

EFR summary

Accounting Process Management,
FEM11020
2025-2026



Weeks 1 to 6

Details

Subject: Accounting Process Management 2025-2026

Teacher: Dr. Y Li

Date of publication: 12.10.2025

© This summary is intellectual property of the Economic Faculty association Rotterdam (EFR). All rights reserved. The content of this summary is not in any way a substitute for the lectures or any other study material. We cannot be held liable for any missing or wrong information. Erasmus School of Economics is not involved nor affiliated with the publication of this summary. For questions or comments contact summaries@efr.nl

Koffietje doen?

Start jouw carrière bij BDO

Maak kennis met BDO Accountants & Adviseurs, de beste plek om als toptalent aan de slag te gaan. De koffie staat voor je klaar. Vertellen wij je over wat jij kan bijdragen, en jij ons over je ambities.



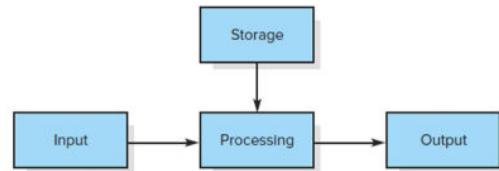
*Scan de QR-code
en plan jouw
koffiemoment in.*



werkenbijbdo.nl ►

BDO

Accounting Process Management



Lecture 1

APM = AIS for this course

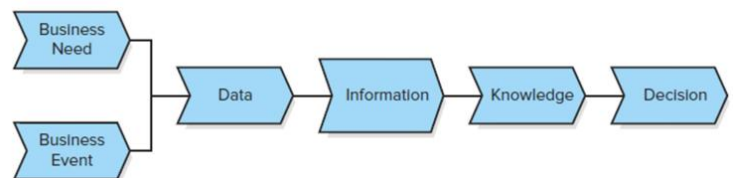
Accounting information system (AIS): a system that records, processes, summarizes, reports, and communicates on transactions to provide financial and non-financial information to make decisions.

- AIS is also designed to ensure appropriate levels of internal controls (security measures to protect integrity and privacy of sensitive data) for those transactions.
- AIS is important because it provides information that companies are required to have, and also information that can be used to make important decisions.

The role of an accountant is to help address business opportunities. There is a trend of accounting merging with IT, because accounting is an understanding information providing activity.

To address such a business opportunity, future accountants need to

- Decide what information is needed;
- Design/use an information system to gather the necessary information, and;
- Analyze that information to offer helpful advice to management.



Data are simply raw facts that describe an event and have little meaning on their own.

Data serves as an input. **Information** is defined as being data organized in a meaningful way to be useful to the user.

Attributes of Useful Information: Relevant, Predictive Value, Feedback Value (usefulness), Materiality,

Faithful Representation reflects the condition of the business: Complete, Neutral, Free from Error

Information Value Chain →

Business risks Ahold Delhaize:

Discretionary information: information that is not required by law.

- Managers must decide if the benefits of discretionary information outweigh the costs of obtaining that information.

Mandatory information is information that is required by law.

- Filing annual reports with stock exchanges and securities regulators
- Filing tax returns with tax administrations
- Providing sustainability reporting (becoming mandatory)
- Since it is required, information has to be produced, but manager may choose to minimize the costs of producing this information.



Income Statement	Effect of AIS on Income Statement
Revenues	Customer relationship management (CRM) techniques could attract new customers, or better service existing customers to generate additional sales revenue.
Less: Cost of Goods Sold	Supply chain management (SCM) software allows firms to carry the right inventory and have it in the right place at the right time. This, in turn, will lower obsolescence as well as logistics and procurement costs.
Gross Margin	The gross margin will change as the result of changes in revenues or cost of goods sold due to the effects of AIS.
Less: Selling, General, and Administrative Expenses (SG&A)	An efficient enterprise system can significantly lower the cost of support processes included in sales, general, and administrative expenses.
Less: Interest Expense	SCM software allows the firm to carry less inventory. Less inventory on hand leaves fewer assets to finance, potentially reducing the amount of debt and the related interest to service the debt.
Net Income	All combined, a well-designed and well-functioning AIS with investments in enterprise systems, SCM, and/or CRM may be expected to improve net income.

A summary of “The data analytics journey: Interactions among auditors, managers, regulation, and technology”

Interviews with auditor–client dyad design, regulators and data analytics experts

How do interactions among managers, auditors, and the technology affect the data analytics journey in the financial reporting environment?

- Managers and auditors view themselves on a data analytics journey together, exploring new techniques and learning from one another.
- Managers and auditors describe interactions that promote progress, including examples of imitation and actor structuring techniques.
- Managers and auditors indicate tensions about differing perspectives on sharing data analytics.
- Interviewees reveal strategic interactions as a result of rising tensions over expectations for future audit fees.

How do rules affect the data analytics journey?

- The lack of explicit regulation seems to slow data analytics' coevolution, prompting duplicative efforts on audits.
- Interviewees perceive normative rules, developed via formal and informal interactions with regulators, that affect data analytics.
- Data analytics appears to shape the development of helpful rules and regulations, especially considering the rapidly changing technical tools and stakeholders' diverse practices.

How do managers and auditors interpret, value, and seek to influence the rules governing the data analytics journey?

- Auditors seem to perceive normative rules that allow the provision of analytics-based business insights to clients.
- Auditors describe taking on more of an advisory role with clients than they have in the past, prioritizing client service over potential independence impairment and erosion of auditors' core expertise.
- Auditors and managers appear to strategically try to influence data analytic rules through official and unofficial channels, with varying degrees of success.
- Auditors seem to creatively interpret rules (i.e., SOX), perhaps through a cognitive bias, in order to maximize data analytics benefits to audit firms.

