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DRAAN Talk:
DigAudit Research
Eilifsen & Kinserdal

Biographies

Aasmund Eilifsen is professor in auditing at the Department of Accounting, Auditing, and Law, Norwegian School of Economics (NHH). He is the research leader of the Digital Audit Research Project at NHH funded by the Research Council of Norway.

His principal research interests are audit quality, auditor judgments, materiality decisions, and audit digitalization.

Eilifsen has published more than 20 articles in refereed journals, including in *Accounting, Organization and Society, Contemporary Accounting Research, Auditing: A Journal of Practice & Theory, European Accounting Review, Behavioral Research in Accounting, Accounting Horizons, Journal of Accounting Literature*, and *International Journal of Auditing* and serves at several editorial boards and scientific committees.

Finn Kinserdal is associate professor in accounting and head of the Department of Accounting, Auditing and Law at the Norwegian School of Economics (NHH). He is in the leader group of the Digital Audit Research Project at NHH funded by the Research Council of Norway and responsible for the NHH master course in digital auditing. His research interests include financial statement analysis and earnings management, and data analytics in the audit profession.

Before joining NHH, Kinserdal had a career as consultant in McKinsey and partner in Arthur Andersen and Ernst & Young (EY), including heading EY's auditing practice in Norway.

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DigAudit: The Digital Transformation of the Audit Process

by
Aasmund Eilifsen and Finn Kinserdal,
Norwegian School of Economics (NHH)

ABSTRACT

The DRAAN Talk will present:
(1) The Digital Audit Research Project (DigAudit) at Norwegian School of Economics (NHH)
(2) Data analytics in the education of auditors at NHH
(3) Research by the DigAudit team

The principal focus will be on the *research agenda*,
including presentation of the recent published article in *Accounting Horizons* 'An Exploratory Study into the Use of Audit Data Analytics on Audit Engagements',
and *highlights* from other DigAudit team's research covering a range of issues related to the benefits and obstacles of the ongoing digital transformation of the audit process.

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Background NHH DigAudit project

Our reasoning behind focusing on digital transformation of the audit process

1. The dramatic increase in *accessible data* and a*dvances in technology* now enable data to be analyzed by a growing set of *affordable* and *more user-friendly* analytical software

2. Expanded data access and data analytics are transforming *global markets and businesses*

3. Technological issues impacting the business environment ultimately affect *accounting and auditing practice*

4. Technological issues impacting accounting and auditing practice ultimately affect *auditing research and education of auditors*

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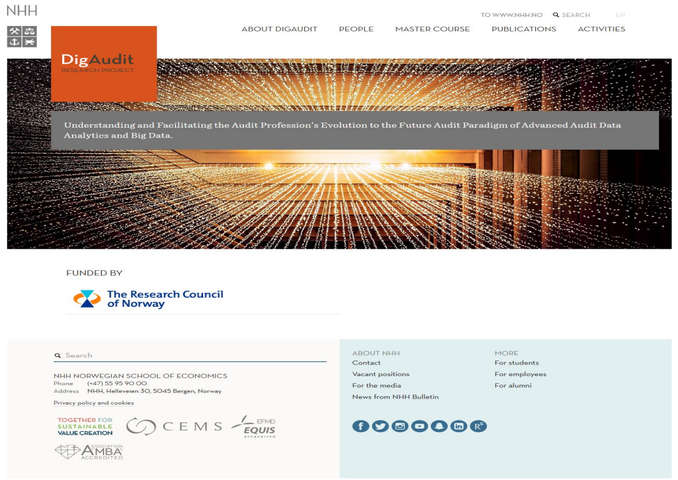
NHH DigAudit Research Project



DigAudit (Digital Audit Research Project) is a five-year NHH research project funded by the Research Council of Norway: https://www.nhh.no/en/research-centres/digaudit/

The DigAudit project is performed by a multidisciplinary team of NHH and international researchers and conducted in close collaboration with the large international accounting firms

Principal Research Topics

- What is the nature and extent of auditors' competence and application of advanced audit data analytics (ADA) using Big Data?
- How can Big Data and ADA be leveraged to improve auditors' judgments and decision-making in the audit process?
- How does digitalization of the audit clients affect internal controls and the audit?
- How are students best trained and prepared for a professional career in a highly digitalized audit environment?

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NHH Master’s in accounting and auditing- Background

NHH has two master’s program

- Economics and business administration
- **Accounting and auditing**

Master’s program in Accounting and auditing

- Two-year full-time program
- Enroll 150+ students each year
- The majority of the students are employed by the (Big4) firms, many enrolled having a master’s degree in economics and business administration
- The exams at NHH qualify for license as state authorized public accountant (Norwegian ‘CPA’) when the practice requirement is met

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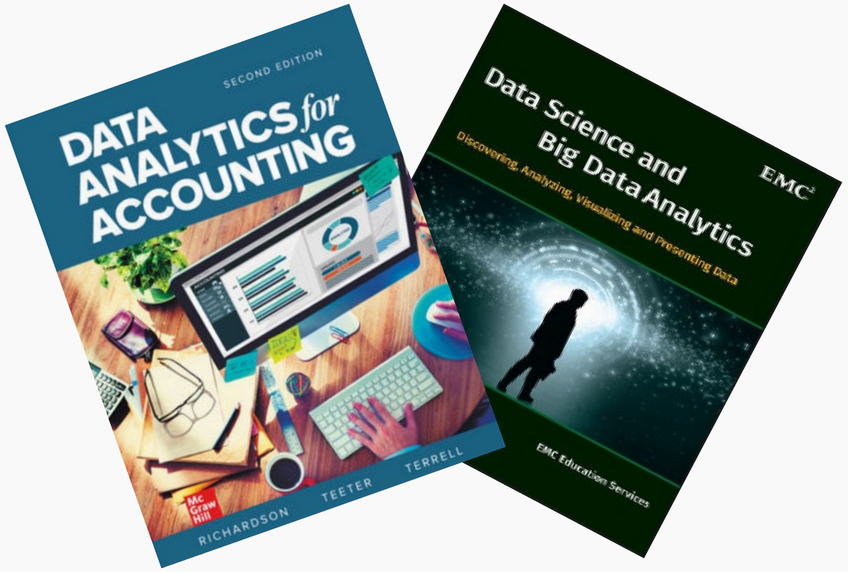
NHH Master Course in Digital auditing (7.5 ECTS Credits)

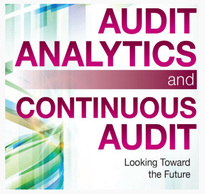
2 hours	4 hours	8 hours	24 hours	12 hours
Intro terminology	Digitalization at the clients	Acquire and clean data	Data analytics for auditors	Audit evidence?
Digitalization IoT Big Data ADA CAAT GAS ..	Current and future Status at the accounting departments • Case: Build a reconsiliation-robot (UiPath) • AI in book-keeping	‘Preprocessing’ •Structured and unstructured data •SQL, SAP connector, Hadoop •Block chain. •ETL-process •Case in cleaning data Consequenses for audit	‘Datamining’ ADA-techniques: •Regression •Clustering •Decision trees •Text-mining •Process mapping •Visualization Cases Tools: Excel, ‘R’, SPSS Tableau Big4 firms demonstrate their tools	How to use it •GAAS vs ADA •Evidence? Case-discussions •Documentation

