



Complex networks in audit

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With you today



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Introduction



Consolidated statement of financial position as at 30 September 2021

(before appropriation of results)

EUR 000		30 September 2021	30 September 2020*
Assets			
Non-current assets			
Intangible assets and goodwill	13	14,246	15,734
Property, plant and equipment	14	148,888	158,867
Other financial assets	15	77	–
Deferred tax assets	11	2,801	2,542
		163,912	177,143
Current assets			
Contract assets		22,257	27,993
Receivables		97,469	97,040
Cash and cash equivalents	17	164,594	85,181
Assets held for sale	18	256	–
		284,376	210,214
		294,576	210,214
Total assets		460,588	387,357

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The need

- A recent report states, among other things, that new technology can improve audit quality. Specifically, it indicates that data-driven methods and analysis could make audits more effective and efficient.



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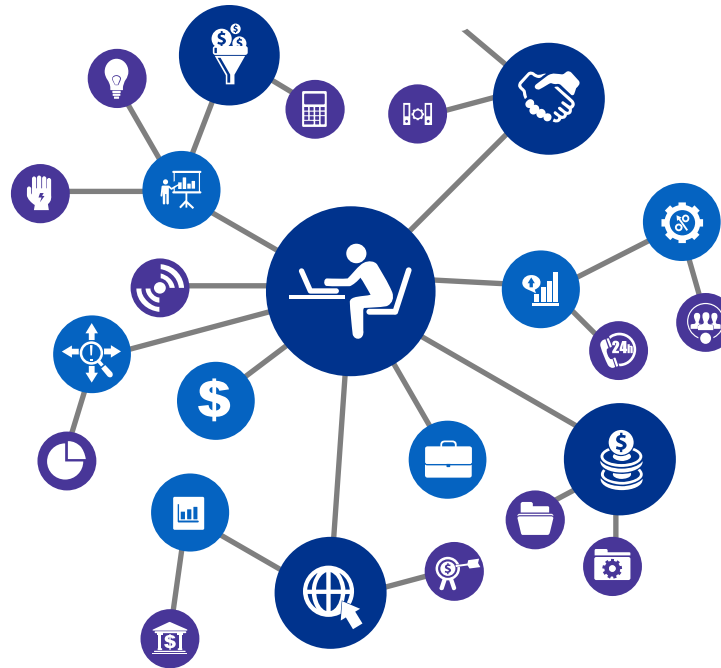
Audit with AI

Develop data driven audit methods

- Build a network representation from journal entry data
- Use the network for risk analysis procedures



