Remodeling Readiness: Using Digitization to Enable Organizational Expertise

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ABSTRACT

Ensuring force-wide training and readiness requires comprehensive descriptions of personnel job requirements, training histories, and proficiencies. Although the U.S. military has created numerous systems that seek to collect and maintain human performance data, a significant gap remains in the lack of shared digital expressions of readiness across the ecosystem. In this paper, we discuss and illustrate the benefits of implementing centralized, standards-based competency frameworks that can be leveraged for actionable insights across the full training and readiness lifecycle. Our "digitization" approach streamlines the framework construction process and has been implemented over numerous recent Navy, Army, and Air Force projects to convert legacy instructional artifacts that describe human experience, capability, potential, and expectations into frameworks that enable analysis and tracking in a modern learning ecosystem. We describe how our semi-automated digitization techniques capture all available data that defines what personnel should know and do within a military organization, including (1) who a person is and their training background; (2) the job duties associated with a person's role and assignments; (3) what a person has demonstrated they know and can do; (4) what credentials a person has earned; and (5) what a person's capabilities and goals are according to their organization. We discuss active military use cases to illustrate how competency frameworks have been and would be employed for team and individual performance analysis, skills gap analysis, training needs analysis, instructional design, assessment, and evaluation. We provide insights into machine actionable URI-referenceable data, typically Linked Data, which allows systems to perform rapid analysis by uniformly following data trails across the system, organizational, and authoritative boundaries.

We conclude with a discussion of how our approach to digitization can provide organizations with a foundation focused on the human element of training and readiness, enabling a data-driven accelerator for sustaining a global force in a digital world.

ABOUT THE AUTHORS

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PROBLEM STATEMENT

Traditional training is typically described as lessons or units with learning objectives or outcomes that are contained in a learning experience. These constructs are useful for tracking a learner's progression through a linear curriculum, but there is not a direct correlation to job performance expectations. Similarly, there exist organizational descriptions of workplace teams, roles, duties, tasks, and performance expectations, and these constructs are useful for workplace performance evaluations that contribute to assessments of readiness. There are difficulties when connecting proficiency measures from the schoolhouse to deployment readiness measures, and thus once performance deficiencies are detected on the job, it is difficult to quickly select the most appropriate and efficient remedial training. Complicating matters is the fact that if there are tracking metrics being gathered, these are mostly referencing siloed/decentralized definitions of a segment of training (categorized in varying organizations), and there isn't an efficient means of collecting and analyzing the information needed to evaluate or compute estimations of readiness. Our approach is based on the premise that both representations (training and job requirements) can be maintained and made centrally available to all learning stack components within an organization's training ecosystem; moreover, conceptual alignments between the training and job representations should exist to determine how performance assertions from either system would impact computations of training effectiveness and estimations of operational readiness.

BACKGROUND

In a traditional remodel project, a building is stripped down to its essential foundation and still-desirable characteristics and then is rebuilt, incorporating new infrastructure and features to make the structure meet a more modern set of expectations and building codes. This paper suggests that traditional U.S. Department of Defense (DoD) training representations, methods, and instrumentations are due for a similar remodeling effort, a redesign and rebuild that enables modern data-driven training capabilities such as team and individual performance analysis, skills gap analysis, training needs analysis, instructional design, assessment, and effectiveness evaluation.

The recently released DoD Data Strategy (DoD, 2020) sets forth basic goals and guidelines for transforming the department into a data-driven enterprise. These goals are summarized with the acronym VAULTIS: 1) Make Data (**V**)isible, 2) Make data (**A**)ccessible, 3) Make Data (**U**)nderstandable, 4) Make Data (**L**)inked, 5) Make Data (**T**)rustworthy, 6) Make Data (**I**)nteroperable, and 7) Make Data (**S**)ecure. In the case of DoD training, we address all of the VAULTIS criteria by taking existing training information and performance requirements that exist as human-readable documents and transforming them into heavily organized digital structures (competency frameworks) that are both human and machine-readable and common to all learning stack components -- thus enabling an entire spectrum of data-driven assisted workflows and automated computations of state and analysis for individuals, teams, and organizations.

