Artificial intelligence reporting as a part of non-financial reporting. Evidences from DAX-30 listed companies 2018-2019.

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Context

- Non-financial reporting in Europe
- Artificial Intelligence narratives in annual reports
- European Commission Ethics Guidelines for trustworthy AI
- White book on AI (starting point for AI regulation in the EU)
- Identify the relevant information that should be mandatory for companies to report

Questions

- Are companies disclosing about AI?
- What are they talking about? General? Risks? Ethics? Products/apps? Projects? Units/labs?
- Which are the projects or units they have launched?
- Which are the products they have developed or they are using?
- Which are the AI ethical principles that companies are disclosing on their annual/sustainability reports
- What progress is there from 2018 to 2019?

Methodology

We downloaded annual/sustainability reports of each company.

Within each report we searched all the mentions for the keywords “artificial intelligence”, “machine learning”, “deep learning” and “big data”.

We classified each mention within one of the pre-established categories.

Based on the Asilomar AI Principles (Future of Life Institute, 2017), Ethics Guidelines for Trustworthy Artificial Intelligence (European Commission, 2019), Opinion of the Data Ethics Commission of the Federal Government of Germany (2019), the White Paper on AI (European Commission, 2019), and the reports of IBEX 35 and DAX 30 companies for 2018 and 2019, we developed and tested a bigram based dictionary to automatically and massively extract evidences on ethical approaches to AI, as a part of non-financial disclosure that has not been explored yet.

Methodology (II)

Dictionary

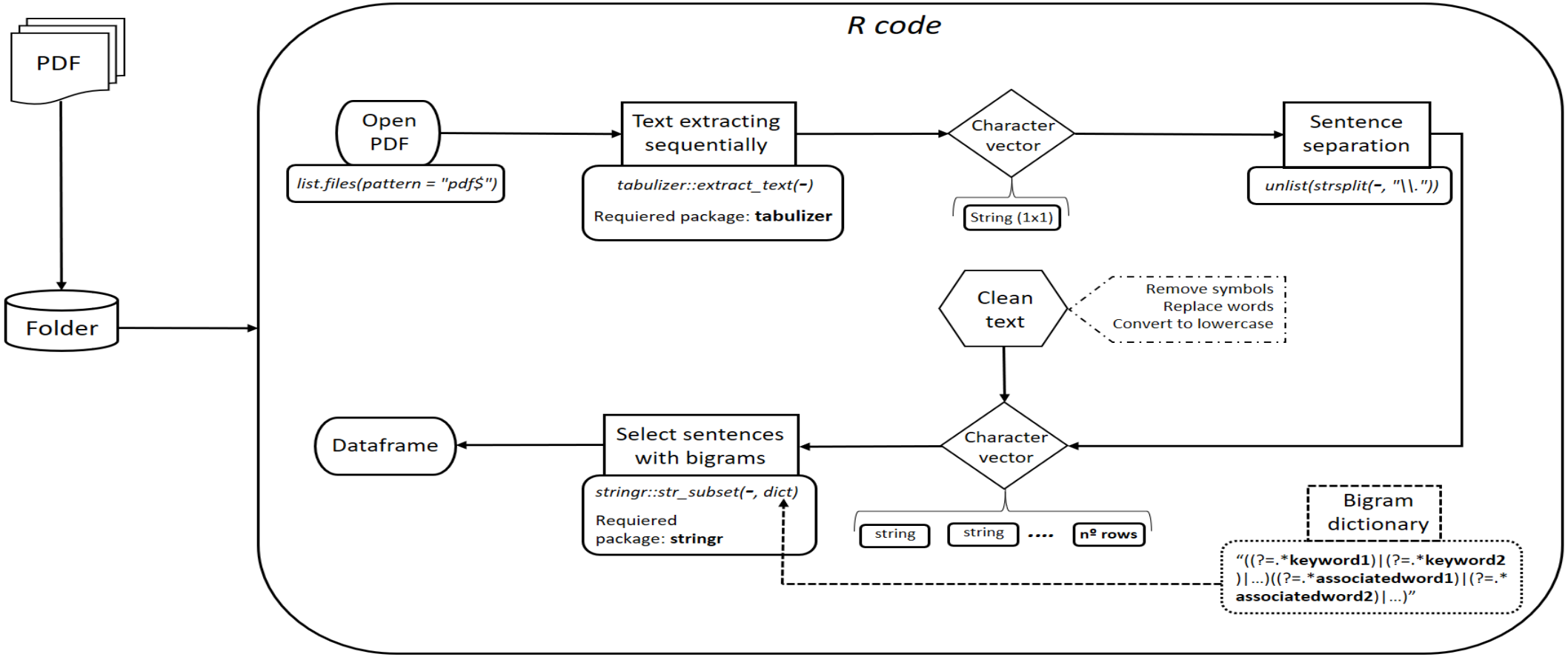
Keywords	
algorithm	*(s) (ic)*
artificial intelligence	
automated driving	
big data	
machine learning	
deep learning	

