

Dialogveranstaltung KI im Mittelstand – Open Session

EU AI ACT und Normen: Schlüssel zur einer vertrauenswürdigen KI

Dr. Andreas Hauser (AIQURIS) & Dr. Wolfgang Hildesheim (IBM)



Ghost Musician Records

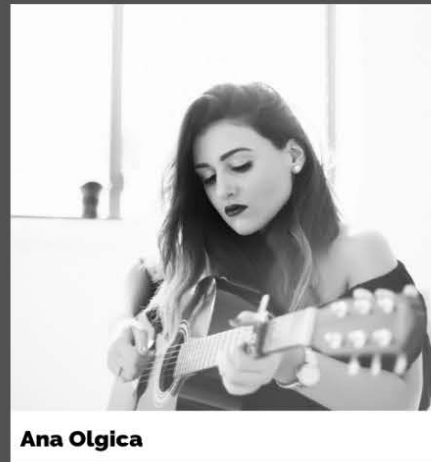
Music your ears won't believe is true.



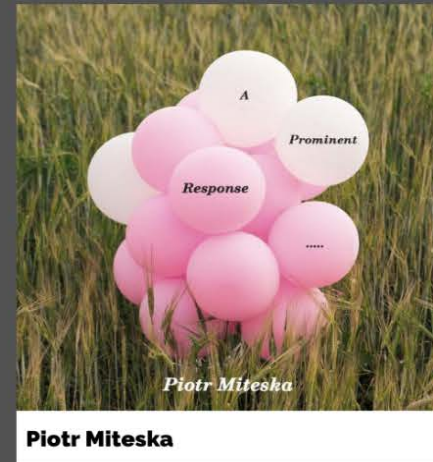
Releases



Charles Bolt



Ana Olgica



Piotr Miteska



Sigimund



They Dream By Day



Charlie Key

1. The European AI Act

Goal is the acceleration of innovation & the mitigation of risk

Europäische KI Verordnung (“EU AI Act”) in 2024

Regulierung auf der Basis von Risikoklassen



Vertrauenswürdigkeit von KI wird der Wettbewerbsvorteil der EU werden

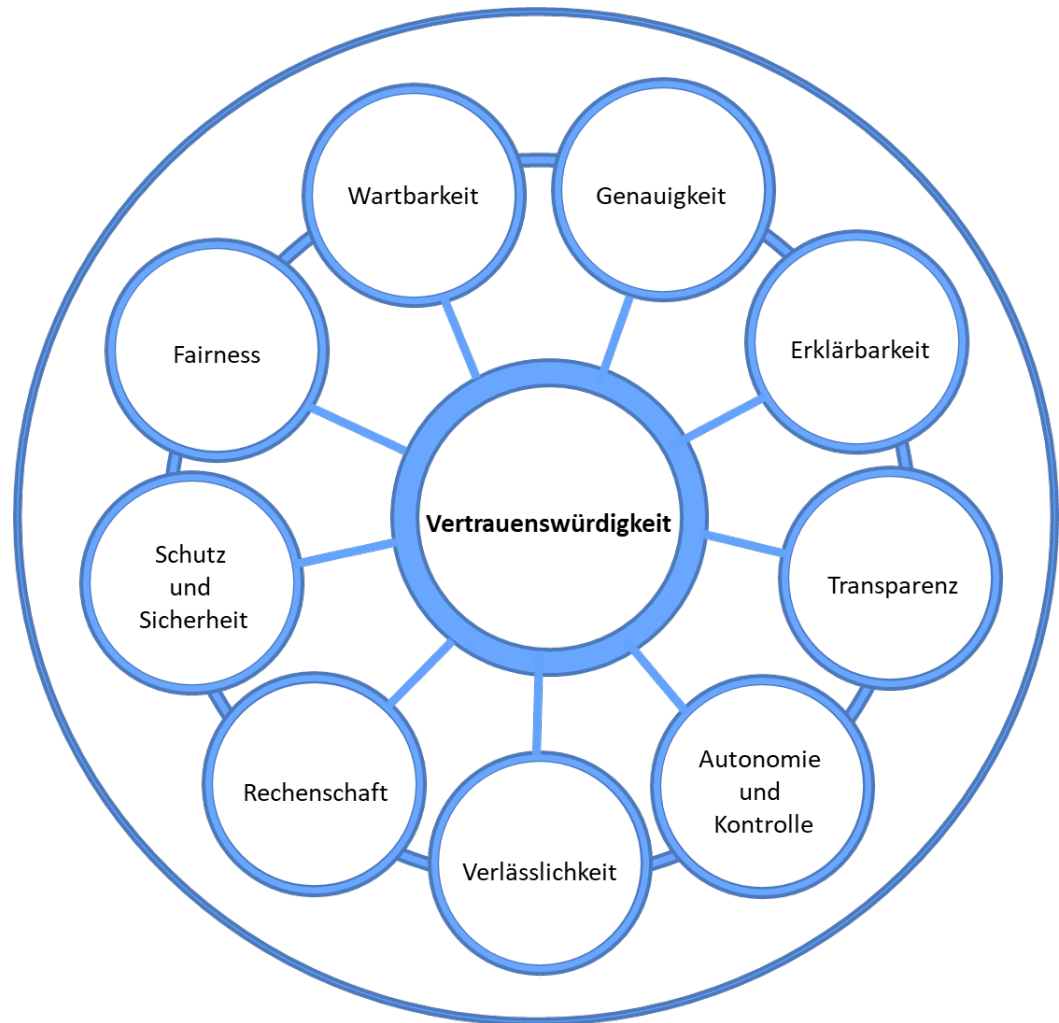
Risikoklasse
gemäß AI Act

Verbotene KI-
Anwendungen

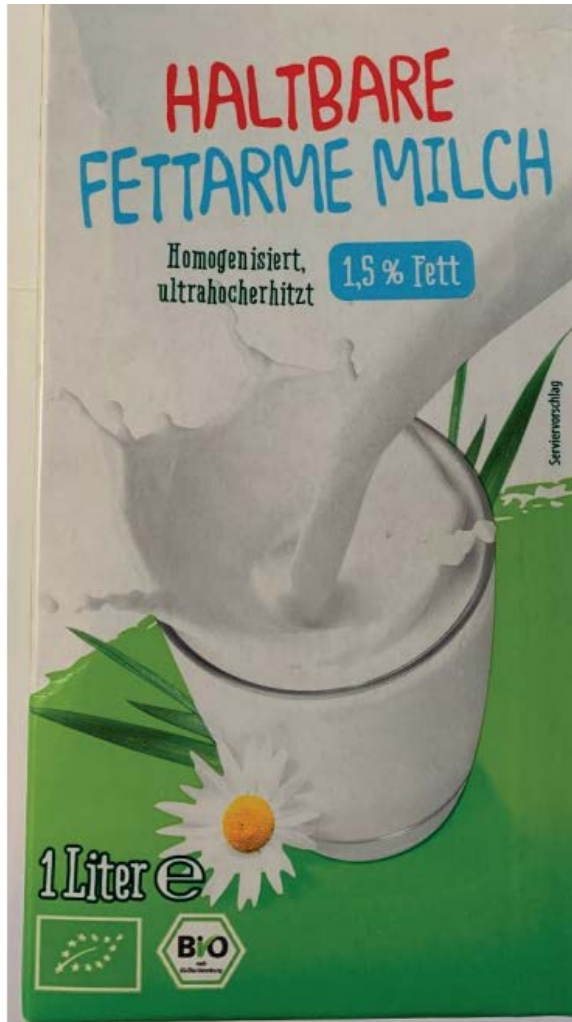
Hochrisiko-
KI-Systeme

KI-Systeme mit bes.
Transparenzpflichten

Sonstige



Food labelling as an example how to create trust



Conformity assessment (1/2)