To understand how competencies and related frameworks contribute to readiness measures, relationships should exist that map the various frameworks of tasks and performance measures as well as competency expressions. We use linked data relationships to add value explicitly and intrinsically to the competency frameworks. The explicit value comes in the form of connections between competencies for equivalence or comparison to build models of competency-based descriptions of learning and performance. Intrinsic value comes in the ability to narrow or expand competency definition, through new framework connections or the ability to calculate value between competencies based on contextual reasoning. Linked data allows for separate systems to reference the same definitions and understanding of learning objectives, Knowledge, Skills, Abilities, Attitudes (KSAAs), and learner performance. (Robson, R., et al, 2020)

We have supported efforts across the DoD for collecting, tracking, interpreting, and sharing human performance data. By leveraging linked data, these efforts have shown that an organization can achieve all the VAULTIS goals through additional application of internally encrypted data items and deployment in secured, access-controlled systems. The process of getting all relevant human-readable training information transformed into machine-actionable linked data is significant; therefore, document pre-processing and a semi-automated workflow are critical. Over time, we have developed and demonstrated a digitization approach that utilizes a shared modular infrastructure that interconnects human performance data, calculates readiness through AI and Machine Learning (AI/ML) tools, and provides analytics and tools that support training decision makers. The success of DoD projects such as the Army STE Experiential Learning for Readiness (STEEL-R) and the Navy's My Navy Learning (MNL) and Surface Training Readiness Management System (STRMS) projects can be partially attributed to the digitization methods outlined in this paper for transforming legacy training descriptions into a complex system of interrelated competency frameworks.

TERMS AND DEFINITIONS

A few terms and concepts need to be operationally defined and will be referenced throughout this paper to describe the proposed digitization methods.

Competency

Competency is a generic term for knowledge, skills, abilities, attitudes, behaviors, beliefs, capabilities, and other characteristics of an entity (individual or team) in the context of practical performance. (University of Antwerp, 2023) In this sense, competencies are used to describe what an entity should know and be able to do when performing. (Robson, E., et al, 2021) By describing an entity by its capabilities and mastery levels, an organization can more easily judge the entity's readiness to perform a job described in the same manner. We expand the use of competency to describe the experience as well, such that a vocabulary describing experiences could be used to define what a person could experience or what they have experienced, and this information could provide an observational basis for machine analysis of human capabilities.

Competency Framework

Organizations will often define competencies from different perspectives, using different terminology, and varied approaches to categorization and grouping. To provide this contextual structure, competencies are grouped or organized into competency frameworks (or competency models). A competency framework initially follows a simple hierarchical structure of parent-child relationships for higher and lower-level competencies. The lower-level competencies will often form a breakdown of the sub-elements of the parent competency. Broad or high-level competencies can be the parent to defining or lower-level competencies. The framework structure can even incorporate entire frameworks as supporting a competency.

Linked Data

It is not enough for the elements of a competency framework to be digitized and stored in a database. To make competencies and frameworks interoperable with other systems they need to be provided as machine-readable linked open data. Linked data is a concept of making discrete data shareable, understandable, and connected through a collection of interrelated datasets converted into a common format, such as Resource Description Framework (RDF) or JavaScript Object Notation (JSON). As an RDF dataset, competencies are machine-readable for systems to query, utilize common vocabularies, make inferences, and expand on those initial frameworks by building new connections between datasets. (W3C, 2023) Linked data as JSON-structured data is referred to as JSON-LD and is a lightweight linked data format that is easier to read and write. (JSON-LD.org, 2020).

Competency Statements

The competency statements themselves are derived from source documentation about the practical experience the competency is meant to support. For example, work elements such as job descriptions, task lists, prerequisite courses, certification, and other artifacts that outline the KSAAs required to perform the job. A report issued by Robson et al in 2020 suggests that each statement of competence should encompass the following attributes:

- Has a unique identifier that can be globally referenced.
- Identifies different components of competency, such as KSAAs and TLOs.
- Allows the description of an Action Verb, Object, and Modifier when referring to KSAAs.
- Delineates the difference between knowledge and ability.
- Lists Proficiency Indicators.

Assertions

Experience statements, or assertions, from learning or work experiences (e.g., Learned and Performed) relate directly to the expectations for each activity area. Assertions are made when an activity or event has taken place, and they provide the context necessary to adjust a learner's current computed profile status. As is described in Figure 1 to the right, an assertion states that a particular performer did something and then also provides supporting information that is necessary to understand the meaning of what was accomplished.

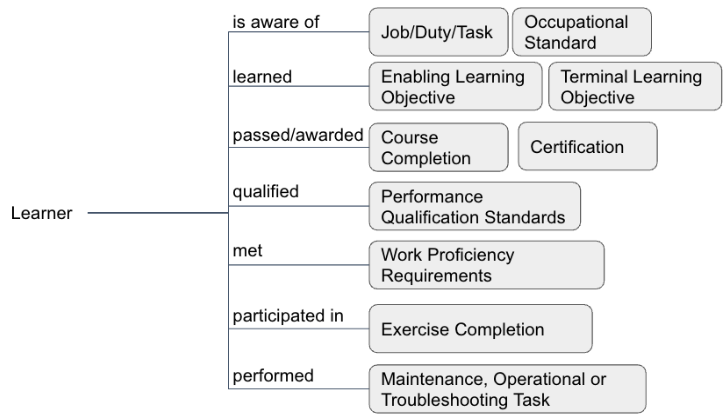


Figure 1 Examples of Competency Sources

Standards for Competency Expression

DoDI 1400.25-V250 defines a competency as "an observable measurable pattern of knowledge, abilities, skills, and other characteristics that individuals need to successfully perform their work.". (DoDI 1400.25, June 2017) While helpful in understanding the DoD's interpretation of competency and its recommended taxonomy (as seen in Figure 2), a technical standard is left to be specified. In a Learning Engineered ecosystem, software interoperability, and data accessibility, and portability is enhanced by the adoption and support of existing standards. In our case, we are especially focused on the data model for representing competencies and competency framework relationships; however, we are also interested in other standard methods for information sharing across disparate learning stack components.

