



# PERSEREC

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## **eAdjudication: Business Rule Development, Testing, and Validation**

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ABSTRACT: Electronic adjudication (eAdjudication) is an automated process by which investigations are electronically reviewed to assess for the presence of derogatory information. eAdjudication applies business rules to identify whether there is any information within the case that requires human review. Past efforts have demonstrated that eAdjudication results in a very high number of incorrect unfavorable determinations, sending a large number of cases to human review that are then granted favorable outcomes (e.g., Baweja et al., 2019). This report presents the results of eight rule modification tests to the business rules for Tier 1 and Tier 3 investigations that were intended to decrease the rate of false alarms without creating the risk of any incorrect favorable determinations (i.e., potential misses). Results showed that, by modifying permissible values (i.e., allowing additional results to pass derogatory information), researchers were able to decrease the false alarm rate by 9% for Tier 3 investigations and by 19% for Tier 1 investigations. Specific recommendations for the business rules and for increased efficiency in testing rule modifications are presented.					
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## **PREFACE**

Over the past decade, automated clean case screening in the form of electronic adjudication (eAdjudication) has provided substantial cost savings to DoD and the Federal Government at large. In order to continue to provide value, however, the business rules eAdjudication applies to screen cases require regular review, update, and refinement. This report presents the results of the latest efforts to refine eAdjudication business rules to allow for additional cases to be automatically granted a favorable review without increasing security risk.

Eric L. Lang  
Director, PERSEREC

## EXECUTIVE SUMMARY

Electronic adjudication (eAdjudication) is an automated process by which investigations are electronically reviewed to assess for the presence of derogatory information. Cases that are deemed to be clean are automatically granted a favorable determination; cases that contain any potentially derogatory information are sent for manual review. To make these determinations, eAdjudication applies business rules to identify whether there is any information within the case that requires human review. Past efforts have demonstrated that eAdjudication results in a very high number of incorrect unfavorable determinations, sending a large number of cases to human review that are then granted favorable outcomes (e.g., Baweja et al., 2019). Thus, the business rules require refinement to reduce this rate of false alarms. To address this need, the Performance Accountability Council's Research and Innovation Division funded the Defense Personnel and Security Research Center to test modifications to the eAdjudication business rules for Tier 3 (used to assess Secret-level eligibility) and Tier 1 (used to assess suitability/fitness and credentialing) investigations.

## METHOD

In this study, we used two convenience samples to test modifications to the Tier 3 and Tier 1 business rules. The Tier 3 sample consisted of 6,331 investigations, 32.9% the investigative service provider labeled as containing no derogatory information. The Tier 1 sample consisted of 2,694 investigations, 38% of which the investigative service provider labeled as G cases. All but one of the Tier 3 cases received a favorable determination; 91% (n = 2,682) of the Tier 1 cases received a favorable determination. Human adjudication outcomes were used as a comparison with eAdjudication outcomes, allowing us to classify eAdjudication decisions as *hits* (i.e., correct favorable determinations), *false alarms* (incorrect unfavorable determinations), *correct rejections* (correct unfavorable determinations), and *potential misses* (incorrect favorable determinations).

We conducted eight rule modification tests. Five contained rules that applied both to Tier 3 and Tier 1 investigations; two applied only to Tier 3 and one applied only to Tier 1. These rule modifications consisted of testing proposed changes that are permissible or allowable (i.e., that do not require referral to human review) as well as adding several rules to allow for testing results of additional investigative items.

## RESULTS

Results for this study showed that, for Tier 3 investigations, few of the modifications led to a substantial decrease in false alarms. Tests #7 and #8 for Tier 3 rules had the largest impact on false alarms. In Test #7, some permissible values were added (particularly, allowing a result of "undeliverable" for the results of an employment inquiry) that reduced false alarms (with Test #7 showing a 5.9% decrease in false alarms with no change in potential misses). Test #8 decreased the rate of false alarms

by an additional 3% (for a total decrease of 8.9%) by allowing modifying rules for case seriousness code (assigned by the investigative service provider) to allow for E.

For Tier 1 results, again, many of the tested rule changes had no real impact on the rate of false alarms. The final test (Test #8) combined many of the changes to permissible values of previous tests (e.g., Test #8 contained changes to the permissible values for the education, employment, and law enforcement checks) as well as changes to the case seriousness code. This resulted in a 19% decrease in false alarms with no impact on potential misses.

## **DISCUSSION**

Results of this study demonstrated that testing modifications to the business rules is challenging in the current operational environment, and, second, that identifying additional rule changes using the testing strategy described in the current report has reached a point of diminishing returns. Because eAdjudication was designed for operations rather than research, the current system does not allow for efficient testing of rule changes. However, for the eAdjudication software to be of greatest value, ways to identify potential rule modifications to increase the hit rate should continue to be explored. Doing so can provide additional cost avoidance for DoD and the Federal Government at large.

- The Defense Information System for Security eAdjudication team and the eAdjudication working group should review and consider the test results presented here, specifically the final test for T3 and T1 investigations (Test #7 and Test #8, respectively). For both T3 and T1 cases, these rule changes served to decrease the rate of false alarms.
- The Defense Information System for Security eAdjudication team and the Defense Personnel and Security Research Center should work together to identify more efficient ways of testing modifications to the eAdjudication business rules. The current approach requires substantial time and labor and introduces substantial delays and difficulties in the testing process.
- Future research should continue to explore ways to process additional portions of the investigative file, particularly the credit report. This area of the investigation causes the most false alarms and has the highest potential for allowing a greater number of hits if processed.
- Future work should strive to identify additional ways eAdjudication could minimize costs. One potential option is to use eAdjudication business rules to increase efficiency in adjudicating additional case types, such as T5 investigations.

## TABLE OF CONTENTS

<b>ACRONYMS USED IN THIS REPORT*</b>	<b>9</b>
<b>INTRODUCTION</b>	<b>10</b>
BACKGROUND	10
CURRENT STUDY	11
<b>METHOD</b>	<b>12</b>
SAMPLE	12
T3 Cases	12
T1 Cases	13
TESTING PROCEDURE	15
<b>RESULTS</b>	<b>17</b>
T3 BUSINESS RULE MODIFICATION TESTING	17
Baseline	17
Most Common T3 Rule Failures	17
Identifying T3 Rule Changes	21
Test #1	21
Test #2	21
Test #3	21
Test #4	25
Test #5	25
Test #6	25
Test #7	25
T3 Summary	26
T1 BUSINESS RULE MODIFICATION TESTING	26
Baseline	26
Most Common T1 Rule Failures	27
Identifying T1 Rule Changes	30
Test #2	32
Test #3	32
Test #4	32
Test #7	32
Test #8	32
T1 Summary	33
<b>DISCUSSION</b>	<b>34</b>
CHALLENGES IN TESTING MODIFICATIONS	34
IDENTIFYING ADDITIONAL CHANGES	35
LIMITATIONS	35
RECOMMENDATIONS	36
<b>REFERENCES</b>	<b>37</b>
<b>APPENDIX A: INVESTIGATIVE ITEMS AND RESULT CODES</b>	<b>38</b>

## LIST OF TABLES

Table 1 T3 Outcomes and Recoded Values (N=6,585)	13
Table 2 T3 Sample Characteristics (N=6,331)	13
Table 3 T1 Outcomes and Recoded Values (N = 2,965)	14
Table 4 T1 Sample Characteristics	15
Table 5 Baseline Results for T3 Investigations	17
Table 6 Most Common Rule Flags and Top Three Descriptions for T3 Investigations	19
Table 7 T3 Tested Rule Changes	23
Table 8 T3 Rule Changes Summary	26
Table 9 Baseline Results for T1 Investigations	27
Table 10 Most Common Rule Flags and Top Three Descriptions for T1 Investigations	28
Table 11 T1 Tested Rule Changes	31
Table 12 Summary Results for T1 Investigations	33
Table 13 Investigative Item Abbreviations and Descriptions	38
Table 14 Result Codes for Investigative Items	41