Lecture 2: Data Modeling, Relational Databases and Enterprise Systems

Purpose of data modeling

- Describe the data and information structures inherent in a business process
- Create a blueprint for the development of a relational database to support the

collection, aggregation, and communication of process information

- Facilitate the use of databases after they are implemented
- Necessary to understand the group project data file

Relational databases

- Has wide usage in the industry
- Advantages of relational databases
- Flexibility and Scalability: handle changes quickly and easily
- Simplicity: easy to communicate to both database users and database developers
- Reduced Information Redundancy: requires each piece of data to be recorded only in one place

Classes: separately identifiable collections of things (objects) about which the organization wants to collect and store information

- Typically implemented as tables in a relational data base
- In the group project data file, examples are Vender table; User ID table
- Each row is an individual instance of things/objects
- For simplicity, classes = entities = tables for this course

Primary Keys: an attribute (or combination of attributes) that uniquely identifies each instance in a class or each row in a table

- A primary key cannot be NULL (null = missing value)
- It should be controlled by the organization that assigns it so it (ideally) will not change over time
- Primary keys do not always occupy the first column!

Foreign Keys: An attribute (or combination of attributes) that allows tables to be linked together

- The foreign key also exists in the other table as a primary key
- Implements the link between two tables, shown by the associations

Associations: depict the (business) relationship between two classes/tables/entities (e.g. vender *receive* purchase order; vender *send* goods)

Multiplicities/Cardinalities: describe the minimum and maximum number of times instances in one class can be associated with instances in another class. Multiplicities are also called cardinalities

There are 4 possible multiplicities/cardinalities between two tables:

- **One-to-one**

Definition: Each value of the shared attribute in one table is related to at most one value in the shared attribute in the other table.

Example: Every car has its own license plate and a license plate is specific to an individual car. Car-to-license is one-to-one.

- **One-to-many**

Definition: Each value of the shared attribute in one table can be related to multiple rows

the other table.

Examples: Many employees have the same manager.

Manager-to-employees is one-to-many.

- **Many-to-one**

Definition: Same as one-to-many. The order of the tables determines which it is.

Examples: Many employees have the same manager. Employees-to-manager is many-to-one.

- **Many-to-many**

Definition: Multiple values of the shared attribute in one table can be related to multiple rows in the other table.

Examples: An actor is in many movies and a movie has many actors. Actors-to-movies is many-to-many.

```
1 SELECT *
2 FROM PurchasesDec
3 WHERE PurchasePrice > 10.00
4 ORDER BY Store ASC
```

```
1 SELECT Store, SUM(Dollars)
2 FROM PurchasesDec
3 WHERE PurchasePrice > 10.00
4 Group by Store
5 ORDER BY Store ASC
```

Structured Query Language (SQL)

- A computer language designed to query data in a relational database, based on relational algebra
- Queries allow the user to access, read, and report on desired data
- Used in Tableau's background

SQL operators (record): INSERT operator, SELECT operator (begin a query, tells the query which columns of a table should be included in the query), UPDATE operator, DELETE operator

The 'SELECT' operator will return a result set of records for specified columns, from a specific table, for those records meeting specified conditions.

- Use an asterisk * to indicate that all columns should be returned in the results
- Select two columns with a comma: SELECT 'x', 'y' FROM 'z'

'WHERE' clauses all for conditions to be applied to the select statement.

For example, if we only want VendorNumber '105', we execute the following:

If we want to execute the same condition, but for multiple values, we use an 'IN' clause within that same WHERE condition:

If we want to set multiple conditions, we can use an 'AND' clause after the initial WHERE clause:

'ORDER BY' clause is a similar to a Sort feature in excel. Use following syntax to order by a specific column (Note: ASC = Ascending, and DESC = Descending):

Aggregate functions, such as AVG, COUNT, MIN, MAX, and SUM, will aggregate all values in a given column

```
1 SELECT *
2 FROM VendorInvoicesDec
3 WHERE VendorNumber = '105'
```

```
1 SELECT *
2 FROM VendorInvoicesDec
3 WHERE VendorNumber IN ('105', '4466', '388')
```

```
1 SELECT *
2 FROM VendorInvoicesDec
3 WHERE VendorNumber IN ('105', '4466', '388')
4 AND InvoiceDate = '2016-01-09'
```

Using SQL to join two tables

```
SELECT *  
FROM [TABLE X]  
LEFT JOIN [TABLE Y] (or: RIGHT JOIN; or: INNER JOIN; or: FULL OUTER JOIN)  
ON [Table X].primary_key = [Table Y].foreign_key
```

- When you use a **left join** to combine two tables, the result is a new table that contains all records from the left table (Table X) and corresponding records from the right table (Table Y).
- When you use a **right join** to combine two tables, the result is a table that contains all records from the right table (Table Y) and corresponding records from the left table (Table X).
- When you use an **inner join** to combine two tables (X and Y), the result is a table that contains records that co-exist in both tables (X and Y).
- When you use a **full outer join** to combine two tables (X and Y), the result is a table that contains all records from both tables.

ON clause specifies the condition.

Lecture 3: Reporting processes, XBRL and emerging technologies (blockchain and AI)

Smart contracts: predetermined transactions rules in software codes that can execute automatically.

