MADLx: Setting Foundations to Measure ROI

PROTOCOL/RECOMMENDATIONS REPORT: DI-MISC-80711A BOLD QUEST 20.2

6 January 2021

Distribution Statement A
Approved for public release: distribution unlimited.

REPORT DOCUMENTATION PAGE

1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From - To)*
06-01-2021	Project Report	October - November 2020

4. TITLE AND SUBTITLE

MADLx: Setting Foundations to Measure ROI
Protocol/Recommendations Report: DI-MISC-80711A Bold Quest 20.2

5a. CONTRACT NUMBER

HQ0034-19-C-0027

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

0603769D8Z

6. AUTHOR(S)

Presnall, Biljana

5d. PROJECT NUMBER

1907

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

Jefferson Institute
160 N Carolina Ave SE
Washington, DC 20003

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

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Orlando, Florida 32826

10. SPONSOR/MONITOR'S ACRONYM(S)

OUSD/P&R/FE&T/ADLI

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT

Distribution A

13. SUPPLEMENTARY NOTES

14. ABSTRACT

The Coalition Capability Demonstration and Assessment series, known as Bold Quest, fosters Joint and Coalition resource pooling, collaborative data collection, and data analysis to inform capability development on a Joint and Coalition scale. The Advanced Distributed Learning (ADL) Initiative's Maturing ADL in Exercises (MADLx) project participated in Bold Quest 20.2 held in October 2020 at Camp Atterbury, Indiana. The exercise sponsor, Joint Chiefs of Staff J-6 (Command, Control Communications, & Computers/Cyber), agreed to allow participants to receive pre-event online training focused on the Android Tactical Assault Kit (ATAK), a suite of software to provide geospatial information for warfighter collaboration. After the exercise, participant performance data was shared with the MADLx team for analysis. This report provides the results and findings and includes impacts on exercise performance due to COVID-19 pandemic circumstances. It documents the ADL contributions to the exercise, the planning process and implementation protocol ("how to"), lessons learned, and recommendations.

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			Preston Bush
U	U	U	UU	6	19b. TELEPHONE NUMBER *(Include area code)* 571-480-4640 Ext. 4659

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BACKGROUND

The objective of the MADLx Project is to build the foundations for measuring learning effectiveness in mission rehearsals to help management make better decisions about the best ways to use different learning approaches in multinational exercises. The goal of the research study is to develop and field test measurement standards with analytics-enhanced learning content in exercises and to visually represent those analytics in a dashboard.

THE PROBLEM

Even as the field of learning analytics becomes increasingly sophisticated, the U.S. currently lacks the capability to produce high-fidelity determinations of how our military exercises have specifically improved personnel readiness. This challenge is magnified in multinational environments due to a lack of standardized measures.

HYPOTHESIS

We can measure and visualize improved operations effectiveness by participants who utilize Advanced Distributed Learning (ADL) content[1].

PLANNING

The Coalition Capability Demonstration and Assessment series, known as Bold Quest, fosters Joint and Coalition resource pooling, collaborative data collection, and data analysis to inform capability development on a Joint and Coalition scale. The live exercise was held from October 24 to October 30, 2020, at Camp Atterbury, Indiana, and included 54 participants down from the initially planned 108 participants. Due to the pandemic, the international participants canceled their participation.

The planning process included the preparation of a pretraining online course on the use of the ATAK system. We created a native xAPI course and enrolled all participants in an independent Learning Management System (LMS) for access. However, only international participants accessed the platform.

DATA COLLECTION

Unlike other exercises, data collection activities represented an integral part of the Bold Quest exercise, and they were performed in support of capability initiatives whose individual collection plans contained experimental and test-focused activities. This diverse data collection process included various military entities and occurred from November 6 to November 19, 2020. All data collection was limited to the essential information required to evaluate the success of the project.

The Jefferson Institute will maintain the data collected during the MADLx study for 180 days after the study is completed so it can be analyzed by the MADLx Testing and Evaluation Team with standard statistical and data visualization software. Subsequently, the nonattributable data will be transferred to the ADL Initiative for archiving, to support further research related to the effectiveness of learning in mission rehearsals, and to benefit eLearning researchers.