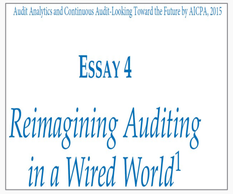
Master’s course: Digital Auditing

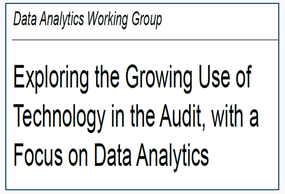
Textbook



Combined with articles







Davern et al, 2019, Technology and the future
Appelbaum, 2017, Big data and analytics in audit
ICAEW: Data analytics for the external auditor
Yoon, Hoogduin, and Zhang, 2016, Big Data as audit evidence

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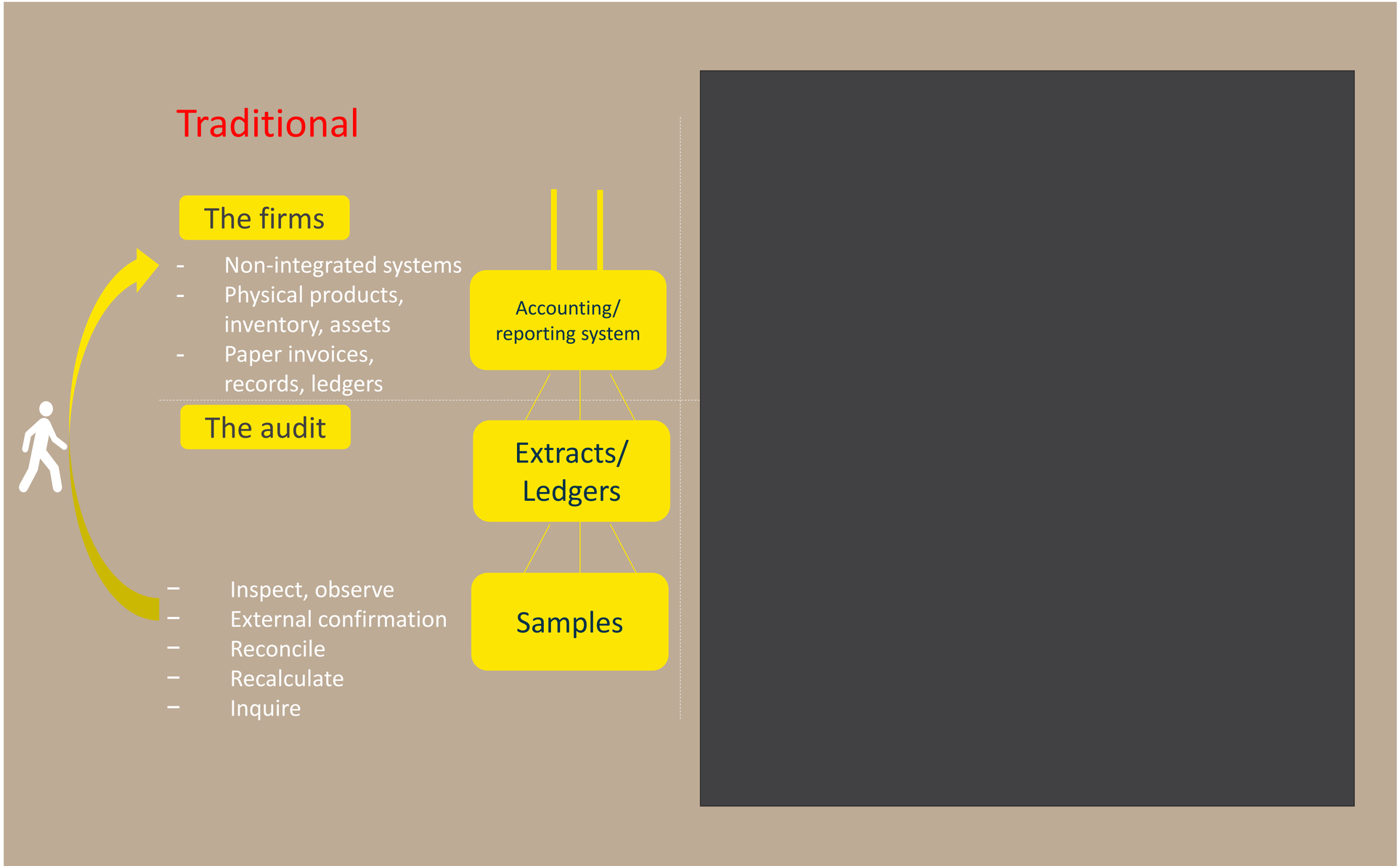
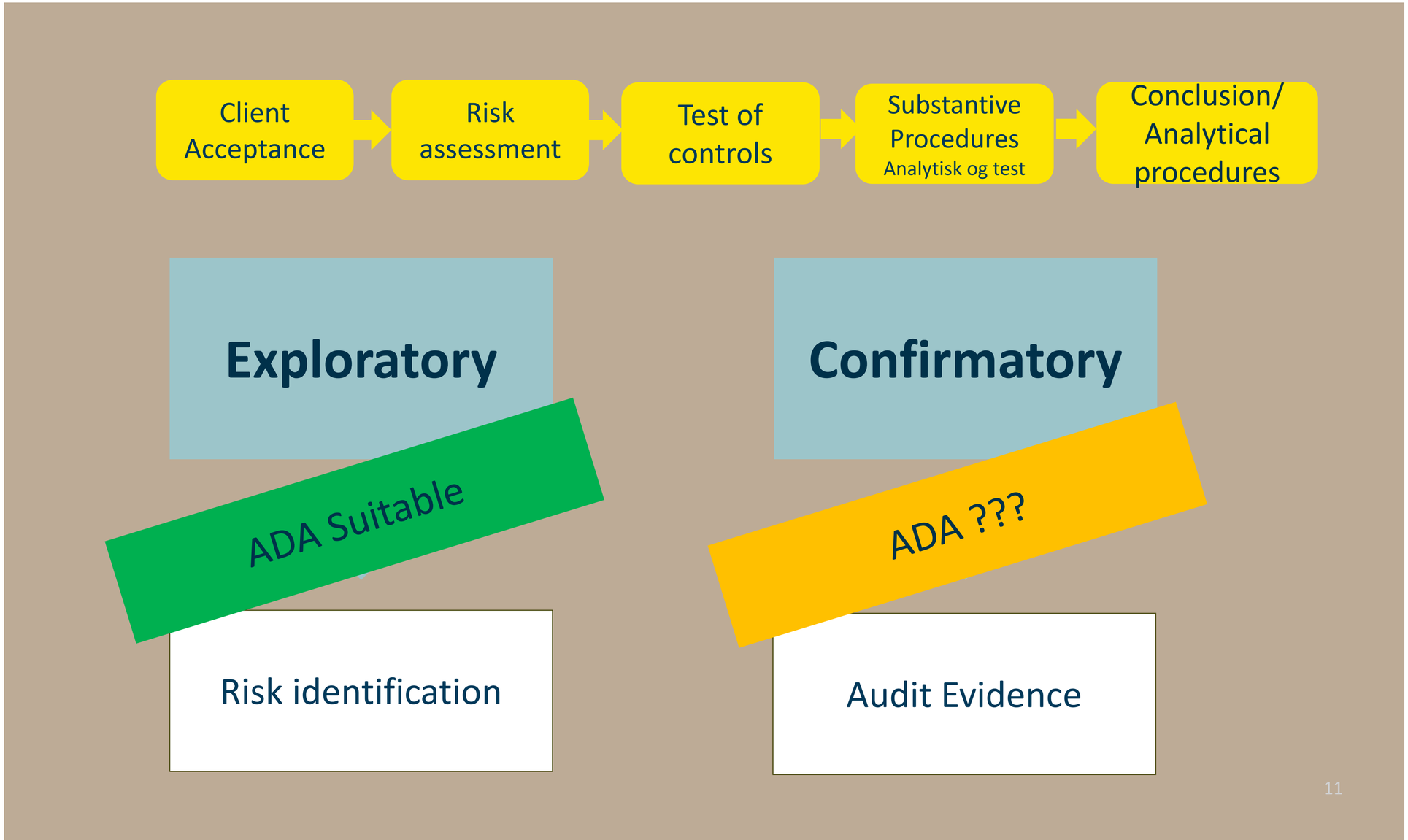
Master’s course: Digital Auditing