→ E.g. revenue recognition, tax compliance, payment execution

How to time stamp a digital document? (Haber and Stornetta, 1991)

- Securing property rights in digital assets is an increasing problem
- Sequentially arranging records in a chain using hash codes can provide an indelible ledger
- As an alternative to a trusted third party, crowdsourcing via wide distribution of the ledger can provide the audit function
- Established Surety in 1994 and registered patents; allowed to lapse in 2004 due to lack of use and interest

Traditional vs blockchain system

Traditional system

- System is centralized
- Requires a middleman to approve and record transactions
- Only one copy of the ledger

Blockchain system

- System is decentralized
- No middleman needed
- Distributed ledger, multiple copies
- When a new transaction occurs, all copies are synchronized
- Information cannot be added or deleted without the knowledge of the entire network

Features of Blockchain

- Distributed and decentralized: The data are distributed and synchronized among all the participants in the network.
- Consensus: All parties will be aware of transactions that take place on the network and agree to the transactions being written to the blockchain.
- Immutability: Once transactions are confirmed on the blockchain, they are, in theory, tamper-proof and cannot be altered (i.e., indelible).

Blockchain key concepts

- Hash function: a type of cryptography that transforms data into a hexadecimal code of fixed length
- 4 elements of each block: (1) transaction data, (2) a timestamp, (3) a nonce or random number related to the proof-of-work algorithm, and (4) the hash of the previous block
- Blocks arranged in chronological sequence using hash functions.

Types of Blockchain

Public Blockchain

- Permissionless blockchain
- No access restrictions in viewing or participation
- Concerns over data privacy and exposing sensitive business information

Private Blockchain (e.g. the port of Rotterdam)

- Permissioned blockchain
- Requires permission to join the network
- Transaction data and validation are restricted
- Not expose internal information to the public

Consortium Blockchain

- Permissioned blockchain
- Allows several organizations to participate
- Administrators establish the access rights and permissions for each participant
- Differentiated permissions allow complicated enterprise behaviors

Usefulness of blockchain

- Enable multiple parties that do not fully trust each other to collaborate with a shared source of truth.
 - Verify responsible mineral usage in production (e.g. Tesla)

- Accelerate transaction settlement and verification by eliminating intermediaries.
 - Threat to the SWIFT
 - Opportunity to tax authorities to close "tax gap"
- Cut costs and resources that would be spent on manual verification
 - US audit market: \$50 billion per year; Ahold: 9 million euro in 2024.
 - Threat to auditors (maybe opportunity?)

Implications of blockchain technology on accounting & auditing

- Real-time accounting & the necessity to have third-party verification
- Reduced opportunities for accruals earnings management
- Less likely to hide related-party transactions
- Smart contracts & pre-programmed book-keepings
- Accountants and auditing firms need to reinvent themselves

Corporate governance implications of implementing blockchains

- Greater transparency of corporate ownership
 - Managers' trading behavior observed in real time
 - Preclude back-dating of options (a compensation instrument)
- Improved liquidity; Faster and cheaper stock trading
 - Has complex impact on institutional investors and shareholder activism
- Improved participation and trust in corporate elections

Governance issues of blockchain systems

- "51% attack": One (or a few) participant control enough mining power in order to force through a change to benefit themselves at the expense of everyone else.
- "Hard fork": To negate a theft by hackers. Ethereum agreed to erase the blockchain from the point of a cyberattack forward, thus "re-write" the history of transactions.

Early Disruptors: Examining the Determinants and Consequences of Blockchain Early Adoption, Guo, Walton, Wheeler, Zhang (2021)

Research background

- There are lots of attentions on blockchain technology.
- Firms feel obliged to investigate blockchain applications.
- Blockchain has numerous pros and cons.
- However, the understanding of blockchain technology and regulations regarding blockchain applications are lacking.
- Early-adopting firms have little external guidance.
- Prior technology adoption (e.g., ERP) showed often delayed benefits.

Research questions

- Why would a firm elect to be an early adopter of blockchain?
 - Patented technology, Agency cost, Firm's complexity, External monitoring
- How are firms impacted by blockchain early adoptions?

Research method

- Textual analysis and regression-based analyses (both are examples of machine learning)
- Use companies' filings with the SEC (US financial regulator) that mention "blockchain" or "block chain"
- Compile a sample 142 firms that early-adopt blockchain technology
- Extract financial, auditor, management, board of directors' information from various data sources

The Impact of Blockchain on Audit and Assurance

Challenges on Audit and Assurance:

- Illegal, fraudulent, or unauthorized transactions can reside in the blockchain.
- Different blockchain platforms with different protocols.
- Updating traditional audit approaches to blockchain technology.
- Acquiring the skill sets needed to understand blockchain and smart contract.

Opportunities on Audit and Assurance:

- Continuous Audit Becomes Possible
 - Test business rules, instead of verifying/reconciling ledgers
 - Reducing audit delays and timely detect frauds
- Future Roles of CPA/RA
 - Smart contracts is one of the key areas
 - Understand the business rules in smart contracts.
 - Verify the appropriateness of accounting/tax treatments
 - Combine accounting & auditing knowledge with IT & programming skills

Financial Reporting and XBRL

- **XBRL** stands for eXtensible Business Reporting Language.
- The XBRL is available for various uses, including reporting on the firm's investor relation website, filings to regulators, and providing (financial and non-financial) information to interested parties.
- EU's European Single Electronic Format (ESEF)

Lecture 4: Guest lecture VOPAK

Strategy

- *Improve* our financial and sustainability performance
- *Grow* our base in industrial & gas terminals
- *Accelerate* towards energy transition infrastructure

AI

AI is important to Vopak, but they struggle how to benefit from it. It is difficult to see positive business impact from it, because it lacks measurable financial returns. Most companies train people how the systems work, but not how to change their behavior. Most companies do not use the free version, because confidential information could be exposed to the public.

AI initiatives

- Vopak AI chatbot: for support, information and guidance
- Commercial contract analysis: using AI to compare contract rates
- Supplier invoice verification: AI checks supplier offer against invoices for smaller contracts
- Notebook LLM for contract review: employing an LLM for efficient contract review
- Machine learning: Energy efficiency improvements
- Simulation and operation research: Capacity Overselling Analysis (AI predicts overselling scenarios),
Advanced Planning and Optimization (AI tools enhance operational planning and logistics).

