The E-Discovery Games:
A Closer Look at Technology Assisted Document Review

David D. Lewis, Ph.D., Information Retrieval Consultant
Kara M. Kirkeby, Esq., Document Review Manager, Kroll Ontrack

Kroll Ontrack.

Dave Lewis, Ph.D.

- President, David D. Lewis Consulting
- Co-founder TREC Legal Track
- Testifying expert in *Kleen Products, LLC, et al. v. Packaging Corp. of America, et al*
- Fellow of the American Association for the Advancement of Science
- 75+ publications; 8 patents in:
  - e-discovery
  - information retrieval
  - machine learning
  - natural language processing
  - applied statistics
- Past research positions: University of Chicago, Bell Labs, AT&T Labs
- http://www.DavidDLewis.com

Kroll Ontrack.

Kara M. Kirkeby, Esq.

- Manager of Document Review Services for Kroll Ontrack

- Previously managed document reviews on complex matters for a large law firm

- Member: Minnesota State Bar Association (Civil Litigation Section), the Hennepin County Bar Association, the American Bar Association, Minnesota Women Lawyers (Communications Committee)

- Served as a judicial law clerk for Hon. Karen Klein, Magistrate judge of the U.S. District Court of North Dakota

- J.D., magna cum laude, Hamline University School of Law

- E-mail: kkirkeby@krollontrack.com

Kroll Ontrack.

Discussion Overview

- What is Technology Assisted Review (TAR)?
- Document Evaluation
- Putting TAR into Practice
- Conclusion