Master’s course: Digital Auditing



Master’s course: Digital Auditing



Client Acceptance → Risk assessment → Test of controls → Substantive procedures → Conclusion/ Analytical procedures

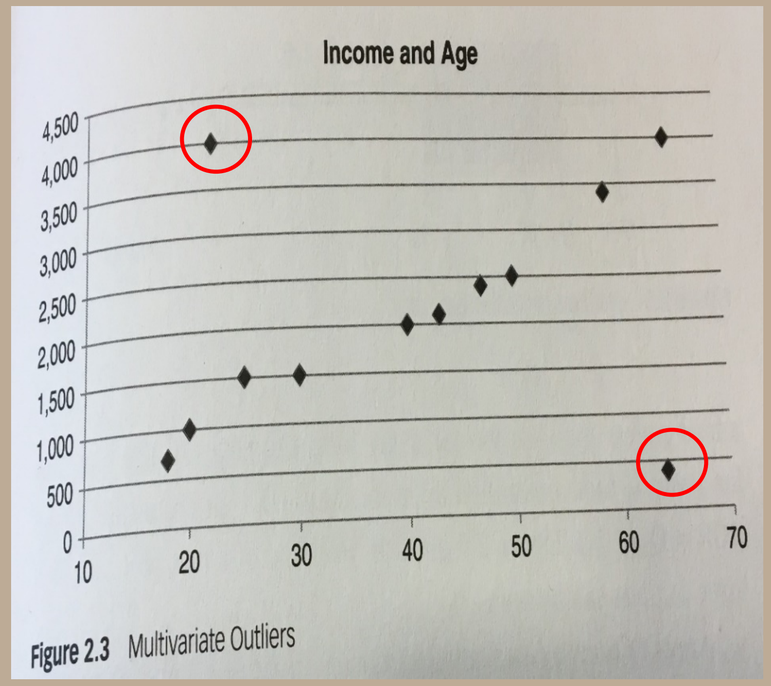
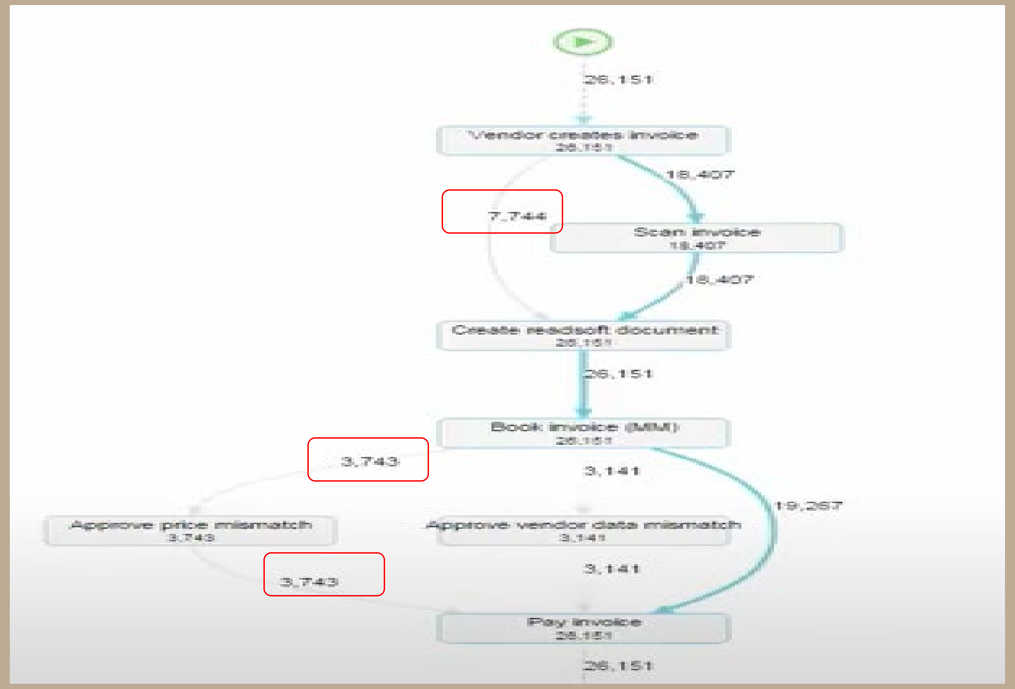


Figure 2.3 Multivariate Outliers

Master’s course: Digital Auditing

Client Acceptance → Risk assessment → Test of controls → Substantive procedures → Conclusion/Analytical procedures

Process mapping



Master’s course: Digital Auditing

Order	Invoice	Bank	Differences
kr 103,00	kr 103,00	kr 103,00	kr -
kr 573,00	kr 573,00	kr 573,00	kr -
kr 998,00	kr 998,00	kr 998,00	kr -
kr 326,00	kr 326,00	kr 326,00	kr -
kr 231,00	kr 231,00	kr 231,00	kr -
kr 664,00	kr 664,00	kr 664,00	kr -
kr 98,00	kr 98,00	kr -	kr (98,00)
kr 3 674,00	kr 3 674,00	kr 3 674,00	kr -
kr 884,00	kr 884,00	kr 884,00	kr -
kr 317,00	kr 317,00	kr 317,00	kr -
kr 883,00	kr 883,00	kr 883,00	kr -
kr 664,00	kr 664,00	kr 664,00	kr -
kr 559,00	kr 559,00	kr 552,00	kr (7,00)
kr 1 122,00	kr 1 122,00	kr 1 122,00	kr -
kr 324,00	kr 324,00	kr 324,00	kr -
kr 745,00	kr 745,00	kr 745,00	kr -
kr 88,00	kr 88,00	kr 88,00	kr -
kr 999,00	kr 1 999,00	kr 1 999,00	kr (1 000,00)
kr 352,00	kr 352,00	kr 352,00	kr -
kr 345,00	kr 345,00	kr 345,00	kr -
kr 52,00	kr 52,00	kr 52,00	kr -
kr 662,00	kr 662,00	kr 662,00	kr -
kr 22,00	kr 22,00	kr 22,00	kr -

2- or 3- way matching

- 100% match = evidence
- 99% match???