Many different standardization efforts should be considered when deciding how to describe a "competency". Authoritative standards bodies such as IEEE LTSC and ISO have spent several years producing standards that can be enforced by Data Item Descriptions (DID), so these are attractive in the DoD. The LTSC offers the accredited "Data Model for Reusable Competency Definitions" (IEEE Learning Technology Standards Committee, 2023) and the ISO/IEC has published the 20006 series "Information Model for competency" in two parts. Other standardization efforts tend to be focused on the needs of a community (were not openly developed) but are published for public use. The most notable for competency frameworks is the IMS "Reusable Definition of Competency or Educational Resource" (IMS Global Learning Consortium, 2023) and the "Competencies and Academic Standards Exchange (CASE)" (IMS Global Learning Consortium, 2023). It is important to note that non-standards-based technical organizations including W3C and Schema.org work more rapidly in the industry and are

Figure 2 DoDI Competency Taxonomy

typically built around a change management process instead. Specifically, Schema.org's "AlignmentObject" (Schema.org , 2023) is useful for defining the structure of a framework.

On the learning system architecture and interoperability front, we benefit from the Advanced Distributed Learning's (ADL) Total Learning Architecture (TLA), (Advanced Distributed Learning, 2023) which is a useful set of technical specifications, standards, and guidance for integrating standards-based learning system components in a data-driven ecosystem. The ADL's Experience API (xAPI) (Advanced Distributed Learning , 2023) is also quite important, which allows learning content to be instrumented to report on experiences a person has had.

PROPOSED APPROACH

Digitization

Traditionally, digitization is the conversion of text, pictures, or sound into a digital form that can be processed by a computer. Of note, the digitization approach we propose is not the process of *defining* competency frameworks; rather, it is the method of *building up digital representations* of the frameworks as already defined. For our purposes, digitization is the method by which a manpower, personnel and training continuum is made machine actionable by transforming legacy artifacts defining human experience, capability, potential, and insights into URI-referenceable data, typically linked data, contained in competency frameworks. Digitization can be applied to many types of data including task analyses, occupational standards, documents that identify human capabilities, experiences, traits, performances, tasks, procedures, training scaffolding, learning objectives, assessments, and evaluations. Digitization is necessary to enable next-generation decision support applications that require an understanding of what people have done, know, and can do in a wide variety of contexts. In a competency management system, competency frameworks and the relationships between competencies form the machine-readable expression of that understanding for those advanced systems.

Without digital, machine readable representations of what people can experience, those experiences cannot be recorded in a way that effectively supports in depth analysis, adaptive learning, or anything other than human summative review. Similarly, if systems have no representation of what people are capable of, then an organization cannot match mission requirements to individual capabilities except via fit/fill. If a computing system has no digital representation of what both learning and performance looks like, then narrow and costly studies would be required to determine the effectiveness of the provided training.

Digitization can be useful for the DoD and other organizations in several different scenarios including the following:

1.) If the organization needs systems that know what people are expected to know and do based on roles and assignments.
2.) If the organization needs systems that know what people are allowed to do based on their role, assignments, and earned credentials, not based on permissions.
3.) If the organization needs systems that track what people have done and experienced, for both learning and job performance.
4.) If the organization needs systems that know (or can estimate) what people know and can do.
5.) If the organization needs systems that know and track the career goals and progressions of their people.

Methods of Digitization

There are currently two separate methods for digitization: manual and parsed. No matter which method is to applied, the first step of digitization is identifying and obtaining authoritative source documents, spreadsheets, doctrine, and systems that represent or contain information that is applicable to current goals, requirements, and objectives. If an authoritative source document is non-standardized, a manual extraction process will be necessary for digitization. However, if the source document is standardized, the parsed extraction process is more efficient and preferable.