## ACRONYMS USED IN THIS REPORT\*

CAC	Common Access Card
CAF	Consolidated Adjudications Facility
CFR	Code of Federal Regulations
DCID	Director of Central Intelligence Directives
DISS	Defense Information System for Security
DMDC	Defense Manpower Data Center
eAdjudication	Electronic Adjudication
EFI	Expandable Focused Investigation
e-QIP	Electronic Questionnaire for Investigations Processing
ISP	Investigative Service Provider
JPAS	Joint Personnel Adjudication System
NACLC	National Agency Check with Law and Credit
PAC	Performance Accountability Council
PERSEREC	Defense Personnel and Security Research Center
ROI	Report of Investigation
SCI	Sensitive Compartmented Information
SF-85	Standard Form 85 (Questionnaire for Non-Sensitive Positions)
SF-86	Standard Form 86 (Questionnaire for National Security Positions)
SOR	Statement of Reasons
T1	Tier 1 Investigation
T3	Tier 3 Investigation
T3R	Tier 3 Reinvestigation
T5	Tier 5 Investigation
XML	Extensible Markup Language

\* NOTE: For investigative item abbreviations and result codes, refer to Appendix A.

## INTRODUCTION

The process of adjudication, or the formal assessment of information contained in the results of a background investigation, is time consuming, difficult, and labor intensive. To mitigate the costs associated with adjudication, DoD implemented automated clean case screening through eAdjudication. eAdjudication has resulted in both substantial cost avoidance and increased timeliness of adjudication decisions (see Youpa, Baweja, Vargheese, Nelson, & Reed, 2018).

eAdjudication is an automated process by which cases are determined either to contain no derogatory information (therefore automatically granted a favorable determination) or to need further human review. Initially implemented for NACLIC investigations, eAdjudication was later expanded to T3, T3R (both Secret eligibility), and T1 (suitability/fitness and credentialing). Regardless of case type, eAdjudication is a very conservative process in that a large percentage of the cases that fail eAdjudication later receive favorable human determinations (Baweja, Morse, Zimmerman, Friedman, & Nelson, 2019).

It is important to note that eAdjudication grants favorable determinations only to clean cases, and does not perform any investigation, mitigation, or adjudication. Any mitigation is performed by human adjudicators using the adjudication criteria specific to the case (i.e., national security, suitability, or credentialing).

Recent efforts to improve the percentage of correct favorable determinations by eAdjudication identified potential modifications for the T3 business rules (Baweja et al., 2019). This project, funded by the Research and Innovation Division of the PAC and conducted by PERSEREC, continues that work with another year of testing results for T3 business rules. In addition, it also tests proposed modifications for T1 rules.

## BACKGROUND

In the eAdjudication process, two files from the background investigation are reviewed electronically: the ROI file (i.e., the summary of all investigative results) and the e-QIP file. The e-QIP file is the electronic version of either the SF-86 (the *Questionnaire for National Security Positions* [T3, T3R]) or the SF-85 (the *Questionnaire for Non-Sensitive Positions* [T1]). These two files are compared to a set of XML business rules that specify a set of permissible values for: (a) each of the responses on the applicable questionnaire and (b) each check conducted during the investigation. If the values for all of these items are permissible when compared to the business rules, the case is deemed clean and automatically granted a favorable determination. If the case is found to contain values not previously identified as permissible, the case is assessed as containing potentially derogatory information and in need of human review.

As mentioned, eAdjudication is conservative and favors human review of cases. As a result, the pool of permissible values is very small and risk avoidant, favoring *false alarms* (i.e., incorrect unfavorable determinations that ultimately receive a favorable human determination). Permissible values were identified by representatives of an

interagency working group and were specifically selected to send any cases with non-permissible values (i.e., that might possibly have information of potential interest) to a human adjudicator. For example, at one of the range of values that are not permitted (i.e., cause a case to fail eAdjudication), any case that has an item with a value indicating an issue (i.e., a value of IS) fails eAdjudication. At the other end of the range, reflecting the conservative approach of eAdjudication, any case that has an education date discrepancy (e.g., the subject misremembered the month of graduation) also fails eAdjudication.

Research suggests that there are modifications, including expansion of the pool of permissible values, that could reduce the rate of false alarms without increasing risk of potential misses (Baweja et al., 2019; Youpa et al., 2018). Recent efforts funded by the PAC and conducted by PERSEREC explored modifications to accomplish this, resulting in proposed changes to the T3 business rules. Some of the suggested modifications were accepted by the Security and Suitability Executive Agents, but the rate of false alarms continues to be high.

## **CURRENT STUDY**

The current work looks to validate additional changes for T3 and T1 cases to improve the rate of correct favorable determinations (i.e., *hits*) without increasing the risk of potential misses. To accomplish this, we tested a series of modifications to the business rule XML file and applied them to a sample of T1 and T3 investigations. This report presents the results of testing and the resulting proposed changes to the business rules.

## METHOD

The method for testing rule changes consisted of first modifying the business rule file to reflect the proposed changes then applying the modified file to samples of cases. The samples used for these testing procedures are described first, followed by a more detailed description of the testing procedures.

### SAMPLE

Given the different investigation types, two different convenience samples—a sample of T1 cases and a sample of T3 cases—were relied on for testing. The data were provided by DMDC from DISS. Each sample is described below.

#### T3 Cases

An initial sample of 6,585 T3 cases was identified with recently completed adjudication determinations. These cases were merged with the final determinations from either DISS (when available) or JPAS. The final determinations were then reviewed and recoded to ensure that the cases included in the analysis had clear, final outcomes (i.e., outcomes that could be translated to Favorable or Unfavorable decisions).

Review and recoding of the final outcomes was necessary because some of the determinations indicated that cases either were not adjudicated to completion or had an unclear outcome. Cases identified as not adjudicated to completion included those with the outcomes No Determination Made, Loss of Jurisdiction, No Action, None, Eligibility Administratively Withdrawn, and Transfer of Jurisdiction, or had a missing final outcome (i.e., null value). Cases with the outcome Revoked were also excluded because Revoked is not a valid outcome for T3 (because they initial investigations for which eligibility has never been granted, and therefore eligibility cannot be revoked). The frequency of each determination type and the way that it was recoded for this study are shown in Table 1. After excluding ambiguous or incomplete determinations, the final sample included 6,331 T3 investigations, all but one of which received favorable determinations.

**Table 1**  
**T3 Outcomes and Recoded Values (N=6,585)**

<b>Outcome from DISS or JPAS</b>	<b>Recoded Outcome</b>	<b>N</b>	<b>%</b>
Favorable	Favorable	6,303	95.7
Favorable - 02 Suitability/Fitness Determination Under 5 CFR 731 or Equivalent	Favorable	12	0.2
Secret	Favorable	9	0.1
SCI - DCID 6/4	Favorable	2	< 0.1
Favorable - Eligible for CAC after CAF Review	Favorable	1	< 0.1
Interim SCI	Favorable	1	< 0.1
Interim Top Secret	Favorable	1	< 0.1
Position of Trust	Favorable	1	< 0.1
Pending Reply to SOR	Unfavorable	1	< 0.1

The case seriousness code assigned by the ISP and investigation close date for these cases are provided in Table 2. The cases were approximately 32.9% G cases that were closed between January 2018 and January 2019. (Cases are assigned a G value when the ISP determines there are no issues in the case.)