DnA office (part of IT): sets the vision, advices and supports global staff departments, support the organization in the identification of data and analytics solutions.

The balance scorecard can be difficult, e.g. if you focus too much on the process, you can lose customers. Data quality is very important. You need to have quality controls for the **KPI's**. A good KPI uses multiple departments (finance, IT).

- Workforce related KPI's: inclusiveness, equal opportunities, culture, work-life balance
- Governance & environment: IFRS, EU Taxonomy, CO2, cyber security

When is an IT project a good project?

Example: The current forecasting methods lack accuracy and timeliness, resulting in incidents in the terminals where strong winds can cause damage. The solution is to buy an IT system that forecasts weather conditions in each port. What questions would you ask to determine the investment?

→ How much does it cost (also future cost), how much can you trust it, etc.

Example: Vopak's terminal management system needs to be replaced. The solution would be to acquire a system of the market or build your own. What questions would you

ask?

→ How dependent do you want to be of a vendor, how fits the external part in your processes, etc.

Life cycle challenges

- Environment is changing constantly
- Vopak uses the Agile approach and has every 4-5 a new release
- Why implement a new IT system while the current one is still working? → too much technical debt, limits new development, attract customers, a third party stops with the IT service

How to evaluate an IT investment?

- NPV, Project IRR, Payback period
- TCO (total cost of ownership): an estimate of all the costs involved in acquiring and operating a product or system over its lifetime. Handy for fiscal reasons, they need a basis of what the costs are.

How to monetize IT?

- Make sure the IT organization is integrated in the business.
- Maintain a gap on maximum spending: prioritize projects by having an internal competition.
- Minimize customermizations, minimize addition costs per user
- Have a critical mass to allocate the fixed costs
- Lock-inn your customer, create high changing expenses.

Lecture 5: Guest lecture PwC, AIS, internal controls

PwC: The New Equation

Data analysis: the process of inspecting, cleaning, transforming, and modeling data in order to discover useful information, draw conclusions, and support decisions-making.

- It involves examining large sets of data to identify patterns, relationships and trends
- It can be performed using various techniques (statistical analysis, data mining, machine learning, etc)
- Goal is provide information to support risks, identify unusual connections and discover errors.

Continuous Monitoring Platform (CMP) monitors transactions.

Paper: Emmett et al. (2025) Leveraging ChatGPT for Enhancing the Internal Audit Process – A Real-World Example from Uniper, a Large Multinational Company

Machine Learning drives key insights by analyzing data. Models and algorithms can be trained using data to forecast accounts, classify items, uncover transaction insights, etc.

Paper is about Uniper SE, a leading German energy company.

Motivation for using ChatGPT could be out of curiosity or for time-consuming tasks

A conditional approval from information technology, information security departments and the CIO

→ There could be cybersecurity risks, data privacy risks, regulation and geopolitical concerns

Internal Audit Function (IAF) worked together with the CIO office and IT function

Four Uses of ChatGPT for Internal Auditors

- Q&A: Answer questions on laws, regulations, accounting, IT, tax, and technologies.
- Research: Generate ideas, recommendations, or audit topics.
- Text Analysis: Summarize long texts, flag critical or unfavorable terms, review multilingual content, and assess impacts of new laws.
- Content Creation: Draft or improve code, meeting minutes, emails, and audit reports.

The Internal audit process

1. Audit Preparation Phase

Brainstorming risks: ChatGPT identified ~80% of potential risks in seconds; client found results reasonable with minor edits

Defining Audit Scope: IAF prompted ChatGPT to generate a 7-area audit scope for physical security at a German power plant:

2. Audit Fieldwork Phase

Interview preparation & summarization:

- ChatGPT used to create initial/follow-up interview questions.
- Summarized, structured, and translated meeting minutes.
- Interviewees informed about ChatGPT use → reactions: from positive to astonishment;

Researching topics:

- IAF used ChatGPT for regulatory & geopolitical research.
- Note: older ChatGPT rely on pre-trained data (until 2021). Newer updates allow online search.
- Also used Synthesia (AI video platform) for technical explanations.

3. Audit Reporting Phase

IAF improving audit reports:

- ChatGPT helped with readability, sentence structure, tone adjustments.
- Only short text fragments entered (to protect confidentiality).
- Produced alternative formulations → IAF chose best, edited, and finalized reports.

Benefits at Uniper: Most effective in scope prep, risk descriptions, interview prep, meeting minutes, research, and report writing. 50–80% efficiency improvement. Time saved used for deeper interviews & value-added consulting.

Risks & Challenges: Inaccurate/misleading info, Bias in responses, Lack of empathy, Privacy/security concerns, Over-dependence on AI, Manipulation/malicious use, Legal/ethical concerns

Identified Practices & Rules: Always verify independently. Use critical thinking. Protect sensitive info. Respect boundaries. Stay updated on AI security & limitations. Learn from and share experience. Consider a “driver’s license” for responsible AI use.

Big Four & Generative AI

- EY: launched EY.ai, integrating AI across enterprise transformation.
- Deloitte: among the first (Netherlands) to deploy AI for nearly all statutory audits.
- KPMG: created a private, secure ChatGPT tool.
- PwC: invested \$1 billion in AI expansion; developed internal ChatPwC.

Deloitte’s 2024 GenAI Enterprise Report:

- Data governance: 45% updating frameworks.
- AI experiments: < 1/3 reach production stage.
- Regulatory compliance: 36% top concern.
- Impact: 41% struggle to measure AI’s business impact.