Activities of a company



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A network model

Data sources of an audit

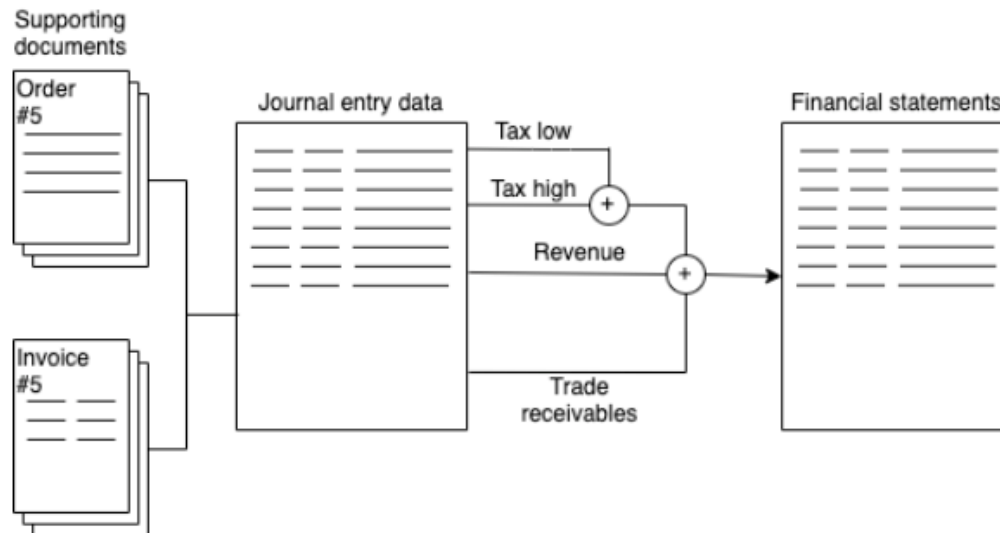


Figure 1.2: This high-level data overview shows how the aggregated information is connected to the documents recorded in the company's systems. The financial statements (right) are an aggregate representation of the journal entry data (middle), which is connected to supporting documents such as invoices, work orders, and more (left).

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The data: Journal entries

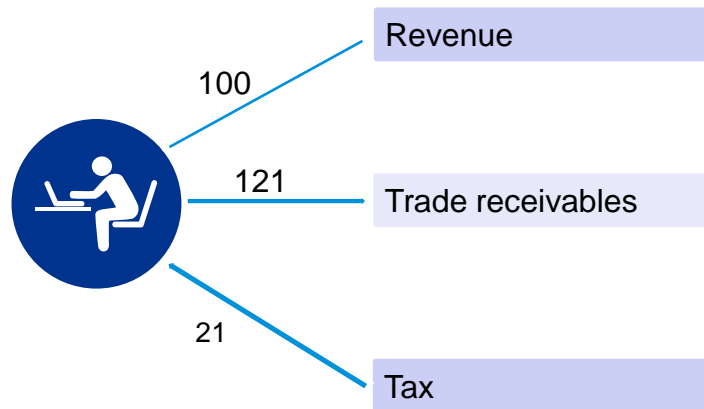


Financial	Journal	Date	Debit	Credit
Revenue	Sales ledger	02-11-2019	-	100
Trade receivables	Sales ledger	02-11-2019	121	-
Tax	Sales ledger	02-11-2019	-	21

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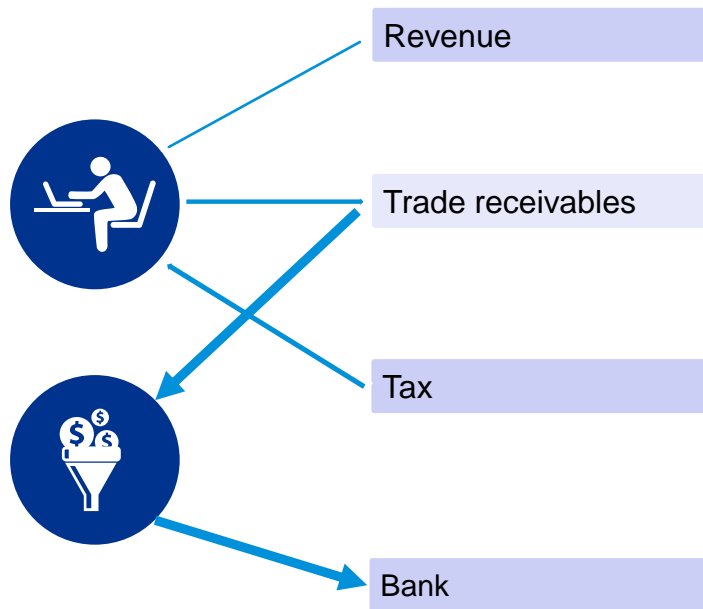
The data structure: a bipartite network