Master’s course: Digital Auditing

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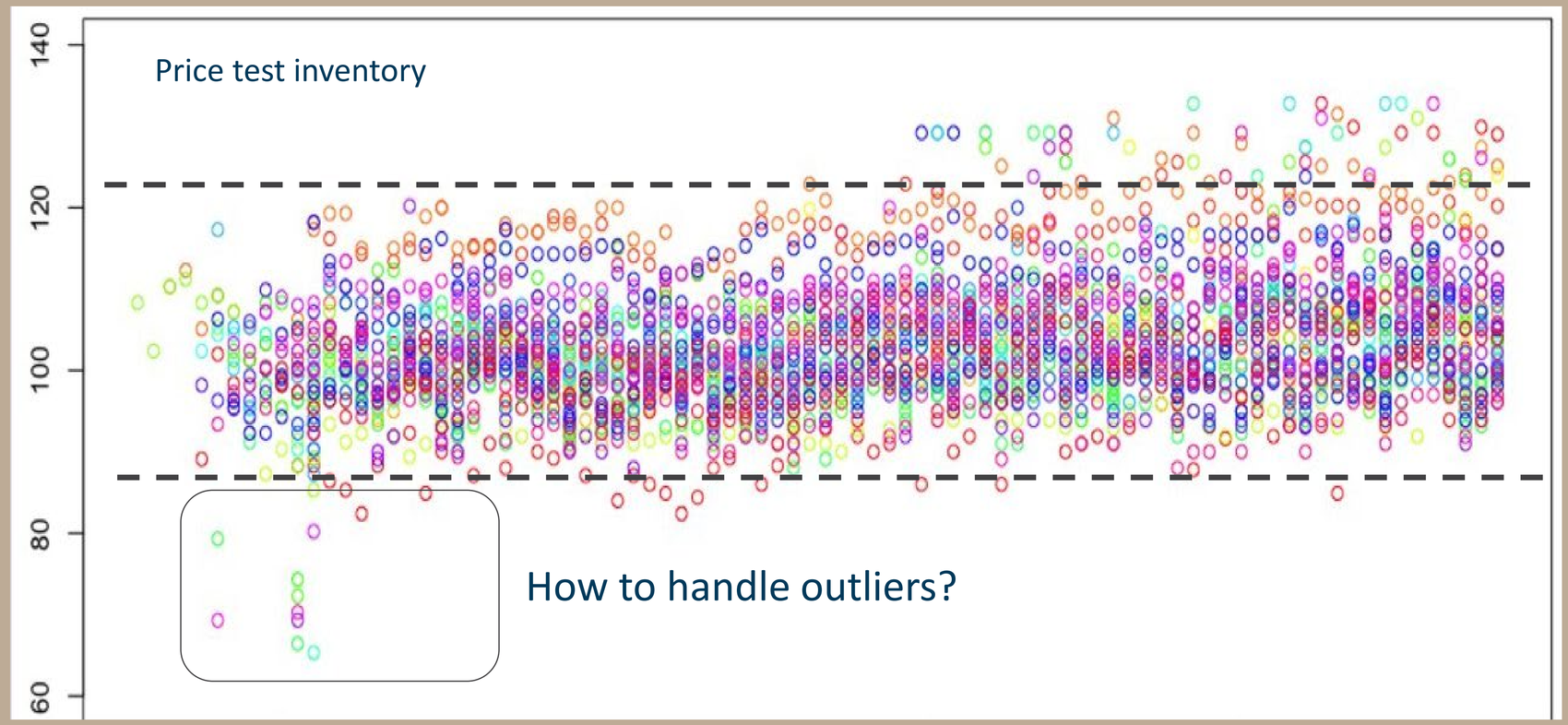
Client Acceptance → Risk assessment → Test of controls → Substantive procedures → Conclusion/ Analytical procedures



DigAudit Educational Cases

T. E. McKee, Medical University of South Carolina/NHH
Current Issues in Auditing (forthcoming)

Analyzing An Audit Population Via Either Excel Pivot Tables and/or R Language Cluster Analysis

Case: Analyze an audit population via either Excel Pivot Tables and/or cluster analysis via the R programming language and RStudio free software environment.

- Background description based on a real company.
- The instructor generated synthetic data containing seeded misstatements.

Analysis via Excel PivotTables is fairly straightforward.
Use of cluster analysis via R is more difficult and an opportunity to think about cluster analysis.

Student feedback was very positive.

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Case used in NHH master's course Digital Auditing

DigAudit Educational Cases

T. E. McKee, Medical University of South Carolina/NHH
Submitted: *Journal of Emerging Technologies in Accounting*

Sharp Edge Inc.: A Case Study Using R For Inductive Decision Modeling

R language for teaching *inductive* modeling via *regression*, *decision trees*, and *neural network algorithms* for auditing or related courses.
In addition to the previous three algorithms, students will learn about basic statistics, decision modeling techniques, and training versus validation samples.

$10 billion dollar revenue company with 2,400 employees which is being sued for $500 million in a class action lawsuit over alleged gender bias in upper management promotions.
Analyzing promotion data for the past 5 years in an effort to prove that gender is not a factor affecting promotions.

NHH student teams were successful in performing the case analyses and had highly positive feedback.

Case used in NHH master's course Digital Auditing

DigAudit Educational Cases

T. E. McKee, Medical University of South Carolina/NHH
Project in progress

Generating Synthetic Data For Auditing Courses and Cases

The paper explains how educators can use *R language*, the most widely used software in the statistical world, to easily *create unique audit data files for classroom* use.
R language facilitates simulating real data sets via generation of all common probability distributions and multi-dimensional integrals. Unique data sets for each student, or student team, can be easily created.

Some *advantages* of simulated data are:
(1) It can be used to create replacement data sets for confidential data,
(2) fraud or anomalies can be inserted into the data in predetermined amounts or frequencies, and
(3) high-dimensional data [extremely large] can be simulated.

Good overview paper: Raschke and Charron JETA 2021,
Review of data analytic teaching cases, have we covered enough?

DigAudit Research

Accounting Horizons 34(4) December 2020

An Exploratory Study into the Use of Audit Data Analytics on Audit Engagements

By

Aasmund Eilifsen, NHH
Finn Kinserdal, NHH
William F. Messier, Jr., NHH
Thomas E. McKee, The Medical University of South Carolina/NHH

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Outline presentation

- What motivated study?
- How did we go about?
- What did we find?
- Why do we observe a slow pace in adopting ADA?

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What motivated study?

- Background
  - The major international public accounting firms are heavily investing in audit data analytics to transform their audit practice (Deloitte 2016; KPMG 2016; PwC 2017; EY 2017)
  - Research recognizes that ADA are likely to significantly transform the conduct of the audit (e.g., Cao, Chychyla, and Stewart 2015; Schneider, Dai, Janvrin, Ajayi, and Raschke 2015; Barr-Pulliam, Brown-Liburd, and Sanderson 2019; Austin et al. 2019; Salijeni et al. 2019)
  - **BUT** little is known about the extent of ADA usage in audit practice and how ADA affect the conduct of audits (e.g., Austin et al. 2019; Walker and Brown-Liburd 2019)

- The ***objective*** of the study is to explore the use of audit data analytics (ADA) in current audit practice, i.e., at engagement level, where systematic knowledge did not exist.
  - Why Norway?