Without and with notified bodies

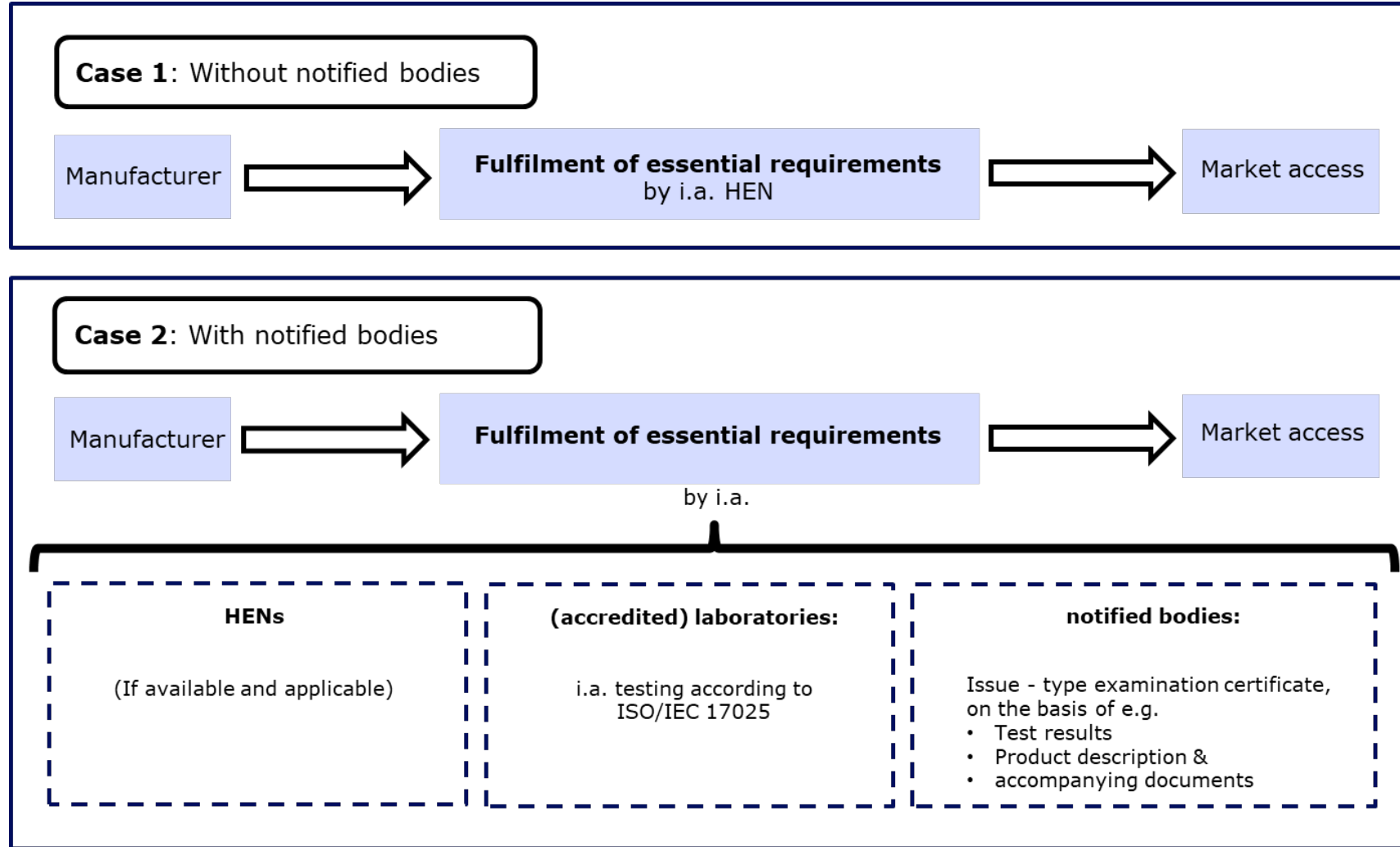


Figure 16.2: Conformity assessment without and with NoBos.