Manual Extraction Method

The manual extraction method consists of a four-step process following the identification of sources:

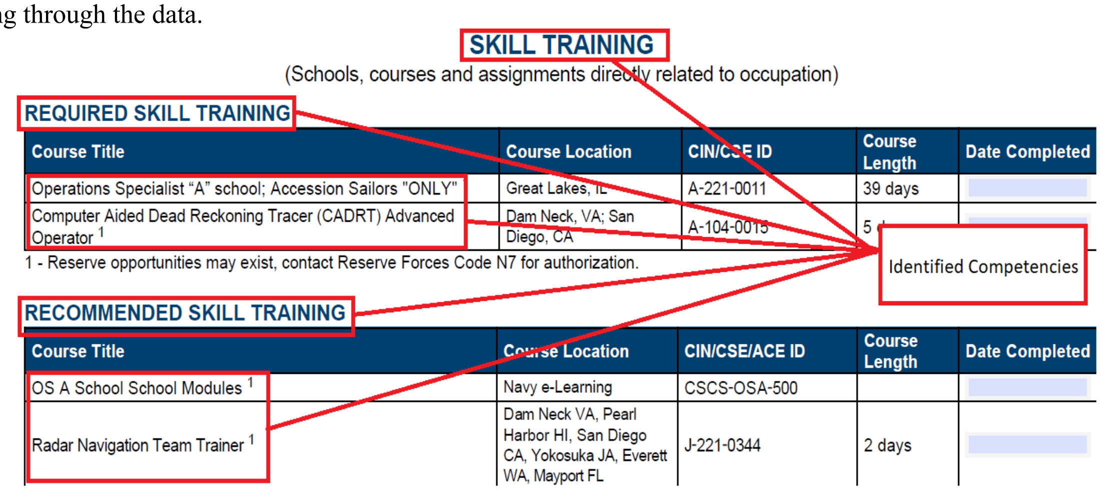
1. Analysis of procured documents
2. Generation of a source data worksheet

3. Import of the source data worksheet
4. Verification of the representative framework.

When analyzing the procured documents to identify framework applicable information, it is important to gauge candidate segments with the following:

- Is this information relevant to the aspect of the framework we are trying to model?
- Can this information be sensibly modeled into a hierarchical format?
- Is this item something that we may need to use to categorize or relate frameworks?
- Is this item something that would be measured either in training or job performance?

High-quality data sources will fall into both of these categories. Good framework modeling candidates are oftentimes found in tables, ordered lists, and relationship diagrams. Categorical groupings of candidate data are of paramount importance during analysis. Document fonts, colors, and styling can imply a great deal of information about data hierarchies. Similarly, legacy IDs and other descriptors are useful to retain as labels that can be used for searching and filtering through the data.


SKILL TRAINING

(Schools, courses and assignments directly related to occupation)

REQUIRED SKILL TRAINING

Course Title	Course Location	CIN/CSE ID	Course Length	Date Completed
Operations Specialist "A" school; Accession Sailors "ONLY"	Great Lakes, IL	A-221-0011	39 days	
Computer Aided Dead Reckoning Tracer (CADRT) Advanced Operator [1]	Dam Neck, VA; San Diego, CA	A-104-0015	5 d	

1 - Reserve opportunities may exist, contact Reserve Forces Code N7 for authorization.

RECOMMENDED SKILL TRAINING

Course Title	Course Location	CIN/CSE/ACE ID	Course Length	Date Completed
OS A School School Modules [1]	Navy e-Learning	CSCS-OSA-500		
Radar Navigation Team Trainer [1]	Dam Neck VA, Pearl Harbor HI, San Diego CA, Yokosuka JA, Everett WA, Mayport FL	J-221-0344	2 days	

Figure 3 OS Skill Training Section- Identified Competencies

Figure 3 shows a portion of the Skill Training section of a document describing the Navy OS Rating training (US NAVY, 2021). The Skill Training section is divided into subsections (Required Skill Training and Recommended Skill Training). Each of these subsections contains a list of relevant courses. Note also that for each item there is a location and ID, which if used as labels in the linked data could be used to locate relevant instances of the training. In a competency management system's representation, we can use the system's ability to represent "organizations of things" to translate this information into a set of related competencies organized with a structure and labels like shown in Figure 4:

1) Skill Training
    i) Required Skill Training
        (a) Operations Specialist "A" School; Accession Sailors "ONLY"
            1. Location: Great Lakes, IL
            2. Code: A-221-0011
        (b) Computer Aided Dead Reckoning Tracer (CADRT) Advanced Operator
            1. Location: Dam Neck VA, Pearl Harbor HI, San Diego CA, Yokosuka JA, Everett WA, Mayport FL
            2. Code: A-104-0015
    ii) Recommended Skill Training
        (a) OS A School Modules
            1. Location: Navy e-Learning
            2. Code: CSCS-OSA-500
        (b) Radar Navigation Team Trainer
            1. Location: Dam Neck VA, Pearl Harbor HI, San Diego CA, Yokosuka JA, Everett WA, Mayport FL
            2. Code: J-221-0344

Figure 4 Structured representation of OS Skill Training Section, with labels

The next step facilitates the import of relevant data found into the competency management system through the creation of an intermediate source data worksheet. Once relevant data is identified through document analysis, data can be inserted into the worksheet.

