the recording function].***

I will also be taking written notes. I can assure you that all responses will be confidential, and a pseudonym will be used when quoting from the transcripts. I will be the only one privy to the recordings which will be eventually deleted after they are transcribed. Do you have any questions about the process or how your data will be used?

This focus group should last less than an hour. During this time, I have several questions that I would like to cover. If time begins to run short, it may be necessary to interject in order to push ahead and complete this line of questioning. Do you have any questions at this time?

Demonstration of LITAM tool (Virtual)

Part III: Focus Group Questions

1. What was your impression of the LITAM tool when using it for the first time?

2. How was your experience with progressing through the different decision points?

3. Do you think the terminology used in the tool is appropriate for target users in the field?

Explain: ____

4. Were there any questions presented in the tool that you felt were unnecessary or

inappropriate? Explain: ____

5. Were the selections generated in the summary report easy to understand?

6. How was your overall experience with the tool?

7. How do you feel about recommending the tool for use to other practitioners?

APPENDIX E

LITAM TOOL INTERFACE OBSERVATION

Observation date/time: ________________________________
Observed Team/Participants: ____

Part I: Before Use

1. The user was able to easily access the LITAM tool using the URL provided.	
Yes/Functioned	*No/Didn't Function*
Comment:	

2. The user was able to unlock the data entry function.	
Yes/Functioned	*No/Didn't Function*
Comment:	

3. The user was able to enter the project data on the initial screen.	
Yes/Functioned	*No/Didn't Function*
Comment:	

4. The user was able to successfully transition to decision point 1.	
Yes/Functioned	*No/Didn't Function*
Comment:	

Part II: During Use

1. The user was presented with questions for all four decision points.	
Yes/Functioned	*No/Didn't Function*
Comment:	

2. The user was given open options for every question.	
Yes/Functioned	*No/Didn't Function*
Comment:	

3. The user was able to select the options they desired.	
Yes/Functioned	*No/Didn't Function*
Comment:	

4. The user was presented with dynamic options based upon their responses.	
Yes/Functioned	*No/Didn't Function*
Comment:	

5. The user was able to change their answers within each decision point.	
Yes/Functioned	*No/Didn't Function*
Comment:	

6. The user was only provided an option to proceed if all queries were satisfied.	
Yes/Functioned	*No/Didn't Function*
Comment:	

7. The user was presented with information when selecting the info icon button.	
Yes/Functioned	*No/Didn't Function*
Comment:	

8. The user was able to smoothly transition between decision points.	
Yes/Functioned	*No/Didn't Function*
Comment:	

9. The user was provided with guidance (warning) before entering another task (TPO).	
Yes/Functioned	*No/Didn't Function*
Comment:	

10. The user was provided with guidance (warning) before generating a summary report.	
Yes/Functioned	*No/Didn't Function*
Comment:	

Part III: After Use

1. The user was presented with an Intervention Selection Summary Report.	
Yes/Functioned	*No/Didn't Function*
Comment:	

2. The summary report included all four decision points.	
Yes/Functioned	*No/Didn't Function*
Comment:	

3. The summary report listed all results by task (TPO) number.	
Yes/Functioned	*No/Didn't Function*
Comment:	

4. The user was presented with the capability to save the summary report (PDF).	
Yes/Functioned	*No/Didn't Function*
Comment:	

5. The user was presented with the capability to print the summary report (PDF).	
Yes/Functioned	*No/Didn't Function*
Comment:	

APPENDIX F

LITAM TOOL DESIGN INTERFACE AND NAVIGATION QUESTIONNAIRE

Please respond to all items by selecting one of the five Likert scale options provided for each. When you have completed all items, please save this file and return survey.

Participant ID#: ______________________________

Part I: Screen/User Design

1. The texts (font, size, spacing) were understandable.

   (a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

2. The prompts remained consistent throughout use of the tool.

   (a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

3. The texts did not contain unnecessarily difficult words.

   (a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

4. Tool objects (like buttons) were consistently located in the same position.

   (a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

5. Icon meanings were clear.

   (a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

6. The screens were not overly cluttered with information.

   (a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

7. The use of key concepts remained consistent.

   (a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

8. Objects with different functions looked different on screens.

   (a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

Part II: Navigation

1. It was made clear when the user needed to wait because the computer was busy.

(a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

2. User tasks on each screen were clear.

(a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

3. The navigation was intuitive.

(a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

4. User location within the tool was clear.

(a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

5. The structure of the tool was logical.

(a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

6. Selection options were clear.

(a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

7. Progression through the tool was easy to understand.

(a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

8. User choices were clearly presented.

(a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

9. Selections in the tool were easy to change.

(a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

10. Navigation help was readily available.

(a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

11. Data provided by the user earlier on, does not need to be retyped later.

(a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

12. When the user selected the wrong response, it could be easily adjusted.

(a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

Part III: Practicality of Use

1. The LITAM tool used a suitable amount of questions to produce the selected intervention.

(a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

2. The LITAM tool used effective questions to produce the selected interventions.

(a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

3. The LITAM tool generated selections for each task entered into the tool.

(a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

4. The LITAM tool generated selections I would feel comfortable sharing with stakeholders.

(a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

5. The intervention selection summary report was easy to understand.

(a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

APPENDIX G

PARTICIPANT EVALUATION LOG

Participant ID ____
Date ____
Project (Analysis) Title _______________________________________

Task #	**Task Description** (Truncated version of full task/TPO)	**Intervention Prediction** (intuition on modality decision)	**Rationale** (Reason for prospective intervention)	**Final Outcome** (modality selection from LITAM tool)	**Practitioner Comments** (feedback concerning the difference between intuition and LITAM decision)

APPENDIX H

DOCUMENT REVIEW

Examples of documents/resources that should be reviewed: instructional and non-instructional resources; new employee department-specific training products; general hospital orientation training products.