**Table 2**  
**T3 Sample Characteristics (N=6,331)**

<b>Case Seriousness Code</b>	<b>N</b>	<b>%</b>
E	2,835	44.8
G	2,084	32.9
A	540	8.5
B	351	5.5
D	238	3.8
C	176	2.8
R	107	1.7
<b>Date Closed</b>		
2018-01	2	< 0.1
2018-02	15	0.2
2018-08	3	0.1
2018-09	5	0.1
2018-10	4,565	72.1
2018-11	1,740	27.5
2019-01	1	< 0.1

### T1 Cases

The initial T1 sample consisted of 2,965 cases and was merged with final adjudication outcomes from DISS or JPAS. Again, the outcomes for this case had to be recoded in order to select a clear outcome for each case. The adjudication strategy for T1 cases

differs from that of T3 cases in that jurisdiction over the case is transferred to the Component that submitted the request if DoD CAF cannot readily grant a favorable determination. However, this transfer of jurisdiction represents an ambiguous outcome. It is possible that the adjudicator found some derogatory information, but it is also possible that the adjudicator determined that not enough information was available to make a decision and that the Component had access to the necessary information. For each case, given the nature of T1 adjudications, the clearest and most conservative final outcome was selected as the final outcome for the case (that is, the least favorable outcome was selected as the final outcome for cases with multiple determinations listed, to ensure that no cases with unfavorable determinations might be granted favorable eAdjudication determinations). Because they had an outcome of Transfer of Jurisdiction, 246 cases were removed. An additional 25 cases were excluded from the T1 analysis because they received a Loss of Jurisdiction outcome or were missing an outcome in DISS and JPAS. The outcome from DISS or JPAS and the recoded outcomes for all 2,965 cases are presented in Table 3. After the cases were recoded, the final sample included 2,694 T1 cases, 90.7% (2,682) of which received favorable determinations and 0.4% (12) of which received unfavorable determinations.

**Table 3**  
**T1 Outcomes and Recoded Values (N = 2,965)**

<b>Outcomes from DISS or JPAS</b>	<b>Recoded Outcomes</b>	<b>N</b>	<b>%</b>
Favorable - 02 Suitability/Fitness Determination Under 5 CFR 731 or Equivalent	Favorable	1,835	61.9
Favorable - Eligible for CAC after CAF Review	Favorable	842	28.4
Secret	Favorable	5	0.2
Favorable with Conditions - 07 - Counseled and/or Letter of Warning/Advisement or Reprimand Issued	Unfavorable	7	0.2
Favorable - Eligible for CAC after Component Review	Unfavorable	4	0.1
Denied - Ineligible for CAC after Component Review	Unfavorable	1	0.0
Transfer of Jurisdiction	Exclude	246	8.3
Loss of Jurisdiction - 04 - Resigned, was Terminated, or Withdrew Application prior to Determination	Exclude	16	0.5
Missing	Exclude	9	0.3

The case seriousness codes assigned by the ISP and investigation close dates for the T1 cases are presented in Table 4. The final sample included approximately 38% G cases (no issue cases) that were closed between January 2018 and January 2019.

**Table 4**  
**T1 Sample Characteristics**

<b>Case Seriousness Code</b>	<b>N</b>	<b>%</b>
G	1,034	38.4
E	788	29.3
R	281	10.4
B	237	8.8
A	205	7.6
D	81	3.0
C	68	2.5
<b>Date</b>		
2018-01	65	2.4
2018-03	12	0.4
2018-04	10	0.4
2018-05	6	0.2
2018-06	10	0.4
2018-07	15	0.6
2018-08	197	7.3
2018-09	1,085	40.3
2018-10	1,065	39.5
2018-11	93	3.5
2018-12	29	1.1
2019-01	107	4.0

## TESTING PROCEDURE

Testing involves a modification to the file containing the business rules. For each test, a set of business rule modifications were tested and then applied to T3 and T1 investigations to assess the outcome. Note that T1 rules are generally a subset of T3 rules—that is, many of the rules that apply to T3 rules also apply to T1 rules. Modifying those rules for T3 investigations therefore also applies the same change to T1 rules. Thus, for both investigation types, in general, the business rule file applied was the same for almost all test runs.

The first modifications tested were based on some potential rule changes, identified by previous research, which might reduce the rate of false alarms (Baweja et al., 2019). In addition, rule modifications proposed in a recent memorandum (Office of the Director of National Intelligence Memorandum, *Updated Electronic Adjudication Business Rules for Tier 1, Tier 3, and Tier 3R Background Investigations, Version 1.3*, 2019) were also tested. Rule modifications were tested in sets, each identified by a Test number (i.e., Test #1, Test #2, and so on). Once all desired rule modifications were tested, a final set of rules was created to combine all of the modifications selected from previous tests. Results of this final, master rule file were examined to determine the potential decrease

in false alarms that might be expected and to ensure that the proposed modifications did not result in any potential misses. Note that all of the modifications involved record checks in the investigation in some capacity. The full name of each of these checks is listed in the List of Acronyms, and additional description for each investigative item is provided in Appendix A.



## RESULTS

In this section, we present study results by type of investigation (T3 or T1). For each investigation type, we discuss the results using the unmodified or baseline XML rule file first. The baseline XML consists of the business rules in use at the time testing began and serves as a comparison to assess improvement resulting from changes to the rules. For each investigation type, we tested six sets of changes then compiled the most promising changes in a final test.

### T3 BUSINESS RULE MODIFICATION TESTING

We identified a series of rule changes by examining the most common failures of the baseline business rules. The examination identified the reason for each failure (e.g., which outcome values for a given check were causing the failure, such as DN for the EMPL check) and the necessary changes to the rules. Through testing, we then assessed the impact of the rule change.

#### Baseline

Table 5 displays the results for the T3 baseline rules. As the table shows, only 3.5% of cases in the sample passed with the baseline rules. Even though over 32% of the cases were G cases (identified by the ISP as having no issues), very few of those cases passed the baseline set of rules. As the next section outlines in further detail, many of these failures are due to additional investigative items for which there are not business rules currently defined.

**Table 5**  
**Baseline Results for T3 Investigations**

eAdjudication Outcome	Human Outcome					
	Favorable		Unfavorable		Total	
	N	(%)	N	(%)	N	(%)
Favorable	<i>Hits: 224</i>	(3.5)	<i>Potential Misses: 0</i>	(--)	224	(3.5)
Unfavorable	<i>False Alarms: 6,106</i>	(96.5)	<i>Correct Rejections: 1</i>	(< 0.1)	6,107	(96.5)
Total	6,330	(99.9)	1	(< 0.1)	6,331	(100.0)

#### Most Common T3 Rule Failures

Table 6 shows the most frequent 25 eAdjudication business rule failures by rule code and description as well as the reason for the failure. Appendix A displays the investigative item abbreviations and descriptions as well as the abbreviations for all of the result codes. For all rules, up to three reasons for failure are shown (i.e., the three most common values that are not permissible are displayed unless there are fewer than three). If the Result column shows multiple descriptions separated by a comma, that check had multiple items with that result (e.g., two SIMM checks). The top three most common reasons for eAdjudication failure are the case seriousness code

(ADJ\_CHECK\_400), the presence of additional investigative items (ADJ\_CHECK\_429, ADJ\_CHECK\_440), and the results of the credit check (ADJ\_CHECK\_411).

