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CURRENT STATE OF ARTIFICIAL INTELLIGENCE DEPLOYMENT IN THE PUBLIC ADMINISTRATION: A SYSTEMATIC LITERATURE REVIEW

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Inhalt

1. Introduction
2. Problem Statement
3. Research Questions
4. Definitions
5. Results
6. Discussion
7. Future Work



Introduction

- Current situation in public administration: wave of retirements, shortage of skilled workers, economical use of budget funds, need for modernization in connection with eGovernment
- More powerful hardware, better algorithms and models (currently ChatGPT) enable new use cases in public administration
- Innovation possible through AI in public administration

Problem Statement (1)

- Public administrations need an overview of the successful use of AI in IT solutions in the same country or in other countries → Learn from the experiences of others
 - Where is AI suitable?
 - Where does AI not provide satisfactory solutions or where are no use cases known yet?
 - Do not repeat mistakes with financial implications
- 6 literature reviews found were examined against the background of the search period, the literature databases used and the examples found and determined → own literature research required in order to obtain a broad and at the same time up-to-date overview for a qualitative content analysis

Problem Statement (2)

- Points of criticism of previous literature reviews:
 - too rough categorization
 - too few literature databases
 - no manual evaluation
 - search period too long
- ideas pursued from the existing literature reviews:
 - Presentation of the result as a PRISMA diagram
 - Public policy cycle for structuring political decision-making processes
 - Use COFOG classification scheme for better comparability between countries
 - Comparison with results (figures) where possible
 - Further development of a model

Research Questions

- Q1: In which applications is artificial intelligence being tested or already being used productively in public administration?
- Q2: Which taxonomy is suitable for classifying the use of AI in public administration?

Definitions (1)

- Artificial Intelligence (AI)
 - For the present purpose the artificial intelligence problem is taken to be that of making a machine behave in ways that would be called intelligent if a human were so behaving. (McCarthy et al. 1955)
 - Accordingly, AI refers to the capability of a computer system to show humanlike intelligent behavior characterized by certain core competencies, including perception, understanding, action, and learning. In line with this, our understanding of an AI application refers to the integration of AI technology into a computer application field with human–computer interaction and data interaction. (Wirtz et al. 2019)
- Note: to distinguish AI from chatbots, which sometimes only simulate artificial intelligence

Definitions (2)

- Public administration: activity of a state that neither is
 - Legislation (legislative power), including individual decrees in the form of laws
 - Jurisdiction (judiciary)
 - International law (warfare, diplomacy)
 - Constitutional auxiliary activity (e.g. election administration)
 - However, public administration also exists in the Ministry of Foreign Affairs and the Ministry of Defense (so-called internal administration)

Therefore: Killer robots are not a topic of this literature review, but only AI deployment as indirect support for the military, e.g. in the context of training

Results (1)