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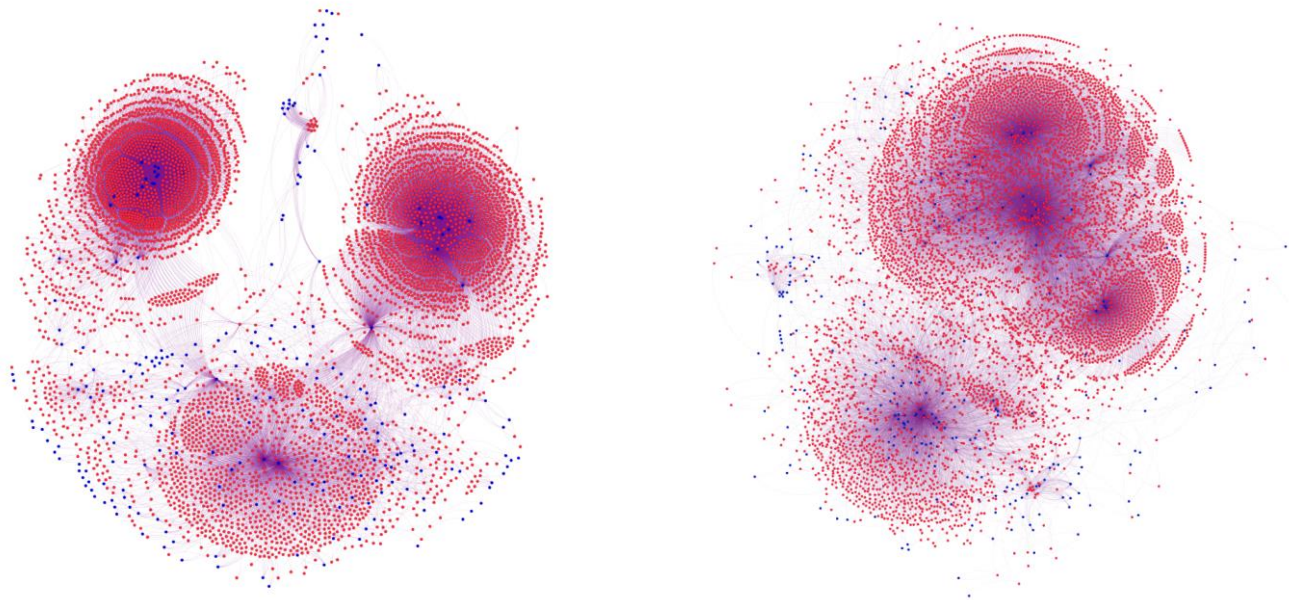