**Table 6  
Most Common Rule Flags and Top Three  
Descriptions for T3 Investigations**

<b>Rule Code</b>	<b>Rule Count</b>	<b>Rule Description</b>	<b>Permissible Result</b>	<b>Result</b>	<b>Description Count</b>
<b>ADJ_CHECK_400</b>	4,248	Case Seriousness Code Check	G	E	2,835
				A	540
				B	351
<b>ADJ_CHECK_429</b>	2,421	Removes cases with specified items	Should not have: OUTS, SIMM, EFI, LAWE PR, GENL, SPIN, MEDI, PUBR, FNCN, FMSP, SECF, SUBC, FINL, TESI	SIMM	540
				SIMM, SIMM	471
				TESI	386
<b>ADJ_CHECK_440</b>	2,421	Removes cases with item codes other than specified	Should have only: CRED, DCII, FBIF, FBIN, SESE, LAWE, MILR, SISC, SSN, TECS, MILD, LAWE, SIIF, SIIC, FBFN, DCIF, INVA, CGIN, PUBH, BVS, SCHR, BAR, OPF, EMPL, EDUC, STPA, IMM, SSTP	SIMM	540
				SIMM, SIMM	471
				TESI	385
<b>ADJ_CHECK_411</b>	1,390	CRED Result Check	AC, AA, NI	IS	1,340
				NR	40
				NZ	4
<b>ADJ_CHECK_490</b>	1,169	EMPL Result Check	AC, AA, RF, UD, UC, PE, RL, PA	DN	495
				DN, DN	145
				IS	133
<b>ADJ_CHECK_036</b>	1,114	Relative Citizenship Check	United States	Mexico, Mexico	190
				Mexico	183
				Philippines	52
<b>ADJ_CHECK_014</b>	1,028	Selective Service Registration Check (SF-86)	Yes	No	845
				I Don't Know	108
				Missing	75
<b>ADJ_CHECK_491</b>	924	EDUC Result Check	AC, AA, RF, PE, UC, RL	DN	300
				UD	225
				IS	177
<b>ADJ_CHECK_428</b>	903	MILD Result Check	NR, AA	DN	639
				RR	254
				IS	10
<b>ADJ_CHECK_061</b>	683	Subject should have no police record in the past 7 years (SF-86)	No	Yes	683
<b>ADJ_CHECK_402</b>	547	SIIF Result Check	AA, RF, PF, AC, NI	IS	282
				RR	125
				RR, IS	42

<b>Rule Code</b>	<b>Rule Count</b>	<b>Rule Description</b>	<b>Permissible Result</b>	<b>Result</b>	<b>Description Count</b>
<b>ADJ_CHECK_064</b>	468	Subject should not have used illegal drugs (SF-86)	No	Yes	468
<b>ADJ_CHECK_488</b>	355	LAWE Record Result Check	NR, NI, RF	IS	202
				UC	79
				IS, IS	25
<b>ADJ_CHECK_492</b>	293	LAWE Inquiry Result Check	NR, NI, UC, UD, RF, RL, FR	IS	251
				RI	35
				IS, IS	2
<b>ADJ_CHECK_037</b>	267	Subject should not have foreign contacts (SF-86)	No	Yes	267
<b>ADJ_CHECK_083</b>	254	Subject should not have any delinquent debt (SF-86)	No	Yes	254
<b>ADJ_CHECK_495</b>	250	SSTP Result Check	AC, AA	NR	199
				NR, NR	39
				NR, NR, NR	8
<b>ADJ_CHECK_103</b>	215	Foreign countries visited should not be on state advisory list (SF-86)	Should not have visited listed countries	Philippines	69
				Haiti	35
				Philippines, Philippines	22
<b>ADJ_CHECK_025</b>	192	Subject should not have a foreign passport (SF-86)	No	Yes	192
<b>ADJ_CHECK_405</b>	189	FBIF Result Check	CN, UF	CR	189
<b>ADJ_CHECK_441</b>	189	FBIF-FBFN Cross Validation	CN	CR	189
<b>ADJ_CHECK_414</b>	165	MILR Result Check	AC, RF	NR, NC	73
				NR, IS	52
				NR, NR	32
<b>ADJ_CHECK_017</b>	155	MILR Check Missing	No	Yes	155
<b>ADJ_CHECK_062</b>	115	Subject should not have a police record ever (SF-86)	No	Yes	115
<b>ADJ_CHECK_024</b>	93	Subject should not have held dual citizenship (SF-86)	No	Yes	93

## Identifying T3 Rule Changes

After reviewing the most frequent failures, a series of changes to the business rules were selected for testing. Table 7 presents the rule changes tested by test number (again, recall that Appendix A presents the investigative item and result code abbreviations). Each test (indicated by Test) appears in a column; the rows show the rules. The tests were somewhat overlapping. For example, ADJ\_CHECK\_014 was modified in some fashion for every test, whereas ADJ\_CHECK\_439 was modified only for Test #4-Test #7. The specific changes made to a rule for a given test are provided in the cell under each test number. If the cell is empty, the rule was not modified in that particular test. Each test is described below; Table 8 presents the results of each test.

### Test #1

In the first T3 rule modification test, analysts updated the business rule to check the results of the SF-86 Selective Service registration question (ADJ\_CHECK\_014). Examination of the baseline T3 business rules suggested that males under the age of 18 (who are not yet required to register for Selective Service) were failing due to their “No” response on the SF-86. Thus, this test modified the rules to allow an exception for males under the age of 18 (i.e., allows a “No” response on the SF-86 if the individual is a minor). Results of this rule modification showed no change in potential misses or correct rejections but showed a slight increase in hits, with 229 (3.67%) of individuals receiving a correct favorable eAdjudication determination (an increase of 0.08%).

### Test #2

In this test, in addition to the modification to ADJ\_CHECK\_014 to address the issue with the Selective Service response on the SF-86, eight additional rules were modified. All but one of these modifications added some additional permissible values—that is, the case could pass eAdjudication with additional values present. Results of the testing procedure showed that an additional 100 cases (1.6%) passed eAdjudication as compared to the baseline rules (a total pass rate of 5.1%, or n = 324 cases). Most of these additional passes were due to the changes to the employment checks (ADJ\_CHECK\_490 and ADJ\_CHECK\_491) and to the change to the result of the DCIF check (specifically, allowing NR as a permissible value).

### Test #3

Test #3 contained all of the changes from Test #2. In addition, three additional rules (labeled ADJ\_CHECK\_XX1, ADJ\_CHECK\_XX2, and ADJ\_CHECK\_XX3) were created to check the results of the passport checks for the subject (STPA) and the subject’s spouse or immediate family (SSTP) as well as the results of the financial crimes and enforcement network (FNCN) check. A single additional change was tested (to the state criminal history repository) allowing for results of UD or NI. Results showed that these additional changes had no impact on the overall hit rate (i.e., the overall correct

favorable decision rate remained at 5.1%). Thus, these additional rules did not cause any potential misses but neither did they decrease the rate of false alarms.

**Table 7**  
**T3 Tested Rule Changes**

<b>Rule</b>	<b>Test #1</b>	<b>Test #2</b>	<b>Test #3</b>	<b>Test #4</b>	<b>Test #5</b>	<b>Test #6</b>	<b>Test #7</b>
ADJ_CHECK_014 (SF-86 Selective Service)	Corrected syntax to allow under age 18 exception	Corrected syntax to allow under age 18 exception	Corrected syntax to allow under age 18 exception	Corrected syntax to allow under age 18 exception	Deactivate (i.e., comment out)	Deactivate (i.e., comment out)	Deactivate (i.e., comment out)
ADJ_CHECK_023 (Citizenship)		Added "USByBirthOutsideUS" and "USNotByBirth" as permissible values	Added "USByBirthOutsideUS" and "USNotByBirth" as permissible values		Added "USByBirthOutsideUS" and "USNotByBirth" as permissible values	Added "USByBirthOutsideUS" and "USNotByBirth" as permissible values	Added "USByBirthOutsideUS" and "USNotByBirth" as permissible values
ADJ_CHECK_400 (Case Seriousness Code)							Added "E" as permissible value
ADJ_CHECK_402 (SIIF)		Added NI as permissible value	Added NI as permissible value		Added NI as permissible value	Added NI as permissible value	Added NI as permissible value
ADJ_CHECK_408 (DCII)		Added NL as permissible value	Added NL as permissible value			Added NL as permissible value	Added NL as permissible value
ADJ_CHECK_415 (INVA)		Added RF as permissible value	Added RF as permissible value		Added RF as permissible value	Added RF as permissible value	Added RF as permissible value
ADJ_CHECK_417 (PUBH)		Removed RF as permissible value	Removed RF as permissible value			Removed RF as permissible value	Removed RF as permissible value
ADJ_CHECK_419 (SCHR)			Added UD and NI as permissible values			Added UD and NI as permissible values	Added UD and NI as permissible values
ADJ_CHECK_429 (Excluded Items)			Removed SSTP, STPA, and FNCN as excluded items		Removed SSTP, STPA, and FNCN as excluded items	Removed SSTP, STPA, and FNCN as excluded items	Removed SSTP, STPA, and FNCN as excluded items
ADJ_CHECK_439 (SESE)				Added NR as permissible value for military subjects	Added NR as permissible value for military subjects	Added NR as permissible value for military subjects	Added NR as permissible value for military subjects