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Contributions of the study

- Provide insight into how *firms' leadership and engagement partners and managers* perceive the prospects and impediments to ADA use.
- Document the prevalence and nature of ADA use on *audit engagements*.
- Develop an understanding of why ADA use *has not yet fulfilled its promised potential.*

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How did we go about?

- We applied a *two-stage research approach*:
  - First, we interviewed the heads of *professional practice of five large international public accounting firms* in Norway to get an understanding of the status of ADA in each firm and to develop the questionnaire.
  - Second, we obtained responses to a detailed *questionnaire* from the engagement partner and/or manager on the implementation of ADA on *109 audits* for 2017 financial statements.

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What did we find (interviews)?

- ADA use is *high on the firms' agenda* and there is a *global push* for ADA to be used on audit engagements.
- The *firms differ in their strategies* of how they implement the use of ADA in their organizations from a 'wait and see' approach to centralized ADA functions and extensive firm involvement to facilitate ADA use.
- The firms' heads of professional practice express *significant uncertainty about how the supervisory inspection authorities* will evaluate and accept ADA generated audit evidence. As a result, *none* of the firms have introduced *mandatory use* of advanced ADA tools.

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What did we find (interviews)?

- The partners and managers indicated that their *knowledge and training* with firm available ADA tools *did not impede* their use of ADA.

- Participants' attitude towards ADA usefulness is *positive* and *more positive* for firm audits in general than for the sampled audit engagement.

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Engagement Sample

Table 1
Engagements per Audit Firm

Audit Firm	Category of engagements[1]				
	ADA	Listed	Large_NL	Small_NL	Total
1	6	6	6	6	24
2	6	5	5	4	20
3	6	6	5	6	23
4	5	5	5	4	19
5	5	6	6	6	23
Totals	28	28	27	26	109

Notes:
[1] ADA: Engagement entity where the audit firm expected high ADA use.
Listed: Largest engagement entity (a parent company or a subsidiary) based on revenues of a listed company (group).
Large_NL: Largest engagement entity (a parent company or a subsidiary) based on revenues of a non-listed (NL) group with group revenues above $100 million.
Small_NL: Engagement entity of a non-listed (NL) group with group revenues below $10 million, or a non-listed (NL) entity not part of a group with revenues below $10 million.

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What did we find? Perceptions of Competency of ADA

	Average Score[1]		
		Audit Team	
Panel A: Perceived Competency	**Overall**	**Partner**	**Manager**
I have sufficient knowledge of ADA tools and procedures available in our firm to use them appropriately.	4.42*	4.38*	4.47*
I have been given sufficient training of usage of ADA tools available in our firm.	4.08	3.89	4.18
I have sufficient knowledge of the ADA statistical methods and their interpretation.	4.20	4.07	4.32*
I have been given sufficient training of the usage of ADA statistical methods and their interpretation.	4.00	3.92	4.07

What did we find? Perceptions of Usefulness of ADA

	Average Score[1]		
		Audit Team	
	Overall	Partner	Manager
Panel B: Perceived Usefulness			
The ADA tools that I have seen, tested or used in our firm are complex and difficult to master and apply in audits.	3.67*	3.67*	3.67*
The ADA tools that I have seen, tested or used in our firm are very time-consuming to implement on my engagements.	4.07	3.91	4.21
Our audit firm gives incentives and/or exerts pressure to use ADA instead of traditional audit tools and procedures.	4.88*	4.83*	4.93*
Current auditing standards accept the use of audit evidence derived from ADA.	4.54*	4.60*	4.49*
Our firm's audit methodology accepts the use of audit evidence derived from ADA.	5.33*	5.27*	5.39*
Supervisory bodies inspecting audit engagements accept audit evidence derived from ADA.	4.59*	4.48*	4.70*
In my opinion. ADA are currently useful for risk identification.	5.27*	5.20*	5.34*
In my opinion. ADA are currently useful for substantive testing to obtain audit evidence.	5.13*	5.38*	4.89*
I am personally hesitant to use ADA with the ADA tools and procedures currently available in our firm.	2.93*	3.03*	2.83*
Our firm has adequate ADA tools.	4.85*	4.92*	4.79*
Compared to traditional audit tools and procedures, the ADA tools and procedures currently available in our firm are improving the quality of audits.	5.44*	5.50*	5.39*
Compared to traditional audit tools and procedures, the ADA tools and procedures currently available in our firm are efficient (time. effort or cost in generating the result) to use in audits.	4.40*	4.46*	4.34*
In our firm, we lack technical competence on the audit teams to use ADA tools.	3.70*	3.65*	3.75*
In our firm, we have sufficient specialist support (outside the core teams) for data-gathering, handling and/or ADA when needed on engagements.	5.15*	5.06*	5.24*
Our firm's clients have a positive attitude to our collection of client data for ADA purposes.	5.19*	5.21*	5.17*
It is easy to collect sufficient data for ADA purposes from our firm's clients.	3.86	4.00	3.73*

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What did we find?

- In the *audit planning phase*, ADA are used for overall assessment of the client's operations and performance, identifying and assessing key risks, and mapping of different processes.
- In the *substantive testing phase*, ADA are used for journal entry testing, calculating sample-size for testing, selection of random samples from populations, and summarizing ledgers.
- In the *completion phase* of the audit, ADA are most used for reconciliation and control between final accounts and underlying ledgers, analytical procedures, and final review of financial statements.

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What did we find?

- Overall, the actual *use of ADA is limited*.
- We find *little use* of what would be considered '*advanced ADA*'
  (e.g., statistical regressions, clustering techniques, statistical predictive analysis, computerized process-mapping, etc.).
- The use of *Big Data* and *text-mining* is almost non-existent.
- ADA are mostly used for *supplementary evidence*.

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What did we find?

- More ADA are used for clients with *integrated ERP/IT-systems*.

	n (%)	Average number of times ADA was used per engagement :
General ledger is not or to a limited extent integrated with other accounting systems.	11 (10.1)	5.0
The accounting system is partially integrated.	41 (37.6)	6.0
The accounting system is highly integrated/highly integrated with other systems.	45 (41.3)	9.2
The accounting system is outsourced, and is not integrated with other systems.	3 (2.8)	4.3
The accounting system is outsourced, and is highly integrated with other systems.	9 (8.3)	7.7
Total	109	

- There is a higher frequency of ADA use on *new audit engagements.*

	Average Score[a]	
	Continuing Engagements[b]	New Engagements[c]
Number of times ADA was used in the specific sub-category on the selected engagement		
Total	570	196
Average number of times per engagement	6.0	14.0

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Where are we and why?

- The *contrast* between
  (1) the firms' desire to create an ADA driven audit product
  (and practitioners' generally positive attitude towards the use of ADA)
  (2) practitioners' slow pace of implementing the use of ADA in their audit can have different explanations.

  - Given the pressure on time and audit fees, it may reflect that *practitioners do not consider it profitable* to apply ADA beyond a modest level.