Conformity assessment and market surveillance

"step-by-step" requirements

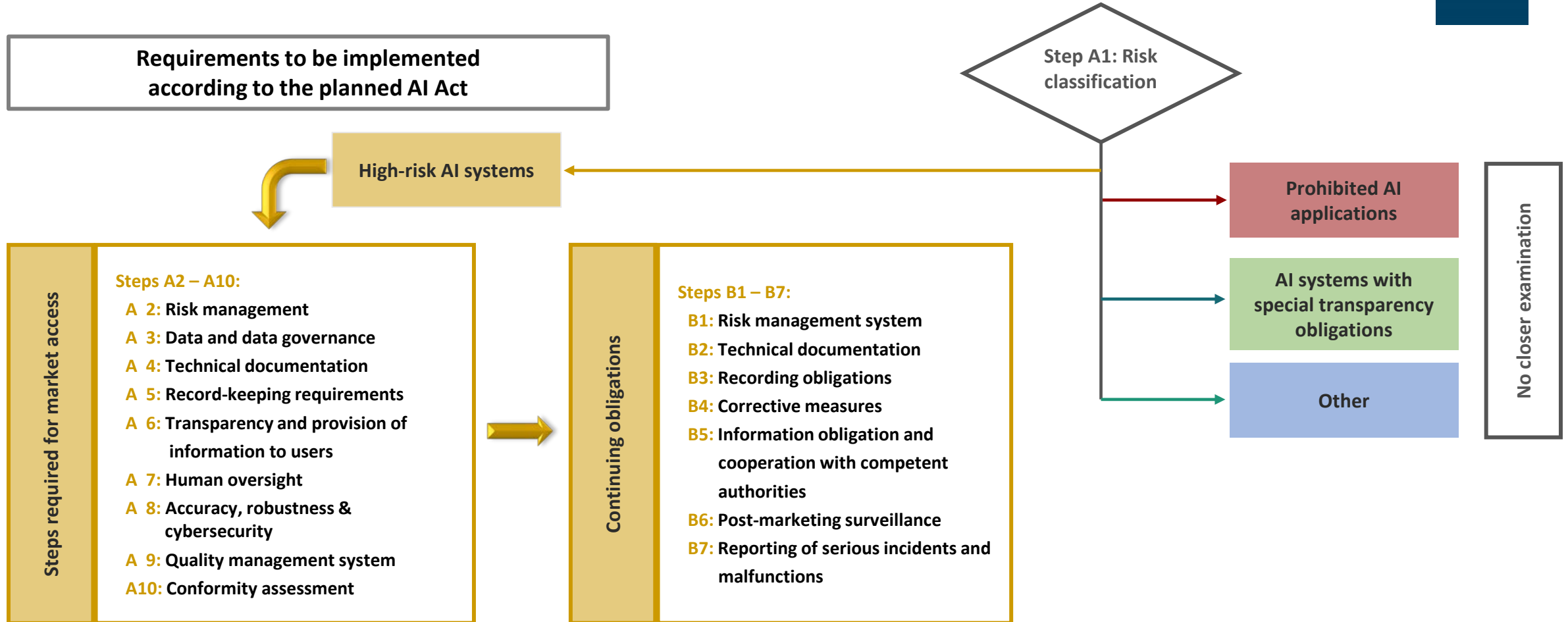
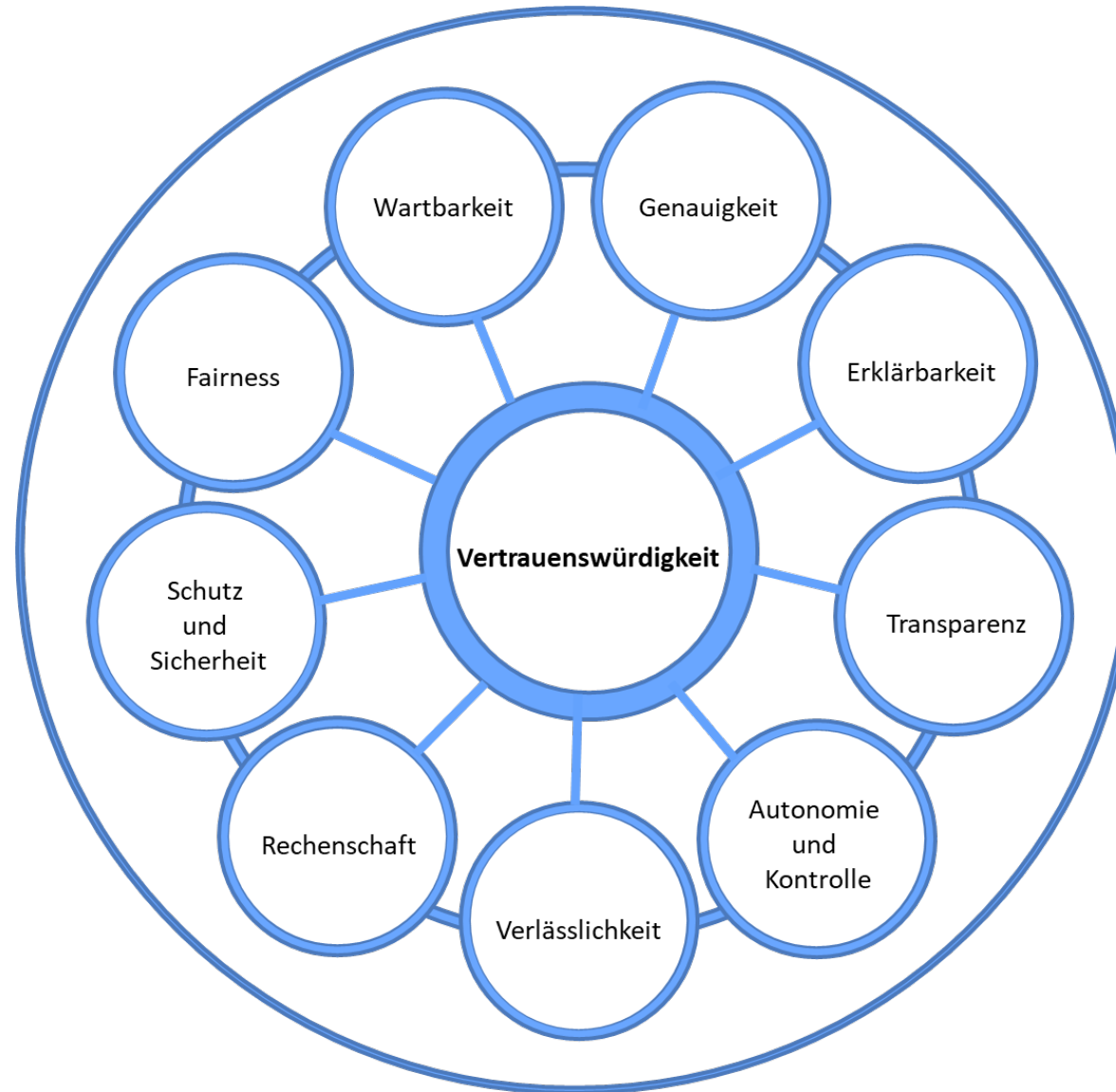
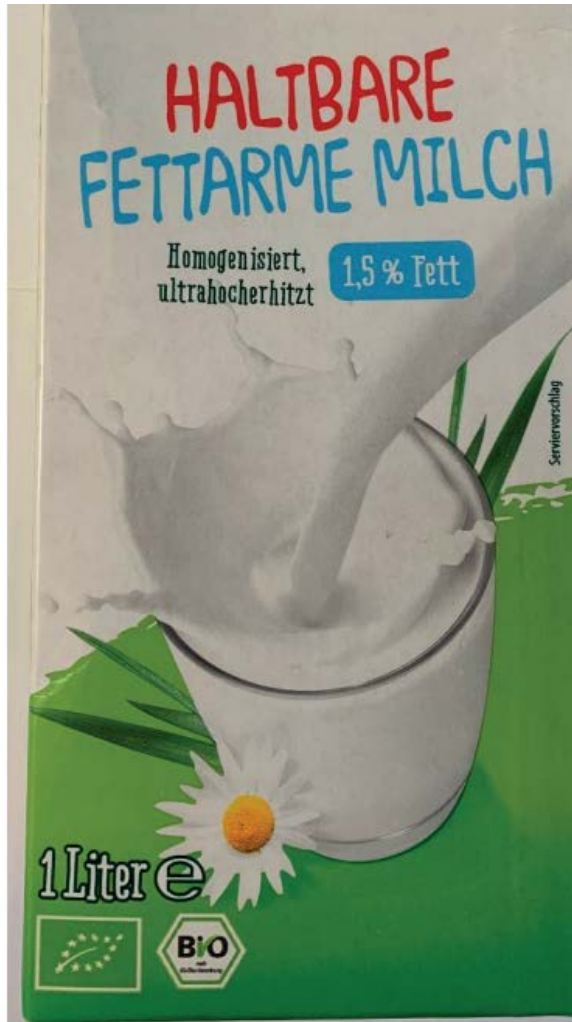


Figure 17.1: Step-to-step guide for implementing the requirements of the planned AI Act according to [1].

Vertrauenswürdigkeit von KI ist erfolgsentscheidend



Food labelling as an example how to create trust



Packaging by **SIG**

Durchschnittliche Nährwerte				
	Je 100 ml	1 Glas (250 ml)**	(250 ml)*	%
Brennwert	198 kJ	495 kJ	118 kcal	6 %
Fett	1,5 g	3,8 g		5 %
- davon gesättigte Fettsäuren	1,1 g	2,8 g		14 %
Kohlenhydrate	5,0 g	13 g		5 %
- davon Zucker	5,0 g	13 g		14 %
Eiweiß	3,4 g	8,5 g		17 %
Salz	0,11 g	0,28 g		5 %
Calcium	120 mg	300 mg		(15 %***)
				(38 %***)

***NRV = Nährstoffbezugswert

*Referenzmenge für einen durchschnittlichen Erwachsenen (8.400 kJ / 2.000 kcal).