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[1] Bold Quest 20.2 Jefferson Institute Research Protocol
[2] Bold Quest 20.2 Data Collection and Analysis Protocol

DATA COLLECTION METHODS

The collection methods included the following data procedures at the live exercise:

- A designated Learning Record Store (LRS) collected data on participants who attended the online pre-training.
- Upon arrival, participants were asked to complete Informed Consent, Demographics, and additional knowledge and self-assessments, if designated.
- Upon commencement of training activities, participants complete a mission-related survey.
- Researchers observed participants' performance on meaningful activities tied to the training curriculum.
- System instrumentation and audio collections occurred during virtual or live scenario performance.
- Upon completion of each day's activities, participants completed the Mission Awareness Rating Scale (MARS), a reaction survey, and additional self-assessments.
- Upon completion of the exercise, participants completed an overall reactions survey and additional self-assessments.
- Researchers asked individual participants a series of questions in the form of semi-structured interviews.

EXECUTION

Only 12 international (Belgian) participants and U.S. Subject Matter Experts (SMEs) attended the virtual learning environment for pretraining. Their interaction was modest and collected 4,164 xAPI statements. Because of the pandemic, Belgian participation in the exercise was cancelled, and their statements could not be compared to live exercise data. The Learning Management System (LMS) was the only xAPI statement source.

Excel files with cleaned demographic survey data and after-mission survey data were shared with MADLx project. However, other types of data collected by the exercise organizers were not sharable and ultimately were unavailable to the project. This included targeted sensor data, observations on participants' performance, and any other type of collected data.

Based on the provided self-assessments of the participants, we reconstructed their opinions on exercise performance and overall mission success. Opinions are organized into Squad (SQUAD) group, Leaders (LDR), Anonymous (ANON), and Exercise Control (EXCON). Participants rated both the mission's success from their perspective and their own performance, ranked on a scale of 1 (Not at all Successful) to 10 (Very Successful). The aggregated average results showed that EXCON performance matched the mission achievements at a very high rate. SQUAD average opinions were rated lower for both their performance and mission achievements. Similarly, the LDR group rated the achievements lower, but with less of a difference between the mission success and their performance. The ANON group (those participants might belong to any said group) rated the mission success highly but noted discrepancies with performance. (Figure 1)
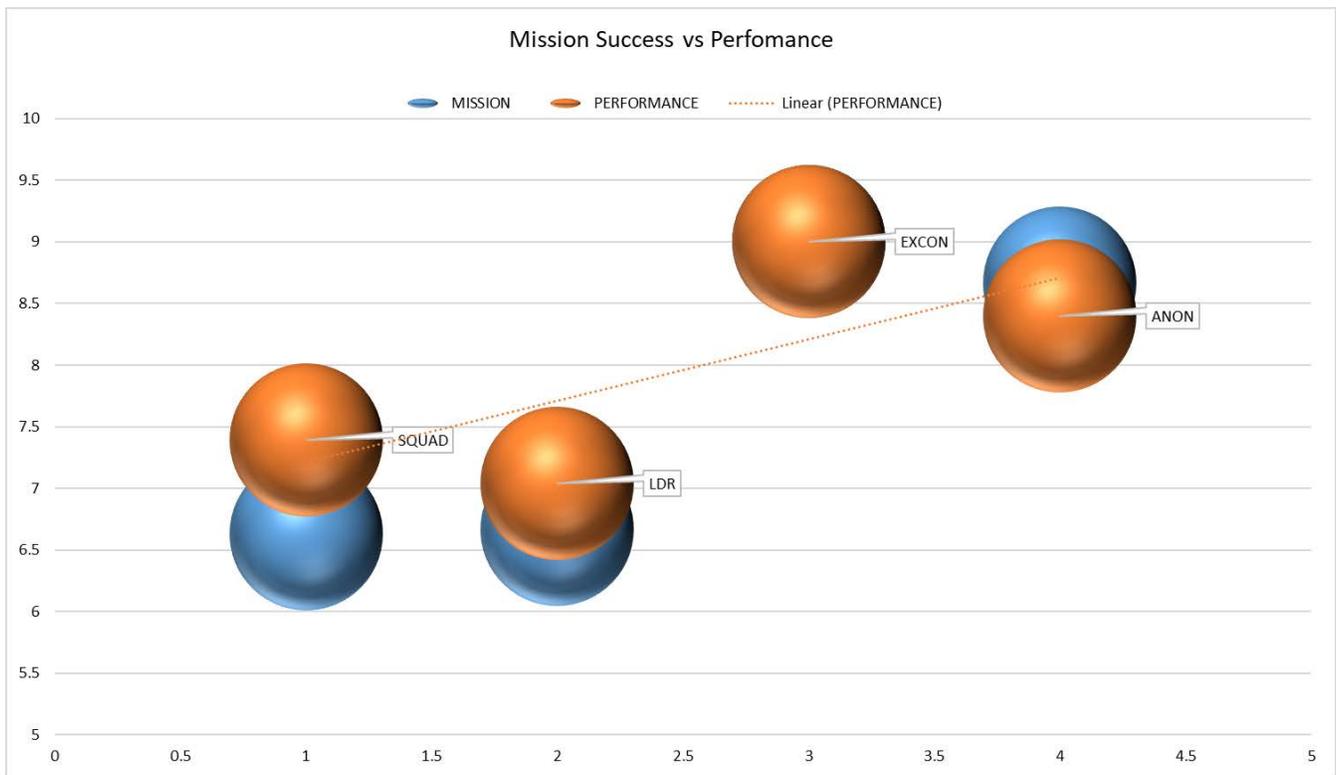
Figure 1. Overall average performance