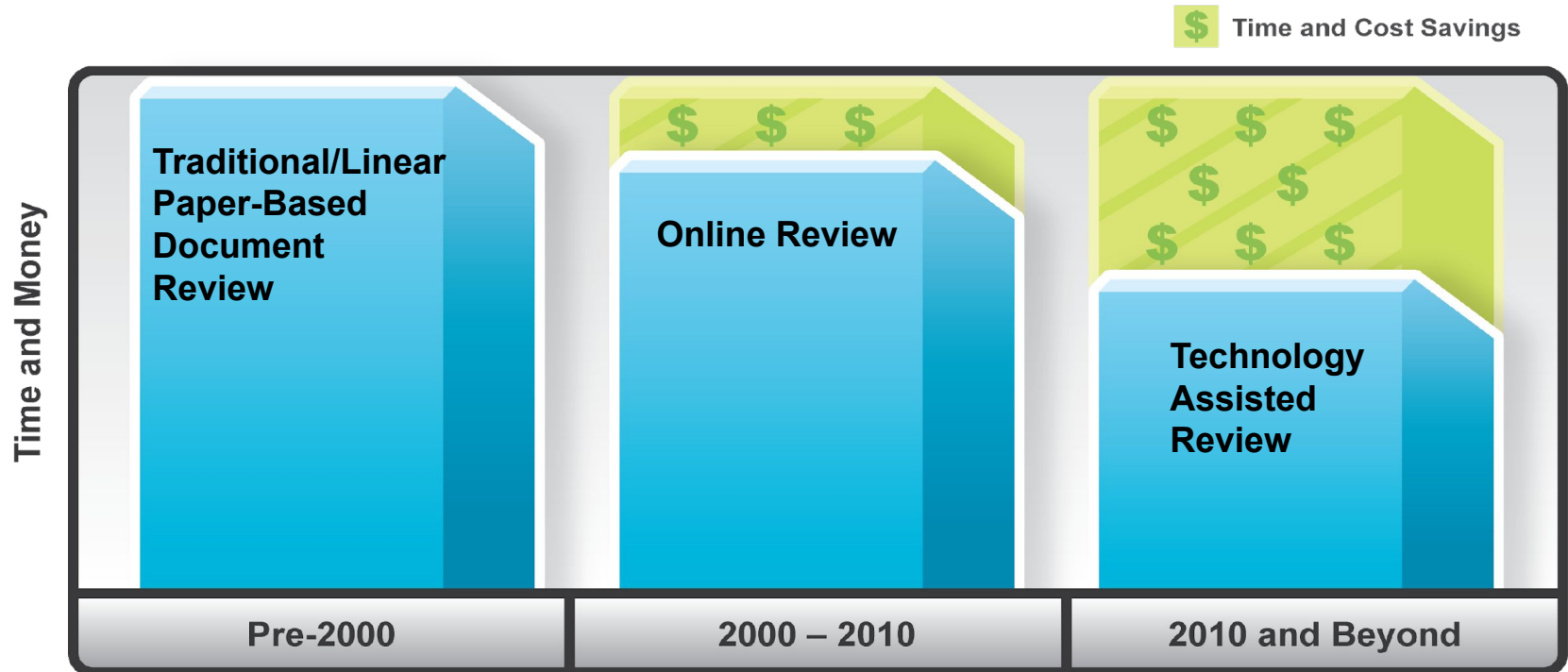**Kroll Ontrack.**

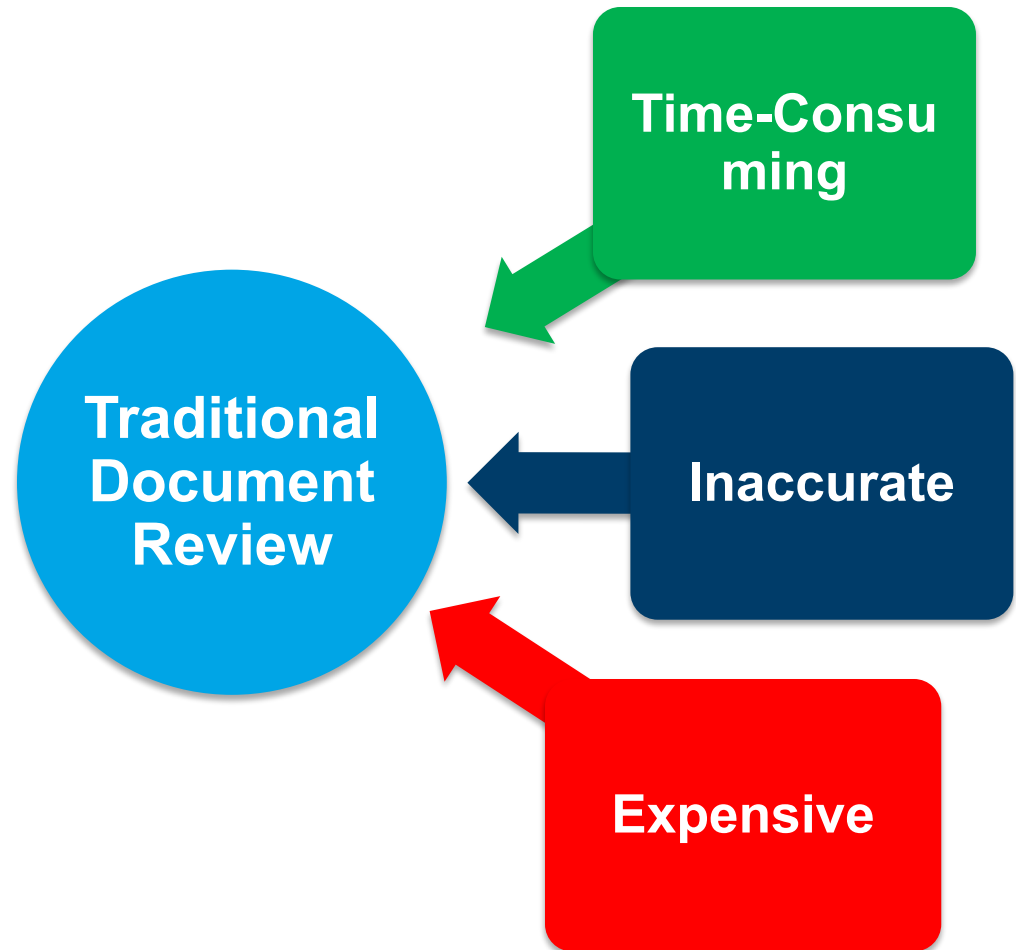# What is Technology Assisted Review?

Kroll Ontrack.

Why Discuss Alternative Document Review Solutions?

Document review is routinely the most expensive part of the discovery process. Saving time and reducing costs will result in satisfied clients.

$ Time and Cost Savings

Time and Money

Traditional/Linear Paper-Based Document Review

Online Review

Technology Assisted Review

Pre-2000 | 2000 – 2010 | 2010 and Beyond

Kroll Ontrack.

Why Discuss Alternative Document Review Solutions?

- **Conducting a traditional linear document review is not particularly efficient anymore**

- Focus instead on a relevance driven review process involving lawyers and technology working together

Time-Consuming

Traditional Document Review

Inaccurate

Expensive

Kroll Ontrack.

What Is Technology Assisted Review (TAR)?

Three major technologies:

✔ Supervised learning from manual coding

✔ Sampling and statistical quality control

✔ Workflow to route documents, capture manual decisions, and tie it all together in a unified process

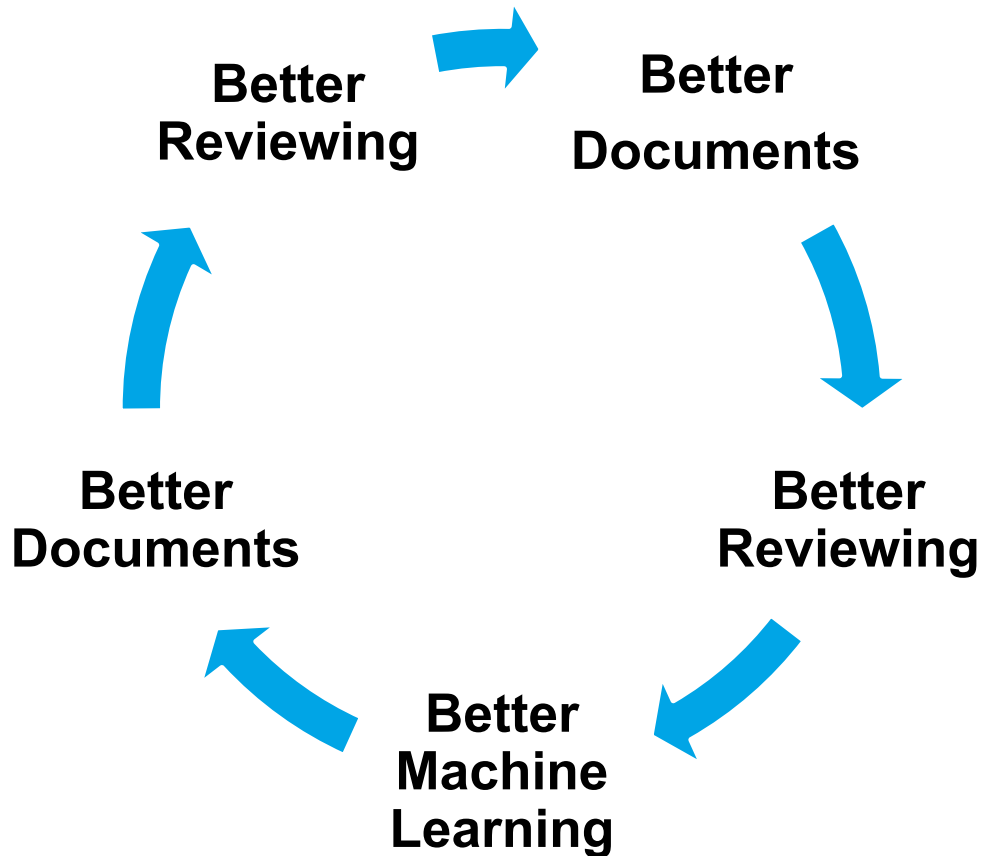|		True	
		X	Y
Predicted	X	a	b
	Y	c	d

recall: 85% +/- 4%

precision: 75% +/- 3%

Presented by Dave Lewis

Kroll Ontrack.