Associated words			
accountab	*(le) (ility)*	human rights	
bias	*(es) (ed)*	impact	*(s)*
data protection		privacy	
decision-making		principle	*(s)*
discriminat	*(ing) (ion)*	regulat	*(ed) (ing) (ion)*
GDPR		reliab	*(le) (ility)*
ethic	*(s) (al)*	responsib	*(le) (ility)*
governance		transparen	*(cy) (t)*
guidelines		trust	*(worth (y) (iness))*
harm			

Bonsón E., Perea D., Alejo V. (2020). *Mining Artificial Intelligence ethical disclosures from corporate reports: an automated bigram-based approach*.

Methodology (III)

Flowchart of PDF text mining



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Results – DAX 30 – 2018/2019

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	General statement		Products/Apps		Projects		Unit/Labs		Risk/Impact		Ethics	
Companies	2018	2019	2018	2019	2018	2019	2018	2019	2018	2019	2018	2019
ADIDAS	1	-	0	-	0	-	0	-	0	-	0	-
ALLIANZ	1	1	0	0	0	0	0	0	0	0	0	1
BASF	1	1	1	1	0	0	1	1	0	0	0	0
BAYER	1	1	1	1	1	1	0	1	0	0	0	0
BEIERSDORF AG	-	1	-	1	-	0	-	0	-	0	-	0
BMW ST	1	1	1	1	1	1	1	1	0	0	1	1
CONTINENTAL AG	0	1	1	1	1	0	0	1	0	0	0	0
COVESTRO	1	1	0	1	0	1	1	0	0	0	0	0
DAIMLER	1	1	1	1	1	1	0	0	0	0	0	1
DEUTSCHE BANK AG	1	1	1	0	0	1	1	0	0	0	0	1
DEUTSCHE BOERSE	1	1	0	0	0	0	0	0	0	0	0	0
DEUTSCHE POST	1	1	1	1	0	0	0	0	0	0	0	0
DEUTSCHE TELEKOM AG	1	1	1	1	1	1	0	1	0	0	1	1
E.ON SE	1	0	1	1	1	0	0	1	0	0	0	1
FRESENIUS SE	-	0	-	1	-	0	-	0	-	0	-	0
FRESENIUS ST	-	0	-	1	-	1	-	0	-	0	-	0
HEIDELBERGCEMENT	0	-	0	-	1	-	0	-	0	-	0	-
HENKEL VZO	1	1	0	1	0	0	0	0	0	0	0	0
INFINEON	1	1	1	1	1	1	1	1	0	0	0	0
LINDE PLC	-	-	-	-	-	-	-	-	-	-	-	-
LUFTHANSA	1	1	0	1	1	0	0	0	0	0	0	0
MERCK	1	1	1	1	1	1	0	1	0	0	1	1
MTU AERO	-	-	-	-	-	-	-	-	-	-	-	-
MUNICH RE	1	1	0	1	0	1	0	0	0	1	0	1
RWE AG ST	-	0	-	1	-	0	-	0	-	0	-	0
SAP	1	1	1	1	1	1	1	0	0	1	1	1
SIEMENS AG	1	1	1	1	0	1	0	0	0	1	0	0
VOLKSWAGEN VZO	1	1	0	1	1	1	1	1	0	0	0	1
VONOVIA	1	-	0	-	0	-	0	-	0	-	0	-
WIRECARD AG	1	-	1	-	0	-	0	-	0	-	0	-
	22	20	14	21	12	13	7	9	0	3	4	10