Major Financial Frauds

- Enron (2001) & WorldCom (2002): collapse of Arthur Andersen → “Big Five” became “Big Four.”
- Theranos (2018): Elizabeth Holmes convicted; 11 years in prison.
- Wirecard (2020): EY Germany fined & banned for 2 years.
- Deutsche Bank/DWS (2023): overstated green claims, settled for \$25M.

Royal Ahold (2000–2004):

Over-consolidation of joint ventures despite owning < 50% of voting shares (not compliant with GAAP/IFRS). Resulting in restatements with massive overstatements: Net income: +17.6% (2000), +32.6% (2001), +88% (2002). Following the disclosure of restatement, Ahold’s stock price plunged from ~\$10.69 to ~\$4.16. Key players: CEO Cees van der Hoeven, CFO Michiel Meurs, EVP Jan Andrae. Deloitte was auditor at the time.

Corporate Governance & Ethics

- Core elements: ethics, internal controls, information security.
- Processes and policies ensure accountability, fairness, transparency in stakeholder relations.
- Growing importance in CSR/ESG reporting.

Business Ethics:

- Codes of ethics act as internal controls.
- “Tone at the top” strongly influences corporate culture.
- Ethics alone insufficient, regulations needed. → Example: Dutch accountants (since

2006) must

pledge an integrity oath; executives reduced discretionary accruals post-oath.

Internal Controls

- Used as a means of preventing errors and deterring fraud.
- Objectives: Safeguard assets. Provide reliable info. Promote efficiency. Enforce policies.
- Establishment and maintenance of internal controls is a management responsibility.
- In the Netherlands, auditors do not provide an opinion on the effectiveness of internal controls

Types of internal control:

- Preventive (e.g., authorization requirements).
- Detective (e.g., reconciliations, balance checks).
- Corrective (e.g., backup recovery).

Examples of control activities: Proper authorization. Segregation of duties. Chain of command. Four-eyes principle. Record keeping. Access control. Independent verification.

Management vs. Auditor Responsibilities (Ahold Delhaize example)

Management Board:

- Establish/maintain adequate risk & control systems.
- Provide reasonable (not absolute) assurance against misstatements.
- Ensure controls align with strategy, operations, compliance, reporting risks.

Auditors:

- Assess risk of material misstatement (fraud/error).
- Gather sufficient evidence to form an opinion.
- Understand internal controls (but not opine on effectiveness).

Fraud Risk & Auditor's Response

- Presumed risk: management override of controls.
- Management can manipulate financials despite controls.
- Risk areas: manual journal entries, revenue recognition, accounting estimates.

Auditor responses: Evaluated design/implementation of fraud-preventing controls. Tested journal entries, vendor allowances, and consolidations. Assessed management judgment for bias. Reviewed prior estimates for consistency. Evaluated appropriateness of changes and assumptions.

Lecture 6: ESG-relevant AIS, S&P Report, COSO Report

Review: ESG, AIS & Information

- Definition of AIS: A system that records, processes, and reports on transactions to provide both financial and non-financial information for decision-making and internal control.
- Importance: AIS provides mandatory and decision-useful information.
- Qualities of useful information: Relevance and Faithful Representation

Ahold Delhaize Annual Report 2024, Data collection and third-party data use:

- ESG indicator data collection is complex and depends on third-party data (e.g., suppliers).
- Challenges: Data quality varies across brands and relies on the cooperation of other parties.
 - Example: Packaging relies on third-party data for weight and composition.

Environment: Scope 3 Emissions

- Challenge: Obtaining accurate Scope 3 data (indirect emissions in the supply chain).
- Solution: Encourage suppliers to report emissions through surveys (e.g., CDP, ImpactBuying).
- Burden: High effort required from suppliers for data validation.
- Calculation focus: Purchased goods and services, 83.6% of total Scope 3 emissions.
- Approach: Standardized factors and information from multiple systems for consistency.

Social: Equal Pay

- Gender pay difference (unadjusted, avg): 14.13% (2024)
- Interpretation: There is still a gap, but progress is shown via adjusted measures.

Roles of Technology in ESG

- Clean Technology: Improves ESG performance (e.g., decarbonization, efficiency).
- Reporting Technology: Captures, analyzes, and reports ESG data.
- Information Technology: Aggregates structured/unstructured ESG data for benchmarking.
- Foundation Technology: Supports reporting through IoT, AI/ML, Blockchain, Cloud, Cybersecurity.

Technology enhances ESG reporting and governance. (articles slide 8-13)

Real-time accounting enables continuous monitoring and data-driven decision-making. Ethical use of AI is vital to prevent bias and ensure transparency. A lack of regulatory standards in ESG data creates inconsistency, highlighting the need for stronger frameworks. Cybersecurity, tied to GDPR compliance, is becoming a key governance concern as firms quantify financial risks from cyber threats. Ahold Delhaize exemplifies this by implementing global cybersecurity policies. Lastly, digital twins and digital threads improve ESG data assurance by providing transparency across supply chains, helping organizations track and manage environmental impacts.

ESG Fraud Case: Deutsche Bank/DWS

In May 2022, German authorities raided DWS for alleged “greenwashing.” CEO resigned; DWS overstated sustainability of investments. DWS settled with SEC for \$25 million. Significance: Highlights risks of ESG misrepresentation and the need for reliable assurance.

Internal Control in ESG

- Roles of internal control: Review ESG data quality and existing control systems.
- Perform gap assessments and issue recommendations.
- Provide assurance on metrics (e.g., GHG emissions, diversity).

Equal-Salary Certification at Ferrari Two-step process: Statistical analysis of salary data, must show <5% gender pay gap. Audit by PwC, reviews company’s commitment to equal pay via HR processes.