Supervised Learning: The Backbone of TAR

By iterating supervised learning, you target documents most likely to be relevant or on topic, creating a virtuous cycle:

Better Reviewing → **Better Documents** → **Better Reviewing** → **Better Machine Learning** → **Better Documents** → **Better Reviewing**

Kroll Ontrack.

Supervised Learning: The Backbone of TAR

- Software learns to imitate human actions
- For e-discovery, this means learning of *classifiers* by imitating human coding of documents
- Any content-based sorting into classes can be imitated
  - Responsive vs. Non-responsive
  - Privileged vs. Non-privileged
  - Topic A vs. Topic B vs. Topic C
- Widely used outside e-discovery:
  - Spam filtering
  - Computational advertising
  - Data mining

Kroll Ontrack.

Research & Development: TREC Legal Track

- *Text REtrieval Conference* ("TREC"), hosted by *National Institute of Standards and Technology* ("NIST") since 1992
  - Evaluations open to academics and industry

- TREC Legal Track (since 2006) provides simulated review for responsiveness task

- Focus is on comparing technology assisted approaches
  - Not a human vs. machine bakeoff
  - Not a product benchmark

- However, results suggest advantages to technology assisted review

Kroll Ontrack.

Research & Development: TREC Legal Track

1. **High effectiveness of TAR runs**
   o Best T-A runs in TREC 2009 examined 0.5% to 4.1% of collection while finding an estimated 76.7% of responsive documents with 84.7% precision

   Text REtrieval Conference (TREC)
   ...to encourage research in information retrieval from large text collections.

2. **Low effectiveness of manual review**
   o Substantial effort needed by TREC organizers to clean up manual review to point it can be used as gold standard
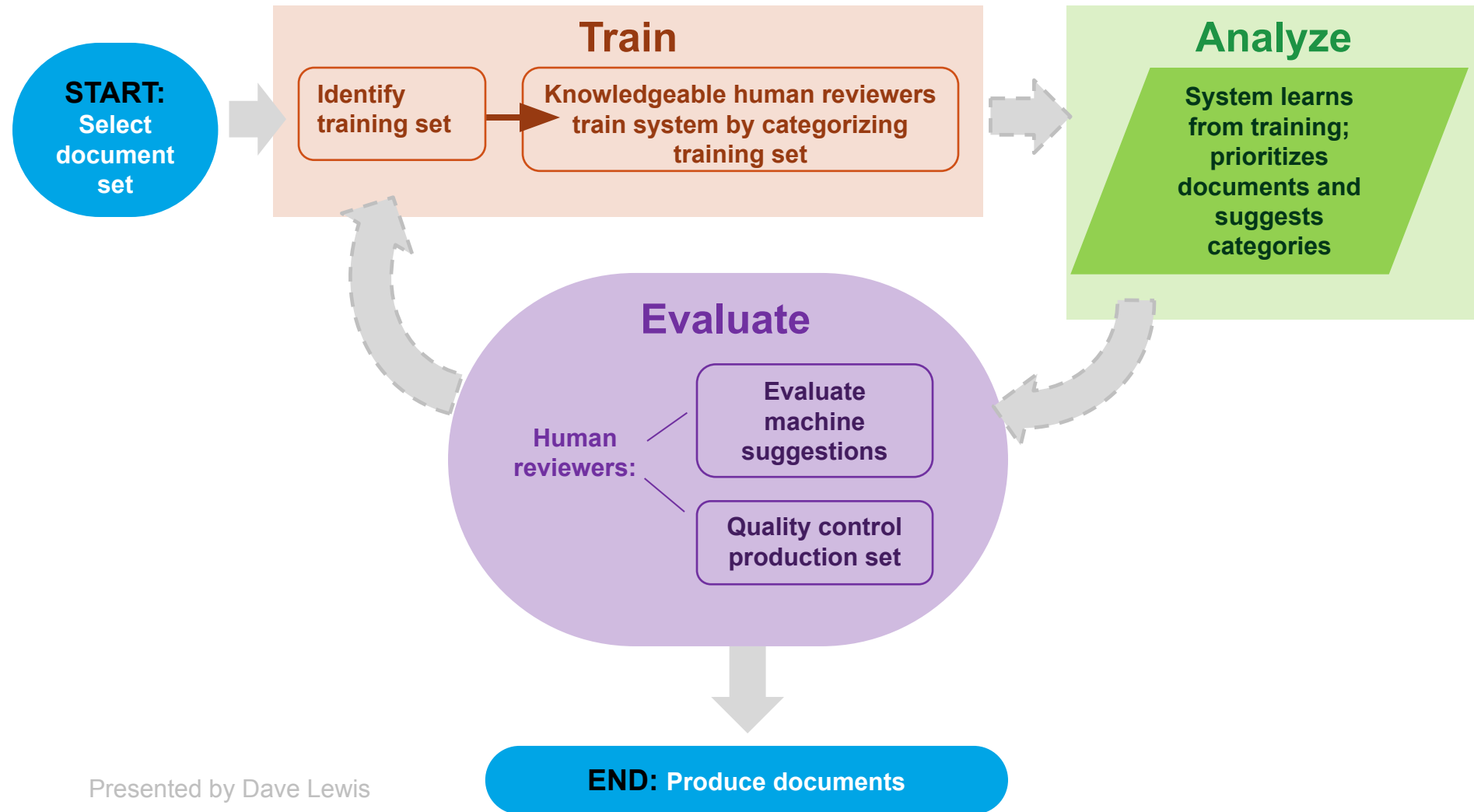
3. An argument can be made (Grossman & Cormack, 2011) that 2009 data shows **TAR results better than pre-cleanup manual review**

Kroll Ontrack.