- Name of the document or resource being reviewed:

  ____

- Date of creation: ____

- Is the document or resource used as paper-based or digital? | Paper-based | Digital

- Intended purpose of the resource:

  ____

APPENDIX I

LITAM TOOL EFFICACY AND EFFECTIVENESS EVALUATION QUESTIONNAIRE

(PHASE 3)

Please respond to all items by selecting one of the five Likert scale options provided for each. Questionnaire to be delivered virtually using secure online survey technology (milSurvey).

Participant ID#: ______________________________

Part I: Practicality of Use

1. The LITAM tool can be used effectively by practitioners with minimal instructions (extrinsic guidance).

   (a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

2. The time spent using the LITAM tool to generate selections was a reasonable amount of time.

   (a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

3. The selections listed on the LITAM's Intervention Selection Summary report, for all four decision points, are readily understandable.

   (a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

4. The Intervention Selection Summary Report, generated by the LITAM tool, is appropriate for sharing results with other stakeholders.

   (a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

5. The amount of resources (learner analysis, environmental information, SMEs, etc.) needed to answer context and learner specific questions in the LITAM tool is reasonable.

   (a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

Part II: Efficacy

1. As a web-based application, the LITAM tool was accessible whenever needed for projects requiring intervention selection.

(a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

2. The LITAM tool used a systematic approach to generating intervention selections.

(a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

3. The selections generated by the LITAM tool reflected the data driven options included in each decision point in the tool.

(a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

4. The LITAM tool generated selections for all four decision points for every task.

(a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

5. The LITAM tool generated an intervention Selection Summary Report for every single task entered into the tool.

(a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

Part III: Effectiveness

1. The LITAM tool generated intervention selections that directly supported the behaviors described in the tasks (TPOs).

(a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

2. The LITAM tool generated intervention selections that were specifically aligned with performers' moments of need (when learning/performance support is needed most) .

(a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

3. The LITAM tool generated intervention selections that were specifically aligned with the context of the performance environment relative to each task.

(a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

4. The LITAM tool generated intervention selections that were specifically aligned with the needs of the target audience relative to each task.

(a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

5. The LITAM tool generated intervention selections that directly supported the performance output (accomplishment) relative to each task.

(a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

6. The LITAM tool generated intervention selections I feel confident in sharing with stakeholders.

(a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

7. The LITAM tool generated intervention selections with the capacity needed to close skills and knowledge gaps.

(a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

8. The LITAM tool generated intervention selections that reflected my intuition as a performance consultant.

(a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

9. The LITAM tool generated intervention selections that are practical for implementation.

(a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

10. The LITAM tool generated optimal recommendations for the Train/No Train decision.

(a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

11. The LITAM tool generated optimal recommendations for the Modality of Instruction decision (Interventions for Train to Memory Tasks).

(a) strongly agree (b) agree (c) neither agree nor disagree (d) disagree (e) strongly disagree

APPENDIX J

CODEBOOK TEMPLATE

This template should be used to capture primary and secondary codes that emerge from data analysis. After coding completion, this template should be used to create primary and secondary codebooks that will be retained with all study documentation.

Primary/ Secondary	Code	Code definition	Frequency

APPENDIX K

ROUND 1 RESPONSES FROM SME PANEL

* The following comments are from the expert interviews in Round One.

<u>Expert 1:</u>

Question 1 –

1 Too many clicks. Made me wonder if there's a way to consolidate decisions in the logic flow
2 either within each Decision Point or by crossing them over; seeking contextual linkage for the
3 reuse of previous selections.
4 The course data entry on page 1 seemed to be turned off and made me wonder if I'm doing
5 something wrong. I couldn't save my results either; gone forever.

Question 2 –

6 I'm not familiar with the 'moment of need' concept. I'd need to go look it up before I used the
7 tool again because I'm guessing now.
8 Likewise 'coaching or scaffolding'
9 My original comments indicated that I believe an AP or SME ought to be alongside the
10 HPT/ISS during task rating. The current language would be difficult to translate. A guide
11 would be helpful.

Question 3 –

12 Performance at stimuli. This concept is confusing and not sure how that impacts the use of
13 job-aids. Also, make a reference that equates cognitive, psycho-motor, and affective to KSAs
14 The frequency of performance options were different than current JTA/FEA metrics. Using a
15 set of options that reflect current methodologies may put the user at ease because of
16 familiarity with options. Most analysts are very intimate with the job-aids from SOP Volume
17 2 so using current the frequency metrics from the DIF (difficulty, importance, frequency)
18 could be an easy fix.

Question 4 –

19 In the Synchronous / Asynchronous Decision Questions section, Q4 Q5 and Q6 seem to be
20 asking about learning issues and not performance like all the other questions. Would like to
21 see them turned around so they were pointed toward the requirements of the OTJ performance
22 if possible.

Question 5 –

23 I selected cognitive for all tasks in this round but wonder how the tool characterizes verbal
24 performance.

Question 6 –

25 Nope

<u>Expert 2:</u>

Question 1 –

26 I liked the tool. The way it flowed was good.
27 Under the Performance Support Decisions page Please check on how the Question fly in and
28 fly out for each question.