**1 Portion = 1 Glas (250 ml) Bio-Fettarme Milch. Die Packung enthält 4 Portionen.

- 75 % Karton aus nachwachsenden Rohstoffen
- + 25 % pflanzenbasierte Kunststoffe mit Mengenausgleich!
- + Verzicht auf Alu bei gleichbleibender Produktqualität

*Im Rahmen der Verpackungsherstellung kommen Kunststoffe zum Einsatz, bei deren Produktion im Rahmen von zertifizierten Massenbilanzverfahren fossile Ressourcen durch pflanzliche Rohstoffe ersetzt wurden. Diese Maßnahme trägt maßgeblich zu einer verbesserten Ökobilanz (CB-100732C vom 31.10.2018) bei. Mehr unter www.signaturepack.de



Durchschnittliche Nährwerte	pro 100 ml	RM* pro 100 ml
Energie	547 kJ	7 %
	129 kcal	
Fett	0,1 g	<1 %
- davon gesättigte Fettsäuren	<0,1 g	<1 %
Kohlenhydrate	30 g	12 %
- davon Zucker	25 g	28 %
Ballaststoffe	1,0 g	
Eiweiß	0,9 g	2 %
Salz	2,6 g	43 %

*RM: Referenzmenge für einen durchschnittlichen Erwachsenen (8400 kJ / 2000 kcal)

LAKTOSE FREI **GLUTEN FREI**

Aktueller Kenntnisstand und Nutzung von KI

Kenntnisstand zum AI Act

- Hoch
- Mittel
- Gering

Reifegrad KI Anwendungen

- Hoch (im produktiven Betrieb)
- Mittel (in Vorbereitung)
- Gering/keine

→ In welchem Bereich/Branche?

Kompatibilität/Konformität Ihrer Prozesse mit dem AI Act

- Ja
- Nein
- unsicher

→ Weil, ggfs. Kommentar

2. AI labels, transparency & norms as competitive advantage

Example 1 - AI solution

AI in shipping (Fraunhofer CML)



Figures 2-5: Typical tasks and roles for the crew composition on a ship.

Methodenspektrum: Klassische KI



FELD	DISZIPLIN	METHODEN	BEISPIELE		
KLASSISCHE KÜNSTLICHE INTELLIGENZ	Problemlösen	Direktes Problemlösen	Ableitungen Formeln Exakte Zuordnung zu bekannten Problemen		
		Suchmethoden	Breitensuche Tiefensuche Bidirektionale Suche Simplex A* MiniMax		
			Nicht-heuristisch	Branch & Bound	
			Heuristisch & Meta-heuristisch	Gradientenabstiegsverfahren Evolutionäre Algorithmen Genetische Algorithmen/ Programmierung	
				Stellvertreter-Optimierung	Schwarmintelligenz Simulated Annealing
				Hyperheuristisch & hybrid	Stochastische Modellierung Bayes'sche Optimierung Hyperheuristiken Memetische Algorithmen
	Planen & Planerkennung	Autonomes & Semiautonomes Planen	Steady State Search Planungsgraphen Hierarchisches Planen Nicht-deterministisches Planen		
			Planerkennung	Zeit- & Ressourcen-Planung Plan-Generierung Abduktive Planerkennung Deduktive Planerkennung Bibliothek-basierte Planerkennung Synthese-Planerkennung	
				Singuläres Entscheiden	Entscheidungsnetzwerke Entscheidungstheoretische Expertensysteme
					Sequentielles Entscheiden

AI-assisted crew planning

Efficient crew planning is crucial for ship management companies aiming to optimize the operation of their fleets both in terms of time and cost. Compliance with international regulations and effective fleet management necessitate a diverse crew with various roles and experiences. Additionally, factors such as border regulations, crew rotation, travel logistics, and required vacation times must be taken into account.

To address these complexities, an AI system is employed to strategically allocate ship crews across different time frames. By leveraging advanced algorithms and machine learning, this AI system streamlines planning processes, ensuring both time as well as financial resources are optimized. The application aims for fostering well-being of crew members and facilitating effective time management for both ship utilization and crew vacations.

Focus on legislations/standards:
 STCW convention, IMO: MSC.373(93), MSC.486(103), MSC.487(103); SOLAS, Oil Pollution Act.

Manufacturer: Fraunhofer Center for Maritime Logistics and Services CML

Application: Improving crew productivity while efficiently meeting crew needs

Capability	Method	Data
1st step		
Process Knowledge > Factual > Procedural	Machine Learning > CNN	Training Input: Historic data of ship routes and crew scheduling. Training Output: Crew planning model (input for 2 nd step) Model Inference Output: Rough crew plan
2nd step		
Process Knowledge > Factual > Procedural	Traditional AI > Linear Optimization	Model Input: Rough crew plan Model Output: Optimized crew plan according to requirements (personal needs, legislation, ...)

Data protection provisions:
 Confidentiality, integrity and availability of crew, ship and business data are ensured as the application runs on site by the application owner, fulfilling legal requirements.