What is Technology Assisted Review?

START: Select document set

Train

Identify training set → Knowledgeable human reviewers train system by categorizing training set

Analyze

System learns from training; prioritizes documents and suggests categories

Evaluate

Human reviewers:
- Evaluate machine suggestions
- Quality control production set

END: Produce documents

Presented by Dave Lewis

Kroll Ontrack.

Learning and Classification

```
SELECT
  various docs for training
  random docs for QC
  priority docs for review
         |
         v
  manual review  <----
    |    |    |
    v    |    |
  train classifiers
    |    |    |
    v    |    |
  auto-code documents  -->  compare coding with elite coding on random sample
                                    |
                                    v
                            estimate effectiveness for entire set
                                    |
                                    v
  NO  <---  good enough to produce?  --- YES -->  review for privilege  -->  PRODUCTION
```
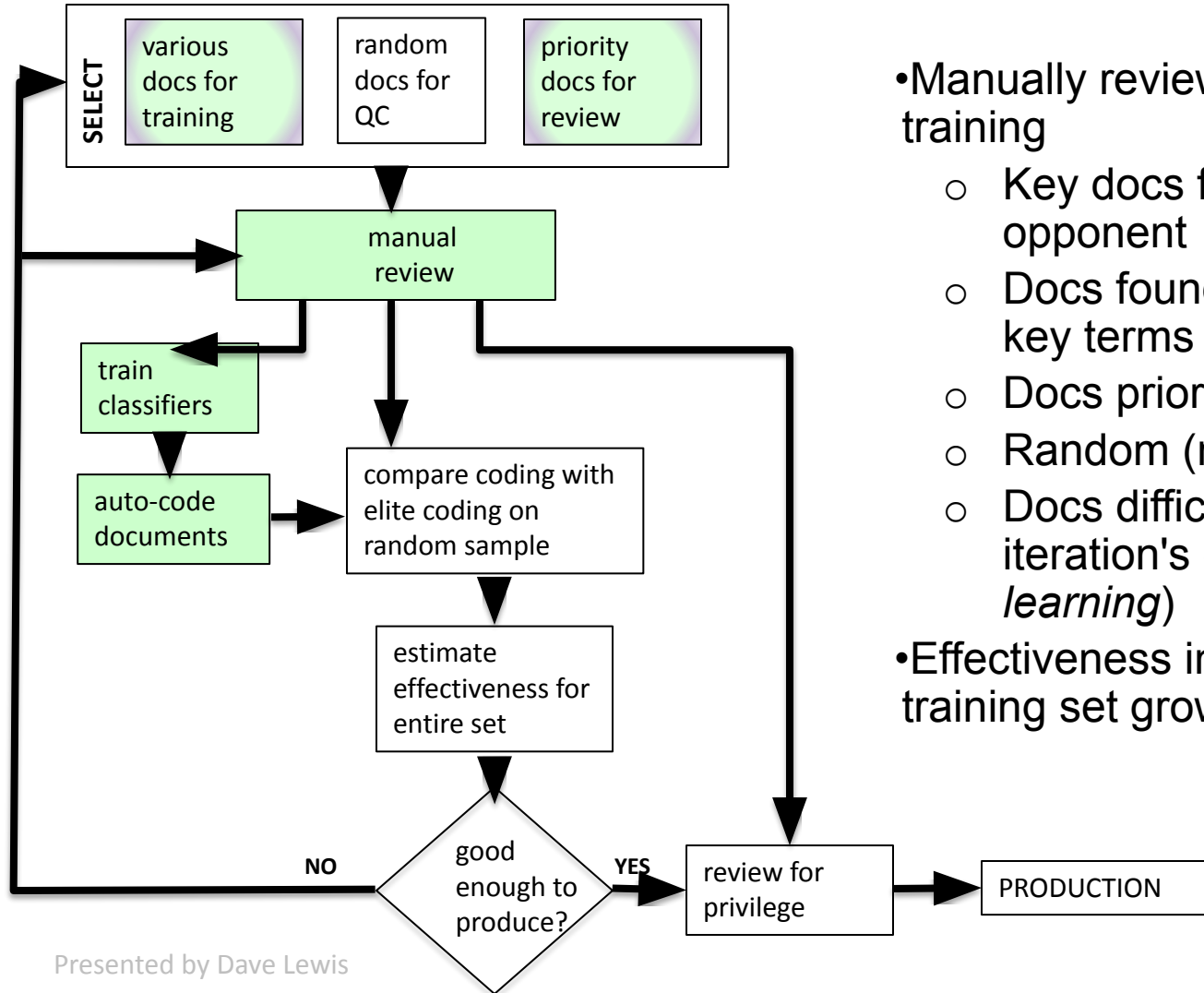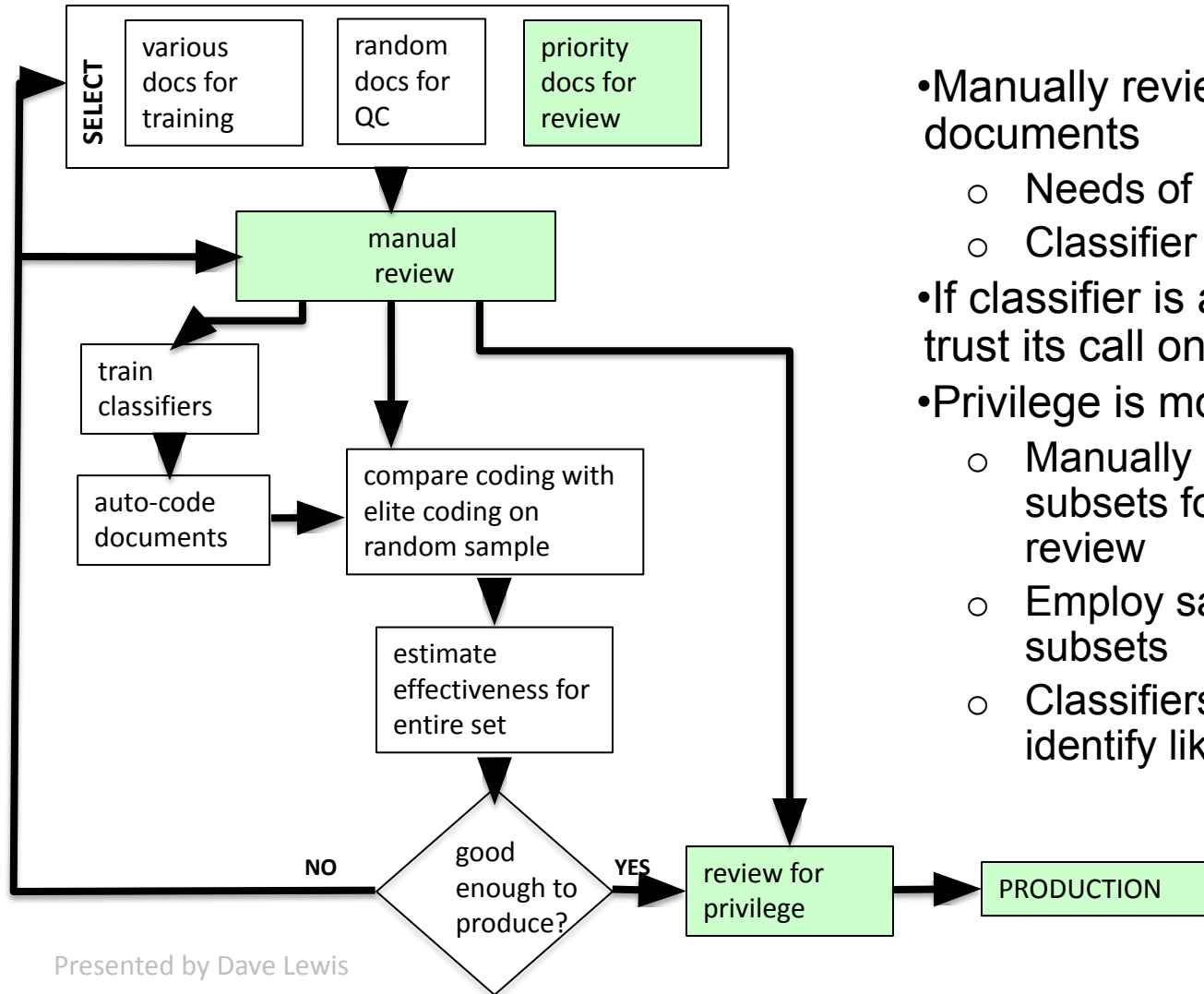
- Manually review documents for training
  - Key docs from your side or opponent
  - Docs found by searches on key terms
  - Docs prioritized for review
  - Random (non-QC) docs
  - Docs difficult for previous iteration's classifier (*active learning*)
- Effectiveness increases as training set grows

