Methods of artificial intelligence in procurement

A conceptual literature review

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PORSCHE

Method and aim of the literature review AI in procurement.

Buyers spend on average fifty-two percent of their time on transactional activities. The typical operating cost is roughly one percent of overall expenditure whereas procurement saves on average ten times as much.

This work builds on broader literature reviews on so-called big data analytics in supply chain management focusing specifically on AI and machine learning methods in the procurement function.

Content analysis approach proposed by Mayring that is followed by highly cited review papers in this area:

1. Material collection, which entails a process of search and delimitation of articles →**1) Key word search**
2. Descriptive analysis, which provides characteristics of the studied literature
3. Category selection, which aims to construct a classification framework →**2) Classification**

Finally, material evaluation to analyze based on the proposed classification framework and interpret results. This is completed by assorted expert interviews to assess business value and effort →**3) Interviews**
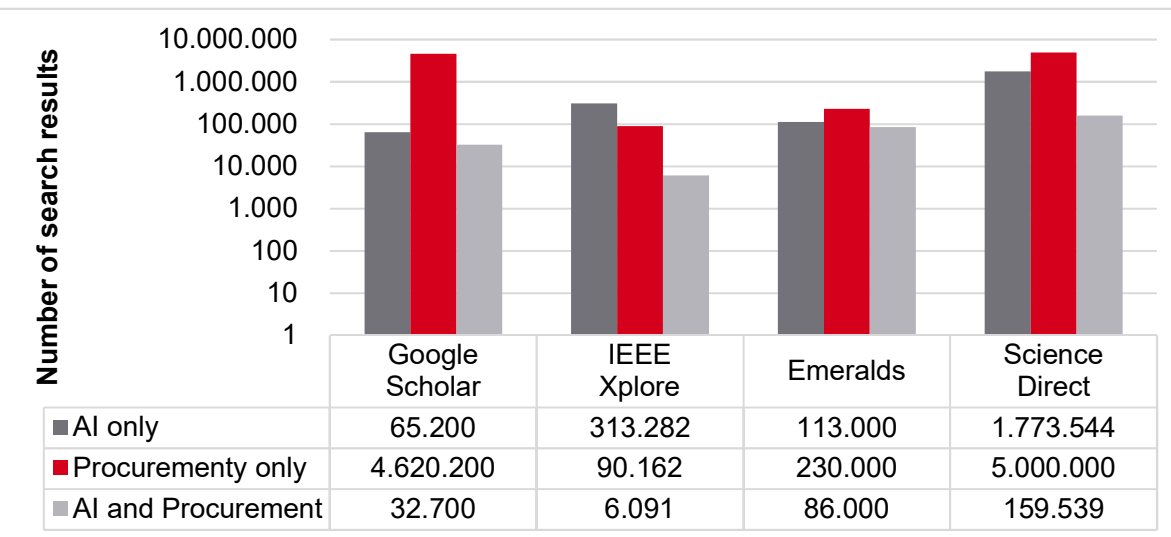
Sources: Waller and Fawcett, 2013, Mayring, 2014, Souza, 2014, Nowosel et al., 2015, Gunasekaran et al., 2017, Nguyen et al., 2017, Vollmer et al., 2018

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1) Material collection with key word based search.

To identify relevant and important previous works, it is essential to identify an effective set of keywords that captures the synthesis of existing literature related to the research topic through the most important search bases such as Google Scholar, Xplore, Emeralds, and Science Direct.

The initial key word set up by examining other **literature reviews**, **prominent publications** within the field, and the **judgement of the authors**:

- Artificial intelligence, AI, machine learning, expert systems, chat bot and
- Procurement, purchasing, sourcing, savings, supply management, supplier, category management, buyer, negotiation

	Google Scholar	IEEE Xplore	Emeralds	Science Direct
■ AI only	65.200	313.282	113.000	1.773.544
■ Procurementy only	4.620.200	90.162	230.000	5.000.000
■ AI and Procurement	32.700	6.091	86.000	159.539

For all search bases, the top 100 results were reviewed based on the title, the key words, and the abstract since afterwards not sufficiently relevant publications were found in the results.