<b>Rule</b>	<b>Test #1</b>	<b>Test #2</b>	<b>Test #3</b>	<b>Test #4</b>	<b>Test #5</b>	<b>Test #6</b>	<b>Test #7</b>
ADJ_CHECK_440 (Allowable Items)			Added SSTP, STPA, and FNCN as allowable items		Added SSTP and STPA as allowable items	Added SSTP, STPA, and FNCN as allowable items	Added SSTP, STPA, and FNCN as allowable items
ADJ_CHECK_447 (DCIF)		Added NR, NL, and RF as permissible values	Added NR, NL, and RF as permissible values		Added NR, NL, and RF as permissible values	Added NR, NL, and RF as permissible values	Added NR, NL, and RF as permissible values
ADJ_CHECK_490 (EMPL)		Added FR, NL, and PA as permissible values to EMPL checks with an Inquiry (I) completion method	Added FR, NL, and PA as permissible values to EMPL checks with an Inquiry (I) completion method		Added FR, NL, and PA as permissible values to EMPL checks with an Inquiry (I) completion method	Added NL and PA as permissible values to EMPL checks with an Inquiry (I) completion method	Added NL and PA as permissible values to EMPL checks with an Inquiry (I) completion method
ADJ_CHECK_491 (EMPL)		Added UD and FR as permissible values	Added UD and FR as permissible values			Added UD and FR as permissible values	Added UD and FR as permissible values
ADJ_CHECK_XX1 (STPA)			Added rule to check STPA with AC, AA as permissible values		Added rule to check STPA with AC, AA as permissible values	Added rule to check STPA with AC, AA as permissible values	Added rule to check STPA with AC, AA as permissible values
ADJ_CHECK_XX2 (SSTP)			Added rule to check SSTP with AC, AA as permissible values		Added rule to check SSTP with AC, AA as permissible values	Added rule to check SSTP with AC, AA as permissible values	Added rule to check SSTP with AC, AA as permissible values
ADJ_CHECK_XX3 (FNCN)			Added rule to check FNCN with NR as permissible value.			Added rule to check FNCN with NR as permissible value.	Added rule to check FNCN with NR as permissible value.



#### **Test #4**

Test #4 contained only a single rule change other than the correction to ADJ\_CHECK\_014.<sup>1</sup> This rule change allowed for a result of NR to the Selective Service check for those subjects who are currently in the military. Results showed that, compared to the baseline rules, this change had a negligible impact on the rate of hits, increasing it by 0.1% (n = 4 cases). Nonetheless, given the nature of the rule change, it represents a modification that does slightly improve the rate of correct favorable decisions with a very low risk.

#### **Test #5**

Test #5 combined many of the prior rule modifications to test all of the changes proposed in the recent memorandum (ODNI, 2019). Results of this test showed that the proposed rule changes increased the hit rate by 4.1% (n = 259 cases) compared to the baseline rules without causing any potential misses. This suggests that the rule changes proposed in this recent memorandum essentially doubled the original hit rate. However, this was still very low compared to previous efforts (e.g., Baweja et al., 2019).

#### **Test #6**

Following the results of Test #5, a number of additional changes were made over and above the memorandum changes in an attempt to further improve the hit rate. The results of this test showed that these rule changes increased the hit rate an additional 1.9% over Test #5, for a total hit rate of 9.3% (n = 591). This is an increase of 5.9% over the baseline rules, with no increase in potential misses. The biggest contributor to this change appears to be the modification to ADJ\_CHECK\_490, particularly allowing UD as a permissible value.

#### **Test #7**

A manual review of the T3 flags suggested a final additional rule change, in addition to all of the other rule changes already tested. After completion of the investigation, the ISP assigns a case seriousness code indicating the amount and degree of derogatory information included in the case. Reviewing the cases, there was some evidence that the permissible value of G (no issues) and the value of E (other disqualifying issues) were similar in the type of eAdjudication flags they received. As a result, in this final rule test, ADJ\_CHECK\_400 (which checks the case seriousness code assigned to the case) was modified to allow E as a permissible value. Results of this test showed further improvement, with a hit rate of 12.4% (n = 787), an increase of 8.9% over baseline.

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<sup>1</sup> This rule change was tested separately because of its complexity. That is, for debugging purposes, it was simpler to test with no other changes in the rule file.

### T3 Summary

Table 8 summarizes all test results completed for T3 business rules. Results show that the highest rate of hits (lowest rate of false alarms) was for Test #7. No tests introduced potential misses.

**Table 8**  
**T3 Rule Changes Summary**

Rule Set	Hits: Correct Favorable	False Alarms: Incorrect Unfavorable	Correct Rejections: Correct Unfavorable	Potential Misses: Incorrect Favorable	Change from Baseline
	N (%)	N (%)	N (%)	N (%)	N (%)
<b>Baseline</b>	224 (3.5)	6,106 (96.5)	1 (< 0.1)	0 (--)	--
<b>Test #1</b>	229 (3.6)	6,101 (96.4)	1 (< 0.1)	0 (--)	5 (0.1)
<b>Test #2</b>	324 (5.1)	6,006 (94.9)	1 (< 0.1)	0 (--)	100 (1.6)
<b>Test #3</b>	324 (5.1)	6,006 (94.9)	1 (< 0.1)	0 (--)	100 (1.6)
<b>Test #4</b>	228 (3.6)	6,102 (96.4)	1 (< 0.1)	0 (--)	4 (0.1)
<b>Test #5</b>	483 (7.6)	5,847 (92.4)	1 (< 0.1)	0 (--)	259 (4.1)
<b>Test #6</b>	591 (9.3)	5,739 (90.7)	1 (< 0.1)	0 (--)	367 (5.9)
<b>Test #7</b>	787 (12.4)	5,543 (87.6)	1 (< 0.1)	0 (--)	563 (8.9)

### T1 BUSINESS RULE MODIFICATION TESTING

As with T3, the team first ran the baseline rules and generated a table of the most common failures. We used this information, in conjunction with the T3 rule changes, to identify a set of modified T1 rule changes for testing.

#### Baseline

During the testing process, the research team identified two rules that generated problems in the T1 baseline rules. ADJ\_CHECK\_456 (which checks the result of Section 23 questions about drug use on the SF-86) and ADJ\_CHECK\_479 (which checks the result of Section 10 questions about dual citizenship on the SF-86) caused all subjects to fail eAdjudication. Examination of the results suggested that the error seemed to be in the eAdjudication software itself and likely only in the version used for testing (i.e., in the standalone executable file provided to the PERSEREC team). To avoid introducing additional delay to the study, these two rules were deactivated for the purposes of testing—thus, the baseline results (and the overall pass rate) do not perfectly match the operational rules.

With that caveat, Table 9 displays the results for the T1 baseline rules. As the table shows, approximately 16% (n = 428) of cases passed the baseline T1 rules, with around 84% (n = 2,254) being false alarms.