A	B	C	D
Parent Competency Name	**Competency Name**	**Code**	**Type**
	Skill Training (LaDR) - OS E1		
Skill Training (LaDR) - OS E1	REQUIRED SKILL TRAINING - OS E1		
Skill Training (LaDR) - OS E1	RECOMMENDED SKILL TRAINING - OS E1		
REQUIRED SKILL TRAINING - OS E1	Operations Specialist "A" school; Accession Sailors "ONLY"	A-221-0011	
REQUIRED SKILL TRAINING - OS E1	Computer Aided Dead Reckoning Tracer (CADRT) Advanced Operator	A-104-0015	
RECOMMENDED SKILL TRAINING - OS E1	OS A School School Modules	CSCS-OSA-500	
RECOMMENDED SKILL TRAINING - OS E1	Radar Navigation Team Trainer	J-221-0344	

Figure 5 LaDR Skill Training- Source Data Worksheet

As shown in Figure 5, each row in the worksheet should include the competency name, the competency's parent competency (if applicable), and any metadata (labels) that should be included in the competency record (competency type, relevant code, etc). Worksheet rows without a parent competency name are considered framework root competencies. When mapping competencies from the original documentation, it may be helpful to append the existing data source entries with some contextual information. For example, the 'Skill Training' competency could be appended with '(LaDR) - OS E1' to add contextual clarification to the competency item.

Now having built the source data worksheet, the next step is to create the framework in the competency management system. This task is best accomplished by using a scripted import process that relies on an open-source CSV reader and uses the application programming interface (API) of the competency management system to create the objects and relationships outlined in the sheet. One may also build out a framework using the competency management system's editing interface, but we have found that the batch import process allows us to wipe and rebuild as many iterations as necessary to guarantee a quality final framework representation.

Verification is the final and arguably most critical step of digitization. Once the framework is created in the competency management system, it must be verified for the accuracy of content, hierarchy, and relationships across existing frameworks by simply comparing the framework to the authoritative source. The digitization team works together to ensure all errors are first documented and then corrected by either making manual changes directly to the framework using the editor or by editing the source data worksheet and/or worksheet parser and reparsing the worksheet for more complex or robust errors.

Parsed Extraction Method

In situations where a type of source document has a common structure and there are many instances of the source documents that need to be digitized, it is often most efficient to build a parser for the source document structure. This parser navigates sequentially through the source document text and formatting markup to detect the location and intent of pieces of text and extracts the bits of interest. Depending on the information contained in the source document, particular parsing rules are created to identify things like section headings, ordinal lists, and other things we intend to find like statements of competency and their relationships to other statements of competency, tasks, and subtasks, knowledge and skills, job performance criteria, and role descriptions. As items are recognized by the parsing rules, they can be automatically added to a worksheet like the one that could be created in the manual extraction process. This allows for review and iteration of the source document parser output before running the import to the competency management system. Again, the competency management system API can then be used to automatically build the resulting framework in the system. It is important to validate the competency management system representation of the framework against the original source document and make any necessary corrections in the parser as needed.

USE CASES

My Navy Learning and STRMS

The US Navy had a requirement to tie readiness between watch standing on a surface vessel and the training sailors received at the beginning of their career, or accession level training. The ultimate capability sought was to measure readiness through a simulated exercise and provide immediate remediation to correct any deficiencies, achieving an end state that is the desired level of readiness. To meet that goal, the system would provide refresher content, adaptively, to sailors as the need was determined in fleet-based exercises that determined the readiness of sailors to stand a particular watch. Readiness assessments would be tied back to 90,000 competencies contained in a variety of US Navy documentation and formats. The existing loose associations by the nature of references at various steps of determining jobs and documenting training would need to be developed into competency frameworks through both the manual and parsed extraction digitization methods. Manual conversion of these authoritative sources would be multi-step and most likely multiyear as there would have to be conversion, normalization, and association of the data by a team of analysts. The digitization outlined above made this project feasible in both cost and schedule but also performance as it resulted in machine-readable frameworks immediately.

To tie a competency framework or collection of frameworks to readiness there needs to be more explicit and complicated relationships between the sources of the jobs, tasks, and training events. For example, Figure 5 takes the list of US Navy documents and competency hierarchy and maps relationships that illustrate a chain of evidence of fleet performance from the job description to job performance.