Question 2 –

29 No
30 I believe the words highlighted in blue all need a definition button added for information.
31 The end users of this tool will not be an ISD or probably have any background in Instructional
32 Design.

Question 3 –

33 Yes, the words I pointed out in the last question. Performance from memory at initial stimuli
34 – this concept is not completely obvious for me. Even when I read the potential selections it is
35 not clear. I think it is referring to the allowance for time upon stimuli to response, but that is
36 not clear. Must be a more concise way to convey this concept

Question 4 –

37 Frequency of performance may not be perceived by all users in the same way and that
38 definitive parameters should be used to define concept more succinctly
39 Moment of Need is confusing, instead of posing questions relative to each ‘moment’, present
40 the user with declarative statements as options that explains what each moment is with
41 examples

Question 5 –

42 Most of these tasks are based on IMO Manuals. A questions should ask also if Reference can
43 only be used in a paper format. This would negate the use of a tablet or computer. Currently
44 USCG cannot download some of IMO and other organization books and they have to be
45 paper based.

Question 6 –

46 Yes, In no train is the recommended solution what other methods are available to use to get
47 the information out to the field. SPeL, EPSS, Job Aid. Allow the end user to then pick what

48 types of intervention can be used. Also, sometimes “there is overlap with a task with concern
49 to cognitive, affective, or psycho-motor.

Expert 3:

Question 1 –

50 Time Gap – looks like a hyperlink to definition, but not functional. Info button is not working
51 and stuck on first page, but may be due to prototype nature of LITAM or use of offline
52 version.

Question 2 –

53 Subject to change – same issue with hyperlink. Info box is “change to: to make different in
54 some particular.” Seldom and Frequently would benefit with objective parameters (e.g.
55 seldom = more than a year from now).

Question 3 –

56 Frequency of performance options are not as I recall with Harless approach, may throw some
57 off balance. Frequency idea was not clear – good three items to select from, but not aligned
58 with JTA scale (of 5 choices). JTA scale for high, which is weekly, should be 2 or more
59 times per week.

Question 4 –

60 Q5: Cognitive behavior: would benefit from an example or two for each of the possibilities.
61 Also, since it is a discrete selection, perhaps change wording to “What is the dominant
62 cognitive behavior?”
63 At the same time, maybe not everything fits so neatly in those three boxes

Question 5 –

64 Q6: Consequence of error – no issues, good explanation/definitions. Just a note that scale
65 differs from JTA. Plus, rewrite the question so that KSA’s are used as well for context

Question 6 –

66 Q7: “…performed from memory at initial stimuli…” I actually like the phrasing…but think it
67 may be cumbersome to target population to use/apply. The wording could probably be
68 simplified to either: a) Are there psycho-social barriers for use of a job aid? Job environment
69 reasons that would prohibit use of a job aid?
70 Or
71 b) Could a job aid be used to guide performance?

Expert 4:

Question 1 –

My initial impression was that the tool was easy to use and branched smoothly. However, I had to enter some of the task data twice, because when I used the back arrow, the information previously entered was deleted.

Question 2 –

Assuming the target users do not understand learning jargon, phrases such as "moment of need" and "scaffolding" will be misunderstood. Also, for Q2 what is the distinction between "seldom" and "frequently"?

With regard to cognitive, affective, and psycho-motor are often referred to by practitioners as KSA – that is, knowledge, skills, and attitudes. And for us as performance technologists, it is imperative to speak the language of those that we serve

Question 3 –

I would either change the terms mentioned in question 2 above to lay terms or provide an explanation similar to what you provided for the responses to the item inquiring about consequences of error.

The moment of need stuff is nuance. An example for each moment of need would be extremely powerful, even if the concept is new to the user.

So maybe back to the Performance from Memory question, would it be easier to ask when could a job-aid could be used from the initial step of the task.

Question 4 –

All the questions and factors made sense to me and seemed appropriate. BZ!

Question 5 –

I cannot think of any questions or factors that should be added. I believe Joe Harless would have perceived your tool to cover the vital areas of his model.

Question 6 –

The outcomes of your model based on my input matched my expectation of what interventions would be effective

APPENDIX L

ROUND TWO RESPONSES FROM SME PANEL

* The following comments are from the open-ended question on the Round Two survey.

Expert # 1

Q4 under Synchronous/Asynch is associated with the learning challenge and not task performance. Q3 in Modality also. Moment of need explanation is still confusing; could be clearer. Great tool, great process, great project!

Expert #2

Under the Performance Tab for the first task, Q2 and Q4 fly in and then out, under the Synchronous and Asynchronous section under Q4 the word Skills is spelled sills in the info Under the modality section for the 3rd task listed after Q6 I got the next button but below that was a Q5 and another Next button. Look at the header for this section additional is spelled wrong, "additional".

Expert # 3

Regarding above responses:
#4. Progression: Perhaps an overview of the decision points to help orient where the user is going. #5. Effective Questions: Q2 Safety Guidance follow-up - I still got the follow-up question asking whether a one-way text would be sufficient, after answering that safety is not an issue? #7 & #10: I'm still uncertain about Q3 Team based question: is this to say multiple people perform the task together (each with own role/responsibility) or that the team works together on the same task? For example, witnessing a CO2 system test - the performer (MI) is not involved in a collaborative task - he/she is just observing. On the other hand, multiple people are involved (ship's crew does the actual test of the system). Q4 asks about whether Scaffolding is involved? Perhaps the question could be whether Scaffolding is appropriate or acceptable (means of shaping behavior or performer)...involved seems to me to indicate it is a nature of the task, which I don't understand. Q6 asks about "need to access learning support on demand" - I'm unfamiliar with what that means...is it performance support on demand? #11 Selections generated easy to understand: Two of my tasks were evaluated as needing Paper (based) performance aid. I think I get that, but I don't see how the logic unfolds based on the answers...so for me to confidently share results with stakeholders, I would want better transparency about how the variables affected the decision points. #12: Q7 asks about "performed from memory at initial stimuli" - my confusion/question is whether this means 1) initial response needs to be from memory, but after initial steps, can be supported with job aid (e.g. airplane engine on fire - need to know from memory to shut off fuel and from memory how to do that...but then refer to job aid for