Internal Control Over Sustainability Reporting (ICSR) is published by **COSO** (2023). COSO is a coalition of 5 global accountancy organizations (AICPA, FEI, IMA, AAA, IIA) and previously developed Internal Control and ERM frameworks. Purpose: Guidance for control in sustainability reporting.

Internal Control—Integrated Framework (ICIF-2013, COSO)

Definition: A process designed to ensure achievement of operational, reporting, and compliance objectives. Five Components: Control Environment, Risk Assessment, Control Activities, Information and Communication, Monitoring Activities

ESG Disclosures and Control Processes (Heineken Example) Source: COSO (2023, p.97)

- Context: Excerpt from Heineken N.V.’s Annual Report (assured by Deloitte Accountants B.V.).
- Content summary: Deloitte reviewed Heineken’s sustainability data (2021) for consistency with reporting criteria in Reporting Basis and Governance for Non-financial Indicators.
- The assurance report concluded that the sustainability data were not materially misstated.
- Heineken’s ESG reporting aligns with ICIF-2013 (the principles are applied).

Applying ICIF-2013 Principles: Ahold Delhaize Example

Management Board:

- Prepares sustainability statements per ESRS (European Sustainability Reporting Standards).
- Performs double materiality assessment (financial and impact perspective).
- Ensures statements are free from material misstatement (fraud or error).

Supervisory Board: Oversees the sustainability reporting process and validates the materiality.

Conventional Financial Reporting vs. Sustainable Business Information:

- Control vs. Influence: Financial reporting focuses on control; ESG involves external influence.
- Quantitative vs. Qualitative: ESG data often qualitative.
- Historical vs. Forward-looking: ESG considers future impact and projections.
- Voluntary vs. Regulated: Sustainability reporting evolving from voluntary to regulated.

Financial data are structured, short-term and stored in systems like ERP;
Sustainability data are more qualitative, long-term and externally sourced.

New Challenges:

- Immature systems, unstructured data
- Shortage of talent and expertise
- Reliance on third-party data
- Need for external assurance
- Rapidly evolving software and data platforms

Exam Literature

"The Data Analytics Journey: Interactions Among Auditors, Managers, Regulation" (Austin, 2021)

1. Purpose of the Paper

The paper examines how data analytics is transforming the audit and financial reporting environment. It emphasizes the interactions among auditors, managers, and regulators as they adapt to new technologies. The central idea: data analytics is not just a tool but a reshaper of roles, expectations, and accountability in accounting.

2. Key Themes

The Analytics Journey

- Analytics adoption is described as a journey, moving from basic data extraction → descriptive statistics → predictive models → prescriptive and automated decision-making.
- This mirrors the broader digital transformation of accounting processes.
- Early stages: mostly efficiency gains (faster audit tests).
- Advanced stages: can fundamentally alter audit evidence, assurance, and risk assessment.

Changing Roles

- Auditors must learn to use and evaluate increasingly complex analytical tools. Traditional sampling is being replaced by full-population testing.
- Managers face new pressures and opportunities: more transparency, but also more expectations for internal analytics and controls.
- Regulators play a critical role in setting boundaries: they must balance innovation with reliability and investor protection.

Tensions and Interactions

- There are frictions between:
 - Innovation (adopting AI/Big Data in audits) and
 - Regulation (ensuring reliability and comparability).
- Firms want flexibility to innovate, but regulators demand consistency and defensibility.
- Auditors sometimes become "technology evaluators" rather than just "checkers."

3. Important Points & Takeaways

- Audit quality: Analytics can increase quality by analyzing entire datasets, but it can also create risks (e.g., reliance on black-box algorithms).
- Skills gap: There's a demand for accountants to develop data literacy, programming familiarity, and statistical reasoning.
- Trust: Stakeholders (investors, regulators) must be confident that analytics-based judgments are valid.
- Standard-setting lag: Regulation and professional standards often lag behind

technological innovation.

- Future outlook: Continuous auditing, real-time reporting, and AI-driven assurance are on the horizon — requiring collaboration among all three parties (auditors, managers, regulators).

4. Relation to the Course (APM / AIS)

- AIS Purpose → Data analytics is a core part of modern AIS.
- Emerging Technologies → The paper covers Big Data, AI, automation in auditing.
- Risks & Controls → Discussion on regulatory oversight, black-box risk, and assurance.
- Roles of Accountants (IFAC's four roles):
 - Users (adopting tools),
 - Managers (implementing firm-wide analytics),
 - Designers (shaping AIS & analytic models),
 - Evaluators (assessing risk, compliance, and audit quality).

5. Quick Exam-Ready Summary

"Austin (2021) highlights how data analytics transforms the relationships between auditors, managers, and regulators. Analytics shifts auditing from sample-based testing to full-population analysis, creating opportunities for better assurance but also challenges in skills, trust, and regulation. The paper frames analytics adoption as a journey, emphasizing both innovation and the tensions with standard-setting. For accountants, this underscores the need to be future-ready in multiple roles: as users, managers, designers, and evaluators of AIS and analytics tools."

"Corporate Governance and Blockchains" by David Yermack (2017)

Summary of the Paper

1. Core Idea

Blockchains are a new way of keeping financial records, potentially as revolutionary as double-entry bookkeeping. They promise lower costs, higher liquidity, more accurate ownership records, and transparency, which could transform corporate governance

2. How Blockchains Work (Technical Foundation)

- Blockchain = a **sequential ledger secured by cryptography**.
- Each block contains transactions, a timestamp, and a link to the previous block (*immutability*).
- Public blockchains (like Bitcoin) are decentralized and verified by "miners," while private/permissioned blockchains are controlled by gatekeepers (e.g., stock exchanges)
- **Smart contracts** (self-executing agreements) allow automation of financial instruments (like options, debt covenants).