Results – DAX 30 – 2018/2019

Types of disclosure	DAX 30 - 2018	DAX 30 - 2019
No disclosure	20%	17,24%
Just general statements	20%	3,45%
1-2 categories	23%	27,59%
3 categories	20%	17,24%
>= 4 categories	17%	31,03%

Results – DAX 30 – 2018/2019

Categories	DAX 30 - 2018	DAX 30 - 2019
General Statement	73%	69%
Project	40%	45%
Product/App	47%	72%
Ethics	13%	34%
Unit	23%	31%
Risk	0%	10%

Products/Apps DAX 30 – 2019

Company	Product/App
BASF	Early predictions about the quality of new materials
BAYER	Robotic process automation
	Drug safety process
BEIERSDORF AG	Important tools enabling us to evaluate enormous amounts of data
BMW ST	Assistance systems to anticipate typical hazardous situations
CONTINENTAL AG	Collaborative robotics
	Driver assistance with sensors
COVESTRO	Better control of the supply chain
	A new knowledge platform
DAIMLER	Smart factories
	Driver assistance
	Hey Mercedes
DEUTSCHE POST	Collaborative robots
DEUTSCHE TELEKOM AG	To ensure infrastructure is built out in line with demand
	SprachID voice authentication
	Software solutions for the automated analysis and operation of network infrastructure
	Chatbot
	Smart robotics solutions
	Digital voice assistant "Hallo Magenta"
	Digital Service Assistant (AI chatbot)
	Network Automation
	Connect app
	Improve and speed up decision-making processes
	Mobile Encryption

Company	Product/App
E.ON SE	Smart home technology
	Digital dashboard
	To optimise the power consumption of each device
FRESENIUS SE	Telehealth with predictive analytics
FRESENIUS ST	Telehealth with predictive analytics
HENKEL VZO	To analyze and positively incfluence plant efficiency in real time
	To recognize patterns and identify potential for optimization
INFINEON	Processors with artificial intelligence applications
	Drive demand for computing power and DRAM / Flash memory
	Collaborative robots
	Virtual factory
LUFTHANSA	To optimise their operations
	To evaluate fresh water consumption and optimize tank fillings
MERCK	This software collects information on compensation, performance, and potential allowing trends to be identified at an early stage
	Scrum and Design Thinking
	A new way to connect physical objects with a digital twin using artificial intelligence
	Chatbot
	Uses image recognition techniques to support the work of clinicians and researchers

Products/Apps DAX 30 – 2019

Company	Product/App
MUNICH RE	Used in healthcare, with repercussions for treatment and insurance cover
	To forecast future losses more precisely and to significantly lower loss ratios
	Robotics
RWE AG ST	To distinguish between normal and irregular wind turbine behaviour
SAP	SAP Leonardo
	SAP Leonardo Artificial Intelligence
	SAP Analytics Cloud
	SAP C/4HANA
	The Business Technology Platform
	SAP solutions for enterprise information management (EIM)
	Automated rule-based, repetitive tasks, digital assistants
	Server architecture in order to respond to the increasing demand for cloud computing solutions
	SAP Cloud Platform Big Data Services
SIEMENS AG	A new module with an integrated AI-capable chip for the Simatic S7-1500 programable logic controller
	Products and applications that improve its customers' productivity, and enabling clinical decisions to be more precise and tailored
	The development of efficient vehicle platforms for higher automated and autonomous driving
	To increase availability, improve operational quality and minimize the stress placed on humans and the environment.
VOLKSWAGEN VZO	Intelligent voice control for navigation and convenience functions
	Precise market forecasts that include a large number of variables.
	Provision of tools for data analysis and machine learning solutions for plants
	To analyze faulty machinery and take action at an early stage