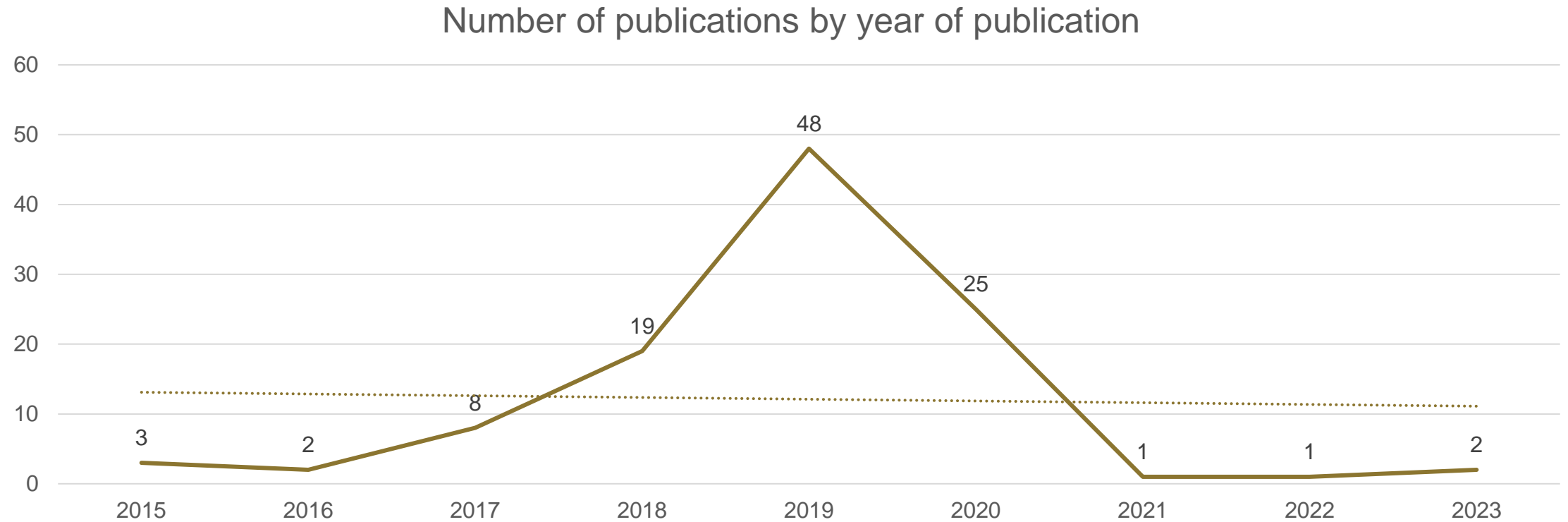
- Searchstring: ("artificial intelligence" OR "machine learning" OR "neural networks" OR "deep learning" OR "natural language processing" OR "künstliche Intelligenz") AND ("public administration" OR "public sector" OR "public service" OR "öffentliche Verwaltung" OR "Behörde" OR "Staat") aufgrund Ergebnisse in Englisch und Deutsch
- Used databases: ProQuest, ScienceDirect, IEEE, ACM, EBSCOhost, Springerlink, Google Scholar, Wiley, Scopus, Research Gate, DOAJ

Results (2)

- Only reverse search performed
- Inclusion and exclusion criteria (inclusion criterion 3 for qual. content analysis opportunities and risks of public administration in the future)