KEY FINDINGS

- **ADL demonstrated the capability to be integrated into and support even a highly disrupted exercise event.**

- **Security raised no issues for the LMS, LRS, and Learning Analytics Dashboard (LAD).**

- **Early integration of ADL into exercise planning resulted in a match between learning objectives of eLearning courses and training objectives.**

- **A native xAPI standardized course was used for the first time by the exercise organizer.**

- **Processing and delivery of analytics with useful visualizations was accelerated, especially for legacy analog paper-based reporting.**

- **Multiple data streams on exercise participant performance offered resilience to analytics delivery, even as the primary performance data was made unavailable.**

- **The COVID-19 pandemic significantly disrupted exercise execution, with cascading negative impact on ADL execution as well.**

- **Targeted sensor data was ultimately unavailable to the project. Data that can land in SIPR is highly vulnerable to breakdown in coordination.**

- **Last minute shifts in participants and support personnel resulted in U.S. exercise participants failing to utilize the online training assets.**

- **Institutional inertia behind a heavy reliance on paper reporting resulted in limited use of the online self-evaluation survey instrument.**

CONCLUSIONS

In the Bold Quest 20.2 Exercise, we were not able to measure and visualize improved operations effectiveness by participants who utilize ADL content because the COVID-19 pandemic undermined our ADL effort by eliminating international participation. We also were not able to utilize the ROI dashboard or give actionable analytics on the training environment to maximize performance success and improve the learning environment. However, we executed a solution that was fully integrated within the planning and operations environment of the existing exercise with a continuous supporting role. With early integration of ADL into exercise planning, we matched the eLearning courses to training objectives.

We recommend the following steps for ADL integration into Bold Quest exercises in the future:

- Assure ADL involvement in planning from an early stage, and directly link ADL with shortening the preparation time at the live event and consequent savings. (For example, make online preparation mandatory, and dedicate in-person time for other elements of mission preparation.)
- Establish protocols for U.S. military personnel to access online resources which reside internationally. (For example, Bold Quest 20.2 participants had difficulties accessing servers located in Germany.)
- Establish protocols for live-streaming non-classified data into the MADLx ROI dashboard, instead of relying on a totally paper-based collecting process, with its subsequent wait for the data. (For example, establish the role of the ROI dashboard in expansive analytical research done by other researchers in the Bold Quest exercise series.)