  - *Low* use of ADA may also stem from
    - that the firms have not yet only to limited degree incorporated ADA into their *methodologie*s
    - that the use of ADA is non-mandatory
    - *auditing standards* do not specifically address and stimulate the use of ADA
    - *supervisory bodies* are reluctant to reveal their position on ADA use.

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Low use of ADA in Institutional Theory perspective

Why do we observe a slow pace in adopting ADA?

Existing research has provided *many theorized ideas* as to why auditors might be slow in adopting the use of ADA during financial statement audits (e.g., Alles 2015; Applebaum 2016; Brown Liburd et al. 2015; Cao et al. 2015).

Examples:

Alles (2015) hypothesizes that auditors will adopt the use of ADA in conjunction with when their *clients use ADA*, as auditors are followers of the technology adopted by clients.

Cao et al. (2015) similarly hypothesizes how ADA could be used to improve the *efficiency and effectiveness* of a financial statement audit but does not empirically test their idea.

Brown-Liburd et al. (2015) state that the difficulty with auditors using ADA during the financial statement audit is related to information processing and can be classified in four categories*: information overload, information relevance, pattern recognition, and ambiguity*.

Appelbaum (2016) further adds that '*data provenance*' is a possible explanation as to why auditors could be reluctant to migrate to the use of Big Data as part of the evidence gathering and evaluation process.

Commerford et al. (2020) go a step further and empirically test auditors' likelihood of relying on AI generated audit evidence and conclude that *algorithm aversion* causes auditors to be less likely to rely on evidence from AI technology.

Highlights DigAudit Research: Algorithm aversion

Commerford, B. P. (University of Kentucky/NHH), S. A. Dennis, J. R. Joe, & J. Ulla (2020).
Available at SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3422591
Paper under review.

Man Versus Machine: Complex Estimates and Auditor Reliance on Artificial Intelligence

RQ: *When and how does receiving contradictory evidence from a firm's AI system (i.e., "specialist system") – rather than a firm's human specialist – influence auditor judgments related to complex estimates?*

Audit firms are *investing* billions of dollars to develop artificial intelligence (AI) systems that will help auditors execute challenging tasks (e.g., evaluating complex estimates).

Although firms assume AI will enhance audit quality, a growing body of research documents that individuals often exhibit '**algorithm aversion**' – *the tendency to discount computer-based advice more heavily than human advice, although the advice is identical otherwise*. Therefore, an experiment is conducted to examine how algorithm aversion manifests in auditor judgments.

Consistent with theory, the study ***finds*** that auditors receiving contradictory evidence from their firm's specialist system instead of a human specialist propose smaller adjustments to management's complex estimates, particularly when management relies on objective (versus subjective) inputs.

The findings suggest that auditor susceptibility to algorithm aversion could prove costly for the profession and financial statements users.

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Highlights DigAudit Research: Mitigating algorithm aversion

K. Holmstrom (Georgia Institute of Technology) (2021).
Available at SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3596478

The Effect of Opaque Audit Methods and Auditor Ownership on Reliance on Independent Expectations

RQ: *Do auditors rely less on independent expectations generated with more opaque audit methods and does psychological ownership moderate the effect of opacity?*

Increasing access to data and advanced statistical methods can help auditors generate independent expectations of estimates, but expectations are not useful *unless auditors rely on them*.

Advanced methods are likely more *opaque* (i.e., more difficult to understand), which in turn affects understanding of the output of the method, such as independent expectations.
The study ***predicts*** that auditors rely *less* on independent expectations generated with more opaque audit methods.

Greater trust in their own or a human expert's judgment as generated by *psychological ownership* (i.e., a feeling that something is 'yours') likely also affects individuals' reliance on statistical sources.
The study ***predicts*** that developing psychological ownership of independent expectations increases reliance on expectations generated using more opaque methods, while ownership is not critical for reliance on expectations generated using less opaque methods.

In an experiment with senior auditors, the study ***finds*** results supporting the predictions, specifically for auditors with relevant task experience.

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Highlights DigAudit Research: Mitigating algorithm aversion

Commerford, B. P. (University of Kentucky/NHH), A. Eilifsen (NHH), R. Hatfield (University of Alabama/NHH)
K. Holmstrom, & F. Kinserdal (NHH)
Research in progress

Title: Control Issues: Auditor Reliance on Artificial Intelligence and the Illusion of Control

RQ: *Does auditors' ability to **provide input** to specialists' complex estimate recommendation affect auditors' reliance on the specialists' recommendations and can it mitigate algorithm aversion?*

Research needs to specifically consider the barriers to reliance on technologies that firms develop and roll out to audit teams in lieu of utilizing specialists.

Research indicates that auditors may rely less on evidence generated by an artificial intelligence (AI) program than evidence generated by human specialists (Commerford et al. 2020).

Prior research (outside accounting) suggests that allowing individuals some ability to directly influence the decision process (e.g., inputs) or output (e.g., the recommendations) of algorithm sources helps mitigate algorithm aversion (e.g., Kaplan et al. 2001; Dietvorst et al. 2018).

In this study we examine auditors' reliance on judgments provided by human specialists versus AI in the audit of complex estimates and *potential solutions to mitigate algorithm aversion*.
Specifically, we examine whether auditors' ability to provide input to specialists (whether human or non-human) affects auditors' reliance on the specialists' recommendations, *through an increase in perceived control over the specialists' work*.
We further discuss the *mechanisms underlying* aversion to rely on AI relative to a human experts, and how auditors' ability to provide input can mitigate the aversion.

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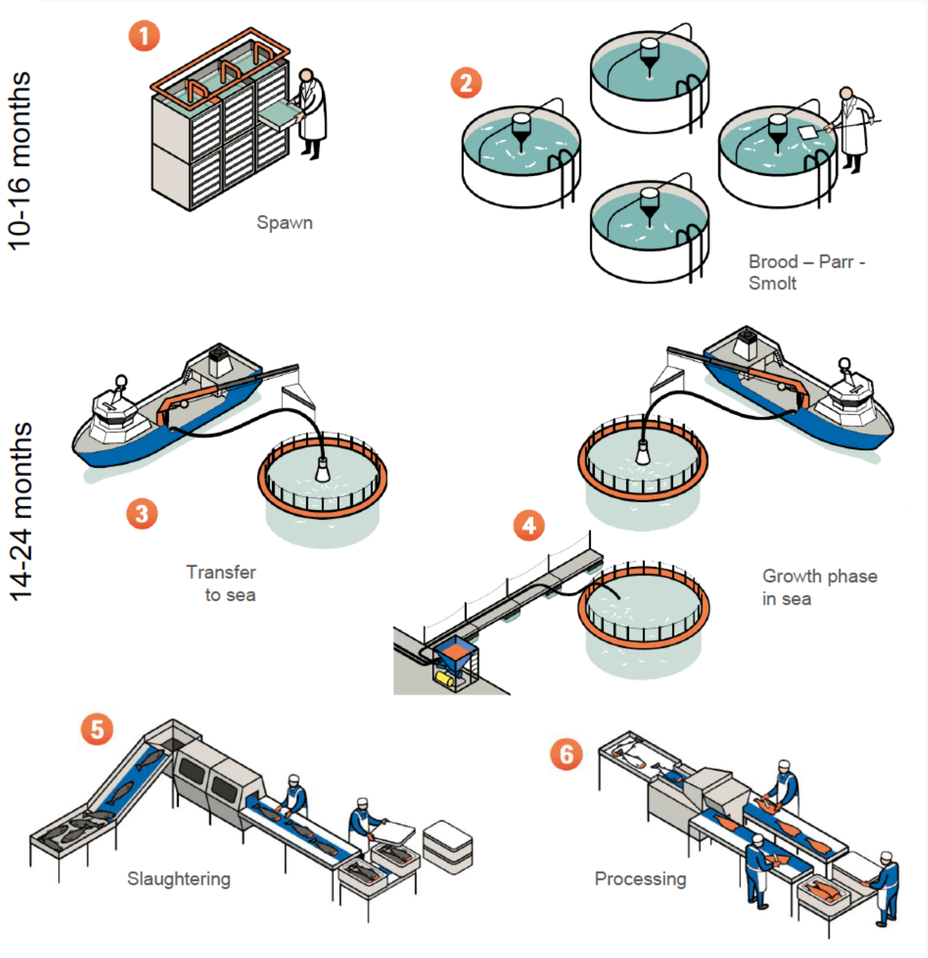
Fish farms