next steps) or 2) initial and subsequent steps need to be from memory (e.g. task of landing the aircraft - steps of enter pattern at X altitude; lower flaps, lower landing gear; reduce speed; align with runway; make call to tower - all need to be done from memory). Overall great job - and I am more confident in the results than what I saw in the JTA recommendations - and of course, these results from the LITAM were more thorough. As a trivial note - the Print function (when saved as a PDF) produced a document titled "Coast Guard Recruit Study Guide" Please feel free to contact me if it would help for me to elaborate further or I can help in any other way.

Expert #4

I recommend a glossary for some terms that may not be clear, such as "scaffolding," "moment of need." Alternatively, you could use plain language for the terms.

APPENDIX M

ROUND 3 RESPONSES FROM SME PANEL

* The following comments are from the open-ended question on the Round Three questionnaire.

Expert 1:

Question 1 –

132 I anticipated rigor because of the number of questions and so forced myself to complete each
133 TPO. In other words I ignored my own impatience as a trade-off for a good benefit at the end.
134 After the third TPO I could anticipate the questions and spent less time considering the answer. I
135 experienced ‘click-fatigue’. I was also puzzled by the logic path; I couldn’t discern key
136 questions and some of the results were a little debatable. If I knew more about the allorhythmia
137 I’d have more confidence. Frankly I’m still a little stumped by the Moment of Need. Is there
138 another way of getting at this info? Is this a variation on Novice, Journeyman, Master?

Question 2 –
139 Will serve the same purpose as the DIF only with more accurate recommendations. Should
140 invoke higher levels of confidence for users

Question 3 –
141 MUST be a qualified practitioner to use the tool.

Question 4 –
142 Allow the user to go back without starting over.

Question 5 –
143 Find a way to randomize the order questions are asked in each section to avoid complacence on
144 the part of the ISD user.

Question 6 –
145 Yes

Question 7 –
146 Yes

Question 8 –
147 TNT Q7: Really great way to frame this question! PSD Q1: I get stuck every time on the 1-
148 2 pages threshold. I can get a lot of job aid info into two pages but others may not see that
149 as sufficient. I may be reading in. Q3: Just say demonstration vice the jargon ‘performance
150 modeling’ Q6: ‘Does’ is singular but ‘performers’ is plural SAD Q4: Coaching or
151 scaffolding?? Must be a better way of framing the intent.

<u>Expert 2:</u>

Question 1 –
The use of the tool shows marked improvement over the first time I used it.

Question 2 –
This seems to take into consideration elements not asked in the current model. The DIF does take into account most of these questions

Question 3 –
The knowledge or skill levels of future performers will require more training on the questions asked. They will not have the ability to understand some of these questions, as they will not be ISD.

Question 4 –
None currently, Once the USCG decides when and where to use this tool, I will have a better understanding on how to answer this question

Question 5 –
N/A

Question 6 –
Yes

Question 7 –
Yes

Question 8 –
1st Task Under Type and Modality Q4 states: Does this task require assistance with making complex decisions it gave me a when answered NO it gives me a Q5 that says Check any/all that apply: This task involves following detailed instructions/procedures. This task involves the support of digital tools: (databases, statistical analysis, calculator, etc.). This task requires cognitive support (pictures, videos, large quantity of information, etc.). This task involves support of an expert system (decision aid, expert system that presents the user questions/options, then suggests the most appropriate procedure or step to do next). 2ND Task Synchronous / Asynchronous Decision QuestionQ4 Is coaching or scaffolding an appropriate means of shaping behavior when learning how to perform this task? Yes No – When No is answered in Q4 it gives me Q5. These answer in Q5 do not reflect the answers that needed to be given Q5 What is the "Moment of Need" for learning this task? Does this task involve learning information/content that is completely new (Example: "A" School, or developing new cognitive schema)? Does this task involve learning more about information/content from a previously learned subject (Example: "C" school, or updating existing cognitive schema)? Does this task involve learning information/content because something has changed in the workplace (policy/problem/procedure)? Does this task involve learning information/content in support of problem solving that is unpredictable (Example: troubleshooting,

Expert 3:

Question 1 –
181 Excellent – interesting, elegant and appreciate seeing the improvements made through the
182 review process.

Question 2 –
183 Takes more variables into account and combines train/no-train; performance aid,
184 synchronous/asynchronous and modality – all in one tool. I'm not aware of another
185 comprehensive model/tool/system that attempts this.

Question 3 –
186 May be a challenge in the tradeoff among: maintaining the fidelity, providing detailed
187 explanations of unfamiliar terms/concepts and keeping the process streamlined among target
188 audience users.

Question 4 –
189 I would prefer to be able to see what questions/answers caused changes in results (i.e. what
190 is the explicit logic behind the tool). Maybe it is available, but I have not been able to see
191 it/find it?