The data structure: a bipartite network





Real networks

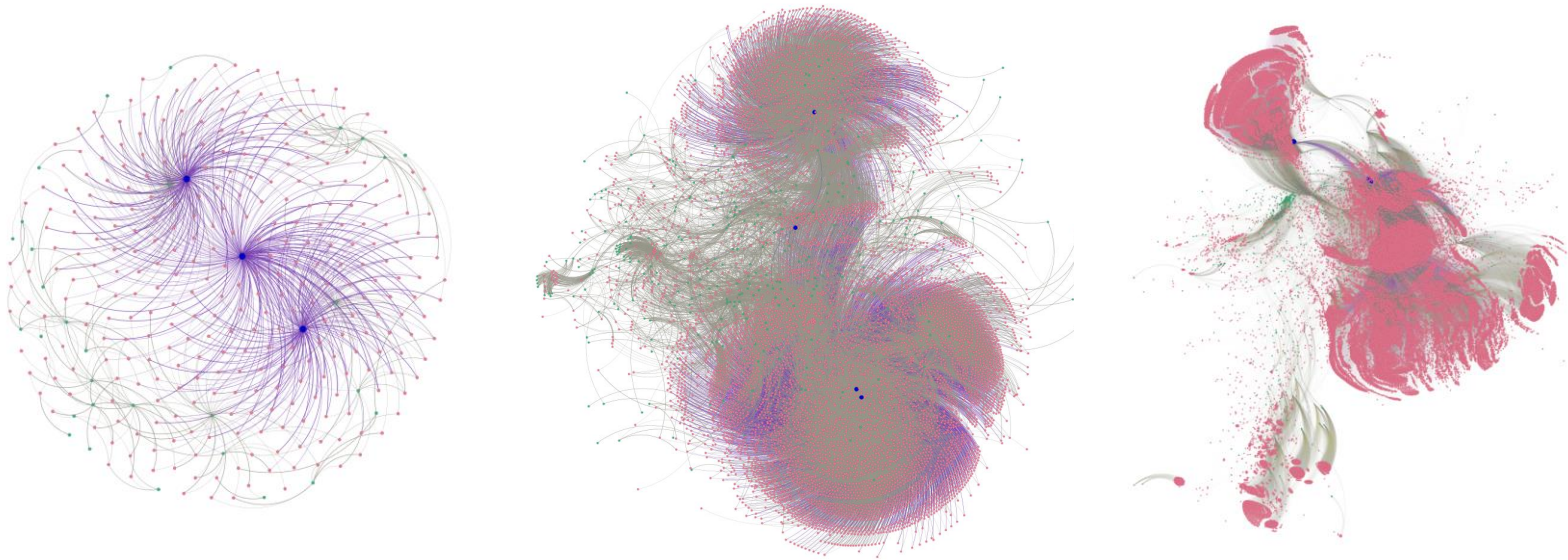


Boersma, Marcel, et al. "Financial statement networks: an application of network theory in audit." *The Journal of Network Theory in Finance* 4 (2018).

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Audit Insights

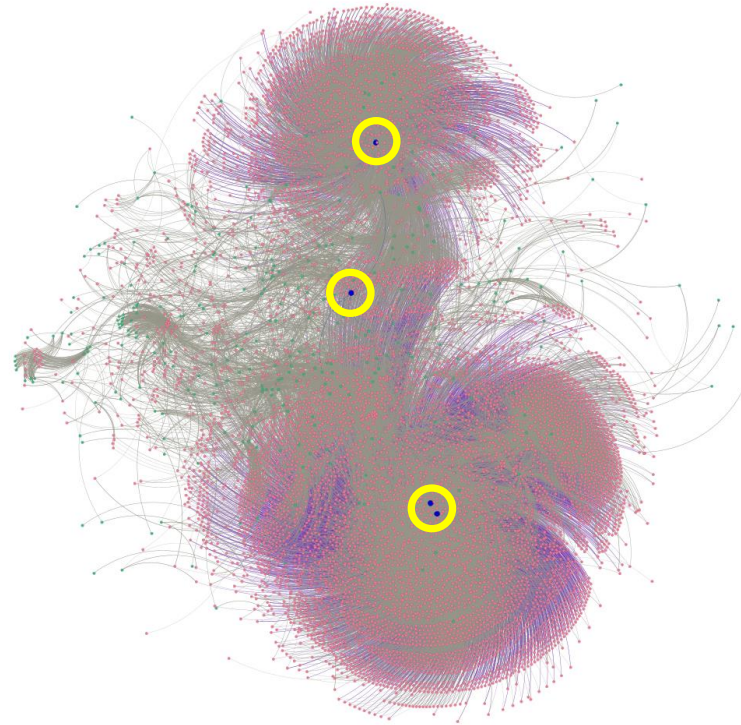
Understanding the networks: finding risks



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Analysis: key parts of the financial structure



Financial

- hubs
- gatekeepers
- core-activities

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Audit insights

Baseline statistics:

- used to assess whether a new client's financial structure is in line with expected statistics (power-law distribution of financial account nodes, diameter expectations, etc).