Partnership projects – DAX 30 – 2019

Company	Partner	Project
BAYER	With Ecscientia Ltd.	Research projects to treat cardiovascular and oncological diseases.
DEUTSCHE BANK AG	With Microsoft	Migration to the public cloud safeguarding data and improving efficiency
FRESENIUS ST	With Humacyte	Investment in method to allow us to care for patients even more effectively
INFINEON	With Tencent	Smart buildings
MERCK	With Iktos	Three drug discovery projects to design new drugs quickly and costeffectively.
	With Alibaba	Ensuring ease of access to our broad product portfolio
	With Darmstadt Technical University	Developing an intelligent humanoid robot
MUNICH RE	With DFKI and Applied AI	We aim to define standars for the evaluation of the various AI algorithms.
SAP	With Microsoft	Agreements with respect to SAP Cloud Platform and SAP's machine learning portfolio.
VOLKSWAGEN VZO	With Ford	To invest in Argo AI to allows both car companies to integrate Argo AI's self-driving system into their own models

Units/Labs – DAX 30 – 2019

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Company	Unit/Lab
BASF	Network for Asian Open Research (NAO)
BAYER	LifeHub UK
BMW ST	Yellowbrick and Recogni
CONTINENTAL AG	Hollistic Engineering and Technologies Area
DEUTSCHE TELEKOM AG	T-labs
	The hubraum Campus
E.ON SE	Training campus in Mettmann
	Vinli
INFINEON	Center in Dresden
MERCK	China Innovation Hub
	Center in Darmstadt, China Innovation Hub and Silicon Valley Innovation Hub
VOLKSWAGEN VZO	Data:Lab Munich
	IT labs in San Francisco and Munich

Ethics – DAX 30 – 2018

To **ensure that the use of artificial intelligence is always hazard-free for humans**, we have developed our own process to methodically safeguard this. We share our experiences in the German research **project PEGASUS** with the goal of **establishing industry-wide standards** in the area of testing through to the approval of highly **automated driving** functions by mid-2019. **BMW, Sustainability report 2018.**

AI offers many advantages, but also presents new challenges. For instance, how do we ensure AI is always developed with the focus on benefiting humanity? How do we tackle the changes to the working environment brought about by AI? Under the auspices of Compliance, in 2018, **we introduced guiding principles for the ethical use of artificial intelligence.** These explain how Deutsche Telekom defines "responsibility" in relation to AI. They also describe how we wish to develop AI-based products and services in the future. **Deutsche Telekom, 2018.**

Ethics – DAX 30 – 2019

Initiation and management of the **“etami” consortium** for standardization and certification of ethical applications of artificial intelligence in Europe in cooperation with partners from business, politics and academia. etami, consisting of 12 major corporations and five universities, **will implement the recommendations of the European High-Level Expert Group on AI** (HLEG) for ethical applications of AI into standardization and certification in 2020. **Volkswagen, 2019**.