Question 5 –
192 A few things I noted: Q5 What is the moment of need? Question is followed by four
193 questions. Perhaps make these four statements (which answer the question). Additionally,
194 the info box for this question explains five scenarios (may need change/update based on
195 latest revision to tool?) Q4 What type of task is this? (tasks are rarely discrete…but certainly
196 there is a dominant type. For example, doing a preflight checklist involves both cognitive
197 and psychomotor (need to comprehend what's being asked on the checklist, but must also
198 physically flip switches, cycle things in the aircraft). My hunch is that psychomotor (if
199 dominant) would require practice to shape the behavior (i.e. hit a baseball). Long way of
200 suggesting that perhaps ask "what type of behavior is dominant in this task?" Frequency of
201 performance: first choice is: "Continuous daily or weekly"…but it my experience, the
202 breakpoint for frequency in train to memory decisions is twice per week or more
203 frequently…so if a task is "weekly" it could be once per week, which I would say leans
204 toward job aid. But if daily, then leans toward train to memory. Need for performance
205 modeling: not sure that this will be understood by target audience without some explanation?

Question 6 –
206 Yes

Question 7 –
207 Yes

Question 8 –
208 Happy to provide follow up/elaboration on any of my points above.

<u>Expert 4:</u>

Question 1 –
209 Positive; easy to use by second or third task being entered.

Question 2 –
210 Quick results due to rapid and easy response system.

Question 3 –
211 Would likely require job aid or resident training, similar to CDC.

Question 4 –
212 Use of acronyms would make necessary interpretation of results and translation for briefing
213 stakeholders

Question 5 –
214 None

Question 6 –
215 Yes

Question 7 –
216 Yes

Question 8 –
217 I would still expect appropriate final conclusions from my instructional developers with
218 explanations if deviating from computer-generated report.

APPENDIX N

PHASE 2 RESPONSES FROM FOCUS GROUPS

* The following comments are from the open-ended questions during Focus Group #1.

Question 1 –
219 This was a very user friendly tools and provide a really easy way to collect data.
220 Very intuitive, and once familiar with the questions you can move through it quickly.
221 Excellent and smooth. Not sure how this might be integrated with our current processes.
223 I enjoyed it. I thought it streamlined the process for us.

Question 2 –
224 It was easy to transition
225 No issues with moving from one section to the next. Not being able to revisit a second once
226 complete was only an issue once after realizing an answer was mis-clicked right as I was
227 moving to the next section and could not go back and revise.
228 Fine.
229 Not bad. The button at the bottom only appeared if I made all required selections.

Question 3 –
230 The terminology is appropriate for analyst but may need more explanation for accomplish
231 performer.
232 I believe so. All the terminology is appropriate and used by analysts. Additional explanation
233 and definitions would only be necessary to help guide the AP, but at the SME level all
234 terminology is spot on.
235 Not sure about using the term "No-Train". I would be concerned about sharing that with a
236 customer.
237 Maybe the No Train decision should labeled as Job-aid.
238 Yes

Question 4 –
239 All questions were necessary and appropriate.
240 Not at all. The only recommendation I would make would be to provide practical examples,
241 or slight rephrase jargon heavy questions such as: Is this task inherently mobile, e.g. does it
242 require dexterity or require the performer to be on the move in order to perform correctly?
243 No
244 Responding to the type of task more than once was a bit unnecessary maybe.

Question 5 –
245 Very easily understood
246 Yes, the selections were very straightforward. I was only surprised by one recommendation
247 of No Train, otherwise based on the known complexity of the tasks being evaluated the vast
248 majority of the recommendations were not surprising and helped validate the results of the
249 NPP FEA tool.
250 Yes, simple enough.

Straightforward to me

Question 6 –

My overall experience with the tool was positive, but needed the opportunity to return to a section to change a answer in a previous section.

I had some issues with the formatting of the PDF report. Otherwise, for peace of mind it would be great if the tool was account based, and I could store reports associated with my account on the server side. When I log-in, being able to pull up previous intervention determinations would be helpful. We were able to finish 14 tasks in approximately 3 hours 15 minutes. For an analysis with 50+ tasks, it may require the use of the LITAM tool over the course of a few days. Being able to save and pick back up where I left off in a new session on a new day would be ideal.

Not bad, just have to get used to it.

I liked it. After a few rounds of entering info, I got the hang of it and it started to go quickly.

Question 7 –

I would recommend this tool for collecting with a few minor changes like being able to go backwards and change responses.

Well done! I look forward to using the LITAM application for future analyses. This is exactly what we need in order to provide specific, data driven justification for recommended interventions.

After running several tasks through the tool, I really started to become confident in the selections the tool was generating.

I think it should be pushed out for everyone to use once testing is complete, so yes I would recommend it.

* The following comments are from the open-ended questions during Focus Group #2.

Question 1 –

I think the tool was great and could be a valuable addition to our set of tools for conducting analysis projects and helping bridge a gap between HPT analysis and ADDIE. Two things I would add, first I would only use this tool after I'd conducted a task validation meeting and not in the presence of accomplished performers or clients who may not understand the terms in the tool, secondly they may attempt to drive the tool to an intended solution rather than answer the question honestly to attempt to get a particular output. I would also change the output of train/no train to train/ job aid. We as analysts understand the difference in the former but our clients may not understand that no train doesn't mean we don't get anything. It would clarify the output and remove some conceptions that the client may not understand.

Solid tool, intuitive. A few quirks with no way to go back and change something or review your answers later.

Some of the verbiage required more explanation than what was given in the tool. It is apparent the amount of work that went into this tool and that is very impressive.

Good tool, will use in the future

Very interesting. I never really thought about something like this.