Case and Instrument

Salmon Life Cycle



Accounting for Live Salmon in Sea

King Fish's *biological assets* (inventory) consist of live salmon in sea. The biological assets are valued at fair value less cost to sell in accordance with IAS 41-*Agriculture* and IFRS 13-*Fair Value Measurement*.

There are *no effective markets* for the sale of live fish in sea but not ready for harvest (immature fish). Therefore, the fair value of live fish is calculated using a model based on a net *present value methodology*, considered "*Level 3*" in the fair value hierarchy.

The primary input into the present value model is the *estimated future sales price* of salmon once the fish are mature and ready for slaughter, which is *unobservable* and *uncertain*.

It typically takes salmon *15 months to mature and be ready for slaughter*. Accordingly, at the year-end management uses expected future sales prices for each of the next five quarters (15 months) to estimate the fair value of salmon.

Changes to the estimated fair value of biological assets are recorded as a *gain or loss* and are presented on the income statement (within operating income) as "Fair value adjustments related to biological assets."

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Participants

Auditors from several international public accounting firms (including auditors from each of the Big 4 firms) participated in the study.

Participants are 169 highly experienced Norwegian auditors with a reported mean of 9.3 years of public accounting experience.

The majority of participants (84 percent) report experience auditing fair value estimates related to biological assets (e.g., live fish), which is the experimental context used in this study.

Method

Remember, management uses *future salmon price estimates* as a key input for estimating the fair value of live salmon.
Case details indicate that the audit team's investigation finds that the key driver of the audit difference relates to disagreements about estimated future sales prices of salmon

We use a 2 x 2 between-subjects experimental design.

Our first independent variable manipulates *the **source** of a firm-provided independent estimate* (i.e., human specialist versus specialist system).
In the *human specialist condition*, the audit firm employs an internal group of specialists that can develop independent estimates for audit engagement teams.
In the *specialist system condition*, we inform participants that the audit firm utilizes a proprietary AI-based system to develop independent estimates.

In addition, we manipulate whether or not participants *provide input to the specialist* pertaining to the estimate (i.e., Input versus No Input).
Participants in the Input condition are told that the firm specialist considers input from the engagement team.
Importantly, participants in the No Input condition make the same assessments. However, there is no mention of these assessments being provided to the specialist for consideration.

After reading the case, we ask participants to provide their *assessment of the potential audit difference*.
Specifically, we ask participants to indicate the amount of the audit adjustment they believe is likely to be made after the issue is discussed with management, which serves as our *dependent measure*.

We also use a scale of '*locus of control*'; i.e., is the extent to which individuals believe they have control over the outcomes in their life or ability to have influence over outcomes in their environment. Internals (Externals) feel more (less) baseline ability to have influence over outcomes in their environment.

Highlights DigAudit Research: Status quo

Christensen, B. (University of Oklahoma/NHH), A. Eilifsen (NHH), W.F. Messier Jr. (NHH),
& S. Vandervelde (University of South Carolina)
Research at early stage

Title: Status Quo Heuristic and the Use of Audit Data Analytics

RQ: *Is the status quo heuristic present in the use (non-use) of Audit Data Analytics (ADA)?*

Status quo represents doing nothing, maintaining the current position, or staying with one's previous decision (Samuelson and Zeckhauser 1988).

The *psychology literature* suggests that individuals, in many judgment situations, rely on the status quo rather than changing their behavior.

Kahneman et al. (1991) suggest that the desire to stay with the existing status quo results from the perceived risk of using the new alternative that outweighs the disadvantages of staying with the existing position.

Curley, Yates, and Abrams (1986) characterize this behavior as ambiguity avoidance.

Existing psychology literature shows that even just *labeling a choice as being the status quo* or incumbent, increases the likelihood of that option being chosen (e.g., Samuelson and Zeckhauser 1988).

Highlights DigAudit Research: Status quo (cont.)

Prior accounting and auditing research (e.g., Salterio 1996; Salterio and Koonce 1997; Clor-Proell and Nelson 2007; Messier, Quick, and Vandervelde 2014) shows that auditors rely on past judgments to address current problems. More specifically, prior research shows that auditors continue to use the *same audit procedures* as the previous year in spite of information that such an approach may not be appropriate.

The current study examines whether the lack of adoption of ADA by auditors is based on staying with the status quo rather than being based on a lack of experience or lack of comfort with the use of the new tools.
If what we hypothesize is true, then what is needed is getting auditors over the first year 'hump' of using the new auditing tools.

Highlights DigAudit Research: Innovation mindset and goal conflicts

T. Carpenter (University of Georgia), M. Christ (University of Georgia) &
A. Gold (Vrije Universiteit Amsterdam/NHH). Research in progress

Title: Thinking Outside of the Box: Engaging Auditors' Innovation Mindset to Resolve Conflicting Goals and Improve Cognitive Flexibility and Audit Effectiveness with Data Analytics

RQ: *Does the **joint effect** of auditors providing client insights and engaging their innovation mindset while using data analytics improve their cognitive flexibility and audit effectiveness?*

The study argues that an *innovation mindset*, and more specifically cognitive flexibility, is an important condition for the effective use of data analytics.
Further, the (implicit or explicit) goal to *add value* to their client through data analytics may inhibit auditors' performance of audit tasks, such as detecting material misstatements due to fraud, because this new goal will cause auditors to experience *goal conflict*. This state of goal conflict will impede auditors' ability to meet their primary goal of high-quality audit judgments.

Hence, the study examines
(1) whether implementing an *innovation mindset* will lead to improvements in auditors' cognitive flexibility and audit judgments,
(2) whether encouraging auditors to identify *value-added insights for their clients* during the course of the audit impairs their professional skepticism, thereby inadvertently decreasing audit quality, and
(3) whether the innovation mindset prime *mitigates* the adverse effects of conflicting goals triggered by the potentially conflicting goal of encouraging auditors to identify client insights.

Highlights DigAudit Research: Inspection risk




S. B. Anis (NHH), H. Brown-Liburd (Rutgers University),
J. Gaudernack (PwC/NHH),
& Natalia Kochetova (Saint Mary's University/NHH)
Research in progress. Presented at AIS MYM.