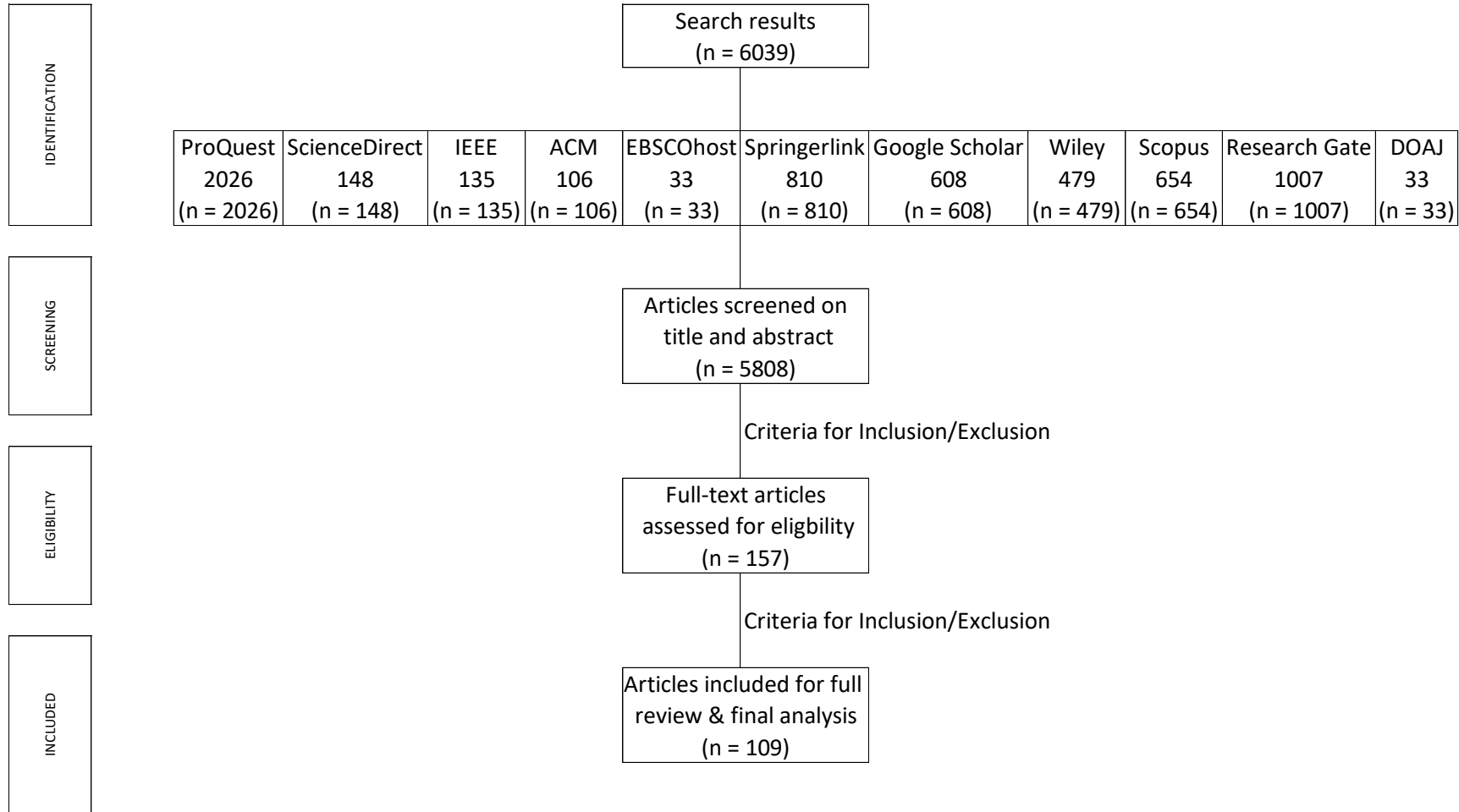
Inclusioncriteria 1	Fulltext available
Inclusioncriteria 2	language: Englisch, Deutsch
Inclusioncriteria 3	Opportunities, risks or actual use of AI in public administration
Inclusioncriteria 4	Paper, conference contribution must be peer-reviewed
Exclusioncriteria 1	AI in public administration not as the main content
Exclusioncriteria 2	Publication period is before 2014 or after 2023 (due to development of Tensorflow 2016 and PyTorch 2016)
Exclusioncriteria 3	No active involvement of public administration, only theoretical use case

Results (3)



Note: Spanish-speaking countries excluded, therefore no claim to completeness

Results (4)



Results (5)

Objectives for the taxonomy:

1. Formation of hypotheses within the research question
2. Recognition of patterns in the use of AI

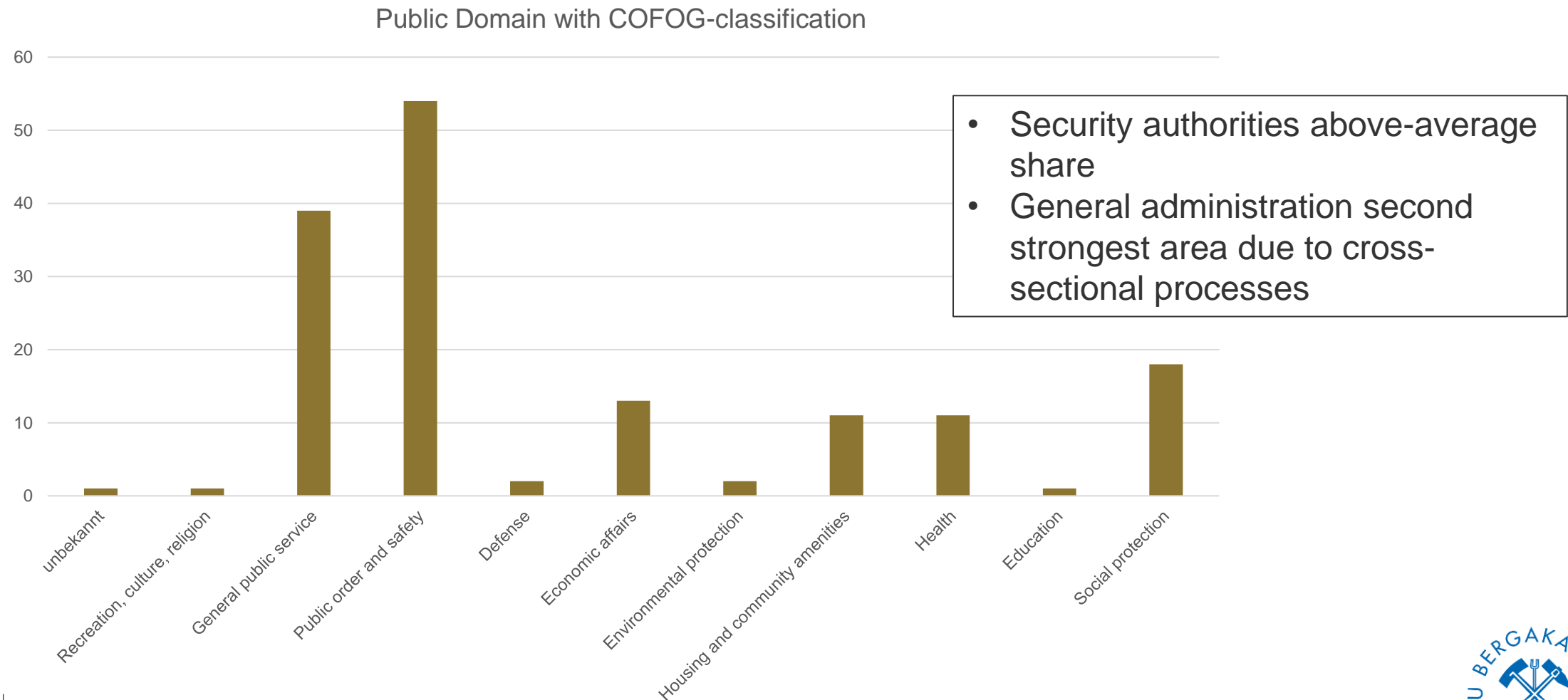
Results (6)

- Land der KI einsetzenden Behörde
 - COFOG-Klassifizierung
 - unbekannt
 - Recreation, culture, religion
 - General public service
 - Public order and safety
 - Defense
 - Economic affairs
 - Environmental protection
 - Housing and community amenities
 - Health
 - Education
 - Social protection
 - Art der KI einsetzenden Behörde
 - unbekannt
 - Sicherheitsbehörde
 - Gerichtsbarkeit
 - andere Verwaltung
- Anwendung der KI
 - unbekannt
 - Anonymisierung
 - Steuerung
 - IT-Sicherheit
 - automatische Entscheidung
 - Formularbefüllung
 - Verwaltungsexterne Kommunikation
 - menschliche Sprache
 - Integration von Sensordaten
 - Krisenerkennung
 - Personenerkennung
 - Handlungen von Menschen erkennen
 - Bedarfsvorhersage
 - Bildanalyse
 - Intelligence Augmentation
 - Risikovorhersage
 - Simulation
 - Datenanalyse
- Art von KI-Technologie
 - unbekannt
 - Linear Discriminant Analysis
 - Logistische Regression
 - Fuzzy Logic
 - Cognitive Mapping
 - Case-Based Reasoning
 - Gradient Boost
 - Bayes Klassifikator
 - Neuronales Netz
 - Supportvektor
 - Entscheidungsbaum
 - Evolutionäre Algorithmen
 - Clustering Algorithmen
- Datenquellen für KI
 - unbekannt
 - unstrukturierte Daten
 - strukturierte Daten
 - Aufgabe der KI
 - unbekannt
 - Time Series Forecasting
 - Klassifikation
 - Clustering
 - Stadium des KI-Einsatzes der Behörde
 - unbekannt
 - Prototyp/Studie
 - Pilotierung/Erprobung
 - Produktivsystem

Note: future mapping to period system of AI planned



Results (7)