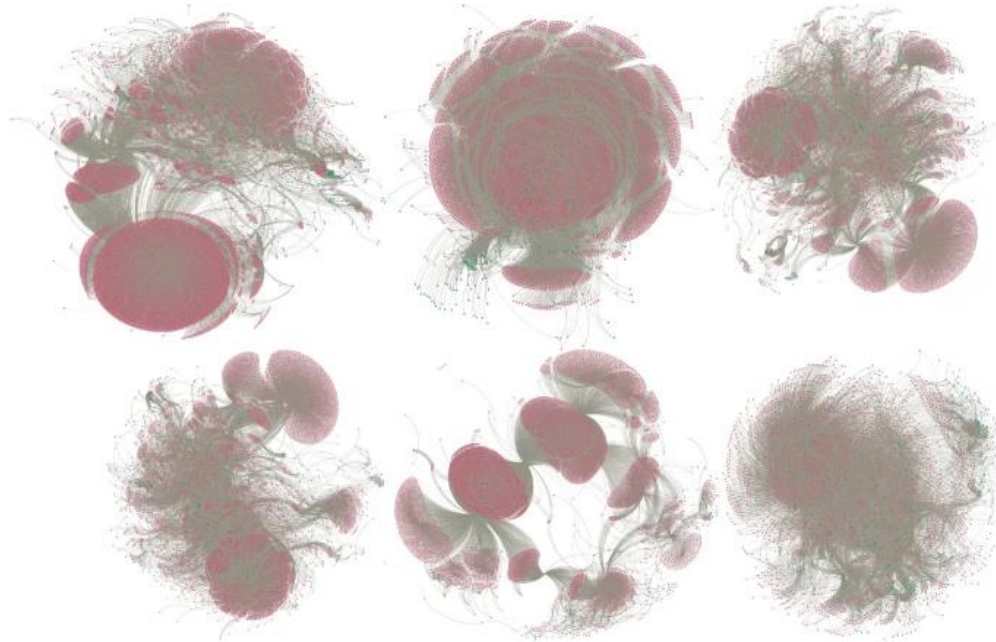
Centrality measures

- Financial Gatekeepers (betweenness centrality)
- Financial Hubs (closeness centrality)
- Financial Core-activities (degree centrality)

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Are these networks similar?



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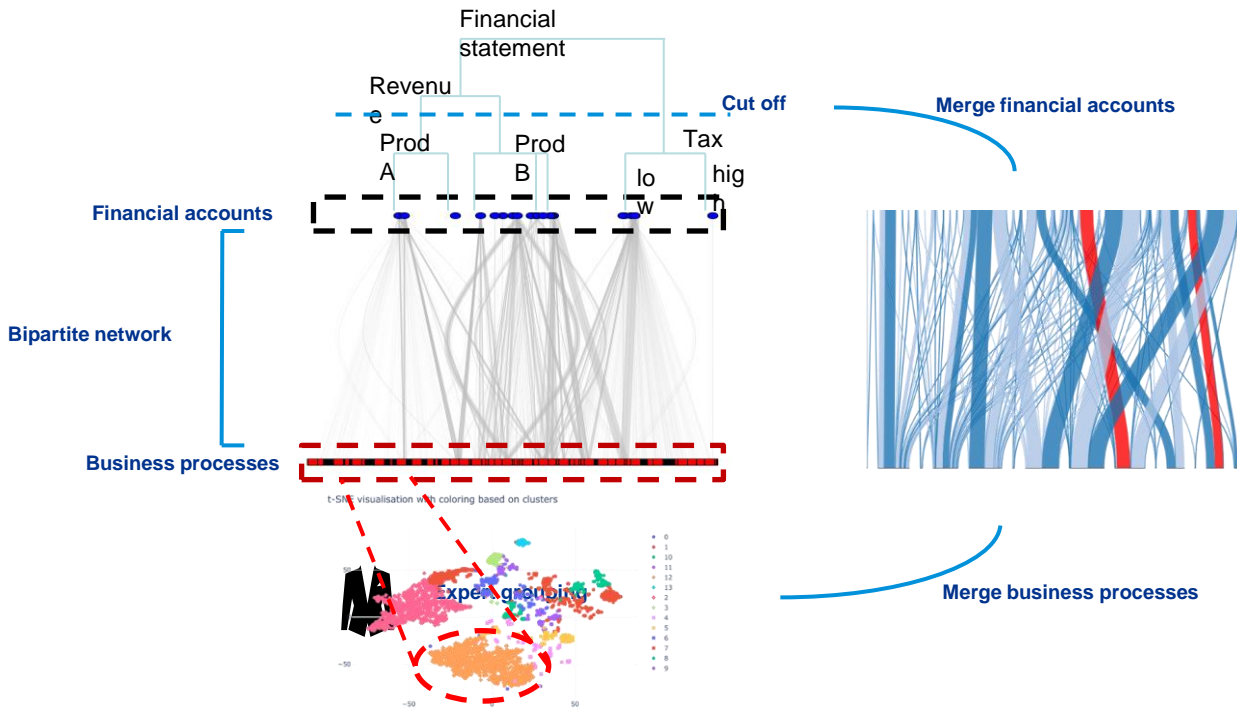
Audit insights