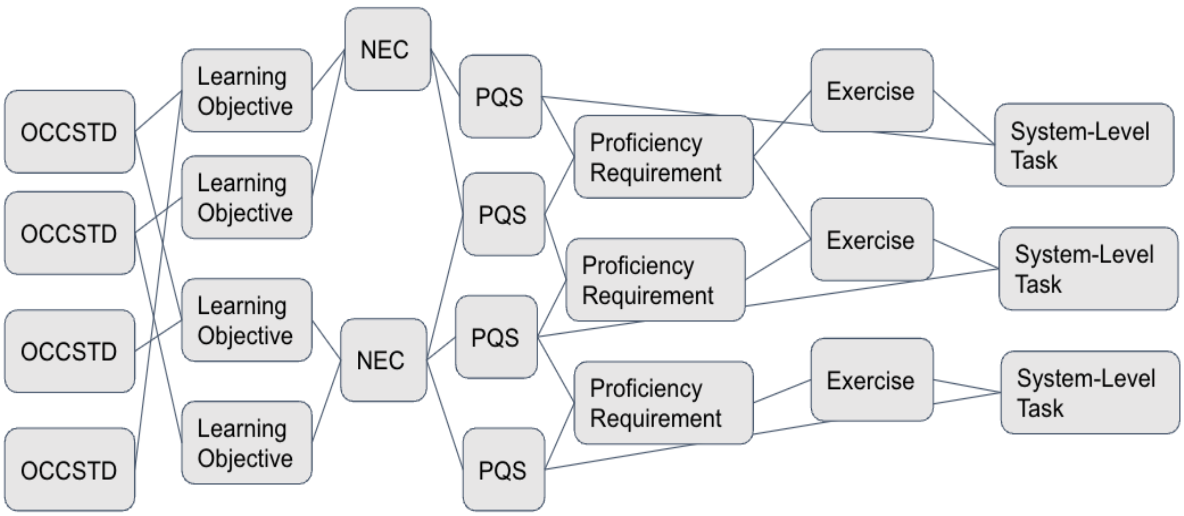


Figure 6 Competency Framework and Readiness Relationship

In Figure 6 the readiness as measured by performance at the System-Level Task can be attributed to relationships to training (Learning Objectives) and certification (PQS) and further back to originating job descriptions (OCCSTDs). With a standardized expression of competency statements in a linked data construct these relationships can be easily maintained as the job requirements change or if proficiency requirements inject new learning experiences. These relationships become more useful with these relationships as training issues or challenges need to be identified. The digitization methods provided digital versions of the various elements.

To illustrate the fault analysis capability of linked data-enabled competency frameworks, Figure 7 shows how a poor performance on a System Level Task can be traced back to a proficiency requirement linked to multiple certifications and their supporting learning experiences. With linked data competency frameworks, the traceability extends deeper than the illustrated containers but also into the individual competencies with direct relationships to the identified tasks and work performance.

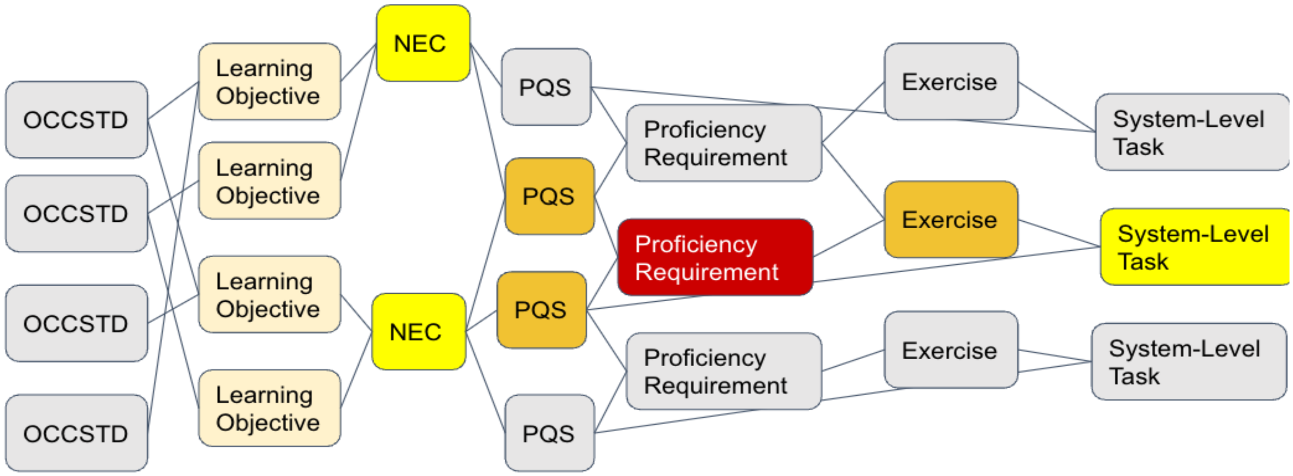


Figure 7 Proposed Readiness Performance Gap Analysis

Individual and group profiles are instantiations of the same linked data structure that have been computed at a specific point in time. Data used for the computation of competence comes from assertions. Assertions are discrete claims about the competencies an entity possesses, has trained on, has experienced, or has demonstrated on the job. Assertions can say whether an entity has or does not have a competency, has practiced the competency (without concluding whether they have it or not), and must indicate the framework item involved, the entity involved, a source for the assertion, and a timestamp. Assertions may include additional elements such as the conditions, additional evidence, an expiration date, a confidence, and more. When the entity participates in an item in the framework and/or is given a measure or status, an assertion is generated on the item with the relevant evidence describing the participation attached. Profile management software navigates the performer's linked data profile and queries for all assertions related to each item when determining the performer's state. The formulas applied in these computations are based on policies for the organization and the inherent understanding of how each item is related to the other items in the framework. The frequency of profile computation can also be determined by the organization, ranging from a regular cycle of state updates to real-time updates made as assertions are generated.