Title: Inspectors and gadgets: The impact of inspection risk and cost efficiency on the auditor's intent to use emerging techniques and technologies

RQ: *Are auditors willing to use more cost-efficient emerging techniques and technologies (ETT) over traditional approaches and does inspection risk affect the willingness?*

In a highly regulated industry like auditing, potential negative consequences of failing an inspection may carry great weight in the mind of the auditor (e.g., Stefaniak et al. 2017).
Studies show that the threat of an *inspection affects auditor effort and decision-making*, and when inspections are perceived as likely, auditors focus more on satisfying the inspector and less on the risks of the company (e.g., Bhaskar 2018).

Auditors may perceive regulatory inspectors as being overly skeptical and critical of emerging techniques and technologies *(*ETT) (Austin, Carpenter, Christ, and Nielson 2018; Emett, Kaplan, Mauldin and Pickerd 2020).
Therefore, auditors may choose not to use ETT to avoid a possible negative reaction during an inspection.
This would suggest that even if the argued behavioral and technical issues were resolved, auditors would still be unwilling to adopt ETT until their perceptions regarding inspectors change.

The paper investigates:
(1) whether auditors *are willing* to use ETT over traditional sampling where it is appropriate, and
(2) whether auditors' concern that *inspectors* may not approve of the use of ETT makes them *less willing* to adopt ETT.

Highlights DigAudit Papers and Projects

P. Navarro (University of Nevada, Las Vegas/NHH) &
S. G. Sutton (NHH/University of Central Florida)
Paper under review

Title: Investors' Judgment and Decisions after a Cybersecurity Breach: Understanding the Value Relevance of Cybersecurity Risk Management Assurance

RQ: *How does voluntary cybersecurity risk management (CyRM**) assurance** affect non-professional investors' judgments and decisions, and how does the value relevance of CyRM assurance alter when having such assurance is **expected/unexpected**?*

This study begins to address the question of whether there is a demand for cybersecurity risk management (CyRM) assurance offered by audit firms, particularly given lingering concerns in research and practice as to the viability of IT-related assurance services.

Employing an experimental approach, the study **finds** that after a cyber-breach occurs, companies previously engaging in voluntary CyRM assurance receive more favorable investor assessments of management credibility and, in turn, higher stock valuations. It also **finds** that investors' assessments of management credibility and stock valuations are more extreme for companies that engage (do not engage) in CyRM assurance in industries where such assurance is not (is) the norm (unexpected/expected).

The research reinforces the profession's position that management and boards need to recognize that cyber risk will differ by industry and that *investors will react* to violations of implicit industry standards for cyber risk management.
The results also demonstrate the *value* to management credibility of having prior CyRM *assurance* after a cyber-breach; the reputation and damage control is important for both management and the company.

Patricia Navarro is the winner of the 2021 AAA AIS Best Dissertation Award

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Highlights DigAudit Papers

C. Hampton, S. G. Sutton, (NHH/University of Central Florida),
Vicky Arnold (NHH/University of Central Florida), & D. Khazanchi
Journal of Information Systems 2020.

Title: Cyber Supply Chain Risk Management: Toward an Understanding of the Antecedents to Demand for Assurance

RQ: *How do the supply chain relationship factors and cyber risk issues relate to the demand for* ***assurance*** *of cyber supply chain risk management (C-SCRM)?*

The study expands the literature on cyber assurance by auditors and elaborates on overall supply chain processes that help drive value from auditors providing such assurance.

Recognizing the need for effective cyber risk management processes *across the supply chain*, the AICPA issued a new SOC in March 2020 for assuring cyber supply chain risk management (C-SCRM) processes.

Resource Advantage Theory of Competition provides the conceptual foundation for assessing the dual drivers of relationship building and cyber risk management on demand for assurance.

The study uses a *field survey* to collect data from 205 professionals enabling evaluation of the complex relationships in the theoretical model.

Results support all hypotheses, provide satisfactory model fit, and support the underlying theory.
Trust between supply chain partners and *cyber supply chain risk* both positively influence demand for assurance over C-SCRM processes.

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Highlights DigAudit Papers

P. Navarro (University of Nevada, Las Vegas/NHH), S. W. G. Robb,
S. G. Sutton (NHH/University of Central Florida), & M. M. Weisner
International Journal of Accounting Information Systems 2020 37

Title: The cost stickiness of information technology material weaknesses:
An intertemporal comparison between IT-related and other material weaknesses

RQ: *How do internal control weaknesses affect audit fees and how do alternative types of IT-related material weaknesses lead to varying degrees of persistence in fee premiums?*

The PCAOB's audit firm inspections drive audit focus and costs. The PCAOB's 2010-initiated increased emphasis on internal control audit work intensified concern over internal control weaknesses (ICW).
IT-related material weaknesses (ITMW) have emerged as particularly significant with PCAOB reports (2008, 2012) highlighting on-going deficiencies in IT controls auditing.

Using propensity score matched samples, the study finds audit fee premiums (after remediation) associated with ITMW linger longer than premiums for non-IT entity-level material weaknesses (ELMW) or firms reporting account-specific material weaknesses.
Moreover, the study finds that audit fee premiums by type of ICW remediated is overall strongest for *ITMW linked to data processing integrity.*

The findings underscore the *importance of distinguishing* not only between non-IT entity-level material weaknesses (ELMW) and IT-related material weaknesses (ITMW) but also *types of ITMW* as identified in data quality research.

Professor Steve G. Sutton received in **2021** the AIS section of the American Accounting Association **Notable Contribution to the AIS Literature Award** for the publication: Elbashir, Mohamed Z., Collier, Phil A., and Sutton, Steve. G. 2011. The Role of Organizational Absorptive Capacity in Strategic Use of Business Intelligence to Support Integrated Management Control Systems, *The Accounting Review*, 86(1): 155-184.

Highlights Other DigAudit Publications

Knudsen, D. R. 2020. Elusive boundaries, power relations, and knowledge production: A systematic review of the literature on digitalization in accounting. *International Journal of Accounting Information* Systems 36.

Mahama , H., M. Elbashir , S. G. Sutton, and V. Arnold. 2020. New development: Enabling enterprise risk management maturity in public sector organizations. *Public Money & Management.*

Reinking, J., S. G. Sutton, and V. Arnold. 2020. Synthesizing enterprise data through digital dashboards to strategically align performance: Why do operational managers use dashboards? *International Journal of Accounting Information* Systems 37.

Elbashir, M. Z., S. G. Sutton, H. Mahama, and V. Arnold. 2020. Unravelling the integrated information systems and management control paradox: enhancing dynamic capability through business intelligence. *Accounting & Finance.*

Eilifsen, A., N. Kochetova, and W. F. Messier Jr. 2019. Mitigating the Dilution Effect of Non-Diagnostic Information on Auditors' Judgments Using a Frequency Response Mode. *Behavioral Research in Accounting* 31(2) (Fall): 51-71.

Sutton, S. G., V. Arnold, and M. Holt. 2018. How Much Automation Is Too Much? Keeping The Human Relevant in Knowledge Work. *Journal of Emerging Technologies in Accounting* 15(2, Fall): 15-25.

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