Presented by Dave Lewis

Kroll Ontrack.

Production

- Manually review prioritized documents
  - Needs of case
  - Classifier predictions
- If classifier is accurate enough, trust its call on responsiveness?
- Privilege is more sensitive
  - Manually select some subsets for 100% privilege review
  - Employ sampling for other subsets
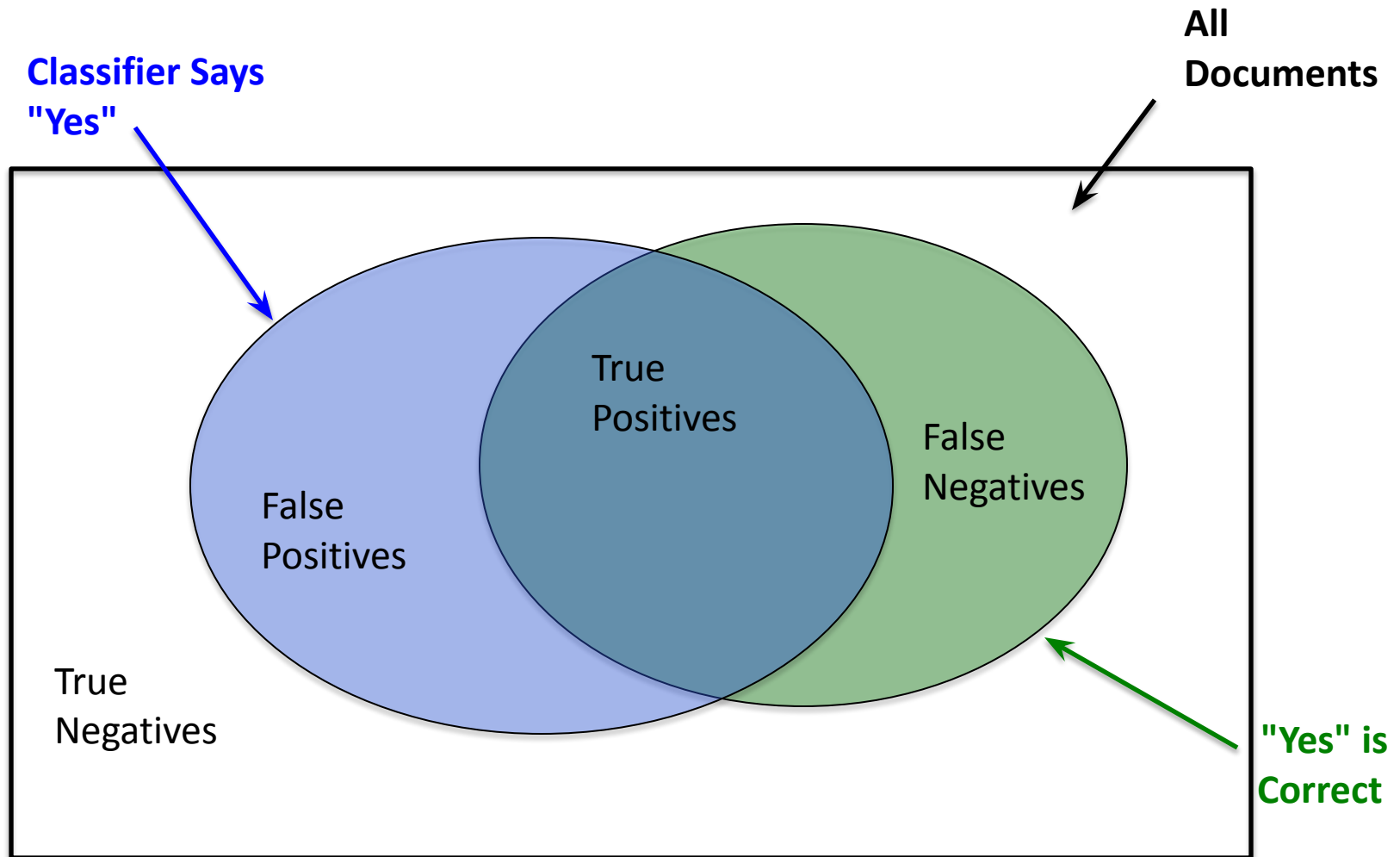 - Classifiers can also help identify likely privileged docs