STEEL-R

The Army's STEEL-R project data strategy takes advantage of the linked-data representations of competency frameworks and relationships across multiple systems and components. These shared definitions provide a consistent scaffolding to which performance reports can be collected, reported, and retrieved as evidence contributing to computed profiles for individuals as well as teams. Frameworks were developed based from the IEEE Reusable Competency Definition standard representation, shown below in Figure 8, which illustrates each of the key competency structure elements being represented. (Goldberg et al, 2021) Competencies were associated with specific role frameworks that align to a particular weapon system, and these were comprised of underlying KSAAs. Each contributing skill is represented as a separate object in the competency management system that defines direct steps/processes/procedures/behaviors that can be measured or assessed.

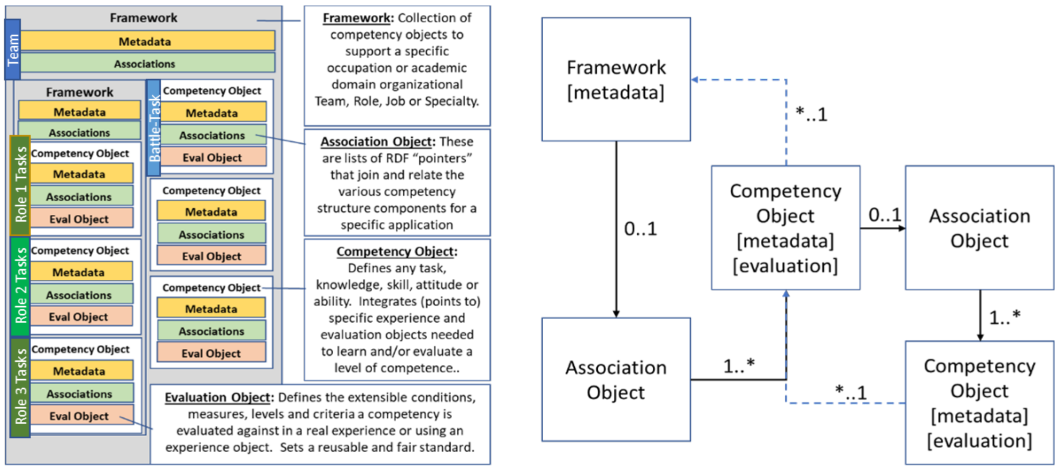


Figure 8 IEEE Competency-Based Structure

To develop metadata and associations, doctrinal documents and training manuals were digitized to allow the extraction of individual and team-based tasks. The source documentation consisted of US Army training doctrine and scenarios that outlined tasks, proficiencies, KSAAs, and implied relationships between individual and team constructs. This digitization differed from the USN use case above in that many times a single source contained competencies for multiple frameworks and needed to be cross-referenced to meet STEEL-R objectives. Linked data representations created the capability to interpret data across experiences for individuals/teams and supported interoperability with simulation systems.