Risk:
 Very Low



TRUSTWORTHY SCORE

Example 2 - AI solution

**Building Recognition with AI: State Office for
Geoinformation and Land Surveying of Lower Saxony
(LGLN)**

Recognition of buildings and outlines

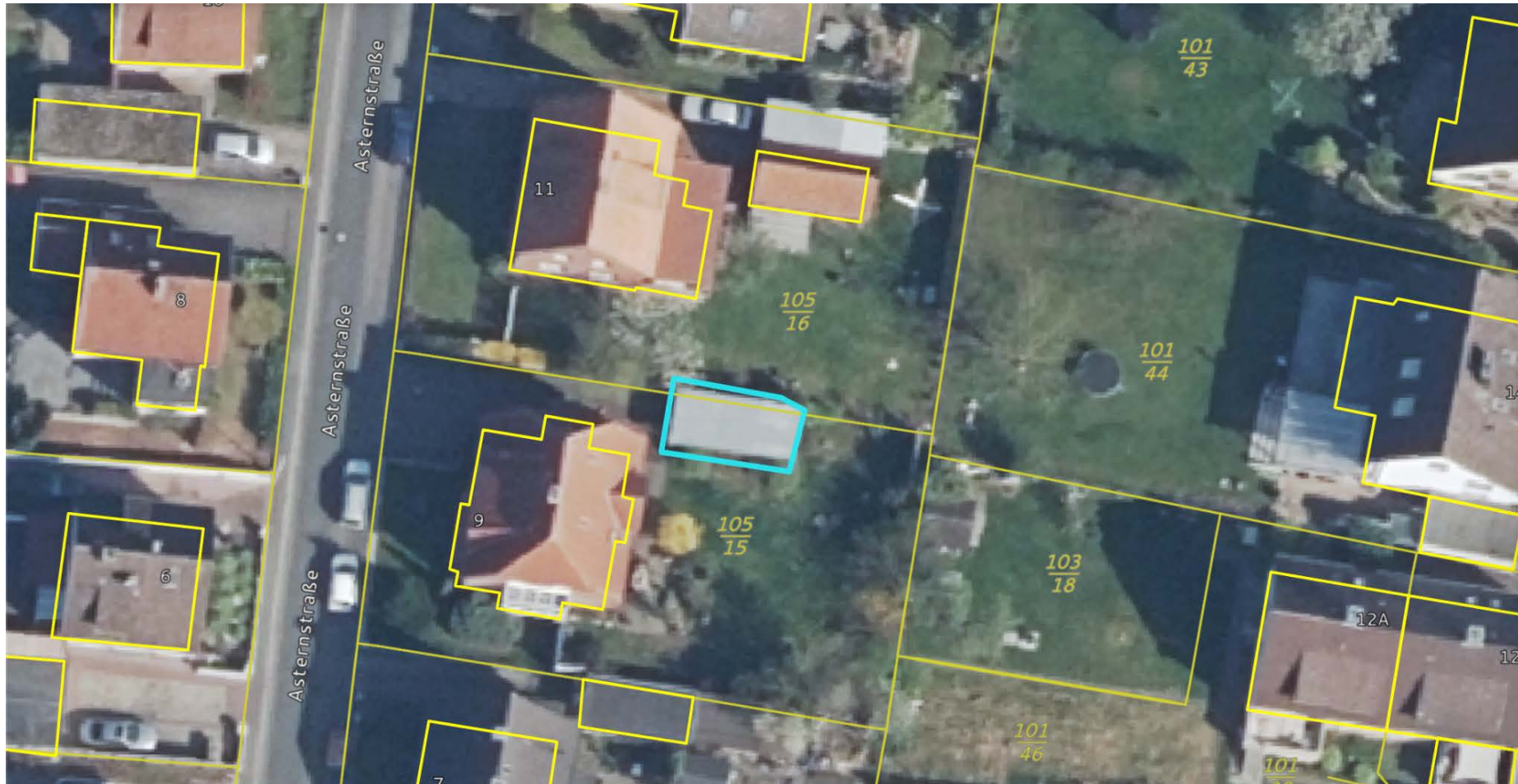


Figure 11.1: Use case for AI: Find the few missing buildings (here a garage in blue) in the buildings (here garage in blue) in the mass data of the real estate cadastre (buildings and parcels in yellow).

Automatic correction of the digital map



Figure 11.5: Automatic calculation to correct (green circles and arrows) the historical data (yellow) using the arrows) of the historical data (yellow) using object recognition (blue).

KI-Matrix: Methoden-Fähigkeiten

METHODEN- & FÄHIGKEITEN MATRIX	WAHRNEHMEN		VERARBEITEN				HANDELN		KOMMUNIZIEREN	
KLASSISCHE KI										
SYMBOLISCHE KI										
HYBRIDES LERNEN										
MASCHINELLES LERNEN										

Figure 5.3: Two-dimensional representation of AI methods and AI capabilities.