In 2019, this international expert committee focused particularly on digital ethics. If we develop new business models based on artificial intelligence and big data, we need clear guidelines, for example in handling patient data. As a result of these discussions, **we have established a Digital Ethics Board** to address ethical issues related to data use and algorithms. **Merck, 2019.**

Our activities are guided by legal requirements, internal rules and regulations such as our Integrity Code and data-protection and AI principles, external guidelines such as AI4People and the IEEE and Asilomar guidelines, and the German government Ethics Commission’s 20 **ethical rules on automated and connected driving. Daimler, 2019.**

Ethics – DAX 30 – 2019

We monitor the impact of the decisions made by AI algorithms to prevent undesirable effects being created or aggravated… In our view, it is unacceptable if a higher risk for a serious illness results for the person concerned due to decisions made by an AI algorithm. **Munich RE, 2019.**

We ensure that AI operates within secure boundaries even in the event of malfunctions. In this context, malfunctions include unforeseen events and manipulative attacks from outside that interfere with the AI system. **Munich RE, 2019**.

Deutsche Telekom - Guidelines for Artificial Intelligence

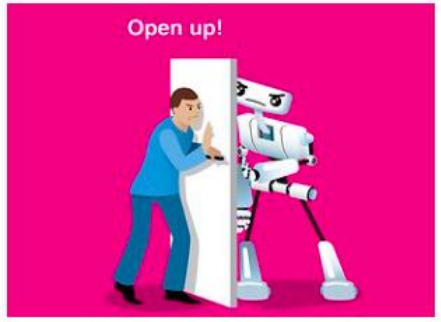
1. Responsible

At Telekom we do different
We are responsible. Clear definition of who is responsible for which AI system.

2. Careful

At Telekom we do different
We care. AI systems and their usage obey human-defined rules.

3. Supporting



At Telekom we do different
We put our customers first. Using AI to simplify our customers' lives.

4. Transparent

At Telekom we do different
We are transparent. Transparency when a customer communicates with an AI and regarding our use of customer data.

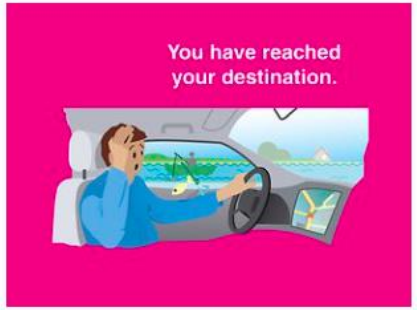
5. Secure

At Telekom we do different
We are secure. Our customers' data is protected against unwanted external access.

6. Reliable

At Telekom we do different
We set the framework. Good preparation precedes an excellent outcome.

7. Trustworthy



At Telekom we do different
We maintain control. Continuous readiness to interfere in AI systems to prevent and/or reduce damage.

8. Cooperative

At Telekom we do different
We foster the cooperative model. Get advantages out of a cooperative and complementary model of human-machine interactions.

9. Illustrative

At Telekom we do different
We share and enlighten. Spreading knowledge about AI and teaching relevant skills.

Sap - Guiding Principles for Artificial Intelligence

We are driven by our values

We design for people

We enable business beyond bias

We strive for transparency and integrity in all that we do

We uphold quality and safety standards

We place data protection and privacy at our core

We engage with the wider societal challenges of AI

Daimler Principles for Artificial Intelligence Munich RE

1st principle: responsible use

"We shape and use Artificial Intelligence responsibly. We realize the opportunities of Artificial Intelligence and harmonize its effects in line with our corporate values."

2nd principle: explainability

"We are committed to a high level of transparency, thereby promoting trust in Artificial Intelligence. To that end, we support explainable Artificial Intelligence."

