
INTRODUCTION TO THE NIST/NIJ EXPERT WORKING GROUP FOR HUMAN FACTORS IN HANDWRITING EXAMINATION REPORT SPECIAL EDITION

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Reference: Nikola K.P. Osborne, Carlyne Bird (2021). SPECIAL ISSUE: Introduction to the 2020 NIST/NIJ Expert Working Group for Human Factors in Handwriting Examination Report. *J. Forensic Document Examination*, Vol 30, 5-10.

Introduction to Journal of Forensic Document Examination Special Edition

The Journal of Forensic Document Examination invited the Expert Working Group for Human Factors in Handwriting Examination (the Working Group) to write a series of articles summarizing the key topics from and assessing the impact of *Forensic Handwriting Examination and Human Factors: Improving the Practice Through a Systems Approach* (the HFHE Report), first published in February 2020 and revised in 2021 [1]. This special edition contains five articles:

- Introduction to the NIST/NIJ Expert Working Group for Human Factors in Handwriting Examination Report Special Edition
- Training, Education, and Certification of Forensic Document Examiners as presented in the NIST/NIJ Expert Working Group for Human Factors in Forensic Handwriting Examination Report [2]
- Validity, Reliability, Interpretation, and Opinion Scales as presented in the NIST/NIJ Expert Working Group for Human Factors in Forensic Handwriting Examination Report [3]
- Cognitive bias as presented in the NIST/NIJ Expert Working Group for Human Factors in Forensic Handwriting Report [4]

- International Response to the NIST/NIJ Expert Working Group for Human Factors in Forensic Handwriting Examination Report [5]

Introduction to *Forensic Handwriting Examination and Human Factors: Improving the Practice Through a Systems Approach*

The HFHE Report was the second report produced through an Expert Working Group series on Human Factors in forensic science sponsored by the National Institute of Justice (NIJ) and the National Institute of Standards and Technology (NIST). The first was in Latent Print Analysis [6].

The Working Group first convened in June 2015 and were charged with “conducting a scientific assessment of the effects of human factors on forensic handwriting examination with the goal of recommending strategies and approaches to improve its practice and reduce the likelihood of errors” [1, p. 2]. Specifically, the Working Group was charged with:

- examining and analyzing the human factors in current policies, procedures, and practices within the field of forensic handwriting examination;
- developing practices based on scientifically sound research to reduce the likelihood of errors in forensic document examination;
- evaluating various approaches to quantifying measurement uncertainty within forensic document analysis; and

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- publishing findings and recommendations that include future research initiatives.

The Working Group met eight times over 2.5 years, and was comprised of handwriting and document examiners, cognitive scientists, statisticians, legal scholars, forensic science academics, and professional organization representatives. A subcommittee developed each chapter and through a consensus process each member of the Working Group had the ability to contribute to and influence the text and recommendations.

The HFHE Report contains six chapters of topic investigation and one chapter that lists all the recommendations:

1. Handwriting Examination Process
2. Interpretation and Technology
3. Reporting and Testimony
4. Quality Assurance/Quality Control
5. Education, Training, and Certification
6. Management
7. Summary of Recommendations

Handwriting Examination Process Map

A process map is a workflow diagram that shows how a process or system operates. It is an essential element in identifying improvement opportunities. One of the first exercises that the Working Group undertook was to develop a process map for forensic handwriting examination. This resulting process map (See [1], Figure 1.1) describes the sequence of activities and decisions and the relationships among these decisions. The process map reflects the (then) current practice of Forensic Document Examiners (FDEs)¹ in the United States.

The main stages in the process map (see section 1.2 of the HFHE Report for more detail) are:

- **Case acceptance:** Determining whether the documents are suitable for examination and the examination request can be met.
- **Questioned writing pre-analysis:** Determining if the available questioned

documents are each of adequate quality and quantity for a meaningful examination.

- **Questioned writing analysis:** Analyzing the features of the questioned writing both macroscopically and microscopically.
- **Known writing pre-analysis:** Determining if each of the available known samples of handwriting are of adequate quality and quantity for a meaningful examination.
- **Known writing analysis:** Analyzing the features of the known standards both macroscopically and microscopically.
- **Comparison of questioned and known samples:** Comparing the observed features between two or more writing samples to determine similarities and dissimilarities.
- **Evaluation:** Considering the degree of similarity or otherwise and the nature of the writing (quality, amount, and complexity), evaluating the evidence, and arriving at an opinion regarding the writership of the questioned writing. (See also [3])
- **Case review/finalization of report:** Reviewing the case file and report according to laboratory policy.