**Table 9**  
**Baseline Results for T1 Investigations**

<b>eAdjudication Outcome</b>	<b>Human Outcome</b>			
	<b>Favorable</b>	<b>Unfavorable</b>		<b>Total</b>
Favorable	<i>Hits:</i> 428 (15.9)	<i>Potential Misses:</i> 0 (--)		428 (15.9)
Unfavorable	<i>False Alarms:</i> 2,254 (83.7)	<i>Correct Rejections:</i> 12 (0.4)		2,266 (84.1)
Total	2,682 (99.6)	12 (0.4)		2,694 (100)

**Most Common T1 Rule Failures**

Table 10 displays the rule failures for T1 rules. Each row shows a rule code, description, and the permissible results as well as the actual result obtained and its associated count for the top three descriptions for each rule failure. Similar to the findings for T3 investigations, the most common reason for failure for T1 was the case seriousness code check. However, in contrast to T3 investigations, the next most common reasons for failure were the result of the EMPL, SIIF, and LAWE checks.

**Table 10**  
**Most Common Rule Flags and Top Three**  
**Descriptions for T1 Investigations**

<b>Rule Code</b>	<b>Rule Count</b>	<b>Rule Description</b>	<b>Permissible Result</b>	<b>Result</b>	<b>Description Count</b>
<b>ADJ_CHECK_400</b>	1,660	Case Seriousness Code Check	G	E	788
				R	281
				B	237
<b>ADJ_CHECK_466</b>	1,288	EMPL Result Check	AC, AA, RF, UC, PE, PA	UD	350
				DN	203
				UD, UD	151
<b>ADJ_CHECK_459</b>	499	SIIF Result Check	AA, RF, PF, AC, NI	IS	217
				RR	151
				RR, RR	43
<b>ADJ_CHECK_461</b>	464	LAWE Result Check	NR, NI, UC, UD, RF, PE	IS	345
				FR	56
				IS, S	18
<b>ADJ_CHECK_405</b>	357	FBIF Result Check	CN, UF	CR	357
<b>ADJ_CHECK_423</b>	344	EDUC Result Check	AC, AA, RF, PE, UC	DN	113
				UD	57
				RL	45
<b>ADJ_CHECK_104</b>	143	Subject should be born in the US	United States	Mexico	8
				Philippines	8
				Philippines	8
<b>ADJ_CHECK_023</b>	138	Subject should be a US citizen by birth	US by Birth	Alien	91
				US Not by Birth	47
<b>ADJ_CHECK_494</b>	135	STPA must be present if IMM is present	AC, AA	STPA not present	133
				NR	2
<b>ADJ_CHECK_409</b>	118	DCIF Result Check	AA, NI, RF	IS	68

Rule Code	Rule Count	Rule Description	Permissible Result	Result	Description Count
				IS, IS	19
				NZ	9
<b>ADJ_CHECK_419</b>	110	SCHR Result Check	NR, RF	PE	44
				UC	32
				IS	17
<b>ADJ_CHECK_478</b>	106	CRED Result Check	AC, AA, NI	IS	106
<b>ADJ_CHECK_480</b>	99	MILR Result Check	AC, RF	Not Permissible Combination	98
				IS	1
<b>ADJ_CHECK_224</b>	91	Subject should be a US citizen	Alien	United States	91
<b>ADJ_CHECK_457</b>	79	SIIC Result Check	AA, RF, NR	IS	79
<b>ADJ_CHECK_455</b>	65	Selective Service Registration Check (SF-86)	Yes	Missing	65
<b>ADJ_CHECK_407</b>	19	FBIN Result Check	NI, NR, AA	IS	16
				RF	2
				RI	1
<b>ADJ_CHECK_454</b>	11	Contact Method "Personal"	Contact Method "Personal" not allowed	P	11
<b>ADJ_CHECK_493</b>	5	STPA Result Check	AC, AA	NR	5
<b>ADJ_CHECK_410</b>	4	SSN Result Check	AC	DN	4
<b>ADJ_CHECK_463</b>	4	Removes cases with items other than specified	Should have only: SSI, FBIF, FBIN, SISC, SIIC, DCII, SSN, TECS, MILD, SIIF, FBFN, DCIF, CRED, SESE, MILR, INVA, CGIN, PUBH, BVS, SCHR, BAR, LAWE, EMPL, EDUC, STPA, IMM	PUBR	2
				PUBR, PUBR, PUBR	1
				SUBC (x6), MEDI (x3)	1
<b>ADJ_CHECK_415</b>	2	INVA Result Check	AC, NI, NR, AA	IS	1
				NZ	1

## **Identifying T1 Rule Changes**

T1 tests were essentially identical to the T3 rule tests. Because T1 rules are a subset of T3 rules, the same business rule files were used for both types of investigations. However, only some of the rule changes applied to T1 cases. After conducting all of the tests used for T3 rules, researchers conducted an additional test (Test #8) to address the most frequent business rule flags shown in Table 10. In addition, several other modifications were made to implement changes in parallel to the changes for T3 rules and to align the modifications tested for T3 rules to the T1 business rules. Due to some variability in the investigations, the same check might have different rule numbers in the actual rule file. These differences were not always accounted for in the previous tests. For example, ADJ\_CHECK\_490 checks the result of the employment inquiry for T3 cases; the corresponding rule for T1 investigations is ADJ\_CHECK\_466. This rule was updated in Test Run #8 to reflect the same changes that were made to the T3 rules. Table 11 summarizes the rule changes for T1 business rules.

**Table 11**  
**T1 Tested Rule Changes**

<b>Rule</b>	<b>Test #2</b>	<b>Test #3</b>	<b>Test #4</b>	<b>Test #7</b>	<b>Test #8</b>
ADJ_CHECK_455 (SF-86 Selective Service)					Deactivate (i.e., remove this rule)
ADJ_CHECK_023 (Citizenship)	Added "USByBirthOutsideUS" and "USNotByBirth" as permissible values	Added "USByBirthOutsideUS" and "USNotByBirth" as permissible values		Added "USByBirthOutsideUS" and "USNotByBirth" as permissible values	Added "USByBirthOutsideUS" and "USNotByBirth" as permissible values
ADJ_CHECK_400 (Case Seriousness Code)				Added "E" as permissible value	Added "E" as permissible value
ADJ_CHECK_408 (DCII)	Added NL as permissible value	Added NL as permissible value		Added NL as permissible value	Added NL as permissible value
ADJ_CHECK_415 (INVA)	Added RF as permissible value	Added RF as permissible value		Added RF as permissible value	Added RF as permissible value
ADJ_CHECK_417 (PUBH)	Removed RF as permissible value	Removed RF as permissible value		Removed RF as permissible value	Removed RF as permissible value
ADJ_CHECK_419 (SCHR)		Added UD and NI as permissible values		Added UD and NI as permissible values	Added UD and NI as permissible values
ADJ_CHECK_439 (SESE)			Added NR as permissible value for military subjects	Added NR as permissible value for military subjects	Added NR as permissible value for military subjects
ADJ_CHECK_423 (EDUC)					Added RL and UD as permissible values
ADJ_CHECK_409 (DCIF)					Added NR and NL as permissible values
ADJ_CHECK_461 (LAW)					Added RL and FR as permissible values.
ADJ_CHECK_466 (EMPL)					Added UD, RL, and FR as permissible values

## **Test #2**

Test #2 contained three rule changes for T1 investigations: allowing individuals who are U.S. citizens either not by birth or by birth outside the United States (ADJ\_CHECK\_023) to pass eAdjudication and modifying permissible values for the DCII (ADJ\_CHECK\_408) to allow NL as a permissible value. Finally, Test #2 allowed RF as a permissible value to the INVA check. Results showed that this had no impact on hit or false alarm rate as compared to baseline—that is, the hit rate remained at 16% and there were no potential misses.

## **Test #3**

Test #3 contained all of the rule changes from Test #2. In addition, ADJ\_CHECK\_419 (SCHR) was modified to allow UD and NI as permissible values. This change had very little impact on the rate of hits or false alarms, increasing the hit rate by 0.3% (n = 8) cases as compared to baseline to a total pass rate of 16.2% (n = 436). There was no change in potential misses.