Question 2 –

Easy and intuitive, with the exception previously noted

No issues. I found using VDI, whether you selected yes or no for the last question of proceed to next task it kicked you out of the system. I have not been able to test using VPN.

Smooth

It went well. I wish I could go back sometimes.

Question 3 –

In our field, yes, for our clients no.

I think some of the terminology needed further explanation and you captured that where we had questions regarding this and is making changes accordingly.

Fine with me.

A few tricky words, but the glossary helped.

Question 4 –

No

Not unnecessary or inappropriate but needing more structure. An example might be the discussion we had on target performers. The knowledge and skill level can vary yet they are often expected to have reached a certain requirement. This needs to be considered. Another example would be cognitive complexity. If someone is troubleshooting security of a computer system and often using a computer system to aid in that troubleshooting but significant decision making is necessary, they are using more than one (application/synthesizing). The question regarding time gap was something that would be subjective and the analysts had a difficult time with determining this. Suggest video demo needed question be changed to visual demo and then have examples such as UTUBE, professional video, animation, simulation, etc.

No

Not really

Question 5 –

For me yes, for our clients yes

Yes

Yes

New analysts may have difficulty with some of the terms so more additions to the glossary may be needed.

Question 6 –

Generally positive with the exception of not being able to go back

Positive

Need to clarify some of the vague terms, such as "Need"

A little rough at first, because of the new questions, but then became very smooth.

Question 7 –

I would say useful but caution people that the output is only a recommendation and should not be taken as for lack of a better term "law".

Overall, I think the tool can be of value. Once the suggested changes are made, I would like to test it further before making recommendations but I feel it will be something I could recommend in the future.

324 Would definitely recommend to others
325 No problem for me.

* The following comments are from the open-ended questions during Focus Group #3.
Question 1 –
326 What was your impression of the LITAM tool when using it for the first time?
327 I think the tool was nice and much better than just using the DIF approach
328 Very impressive. I can't imagine how long it took to make.
329 Great tool. I really like that it was web accessed so I can pull it up whenever.
330 Quite interesting. A bit concerned about taking the human element out of the process, but
331 may be thee is a way to make the tool more personal.

Question 2 –
332 Just fine
333 I don't recall any concerns
334 Okay, I wish I could go back on occasion.
335 Same here, it was okay but I wish I could go back sometimes.

Question 3 –
336 I think I was familiar with most of the terms, but some concepts I haven't thought about in a
337 while. Not sure if this is for everyone. Some of the training specialists or instructors may
338 have difficulty.
339 I like how some of the learning concepts were integrated.
340 A very broad set of terms used. Things not considered with the MSC.
341 Fine with me.

Question 4 –
342 No
343 The amount of questions was okay, but seemed like I answered the same question a few
344 times. Maybe there is a way to store those responses. Maybe not. I could see how some
345 might get fatigued with so many questions.
346 Not really
347 It was fine

Question 5 –
348 Yes
349 Not sure if I got the no-train thing at first. Does that mean nothing? Does that mean the
350 same as job-aid. We always recommend something with the DIF. Should we say no-train
351 if we are still recommending job-aid. That part was not clear.
352 I was confused about the same no-train thing.
353 It was fine. Easy to read. Not sure if everyone understands the synchronous and
354 asynchronous thing, but probably.

Question 6 –
355 Positive
356 I really liked it and look forward to the final version.

Very good. I thought it was intuitive and after about the third task, it really started to go much faster. I got a little confused at the end about entering another TPO, but I figured it out. I went to the menu button a few times, but not much there. Is there a way to add more if people are confused? But I really liked it.

Fantastic. I never thought about something like this, but it was good.

Question 7 –

No problem. I think the report helps at the end.

I would recommend it for other ISDers, but maybe not for everyone. If the customer used it without us, it could be confusing. Not sure about the training managers. I think a job-aid for it might be helpful.

Yes I would. I liked the way it worked and thought the final report had excellent recommendations. Looking forward to hearing more about it.

Yes. I would recommend it. It has lots of potential.

APPENDIX O

INFORMED CONSENT DOCUMENT

OLD DOMINION UNIVERSITY

PROJECT TITLE:

Closing the Contextual and Chronological Gap: A Design and Development Study of a Systematic Tool for the Selection of Learning and Performance Support Interventions

INTRODUCTION

The purposes of this form are to give you information that may affect your decision whether to say YES or NO to participation in this research, and to record the consent of those who say YES. You are being asked to participate in a study designed to validate, test, and evaluate a web-based intervention selection decision-aid tool for closing skills and knowledge gaps. Your participation in the study will through a virtual (computer-mediated) environment.

DESCRIPTION OF STUDY

This research study aims to validate, test, and evaluate a systematic intervention selection decision-aid tool for closing skills and knowledge gaps. The study will utilize HPT subject matter experts (SMEs) and practitioners to evaluate the functionality and efficacy of the tool. The data from participants will be used to inform the development of the tool.

Taking part in the research, subjects will be asked to examine a new digital intervention selection decision-aid tool. To do so, you will be given access to the Learning Intervention Type and Modality (LITAM) decision-aid tool prototype. This research will utilize a design that spans three distinct phases with a specific set of objectives and methods for each. Therefore, the findings from each phase will update the development of the tool prior to execution of the subsequent.