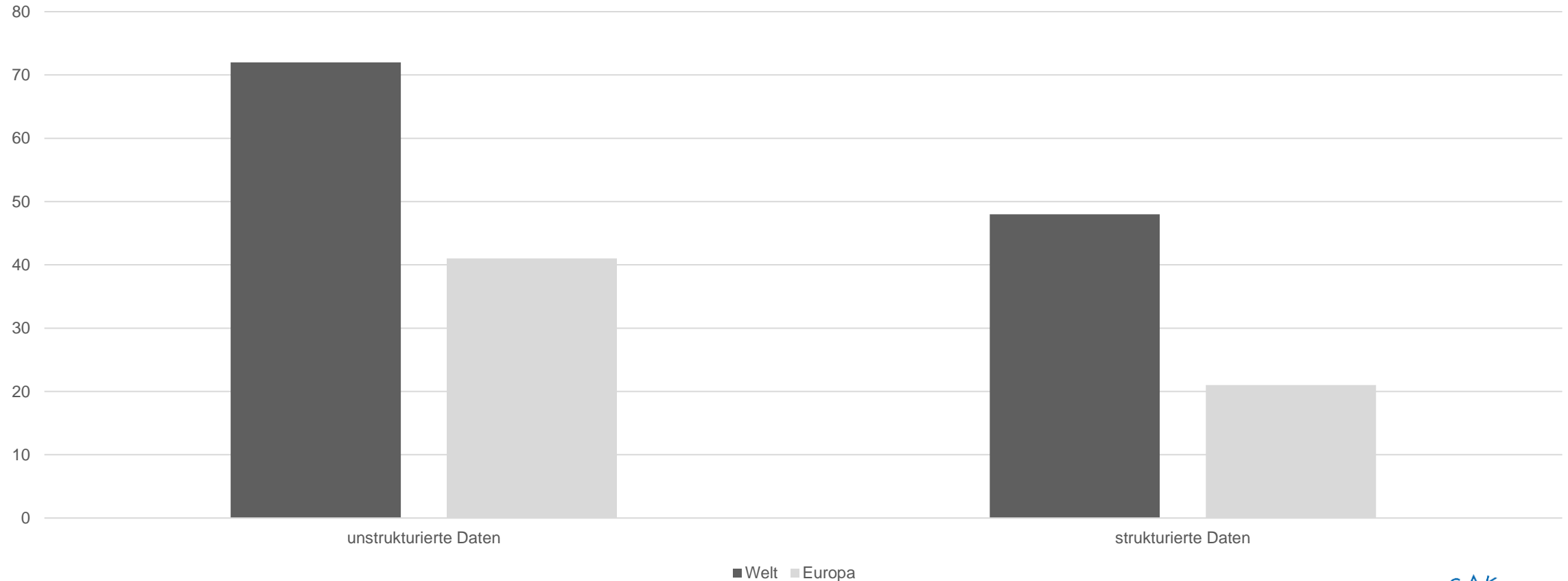
Results (8): AI-implementation in the world according to literature review

Asia	30
Australia	4
Europe	82
Int. Organisations	1
North America	44
South America	1
total	162

Results (9)

- Automated decision-making: AI is already frequently used without humans as the final decision-making authority in public administrations
- External administrative communication: AI helps administrations to make efficient use of scarce human resources
- Human language: diverse application scenarios in which AI is already able to communicate successfully via human language and understand it
- Crisis detection: important application of AI in public administration, as it can evaluate large amounts of sensor data efficiently and accurately
- Person recognition: AI is increasingly being used to recognize people
- Demand forecasting: strengthens public participation in political decision-making processes
- Image analysis: an important field of application for AI to increase efficiency in public administration
- Intelligence augmentation: an important area of application, as humans are often still required to make the final decision
- Risk prediction: diverse and important area of application for AI in public administration

Results (10): Data source (structured data vs. unstructured data) - Comparison of Europe and global use of AI



Similar ratio within the EU as in the rest of the world



Discussion

- Public administration could be more transparent with regard to AI use → Search a large number of literature databases
- Only a global study on the use of AI in public administration will lead to a stable taxonomy
- Taxonomy for AI in public administration helps decision-makers in public administration to classify their AI project → targeted use of budget funds for promising projects

Future Work

- Contributions through subsequent qualitative content analysis:
 - Spread of AI in public administration
 - Comparison of administrative areas according to COFOG classification
 - Recognizable patterns in technology, data basis, task of AI and application purpose in public administration
 - Proportion of productive use vs. studies and pilots

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