AI Matrix: Methods-Capabilities-Criticality

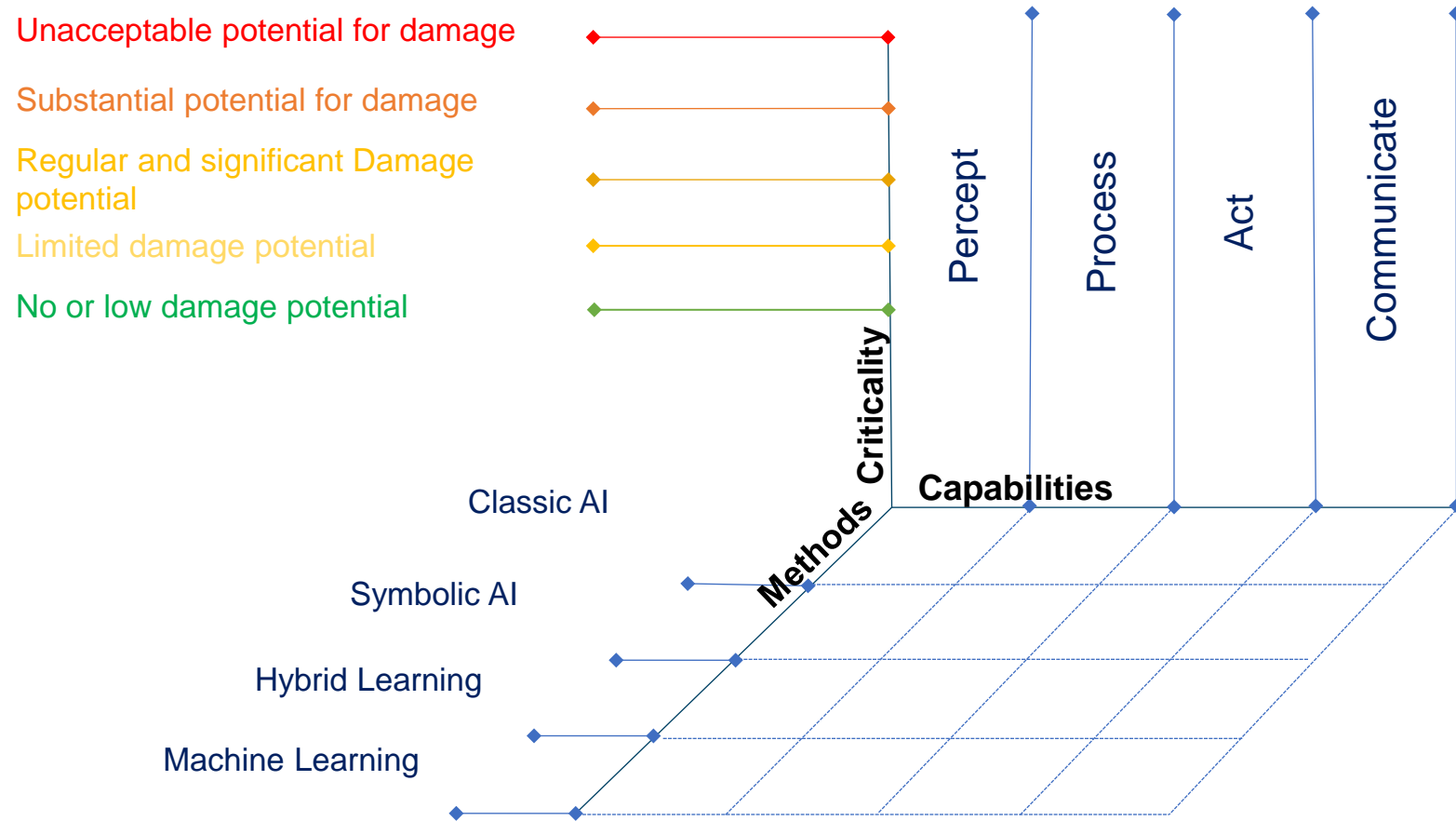


Figure 5.4: Three-dimensional representation of the AI=MC² taxonomy.

Artificial Intelligence

The AI model recognises objects on satellite images. The model is trained on building locations, building outlines, building types and other building properties. The satellite images are composed of different sensor data: optical images, lidar images.

DIN Standard 4711.4711
CE – AI Label V.0

Manufacturer: LGLN
Model version: V2.3 aus 2022

Risk:
Very Low

Application: Object recognition on aerial photographs

Capability

Percept
>External
>>See

Process
>Facts
>>Select
>>Verify

Act

Communicate

Method

Machine Learning
>Supervised Learning
>>Neural Network

Machine Learning
>Supervised Learning
>>Neural Network

Data

Training input: known quality-checked satellite images (optical, infrared) and lidar data
Operational data: unknown images

Building location ,+-xx cm,
Building outline ,+- yy cm



2 – KI Anwendungen der Teilnehmenden

Was für (geplante) KI Anwendungen sind für Sie relevant?

Bild/Computer Vision

Text/Sprachmodelle

Zahlen/Daten/Vorhersagen

2 – Beispiele für Wettbewerbsvorteile durch AI labels und AI norms

Wie kann das Vertrauen der Kunden in ein Produkt/Service oder dessen Sicherheit zu erhöht werden?

Wie können Sie Vorteile/Wettbewerbsvorteile daraus ziehen?