## **Test #4**

Just as with T3 investigations, Test #4 contained only one rule change: the modification for ADJ\_CHECK\_439 to allow NR as a permissible result for the MILR check for those subjects in the military. This minor change had no impact on the hit rate as compared to baseline. The pass rate remained at 15.9% (n = 428).

## **Test #7**

Test #7 contained all of the previously tested rule changes as well as the modification to ADJ\_CHECK\_400 that allowed E as a permissible value. Results showed that this change increased the hit rate from 15.9% (n = 428) in the baseline to 20.9% (n = 562), with no change in potential misses. Just as with T3 investigations, this change increased the hit rate from baseline a relatively substantial amount, at 5.0% (n = 134), with no change to potential misses. This suggests that allowing E cases does increase the hit rate (i.e., reduce false alarms) without increasing risk.

## **Test #8**

Test #8 contained all of the previously tested rule changes and added permissible values to the EDUC, EMPL, LAWE, and DCIF checks. In addition, the rule to check the response to the SF-86 question about Selective Service was deactivated. In doing so, this final test aligned the changes in T1 with many of the changes proposed for T3 business rules. Results show that this increased the hit rate by a very large amount from baseline, to 35.1% (n = 945), an increase of 19% from baseline. There were no changes in potential misses.



## T1 Summary

Table 13 summarizes the results for tests for T1 business rule modifications. By far the largest change in hit rate (and corresponding rate of false alarms) was found in Test #8, which increased the rate by roughly 19%. None of the rule tests presented here had any impact on potential misses; this suggests that all could be considered relatively low-risk modifications to the eAdjudication business rules.

**Table 12**  
**Summary Results for T1 Investigations**

<b>Rule Set</b>	<b>Hits: Correct</b>	<b>False Alarms:</b>	<b>Correct Rejections:</b>	<b>Potential Misses:</b>	<b>Change</b>
	<b>Favorable</b>	<b>Incorrect</b>	<b>Correct</b>	<b>Incorrect</b>	<b>from</b>
	<b>N (%)</b>	<b>Unfavorable</b>	<b>Unfavorable</b>	<b>Favorable</b>	<b>Baseline</b>
	<b>N (%)</b>	<b>N (%)</b>	<b>N (%)</b>	<b>N (%)</b>	<b>N (%)</b>
<b>Baseline</b>	428 (15.9)	2,254 (83.7)	12 (0.4)	0 (--)	--
<b>Test #2</b>	428 (15.9)	2,254 (83.7)	12 (0.4)	0 (--)	0 (--)
<b>Test #3</b>	436 (16.2)	2,246 (83.4)	12 (0.4)	0 (--)	8 (0.3)
<b>Test #4</b>	428 (15.9)	2,254 (83.7)	12 (0.4)	0 (--)	0 (--)
<b>Test #7</b>	562 (20.9)	2,120 (78.7)	12 (0.4)	0 (--)	134 (5.0)
<b>Test #8</b>	945 (35.1)	1,737 (64.5)	12 (0.4)	0 (--)	517 (19.2)

## DISCUSSION

Adjustments to the eAdjudication rules were identified that could increase hit rate without increasing the rate of potential misses. Many of the rules tested were suggested in a recent memorandum; these results serve to support that these rule changes do not introduce additional risk. The results of this study also highlight two major points: first, that testing modifications to the business rules is challenging in the current operational environment, and, second, that identifying additional rule changes using the testing strategy described in the current report has reached a point of diminishing returns.

### CHALLENGES IN TESTING MODIFICATIONS

During the course of conducting this research, a variety of difficulties were encountered when attempting to test modifications to the eAdjudication business rules. In particular, the current eAdjudication operational environment requires that the team that manages the adjudication case management system (DISS) provide case files to PERSEREC researchers for testing and that they produce a standalone executable file for applying the business rule file to the case files. This is challenging for a number of reasons, which are discussed below.

First, the transfer of files is a time- and labor-intensive process. The files have to be selected and electronically transmitted to the PERSEREC team in a secure, password-protected format, and, as we have learned from the DISS team, the process of identifying and transferring the files takes time and effort. For the PERSEREC team, downloading the files is time-consuming, and the files themselves (because they come from an operational system) require cleaning prior to completing analyses.

Second, producing the standalone executable file resulted in a number of errors when the business rules were applied to the cases. For example, the standalone executable file did not allow for processing of investigations that used an older version of the SF-86; all investigations that did not use the 2016 version of the SF-86 therefore had to be removed.<sup>2</sup> For T3 and T1 business rules, use of the standalone software caused an error in some business rules. For T3 rules, the software was modified to correct the error. However, for T1 rules, rather than attempting to identify and debug the issue in the executable file, which would have introduced additional delays, two rules (ADJ\_CHECK\_456 and ADJ\_CHECK\_479<sup>3</sup>) were commented out for testing purposes.

These issues serve to accentuate the need to identify or create a more streamlined process for rule modification and testing. Because eAdjudication was designed for

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<sup>2</sup> Although the DISS team indicated that the executable file could be modified to allow for processing of these cases, this would have introduced additional delay to the study and not provided any additional value to the operation of eAdjudication. Thus, for this effort, we decided not to include these cases.

<sup>3</sup> These rules check the subject's response regarding illegal drug use and regarding dual citizenship on the SF-86. Although not ideal to remove them, they did not cause any potential misses, therefore did not substantially impact the testing process.

operations rather than research, the current system does not allow for efficient testing of rule changes. However, for the eAdjudication software to be of greatest value, ways to identify potential rule modifications to increase the hit rate should continue to be explored. Doing so can provide additional cost avoidance for DoD and the Federal Government at large.

## **IDENTIFYING ADDITIONAL CHANGES**

Results of this study also suggest that the current approach to identifying rule changes has reached a point of diminishing returns. When considered in the context of previous studies examining potential rule changes (e.g., Baweja et al., 2019; Youpa et al., 2018), the results here suggest that there are few remaining changes that are low risk and also have a considerable impact on the hit and false alarm rate. As such, it is becoming increasingly clear that the use of additional technology to process more portions of the investigative file should be explored. For instance, the greatest cause of eAdjudication failures (outside of case seriousness code or investigative items that are not allowed) is the credit check. Additional processing of credit-related information (e.g., the number of collections, the amount associated, and the age of the debt) might allow for additional cases to be favorably eAdjudicated without increasing potential risk.

Without processing additional aspects of the investigative file, there are few additional rule changes that can substantially reduce the rate of false alarms. For example, one of the most common reasons for failure is a result of DN for the EMPL check. Additional processing of the investigative file might allow for identification of the nature of the discrepancy. A minor discrepancy, such as job title or date, might be allowable if no other derogatory information is found. This kind of analysis might be possible with natural language processing and could help to further reduce the rate of false alarms.

## **LIMITATIONS**

Given the challenges encountered in running the software, this study is limited by the fact that the T1 rules do not match the operational version of the eAdjudication software. In order to test modifications, researchers had manually deactivate some portions of rules. As a consequence, the overall rates of case classification (e.g., hits, false alarms) might not match the rates seen in operations.

In addition, the samples here are convenience samples and are not necessarily representative of DoD personnel as a whole. As a result, it is unclear whether the overall pass rates are comparable to the larger DoD population. It is unlikely that the rates of case classification would generalize to other groups.

Finally, unfavorable determinations (i.e., adverse adjudicative outcomes) are generally very rare. Given the low rate of denials overall, only one case with a negative outcome was contained in this sample. As a result, these tests cannot guarantee that (in a population with a larger number of denials) a rule might result in a potential miss.

Proposed changes must be considered in the context of the risk of the rule change itself as well as the testing presented here.