Kroll Ontrack.

Classification Effectiveness

"Truth"

		Yes	No
Pre dic tio n	Yes	*TP (true positives)*	*FP (false positives)*
	No	*FN (false negatives)*	*TN (true negatives)*

- *Any* binary classification can be summarized in a 2x2 table
  - Linear review, automated classifier, machine-assisted...
  - Responsive v. non-responsive, privileged v. non-privileged...
- Test on sample of *n* documents for which we know answer
  - TP + FP + FN + TN = *n*

Kroll Ontrack.

Classification Effectiveness

Classifier Says "Yes"

All Documents

True Positives

False Positives

False Negatives

True Negatives

"Yes" is Correct

Presented by Dave Lewis

Kroll Ontrack.

Classification Effectiveness

		"Truth"	
		Yes	*No*
Prediction	*Yes*	*TP (true positives)*	*FP (false positives)*
	No	*FN (false negatives)*	*TN (true negatives)*

- Recall = TP / (TP+FN)
    - o Proportion of interesting stuff that the classifier actually found
- High recall of interest to both producing and receiving party

Kroll Ontrack.

Classification Effectiveness

"Truth"

		Yes	No
Pre dic tio n	**Yes**	TP (true positives)	FP (false positives)
	No	FN (false negatives)	TN (true negatives)

- Precision = TP / (TP+FP)
  - Proportion of stuff found that was actually interesting
- High precision of particular interest to producing party: cost reduction!

Kroll Ontrack.

Research & Development: Blair & Maron

Seminal 1985 study by Blair & Maron

- Review for documents relevant to 51 requests related to BART crash

- Boolean queries used to select documents for review

  - Process iterated until reviewer satisfied 75% of responsive documents found

- Sampling showed recall of *less than 20%*

- B&M has been used to argue for everything from exhaustive manual review to strong AI

 - Real lesson is about need for sampling!

Kroll Ontrack.

Sampling and Quality Control

- Want to know effectiveness without manually reviewing everything. So:
  - Randomly sample the documents
  - Manually classify the sample
  - *Estimate* effectiveness on full set based on sample
- Type of estimates:
  - *Point estimate*, e.g. F1 is 0.74
  - *Interval estimate*, e.g. F1 in [0.67,0.83] with 95% confidence
- Sampling is well-understood
  - Common in expert testimony in range of disciplines