3. Implications for Corporate Governance

Transparency of Ownership

- All shareholders could see ownership changes in real time.
- Harder for managers or activists to hide trades.
- Could weaken hostile takeovers and activist strategies that depend on secrecy

Liquidity Improvements

- Settlement times (currently 2–3 days) could be reduced to near-instant.
- Fewer intermediaries → lower transaction costs.
- Higher liquidity could encourage more investors and change trading behavior

Institutional Investors & Activists

- Transparency makes “secret” stake-building harder → activism costlier.
- Liquidity makes **exit (selling shares)** easier than **voice (pressuring management)**.
- Could shift governance toward more passive shareholder behavior

Managers

- Insider trading becomes harder: trades are visible instantly.
- Backdating compensation (options, stock grants) becomes impossible.
- Pledging shares as collateral or hedging becomes more transparent.
- Managers may need higher pay since they lose “hidden” perks

Market Microstructure

- Easier to identify informed vs. uninformed traders.
- Bad news might reach markets faster (since selling patterns become clearer).
- More informative share prices → more efficient capital allocation

Voting in Corporate Elections

- Blockchain voting = faster, transparent, less error-prone.
- Could reduce manipulation of close elections.
- Makes “empty voting” (borrowing shares just to vote) harder

Real-Time Accounting

- Firms could publish all transactions directly on a blockchain.
- Would reduce need for auditors → estimated \$50B in savings in the U.S.
- Managers would lose ability to manipulate accruals or earnings timing.
- Related-party transactions would become instantly visible

Smart Contracts

- Automate debt repayment, employee bonuses, option exercises, etc.
- Reduce agency costs, lower risk of default, less need for covenants and credit rating agencies

4. Governance of Blockchains Themselves

- Open blockchains risk 51% attacks or sabotage by miners.
- Governance depends on consensus: software code changes require majority adoption.
- Case study: Ethereum “hard fork” in 2016 after a hack showed even supposedly

immutable systems may get rewritten

5. Conclusions

Blockchains could fundamentally shift the balance of power in corporate governance:

- Shareholders gain transparency, liquidity, and better voting rights.
- Managers lose stealth benefits and flexibility in reporting.
- Auditors, lawyers, rating agencies may become less relevant.
- Markets could allocate capital more efficiently.

But: New governance challenges arise around who controls blockchain infrastructure itself

Key Takeaways for the Exam

- Purpose of AIS/APM: Blockchains represent the next evolution in accounting information systems.
- Value of Emerging Tech: Transparency, immutability, efficiency — but also risks (privacy, sabotage).
- Risks/Control Issues: Insider trading harder, accrual manipulation reduced, but activists lose secrecy.
- Role of Accountants: From “auditors” to interpreters of blockchain data.
- Big Picture: Blockchain = decentralization + automation → disrupts corporate governance, auditing, compensation, and shareholder rights.

Leveraging ChatGPT for Enhancing the Internal Audit Process—A Real-World Example from Uniper, a Large Multinational Company (Accounting Horizons, 2025)

Context & Motivation

- **Internal audit (IAF)** is central to risk management, compliance, and governance. But it often faces resource constraints.
- **ChatGPT** and other large language models (LLMs) are seen as tools that can help auditors with tasks like planning, data analysis, and reporting.
- The study provides one of the **first real-world case studies** of using ChatGPT in auditing, focusing on Uniper (a German energy company with ~28 auditors).

Methodology

- Case study + interviews with 6 people (internal auditors + auditees).
- Covers **audit phases**: preparation, fieldwork, reporting, and monitoring.
- Researchers were independent, ensuring unbiased interpretation.

How ChatGPT Was Used in Internal Audit

Audit Preparation

- Brainstorming risks: 80% of identified risks came from ChatGPT.

- Defining scope: Generated scoping documents with audit areas + subitems.
- Risk/program development: Suggested audit steps and interview questions.

Fieldwork

- Interview support: Created tailored interview questions.
- Minutes & translation: Summarized + translated meeting notes (German → English).
- Research: Processed regulatory texts and news articles relevant to audits.

Audit Reporting

- Report writing: Improved readability, structure, and wording.
- Translation help: Especially useful for non-native English speakers.

Benefits Observed

- Efficiency gains: Estimated 50–80% time savings on some tasks.
- Quality improvements: Reports became clearer and more professional. More risks and perspectives identified during brainstorming.
- Reallocation of effort: Auditors used saved time for deeper interviews and more consulting-style tasks.
- Positive reception: Both auditors and auditees found it valuable.

Risks & Challenges

Main Concerns:

1. Inaccurate or misleading answers (hallucinations).
2. Bias in responses.
3. Loss of personal tone in reports.
4. Privacy/security risks when entering sensitive data.
5. Over-reliance without critical evaluation.
6. Potential malicious misuse.
7. Legal/ethical issues (IP, compliance).

Key Practices:

- Always verify outputs independently.
- Avoid putting sensitive data into ChatGPT.
- Require training (“driver’s license”) for users.
- Run roadshows to share experiences across the firm.
- Use secure/private environments (e.g., Azure cloud).

Broader Implications

- Uniper now uses ChatGPT in every audit (though still a “pilot” in IT terms).
- Potential future: Generative AI could reshape auditing, but governance frameworks are needed.
- Shows how accountants act as users, managers, designers, and evaluators of AIS—exactly the roles mentioned in your course description.

Why This Matters for the Exam (APM context)

- Purpose of AIS/APM: This paper shows exactly how an AIS tool (ChatGPT) supports business processes.
- Emerging technologies: Demonstrates how AI/LLMs impact accounting, a key exam theme.
- Risk & control issues: Privacy, bias, and hallucinations highlight the control perspective.
- Data acumen: Auditors learned to critically interpret AI outputs—ties to your skill-building (Excel/Tableau parallel).
- Recommendations: The article models how accountants can recommend responsible use of AI in organizations.