The consecutive snow ball search through the references was most valuable where about four in five publications were found.
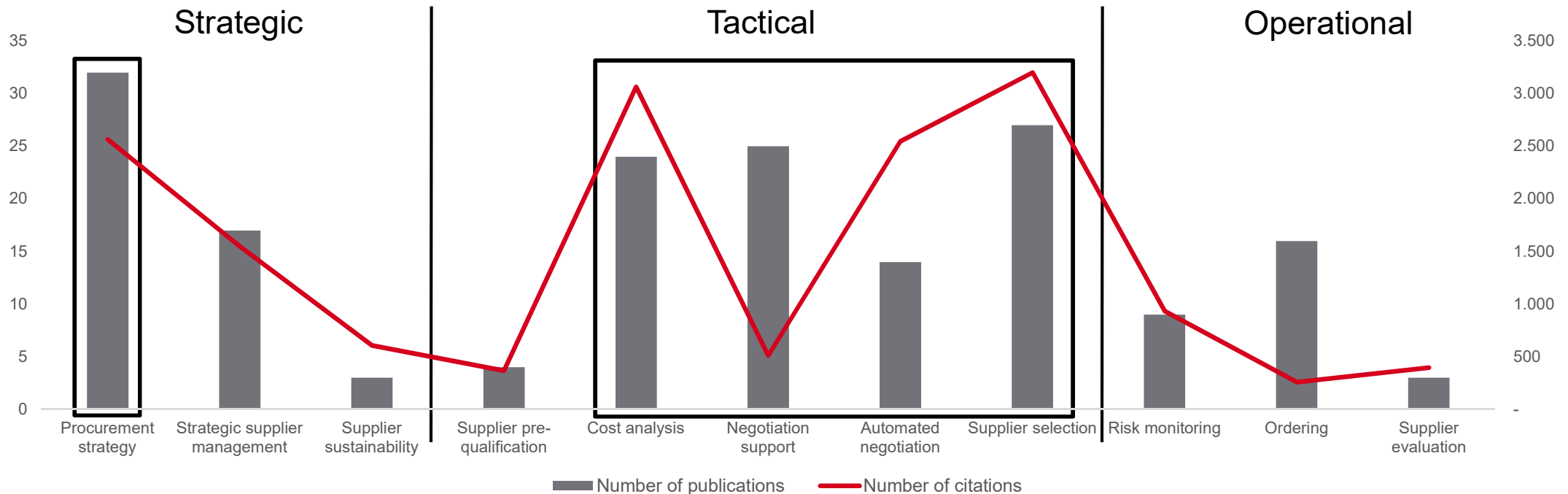
The completeness of the review was controlled by a second key word search. Although a literature review is probably never absolutely complete, with the final key word search only a very limited number of further publications were identified.

Sources: Eisenhardt, 1989, Kobbacy and Vadera, 2011, Spina et al., 2013, Nguyen et al., 2017