You will not be asked to participate in all three phases of the study. The first phase will use an expert review panel. The expert panel will be interviewed following an opportunity to use the LITAM tool. The second phase will use participants who are current instructional designers or performance analysts using inactive projects. Data will be collected in the second phase using an observation checklist which centers upon screen design, functionality, and navigation aspects of the tool. The third phase will select participants who are current practitioners using active projects awaiting intervention selection. Participants in the third phase will be asked to respond to a survey questionnaire following their interaction with the tool. All three data collection methods will be administered virtually (computer mediated) as no participant will be subject to human contact.

The observation portion of the study is focused on how the tool performs during a field try-out using practitioners. More specifically, the observation is focused on tool usability, screen design, and navigation. Therefore, all of the items on the observation checklist involve the functionality of the tool. Because the LITAM tool is a web-based application accessed through a website, the investigator will be able to observe through the screen sharing function of MS Teams (digital meeting platform).

STUDY PROCEDURES

If you take part in the research, you will be asked to examine a new digital intervention selection decision-aid tool. To do so, you will be given access to the Learning Intervention Type and Modality (LITAM) decision-aid tool prototype. The scope of your tool examination is dependent upon your participation within different phases of the study. This research will utilize a design that spans three distinct phases with a specific set of objectives and methods for each. As such, each phase will incorporate research methodologies specific to the aim of each phase and the data needed to inform the research questions and development goals of each stage. The first phase of the study, the data will be used to validate the systematic variables of the tool. The second phase, the data will be used to determine the usability of the tool. The third phase, the data will be used to examine tool efficacy. Each phase is designed to generate the data needed to inform the subsequent phase. The overarching research phases, aims, and strategies are as follows.

1. Phase 1: Tool development and confirmation of systematic components using most current prototype.
2. Phase II: Tool field test (try-out) for usability and interfacing with practitioners in natural work setting.
3. Phase III: Tool evaluation of efficacy and effectiveness with target practitioners using active analysis cases requiring intervention selection.

PARTICIPATION CRITERIA

If you agree to participate in the study, you should be actively serving in a role in performance improvement (PI) that involves intervention selection or design. Subjects may be serving in a multitude of roles (instructional designer, instructional developer, training manager, performance analyst, performance consultant, etc.), but must be involved in the intervention selection process. There is no specific education or experience background required. Subjects must be at least 18 years old to participate.

EXCLUSIONARY CRITERIA

Participants will be excluded if they are not involved in the intervention selection process. Simply serving in a position within Instructional Systems Design or Human Performance Technology is not sufficient if not actively involved with intervention selection. A performance analyst who conducts analyses, but does not participate in intervention selection may be excluded as well as instructional designers who develop interventions, but not involved in the intervention selection process.

INVESTIGATORS

Principal Investigator:

John Baaki, PhD, Assistant Professor, Instructional Design & Technology, STEM Education & Professional Studies, Old Dominion University

Investigator:

James Knapp III, Ph.D. Candidate, Instructional Design & Technology program, Old Dominion University

Please address all research concerns to jbaaki@odu.edu or james.knapp@uscg.mil.

RISKS AND BENEFITS

RISKS There are no known significant physical or psychological risks incurred by participants in this study. However, as with any research, there is some possibility that you may be subject to risks with concern to your confidentiality. To reduce the risks associated with confidentiality, the investigators will take specific security measures. All participant information collected during the study will be kept confidential through storage on an encrypted, password protected hard drive. Also, each participant will be assigned an alphanumeric identifier, and all data contribution will be linked to that identifier only.

BENEFITS There are no direct benefits as a participant in this research study. However, we hope that your participation in the study may inform best practices associated with selecting learning interventions.

COSTS AND PAYMENTS

There will be no costs to you for participation in this research study. The researchers are unable to give you any payment for participating in this study.

NEW INFORMATION

If the researchers find new information during this study that would reasonably change your decision about participating, then they will provide you with that information.

CONFIDENTIALITY

We will do our best to protect the confidentiality of the information we gather from you, but we cannot guarantee 100% confidentiality. Your confidentiality will be maintained to the degree permitted by the technology used. All information collected about you during this study will be kept in confidence by the investigator and will be stored on an encrypted, password protected hard drive. The investigator will use alphanumeric coding and all participants will be assigned an alphanumeric identifier. All data contribution will be linked to that identifier only.

All information obtained about you in this study is strictly confidential unless disclosure is required by law. The results of this study may be used in reports, presentations and publications, but the researcher will not identify you.

WITHDRAWAL PRIVILEGE

It is OK for you to say NO and not continue. Even if you say YES now, you are free to say NO later, and walk away or withdraw from the study -- at any time. Your decision will not affect your relationship with Old Dominion University, or otherwise cause a loss of benefits to which you might otherwise be entitled. Furthermore, your participation will not affect your job position in the Coast Guard, nor relationship among practitioners and leadership within the USCG Training System workforce.

COMPENSATION FOR ILLNESS AND INJURY

If you say YES and continue, then your consent in this document does not waive any of your legal rights. However, in the event of harm, injury, or illness arising from this study, neither Old Dominion University nor the researchers are able to give you any money, insurance coverage, free medical care, or any other compensation for such injury. In the event that you suffer injury as a result of participation in any research project, you may contact Dr. Tracy Vandecar-Burdin, the current chair for the DCOEPS Human Subjects Committee, at tvandeca@odu.edu, or 757-683-3802 at Old Dominion University.