## **RECOMMENDATIONS**

We recommend the following modifications to eAdjudication business rules, testing environment, and future research:

- The DISS eAdjudication team and the eAdjudication working group should review and consider the test results presented here, specifically the final test for T3 and T1 investigations (Test #7 and Test #8, respectively). For both T3 and T1 cases, these rule changes served to decrease the rate of false alarms.
- The DISS eAdjudication team and PERSEREC should work together to identify more efficient ways of testing modifications to the eAdjudication business rules. The current approach requires substantial time and labor and introduces substantial delays and difficulties in the testing process.
- Future research should continue to explore ways to process additional portions of the investigative file, particularly the credit report. This area of the investigation causes the most false alarms and has the highest potential for allowing a greater number of hits if processed.
- Future work should strive to identify additional ways eAdjudication could minimize costs. One potential option is to use eAdjudication business rules to increase efficiency in adjudicating additional case types, such as T5 investigations.

## REFERENCES

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## APPENDIX A: INVESTIGATIVE ITEMS AND RESULT CODES

**Table 13**  
**Investigative Item Abbreviations and Descriptions**

Abbreviation	Full Name	Description
<b>BAR</b>	Bar Association License Check	Scheduled by request if Extra Coverage “Q” is listed in the Extra Coverage block on the Standard Form and State of membership is provided.
<b>BVS</b>	Bureau of Vital Statistics	Verification of birth record on file at listed State of birth conducted by case-specific request only using Extra Coverage Code “L” on Standard Form. Requester must provide Mother’s full maiden name and Father’s full name.
<b>CGIN</b>	Coast Guard Investigative Service	Coast Guard database containing records of investigations conducted by the Coast Guard for military and civilian personnel. Scheduled if case papers indicate prior or current service with U.S. Coast Guard.
<b>CRED</b>	Credit (National Credit Bureaus)	Search of national credit bureaus.
<b>DCIF</b>	Defense Central Index of Investigations File	All files identified in DCII are provided.
<b>DCII</b>	Defense Central Index of Investigations	Check of database that contains trace records of DoD conducted investigations (e.g. ACRD, OSI, DSS).
<b>EDUC</b>	Education	Verification of educational activity based on recency and receipt of degree.
<b>EMPL</b>	Employment	Verification of employment activity and records based on recency.
<b>FBFN</b>	FBI CJIS name check (Criminal History)	Name check provided if FBIF results Unclassifiable.
<b>FBIF</b>	FBI CJIS Fingerprint Classification	Fingerprint classification attempted on all.
<b>FBIN</b>	FBI Records Management Division (Investigations)	FBI-maintained database of FBI-conducted investigations (includes FBI employment verification)
<b>FNCN</b>	Financial Crimes Enforcement Network	Scheduled on all to detect large currency transactions, suspicious activities, and unexplained affluence.
<b>IMM</b>	Department of Homeland Security Citizenship and Immigration Services check	Scheduled for all cases when Subject claims he or she is a foreign born U.S. citizen and no State Passport information is provided on the case papers or to verify the legal status of foreign-born Subjects who do not claim U.S. citizenship through Department of Homeland Security United States Citizenship and Immigrations Services.
<b>INVA</b>	Investigative Agencies Files	Scheduled to obtain prior/current investigative records from agency databases OR if Subject admits to a previous background investigation on case papers.

<b>Abbreviation</b>	<b>Full Name</b>	<b>Description</b>
<b>LAWE</b>	State and/or Local Law Checks	Scheduled to current residence and current employment, regardless of duration. Scheduled to appropriate jurisdictions for all locations of listed residence, employment, and education activities for any consecutive period exceeding 6 months. Additional investigative action is conducted when inquiry is not returned. Outside the U.S. – Interpol Search conducted when Subject has been overseas for any consecutive period of 6 months or more. For non-DOD subjects not on military base, an additional law check will be conducted by the State Department if subject has been overseas for any consecutive period of 6 months or more. Interpol and Canadian law check will be conducted for overseas activity in Canada for any consecutive period of 6 months or more.
<b>LAWE PR</b>	Police Record listed or developed arrests	Scheduled to appropriate criminal history repository for listed or developed arrests within 7 years (exception: fines of less than \$300 for traffic offenses that do not involve alcohol or drugs). All charges or convictions that involve felonies, firearms, or domestic violence shall be reviewed regardless of when they occurred.
<b>MEDI</b>	Alcohol/Drug/Mental/Emotional Health Treatment follow-up	Review of medical records to verify reported or discovered information regarding Subject's health and treatment history.
<b>MILD</b>	Military Discharge Records	Verification of the nature of discharge (i.e., honorable or otherwise) for military subjects.
<b>MILR</b>	Military Personnel Records Repository	Verification of military service based on recency or potentially derogatory information (i.e., other than honorable discharge).
<b>OUTS</b>	Outside of the US	Interview and other verification conducted if Subject resides outside the United States.
<b>PUBH</b>	Public Health Service	Verification of any reported or discovered employment with the U.S. Public Health Service.
<b>PUBR</b>	Public Records	Record review to obtain details of civil and criminal court actions.
<b>SESE</b>	Selective Service	Scheduled for all persons born a male after 12/31/59 if currently at least 18 years of age to validate Selective Service registration when required or by request using extra coverage code J.
<b>SII</b>	OPM Security/Suitability Investigations Index	Database maintained by OPM that contains historic record of investigations conducted for a minimum of 16 years from the date of the last investigative activity.
<b>SIIC</b>	Central Verification System	Expanded SII search for CVS data, which include pending/closed/unacceptable/discontinued/incomplete investigations, adjudications, OPM BAR, Clearance/Access, Polygraph, and HSPD-12 information when it exists for the Subject of investigation.
<b>SIIF</b>	OPM Security/Suitability Investigations Index File	All files in SII provided.

<b>Abbreviation</b>	<b>Full Name</b>	<b>Description</b>
<b>SIMM</b>	Department of Homeland Security Citizenship and Immigration Services check of Spouse/Cohabitant or Immediate Family	Scheduled for all cases when spouse/cohabitant or immediate family member is a foreign born U.S. citizen and no State Passport information is provided on the case papers or to verify the legal status of foreign-born spouse/cohabitant or immediate family members who do not claim U.S. citizenship through Department of Homeland Security-United States Citizenship and Immigrations Services.
<b>SSIF</b>	Spouse/Cohabitant OPM Security/Suitability Investigations Index File	Spouse/Cohabitant check of all files in SII provided
<b>SSN</b>	Social Security Number Check	Check of SSA's Enumeration Verification System (EVS) for SSN verification that will verify that the given SSN is assigned to the individual whose name and DOB were submitted. Will also identify if the SSN provided is identified with a person who is deceased.
<b>SSTP</b>	State Department Passport check of Spouse and/or Cohabitant or Immediate Family	Scheduled when case papers indicate or spouse/cohabitant immediate family member is born abroad and State Passport information is provided on the case papers. Search is conducted through the American Citizens Records Query System (ACRQS).
<b>STPA</b>	State Department Passport	Scheduled when case papers indicate Subject is born abroad and State Passport information is provided on the case papers. Search is conducted through the American Citizens Records Query System (ACRQS).
<b>TESI</b>	Triggered Enhanced Subject Interview	Tailored investigative leads conducted in accordance with the Tier 5 Expandable Focused Investigation Model to develop and resolve identified issues and explore the potential for other pertinent issues.



**Table 14**  
**Result Codes for Investigative Items**

<b>Abbreviation</b>	<b>Meaning</b>
AA	Acceptable/Attached
AC	Acceptable
CN	Classifiable, No Record
CR	Record
DN	Discrepant
FR	Fee Required
IS	Issues
NC	Not Completed
NI	No Pertinent Information
NL	Not Located
NR	No Record
NZ	Not Available
PA	Confidential/Acceptable
PE	Pending
PF	Previously Furnished
RF	Referred
RI	Record Inconclusive
RL	Release Required
RR	Record Returned
UC	Unable to Contact
UD	Undeliverable