The steps outlined in the process map are typical of a routine handwriting examination case and are presented in a linear fashion; however, in practice, the sequence of steps may vary, and several steps or examinations may be conducted in parallel. Additional steps may be necessary in some cases.

Recommendations

Chapter 7 of the HFHE Report [1] lists the recommendations that are made throughout the report. The recommendation number corresponds with which chapter and order it can be found in the report; for example, Recommendation 2.1 is the first

recommendation in Chapter 2 of the report. Although these recommendations are designed to stand alone, it is beneficial to read them in context with the text associated with them in the corresponding chapters of the report.

List of all the Working Group's Recommendations.

Recommendation 2.1:

The research community, in collaboration with forensic document examiners, should conduct research to study

- The impact of various sources of contextual information on forensic handwriting examinations, and
- How to balance the risks of bias and information loss with respect to all levels of contextual information.

Recommendation 2.2:

Forensic document examiner laboratories performing handwriting examinations must use a contextual information management protocol, which must be documented within their quality management system.

Recommendation 2.3:

Forensic document examiners must not report or testify, directly or by implication, that questioned handwriting has been written by an individual (to the exclusion of all others).

Recommendation 2.4:

Forensic document examiners should collaborate with researchers to design and participate in “black box” and “white box” studies.

Recommendation 2.5:

A forensic handwriting examination should be based on at least two mutually exclusive propositions relevant to the examination(s) requested. These propositions should be explicitly considered in the

interpretation of the handwriting evidence and included in the conclusion, report, and testimony.

Recommendation 2.6:

The forensic document examiner community should consider the claims made by forensic document examiners and then conduct empirical studies in collaboration with the research community to characterize the extent of scientific support for those claims.

Recommendation 2.7:

The forensic document examiner community, in collaboration with researchers, should design and construct publicly available, large databases of representative handwriting features to facilitate research in and improve the accuracy of handwriting examination.

Recommendation 2.8:

The forensic document examiner community should collaborate with the computer science and engineering communities to develop and validate applicable, user-friendly automated systems.

Recommendation 3.1:

Whenever a handwriting examination is conducted, forensic document examiners should prepare reports as described in Recommendation 3.2, unless exempt by documented laboratory policy.

Recommendation 3.2:

At a minimum, the forensic document examiner must include all the information listed below in the case record. Written reports must accurately and clearly detail all relevant aspects of analyses and comparisons. Unless this information is readily accessible by another mode (e.g., case record or report appendices), the written report should include

1. Demographics: Submitter, forensic document examiner(s), laboratory, case identifier(s), or other information dictated by the laboratory.

2. Request for examination: What is being requested for each document.
3. Inventory of evidence: A listing or description of what documents are being submitted, their condition, and unambiguous identification of the items.
4. The curriculum vitae for each forensic document examiner.
5. A statement of case-related background information provided to the forensic document examiner(s).
6. A statement of propositions used in the evaluation of the evidence and a statement that if there are changes to the propositions, the opinion may change.
7. A statement of any assumptions made by the forensic document examiner and the basis for them and a statement that if there are changes in the assumptions, the opinion may change.
8. Methods: A listing of the instruments and methods used in the examination of the evidence, the range of possible conclusions, and a definition of terms.
9. Procedures: Specific step-by-step procedures for the examination of each document or set of documents and any deviations from established test methods.
10. Observations: A description of observed characteristics of each document or each set of documents and other bench notes.
11. Evaluations: The interpretation of the combined observations given each proposition.
12. Conclusions: A complete statement of the conclusions reached based on the observations and evaluations. When associations are made, the significance of the association should be communicated clearly and qualified properly. When exclusions are made, they shall be clearly communicated. When no conclusions are made, the reasons must be clearly stated.
13. Limitations: A statement of the limitations of the examination and the procedures.
14. Error rates: A statement of potential sources of error and, if available, relevant rates of error; if no relevant error rate is known by the laboratory, that fact should be disclosed.
15. Data: Charts, graphs, diagrams, or other data generated by the examination of the evidence as necessary for the proper understanding of the report.
16. Review of conclusions: If a review of conclusions occurred, whether a disagreement existed between the forensic document examiner and the reviewer.
17. Other statements required by the accreditation body or the laboratory.