VOLUNTARY CONSENT

By signing this form, you are saying several things. You are saying that you have read this form or have had it read to you, that you are satisfied that you understand this form, the research study, and its risks and benefits. The researchers should have answered any questions you may have had about the research. Participants are to type or electronically sign their name indicating their participation. If you have any questions later, then the researchers should be able to answer them. Dr. John Baaki: (757) 683-5491 or James Knapp III: (757) 856-2893

Subject's Printed Name & Signature	**Date**

INVESTIGATOR'S STATEMENT

I certify that I have explained to this subject the nature and purpose of this research, including benefits, risks, costs, and any experimental procedures. I have described the rights and protections afforded to human subjects and have done nothing to pressure, coerce, or falsely entice this subject into participating. I am aware of my obligations under state and federal laws and promise compliance. I have answered the subject's questions and have encouraged him/her to ask additional questions at any time during this study. I have witnessed the above signature(s) on this consent form.

Investigator's Printed Name & Signature	**Date**

If at any time you feel pressured to participate, or if you have any questions about your rights or this form, then you should call Dr. Tancy Vandecar-Burdin, the current IRB chair, at tvandeca@odu.edu, or 757-683-3802 at Old Dominion University.

APPENDIX P

IRB APPROVAL LETTER

OLD DOMINION UNIVERSITY

OFFICE OF THE VICE PRESIDENT FOR RESEARCH

Physical Address
4111 Monarch Way, Suite 203
Norfolk, Virginia 23508
Mailing Address
Office of
Research 1 Old
Dominion University
Norfolk, Virginia 23529
Phone(757) 683-3460
Fax(757) 683-5902

DATE:	February 23, 2021
TO:	John Baaki
FROM:	Old Dominion University Institutional Review Board
PROJECT TITLE:	[1719271-2] Closing the Contextual and Chronological Gap: A Design and Development Study of a Systematic Tool for the Selection of Learning and Performance Support Interventions
REFERENCE #:	21-035
SUBMISSION TYPE:	New Project
ACTION:	APPROVED
APPROVAL DATE:	February 23, 2021
NEXT REPORT DUE:	February 22, 2022
REVIEW TYPE:	Expedited Review
REVIEW CATEGORY:	Expedited review category # 7

Thank you for your submission of New Project materials for this project. The Old Dominion University Institutional Review Board has APPROVED your submission. This approval is based on an appropriate risk/benefit ratio and a project design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission.

This submission has received Expedited Review based on the applicable federal regulations.

This project has been determined to be a MINIMAL RISK project. Based on the risks, this project does not require continuing review. You will receive an annual check in reminder. Please complete the annual check in form and submit it for administrative approval by your next report due date of February 22, 2022.

Please remember that informed consent is a process beginning with a description of the project and insurance of participant understanding followed by a signed consent form. Informed consent must continue throughout the project via a dialogue between the researcher and research participant. Federal regulations require that each participant receives a copy of the consent document.

Please note that any revision to previously approved materials must be approved by this committee prior to initiation. Please use the appropriate revision forms for this procedure.

All UNANTICIPATED PROBLEMS involving risks to subjects or others (UPIRSOs) and SERIOUS and UNEXPECTED adverse events must be reported promptly to this office. Please use the appropriate reporting forms for this procedure. All FDA and sponsor reporting requirements should also be followed. All NON-COMPLIANCE issues or COMPLAINTS regarding this project must be reported promptly to this office.

Please note that all research records must be retained for a minimum of three years after the completion of the project.

If you have any questions, please contact Danielle Faulkner at (757) 683-4636 or dcfaulkn@odu.edu. Please include your project title and reference number in all correspondence with this committee.

This letter has been issued in accordance with all applicable regulations, and a copy is retained within Old Dominion University

APPENDIX Q

VITA

JAMES KNAPP III
16 POULAS CT
HAMPTON, VA 23669
Phone: 757-344-2575

EDUCATION:

Ph.D.	Old Dominion University, Norfolk, VA INSTRUCTIONAL DESIGN & TECHNOLOGY, 2021
M.S.Ed.	Old Dominion University, Norfolk, VA CURRICULUM & INSTRUCTION, 2015
B.A.	American Military, Manassas, VA ORGANIZATIONAL DEVELOPMENT, 2011

RESEARCH AND MANUSCRIPTS IN PROGRESS:

Research

Knapp, J. (2021). Closing the contextual and chronological gap: an hpt tool for the selection of learning and performance support interventions. I/ITSEC Proceedings (NTSA), 2021.

Knapp, J. (in personal review). Between art and science: The factors impacting intervention selection when closing a skills and knowledge gap.

Knapp. J. (in personal review). The relationship between perceived academic self-efficacy and academic achievement.

Presentations

Knapp, J. (2021). Learning intervention type and modality: a web-based decision-aid tool for intervention selection. I/ITSEC (NTSA), 2021.

Knapp, J. (2021). Conducting qualitative and quantitative research during pandemic conditions and constraints. AECT, 2021.

MEMBERSHIP IN PROFESSIONAL SOCIETIES:

2020–Present: International Society for Performance Improvement, Member
2019–Present: eLearning Guild (The Learning Guild), Member
2020–Present: Association for Educational Technology (AECT), Member
2018–Present: National Training and Simulation Association (NTSA), Member

PROFESSIONAL EXPERIENCE:

2018–Present: Instructional Designer (Team lead), Performance Technology Center – USCG, Department of Homeland Security.

2015–2018: Instructional Designer, Performance Systems Branch – USCG, Department of Homeland Security.

2011–2015: Instructional Specialist, Career and Technical Education - Hampton City Schools.

PROFESSIONAL SERVICE:

1991–2011: UNITED STATES MARINE CORPS, First Sergeant (ret)

RESEARCH INTERESTS:

Human Performance Technology
Intervention Selection
Situated Cognition
Context of Performance
Self-regulated Learning