An auditor can use this to assess the audit risk by:

- Comparison with industry peers
- Comparison with prior year network structures



Simplifying the network

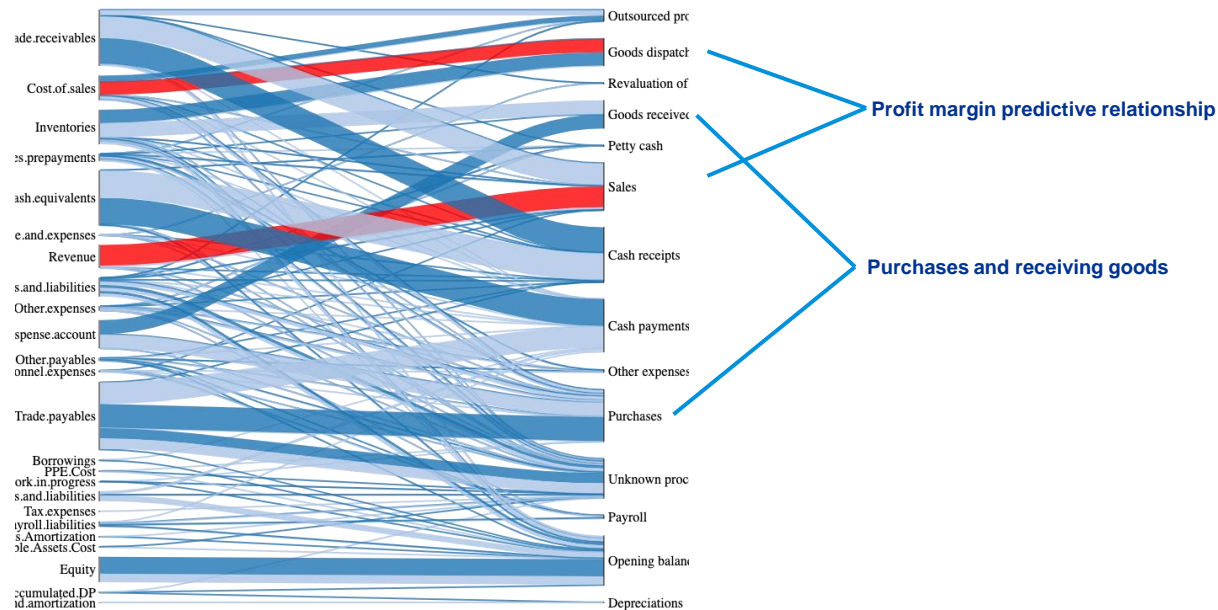


Boersma et al. 2020 Scientific Reports

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Simplified network



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Audit insights

Use statistical relationships as:

- Risk assessment procedure
- As substantive analytical procedure

Financial statement networks



Outlook and discussion

Contributions

- A generic network representation of transaction data
- Base line statistics of Financial statements network
- A way to coarse-grain the network to provide a high-level understanding of the financial flows
- Similarities across companies

Conclusion: Our research focuses on developing data-driven audit methods to enhance the overall quality of audits. We achieved this by revealing the financial structure as a bipartite network. We answered multiple relevant audit questions by analyzing the network structure, demonstrating the chosen representation's usefulness. We showed that the financial statements network could be applied to risk assessment procedures.

Outlook:

- Financial statements network for fraud analysis in audit
- Assurance from models

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Data driven audits – paving the way for higher quality audits



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Getting Started

- Start building your own networks with Python using NetworkX
- Analyze them with standard libraries



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Want to connect?

Add me on LinkedIn



Write me an e-mail

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