3rd principle: protection of privacy

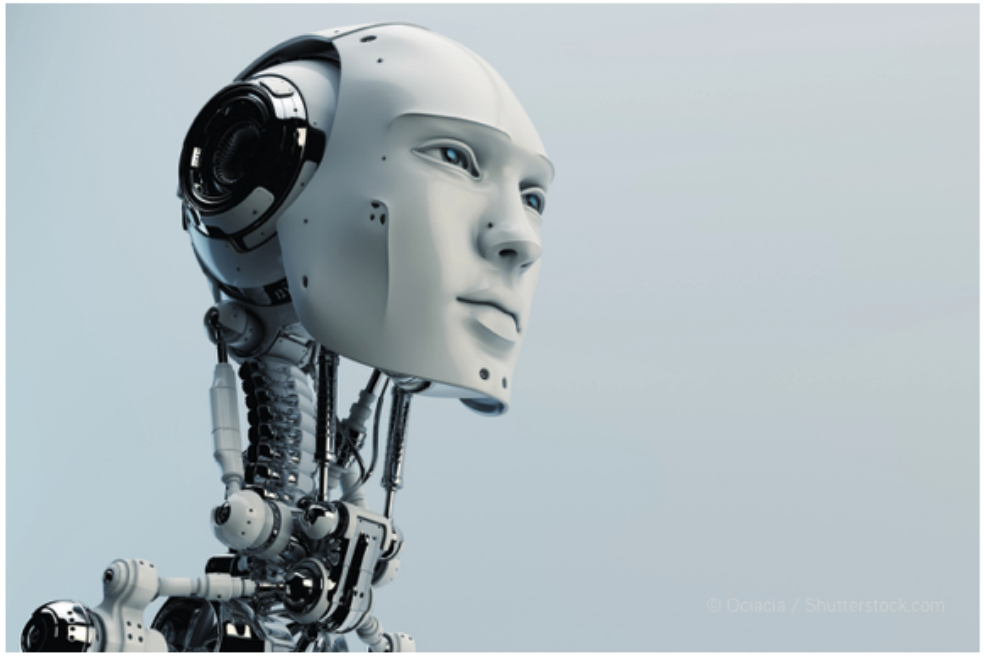
"We respect privacy. We consider privacy protection from the design phase of Artificial Intelligence systems onwards. We support privacy-enhancing technologies."

4th principle: safety and reliability

"We develop and test our AI technologies consciously and according to state-of-the-art science and technology. We take adequate measures to develop safe and reliable Artificial Intelligence."

Principles of “ethics guidelines for trustworthy AI”

Responsible handling of artificial intelligence (AI) and big data



View requirements for use of AI, CR Report p. 42

Artificial intelligence and big data will play a central role in the insurance industry in future, whether in product design, underwriting, claims management, or in internal accounting processes. Liability issues are changing through the use of AI in insured products and services, for example with autonomous driving or in the field of medicine. Ethical principles are essential when using new data-based algorithms in order to protect the rights of our clients. Under the guiding principle of “Responsible Artificial Intelligence”, Munich Re is currently devising a strategy based on the four “ethics guidelines for trustworthy AI”.

Principles of “ethics guidelines for trustworthy AI”