Presented by Dave Lewis

Kroll Ontrack.
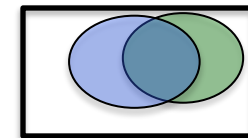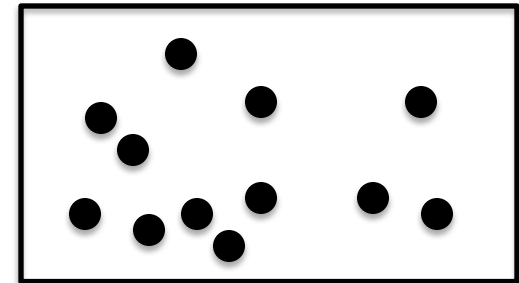
Sampling and Quality Control
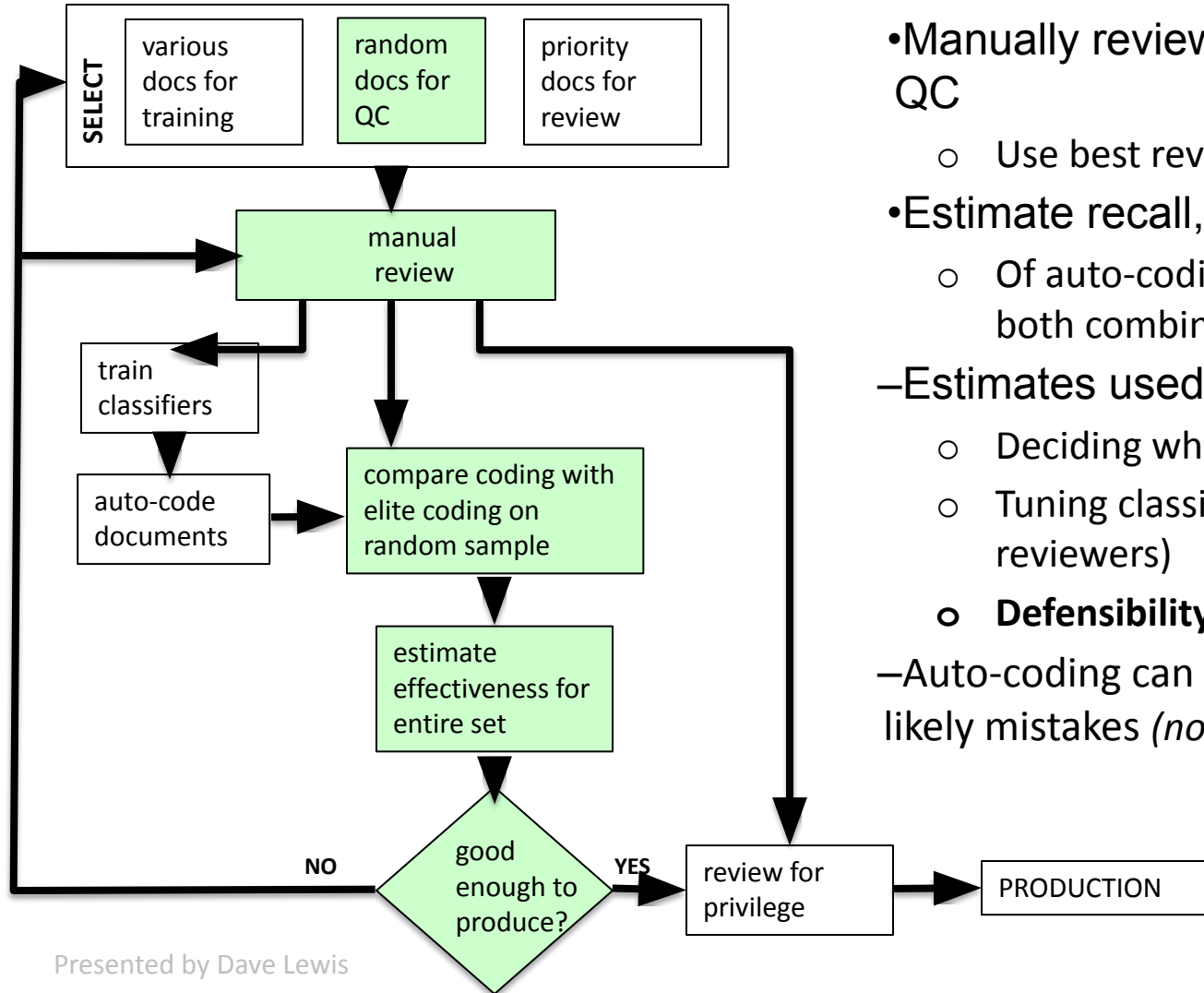
- Manually review random sample for QC
  - Use best reviewers here
- Estimate recall, precision, etc.
  - Of auto-coding, manual review, or both combined
- Estimates used in:
  - Deciding when finished
  - Tuning classifiers (and managing reviewers)
  - **Defensibility**
- Auto-coding can also be used to find likely mistakes *(not shown)*

Presented by Dave Lewis

Kroll Ontrack.

Putting TAR into Practice

Kroll Ontrack®

Barriers to Widespread Adoption

- **Industry-wide concern: Is it *defensible*?**

- **Concern arises from misconceptions about how the technology works in practice**

  - » Belief that technology is devoid of any human interaction or oversight

  - » Confusing "smart" technologies with older technologies such as concept clustering or topic grouping

  - » Limited understanding of underlying "black box" technology

- **Largest barrier: Uncertainty over judicial acceptance of this approach**

  - » Limited commentary from the bench in the form of a court opinion

  - » Fear of being the judiciary's "guinea pig"

Kroll Ontrack.

Developing TAR Case Law

- **_Da Silva Moore v. Publicis Groupe_**
  - » Class-action suit: parties agreed on a protocol signed by the court
  - » Peck ordered more seeding reviews between the parties
  - » "Counsel no longer have to worry about being the first 'guinea pig' for judicial acceptance of computer-assisted review … [TAR] can now be considered judicially approved for use in appropriate cases."

- **Approximately 2 weeks after Peck's _Da Silva Moore_ opinion,** District Court Judge Andrew L. Carter granted plaintiff opportunity to submit supplemental objections
  - » Plaintiff later sought to recuse Judge Peck from the case

- **Stay tuned for more….**

Kroll Ontrack.

Developing TAR Case Law

- ***Kleen Products v. Packaging Corporation of America***

  » Defendants had completed 99% of review, Plaintiffs argue that they should use Predictive Coding and start document review over

  » Not clear whether Defendants did more than keyword search

- **Other notable points from *Kleen Products***

  » Defendants assert they were testing their keyword search queries, not just guessing

    – Argue they did not use Predictive Coding because it did not exist yet

- **Stay tuned for more….**

Technology Assisted Review: What It *Will Not* Do

- **Will not** replace or mimic the nuanced expert judgment of experienced attorneys with advanced knowledge of the case

- **Will not** eliminate the need to perform validation and QC steps to ensure accuracy

- **Will not** provide a magic button that will totally automate document review as we know it today

Kroll Ontrack.

Technology Assisted Review: What It *Can* Do

- **Reduce:**

  - » Time required for document review and administration

  - » Number of documents to review; if you choose an automated categorization or prioritization function

  - » Reliance on contract reviewers or less experienced attorneys

- **Leverage** expertise of experienced attorneys

- **Increase** accuracy and consistency of category decisions (vs. unaided human review)

- **Identify** the most important documents more quickly

Kroll Ontrack.

TAR Accuracy

- TAR must be as accurate as a traditional review
- Studies show that computer-aided review is as effective as a manual review (if not more so)
- **Remember:** Court standard is *reasonableness*, not perfection:
    - "[T]he idea is not to make it perfect, it's not going to be perfect. The idea is to make it significantly better than the alternative without as much cost."

-U.S. Magistrate Judge Andrew Peck in *Da Silva Moore*

Kroll Ontrack.

What is Intelligent Review Technology (IRT) by Kroll Ontrack?