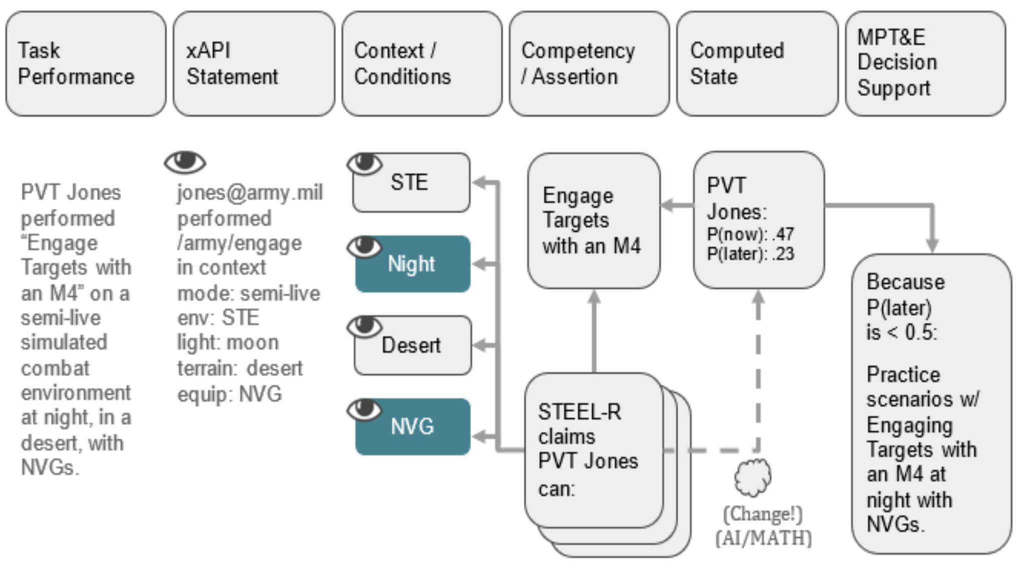


Figure 9 Establishing Context in Competencies

As described in Figure 9, STEEL-R used xAPI activity statements to describe performer experiences with contextual details which are considered when the performer's computed state is updated. This experiential data was directly tied back to the digitized doctrine that originally required a large level of effort to interpret and realize in an experiential training setting.

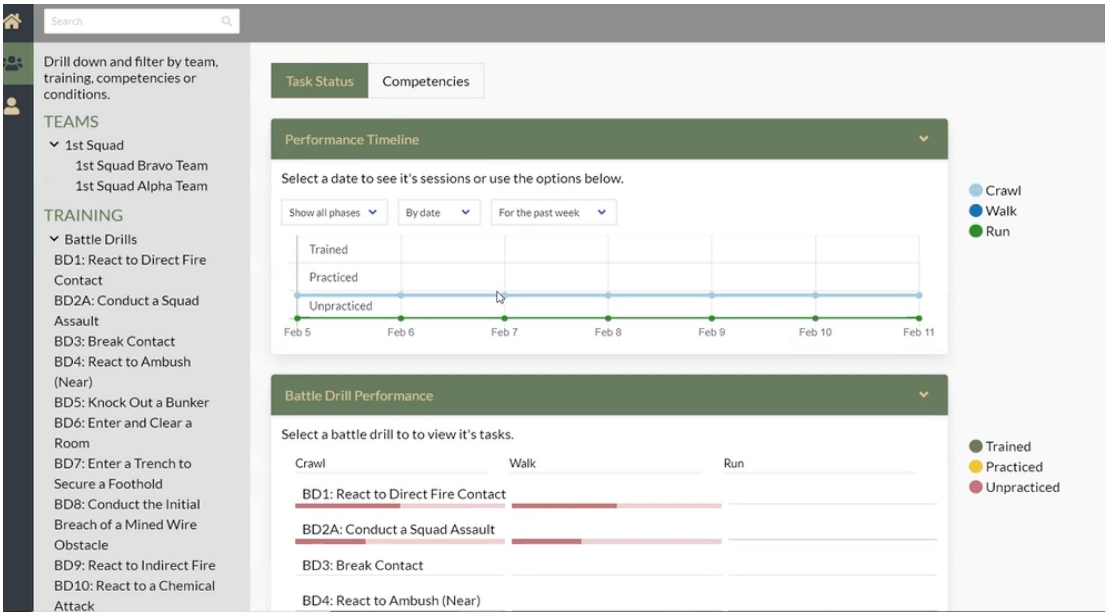


Figure 10 STEEL-R dashboard view of drill performances for teams

All this data was used to provide training exercise-focused, task- and competency-based visualizations of performance over time, for teams and individuals, in the STEEL-dashboard shown in Figure 10. To provide additional context to the data, performance measures were classified into “Crawl”, “Walk”, and “Run” phases of performance and “Unpracticed”, “Practiced”, and “Trained” levels of performance. STEEL-R relied on the competency management system’s ability to monitor xAPI activity streams and make assertions of competence when milestones were achieved. The selected entity’s profile status was computed dynamically, based on xAPI reported experience and performance history that was asserted per competency.

CONCLUSION

In a data-driven Learning Engineered Ecosystem, all tools, technologies, and resources in the training stack work in unison to support and maintain the knowledge and skills of its learners, ultimately in the most efficient and effective learning experience that is possible. Such an ecosystem leverages standards and common competency definitions across the entire instructional design process and requires instrumentation of training and performance evaluation tools to facilitate the collection of data. For the DoD, there is a massive amount of human-readable documentation that needs to be transformed into the actionable linked-data representations that this ecosystem requires. We conclude that the semi-automated digitization of these resources is necessary to reduce the time and costs associated with migration. By consolidating and centralizing a linked-data representation of what an entity should know or be able to do, all components of a training ecosystem can reference the same definitions, understand how knowledge is constructed, identify training and performance gaps, make assertions using standards-based and interoperable methods, leverage performer profiles to make training experiences more efficient and provide relevant performance support, and conduct meaningful data-driven training evaluations.

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