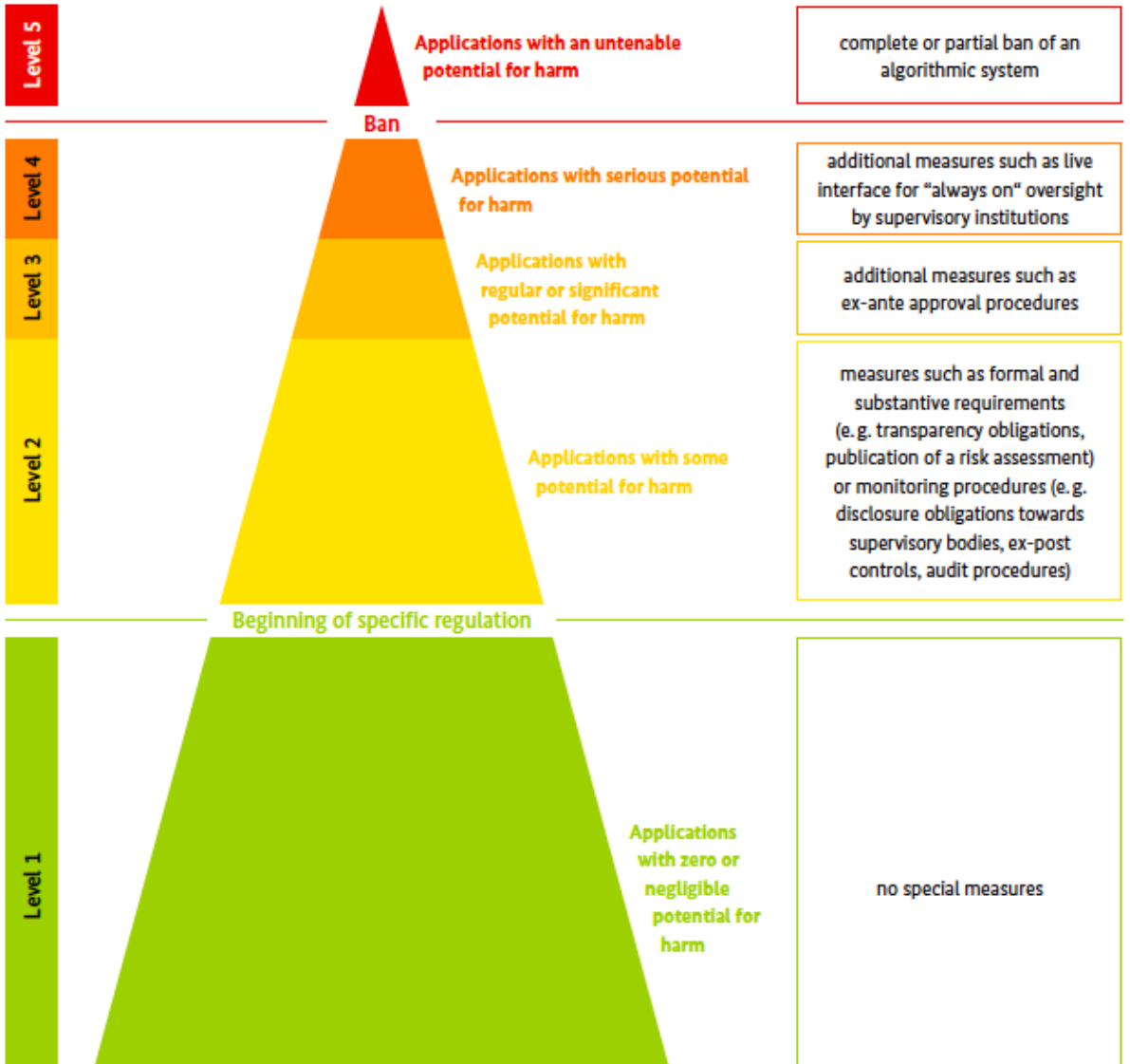
- Respect for human autonomy
- Prevention of harm
- Fairness
- Explicability

From these principles, Munich Re has derived a definition of the requirements for responsible use of AI in its own activities.

Summary of ethical principles/guidelines for AI

	Daimler	Deutsche Telekom	Munich RE	Sap
Human & Value- Centric		X	X	X
Non-discrimination & Fairness		*implicit*	X	X
Transparency & Explainability	X	X	X	X
Responsibility & Accountability	*X*	*X*		*implicit*
Privacy & Data Governance	X	X		X
Technical Robustness & Safety	X	X		X
Social & Environmental Wellbeing		X		X

Risk-adapted regulatory approach. German Data Ethics Commission



Conclusions

- AI reporting activity is growing as AI is becoming more used in companies.
- It is growing in a non-structured way.
- Although the adoption of ethical approaches to AI is at a very preliminary stage, we believe that it will become a key point in the non-financial reports of companies.
- It will become more important to have a specific sub-section on artificial intelligence in the non-financial information section of the annual reports.
- There is a need for clear guidelines on what information is relevant and mandatory for companies to report and what ethical principles or regulations these AI applications must comply.

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