Key Takeaways for Quick Recall

1. Case: Uniper used ChatGPT in all audit stages → efficiency + quality.
2. Benefits: 50–80% time saved, better risk identification, improved reporting.
3. Risks: Inaccuracy, bias, privacy, over-reliance → need verification.
4. Controls: Verify, train, secure environment, critical thinking.
5. Big Picture: Accountants must adapt as users, managers, designers, evaluators of tech-driven AIS.

Early Disruptors: Examining the Determinants and Consequences of Blockchain Early Adoption by Feng Guo, Stephanie Walton, Patrick R. Wheeler, and Yiyang (Ian) Zhang (2021, Journal of Information Systems)

Overview of the Study

The paper investigates:

- Why firms decide to early-adopt blockchain technology, and
- What the consequences of early adoption are on firm performance.

Core Argument

Blockchain is a *disruptive innovation* that can transform how organizations record, process, and verify transactions, but early adoption often involves managerial opportunism, uncertainty, and high implementation costs.

The authors used data from 142 public firms (2015–2017) that disclosed blockchain projects to the SEC.

Blockchain in Accounting and Business Processes

Blockchain Definition : A *decentralized digital ledger* that records transactions in an immutable, transparent, and secure way. It allows participants to share information without a central authority

Potential Benefits

- Increased transparency and data integrity
- Reduction in fraud and audit sampling costs

- Enhanced real-time reporting and process efficiency

Challenges and Risks

- Regulatory uncertainty and lack of accounting standards
- High costs of integration with existing systems
- Complexity and scalability issues
- Possible hype-driven or opportunistic adoption

Theoretical Framework

The study builds on Diffusion of Innovation Theory (Rogers, 2003), which explains how new technologies spread. It identifies five determinants of innovation adoption:

1. Relative advantage
2. Compatibility
3. Complexity
4. Trialability
5. Observability

The authors align these with firm-level factors to test four main hypotheses:

Determinant	Proxy	Hypothesis
Patented Technology	# of patents	Firms with more technological capacity are more likely to early-adopt blockchain.
Agency Costs	Managerial discretion (accruals, earnings smoothing)	Opportunistic managers are more likely to early-adopt blockchain.
Complexity	Reporting complexity, audit delay	Complex firms are more likely to adopt blockchain to simplify processes.
External Monitoring	Analyst following, Big 4 auditor, institutional ownership	Monitoring constrains risky or opportunistic early adoption.

Methodology

- Sample: 9,396 firm-year observations (2015–2017)
- Blockchain adopters: 142 firms across industries
- Data Sources: SEC filings (10-K, 8-K, etc.) and Capital IQ news
- Main analysis: Probit regression on determinants of adoption
- Performance impact: Propensity score matching to compare early adopters vs. non-adopters

Key Findings

1. Determinants of Adoption

- Patented Technology (+): Firms with more patents are significantly more likely to adopt blockchain, possibly to signal innovation or attract partners.

- Agency Costs (+): Firms showing higher managerial discretion and earnings smoothing adopt blockchain more, suggesting opportunistic motives.
- Complexity (+): Firms with complex reporting (e.g., many XBRL tags, long audit lags) are more likely to adopt blockchain to improve transparency.
- External Monitoring (-): Firms with high institutional ownership or Big 4 auditors are *less likely* to early-adopt blockchain—monitoring mitigates risky decisions.

2. Consequences of Adoption

- No immediate performance benefits. Early adopters experienced:
 - Lower return on assets (ROA)
 - Lower operating cash flows (OCF)
- Suggests high implementation costs and delayed efficiency gains—consistent with the “productivity paradox” of new technology.

3. Industry Pattern

- Majority of early adopters are in technology-intensive industries (software, electronics).
- Non-tech firms show similar patterns, meaning results are not driven only by tech supply firms.

Relevance to Accounting Process Management (APM)

Technology and AIS

Blockchain represents a next-generation AIS enabling *real-time, verifiable, and decentralized* accounting records. The paper demonstrates how technology adoption decisions are linked to organizational characteristics and managerial incentives.

Roles of Accountants in the Digital Age (IFAC framework)

IFAC Role	Paper Relevance
User of Technology	Accountants must understand blockchain’s potential for transparency and data integrity.
Manager of Technology	They oversee adoption feasibility, considering cost, complexity, and risk.
Designer of AIS	Blockchain can redefine how accountants design systems for auditability and control.
Evaluator of AIS	Accountants assess whether adoption is strategic or opportunistic, and evaluate financial outcomes.

Exam-Relevant Insights

Blockchain adoption isn't purely technological — it's strategic, behavioral, and regulatory. Early adoption often results in short-term financial strain, emphasizing the importance of cost-benefit analysis and risk evaluation—skills central to APM.

Key Takeaways

Theme	Summary
Innovation Dynamics	Blockchain adoption follows diffusion patterns influenced by technological capacity, managerial discretion, and external oversight.
Managerial Behavior	Early adoption can be driven by hype or self-interest, not always by efficiency gains.
Accounting Implications	Blockchain could revolutionize transaction processing, but regulatory, audit, and control frameworks are still evolving.
Performance Impact	Short-term performance may decline; long-term benefits depend on integration quality and transparency.
Future Role of Accountants	Accountants will be central in managing and evaluating blockchain-based accounting systems.

How to Use for Exam Preparation

- Connect blockchain adoption theory to AIS modernization and process improvement.
- Use the study as an empirical case for:
 - Innovation diffusion in AIS
 - Technology risk management
 - Governance and control implications of new accounting systems.