Augments the human-intensive document review process to conduct faster and cheaper discovery

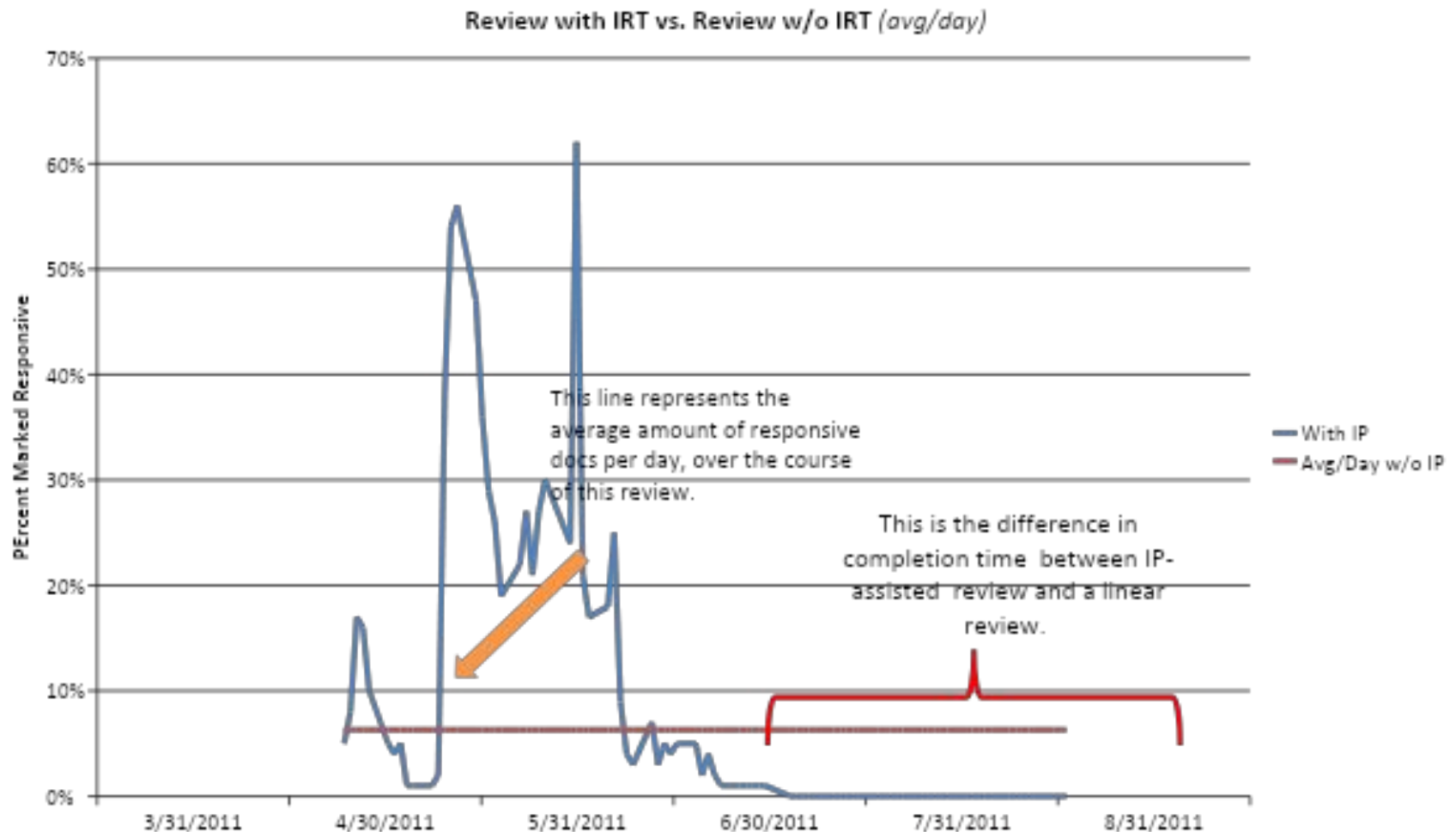**Intelligent Categorization**

Intelligent Prioritization

Automated Workflow

=

Reviewing Efficiently, Defensibly & Accurately

Kroll Ontrack®

Successes in the Field: Kroll Ontrack's IRT

1. **Cut off review** after prioritization of documents showed marginal return of responsive documents for specific number of days

2. **Cut off review** of a custodian when, based on prioritization statistics that showed only non-responsive documents remained

3. Used suggested categorizations to **validate human categorizations**

4. Used suggested categorizations to **segregate documents as non-responsive** at >75% confidence level. After sampling that set, customer found less than .5% were actually responsive (and only marginally so). Review was cut off for that set of documents

5. Used suggested categorizations to **segregate categories suggested as privilege and responsive** at >80% confidence. Sampled, mass categorized

6. Use suggested categorizations to **mass categorize documents** and move them to the QC stage, by-passing first-level review

7. Used suggested categorizations to **find documents on a new issue** category when review was nearing completion

Kroll Ontrack.

Successes in the Field: Kroll Ontrack's IRT

Review with IRT vs. Review w/o IRT *(avg/day)*

This line represents the average amount of responsive docs per day, over the course of this review.

This is the difference in completion time between IP-assisted review and a linear review.

— With IP
— Avg/Day w/o IP

Kroll Ontrack.

Conclusion

Kroll Ontrack®

Parting Thoughts

- **Automated review technology helps lawyers focus on resolution – not discovery – through available metrics**

  » Complements human review, but **will not replace the need for skillful human analysis and advocacy**

- We are on the cusp of full-bore judicial discussion of Automated Review Technologies

  » Closely monitor judicial opinions for breakthroughs

  » Follow existing best practices for reasonableness and defensibility

- Not all Technology Assisted Review solutions are created equal

  » Thoroughly vet the technology before adopting

Kroll Ontrack

Q & A

Kroll Ontrack®