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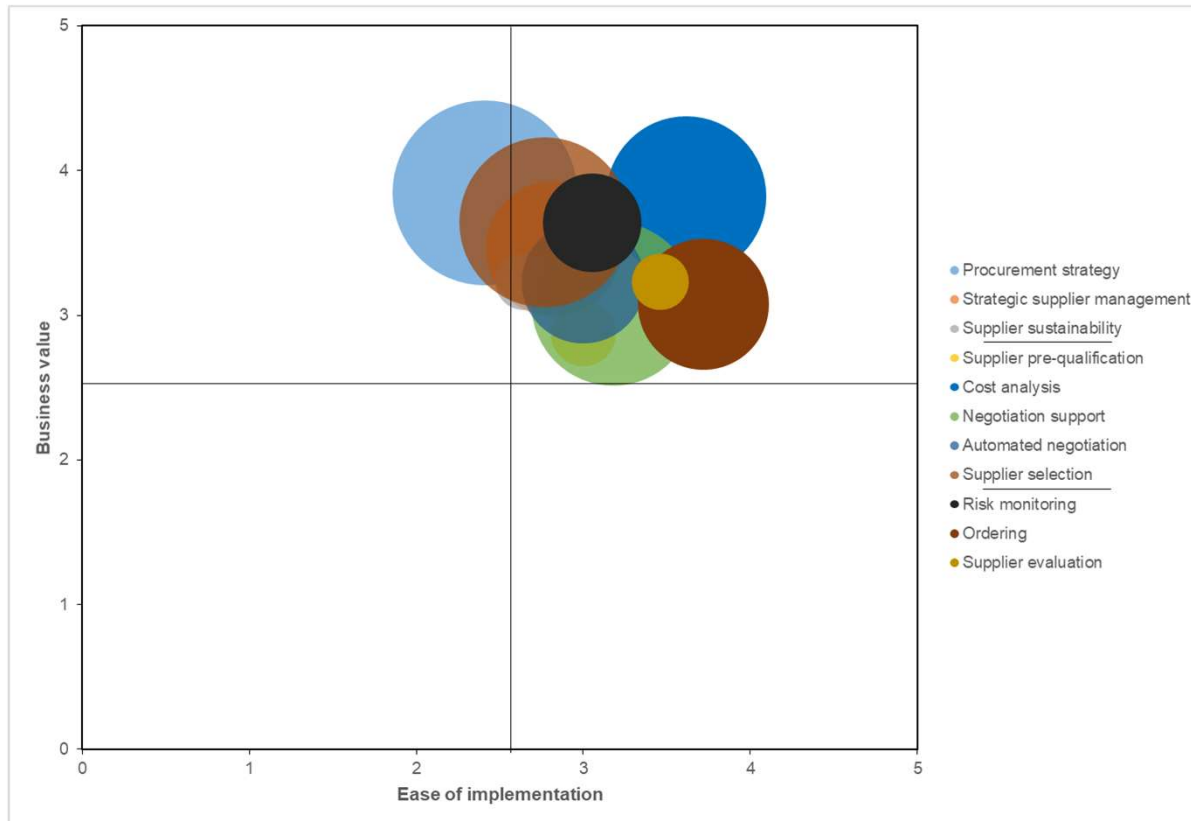# 2) Classification of procurement dimensions with clusters.

The procurement function can be subdivided in different ways, i.e. strategic, tactical, and operational level. SAP utilizes this framework under the name of plan to strategic, source to contract, and purchase to pay as well as the German supply chain association, the consultancy BCG, other reviews and academic works.

All publications have been clustered in the eleven sub-cluster to further assess them in the interviews.

Sources: Souza, 2014, van Weele, 2014, Batran et al., 2017, BME, 2018, Chopra, 2019, Inverto, 2020

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3) Findings and interpretation based on 13 expert interviews.

- Most **discussed use case cluster** are **sustainability** and **automated negotiation**

- Strongest **business case value** are procurement strategy and cost analysis (leaning **strategic** level)

- Strong **ease of implementation** ordering, cost analysis, and supplier evaluation (leaning **operational** level)

- **Overall cost analysis** most attractive, overall much research focus on tactical level, **operational level** seems a **gap**!

Legend (chart):
- Procurement strategy
- Strategic supplier management
- Supplier sustainability
- Supplier pre-qualification
- Cost analysis
- Negotiation support
- Automated negotiation
- Supplier selection
- Risk monitoring
- Ordering
- Supplier evaluation

Chart axes: X-axis "Ease of implementation" (0–5), Y-axis "Business value" (0–5)

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Now the fun part with implications, questions and discussion!

Although application of AI in procurement is still in its early days, body of literature is larger than expected especially of automated negotiations, procurement strategy, and negotiation support.

Through the expert interviews, further research direction for my PhD studies, research and practice in general could be derived.

→What did you like about the study? Where do you see the most value for research and practice?

→ What experience have you made with AI? Which use case cluster do you find most interesting?

→Where do you see (potential) hurdles/ weaknesses? What would you do differently methodically?

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Thanks for your time! References are summarized below.

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