Recommendation 3.3:

The forensic document examiner who conducts the examination and writes the report should be the one to testify in any proceeding.

Recommendation 3.4:

Forensic document examiners must testify in a nonpartisan manner; answer questions from all counsel and the court directly, accurately, and

fully; and provide appropriate information before, during, and after trial. All opinions must include an explanation of any data or information relied upon to form the opinion.

Recommendation 3.5:

In testimony, a forensic document examiner must be prepared to describe the steps taken during the examination to reduce the risk of process, observational, and cognitive errors. The forensic document examiner must not state that errors are impossible.

Recommendation 3.6:

Forensic document examiners must have a functional knowledge of the underlying scientific principles and research regarding handwriting examination, as well as reported error rates or other measures of performance, and be prepared to describe these in their testimony.

Recommendation 3.7:

Demonstrative visual aids, when used, must be consistent with the report and anticipated verbal testimony. Aids must accurately represent the evidence, including both similarities and dissimilarities found in samples, and be prepared and presented in a manner that does not misrepresent, bias, or skew the information.

Recommendation 4.1a:

Forensic document examiner laboratories should be accredited to the current ISO/IEC 17025 standard by a recognized accrediting body.

4.1b:

In recognition of the practical constraints for sole practitioner laboratories to obtain accreditation, these laboratories should work toward meeting the requirements set forth in the current ISO/IEC 17025 standard and should become accredited when legitimate constraints are addressed.

Recommendation 4.2:

All forensic document examiner laboratories, whether accredited or not, must have a quality

assurance and quality control system. This system should preferably align with the requirements of an international laboratory accreditation body.

Recommendation 4.3:

The forensic document examiner community should collaborate with the research community and accreditation bodies to conduct and participate in studies to determine the optimal content and frequency of proficiency tests to properly evaluate forensic document examiners' ability to perform the range of tasks encountered in casework.

Recommendation 4.4:

The forensic document examiner community should develop collaborative testing programs aimed at monitoring and providing performance improvement opportunities related to specific claims and sub-claims. The type, content, and frequency of these collaborative tests should be determined in consultation with the research community.

Recommendation 4.5:

The forensic document examiner community should develop a framework for feedback-driven training, testing, and development based on ground-truth-known material.

Recommendation 4.6:

Quality control procedures should include tracking of inconclusive and insufficient opinions. Test material should include these opinion categories.

Recommendation 5.1:

To improve training, forensic document examiner professional organizations and practitioners should pursue both private and government funding like scholarships, grants, or loans to offset training costs.

Recommendation 5.2:

Academia and professional forensic document examiner organizations should collaborate to develop trainer-skill workshops and classes.

Recommendation 5.3:

The forensic document examiner community should develop a modular training program that

consists of a publicly available standardized curriculum, as well as training and testing material.

Recommendation 5.4:

All forensic document examiners conducting handwriting examinations should be certified by a certifying body accredited to ISO/IEC 17024.

Recommendation 5.5:

Bar associations, judges' groups, and professional forensic document examiner organizations should collaborate to strengthen communication between the judiciary and forensic science communities for mutual benefit.

Recommendation 6.1:

Management should dedicate appropriate resources to meet accreditation and certification requirements.

Recommendation 6.2:

Management must ensure appropriate resources are available and used for any initial, remedial, and ongoing competency training, including selection of qualified, effective trainers.

Recommendation 6.3:

To provide the forensic document examiner with the best opportunity to make an appropriate examination, management must consider ergonomics of the work environment, including the influence of good lighting, sufficient workspace, and sufficient equipment.

Recommendation 6.4:

Management should foster a culture in which it is understood that some human and system error is inevitable and that openness about errors will lead to improvements in practice.

Discussion

At the time of publication, the HFHE Report presented the current state of forensic handwriting examination as described by various experts in the United States and internationally.

The Working Group welcomes feedback on the Report and invites the document examination, and wider forensic science, community to contact the authors with questions and queries.

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