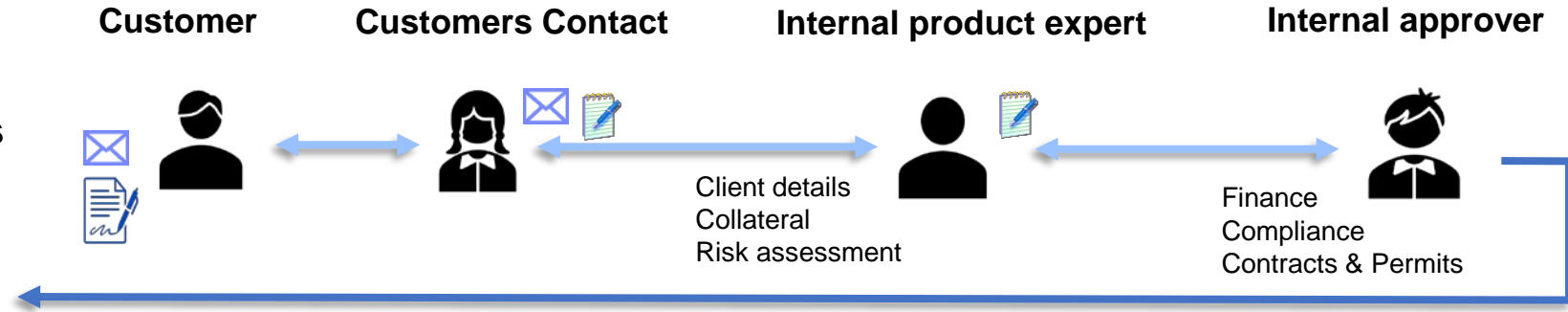
Welche Herausforderungen können bei der Einführung von KI Labeln und Normen auftreten?
Welche Herausforderungen gab es bei ähnlichen Themen/Labeln?

3. AI Testing as success factor

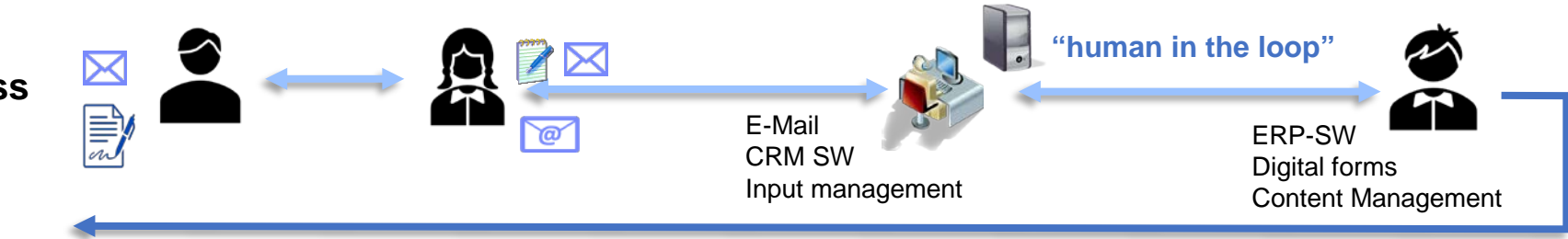
AI - AI model



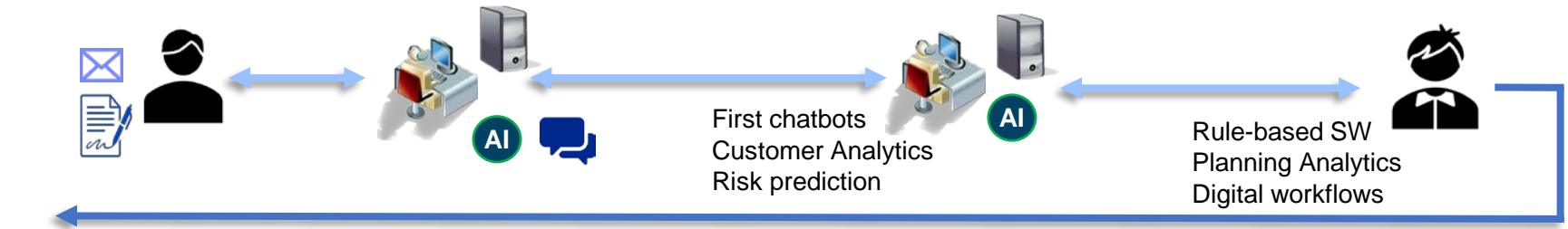
1. Paper-based process
Response time = weeks



2. SW supported process
Response time = days



3. SW-based process
Response time = hours



4. AI-based process
Response time = seconds

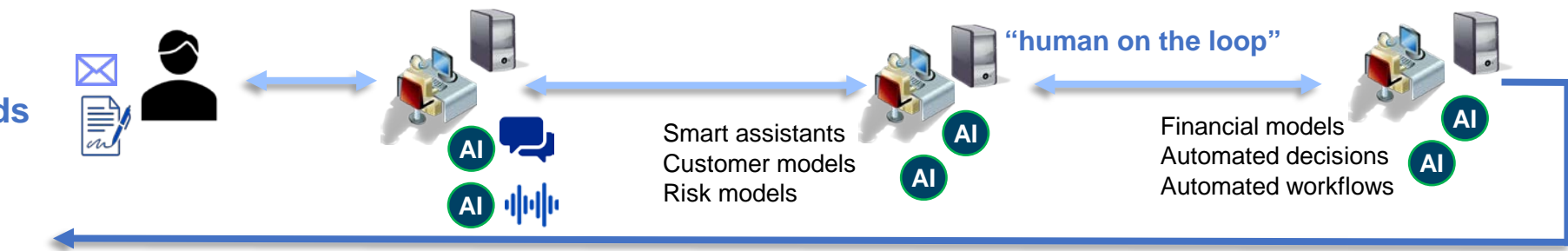


Figure 3.1: Example of a typical transformation process towards AI-supported automation: the bank use case "loan for homeowners".

Cycles: AI development and operation

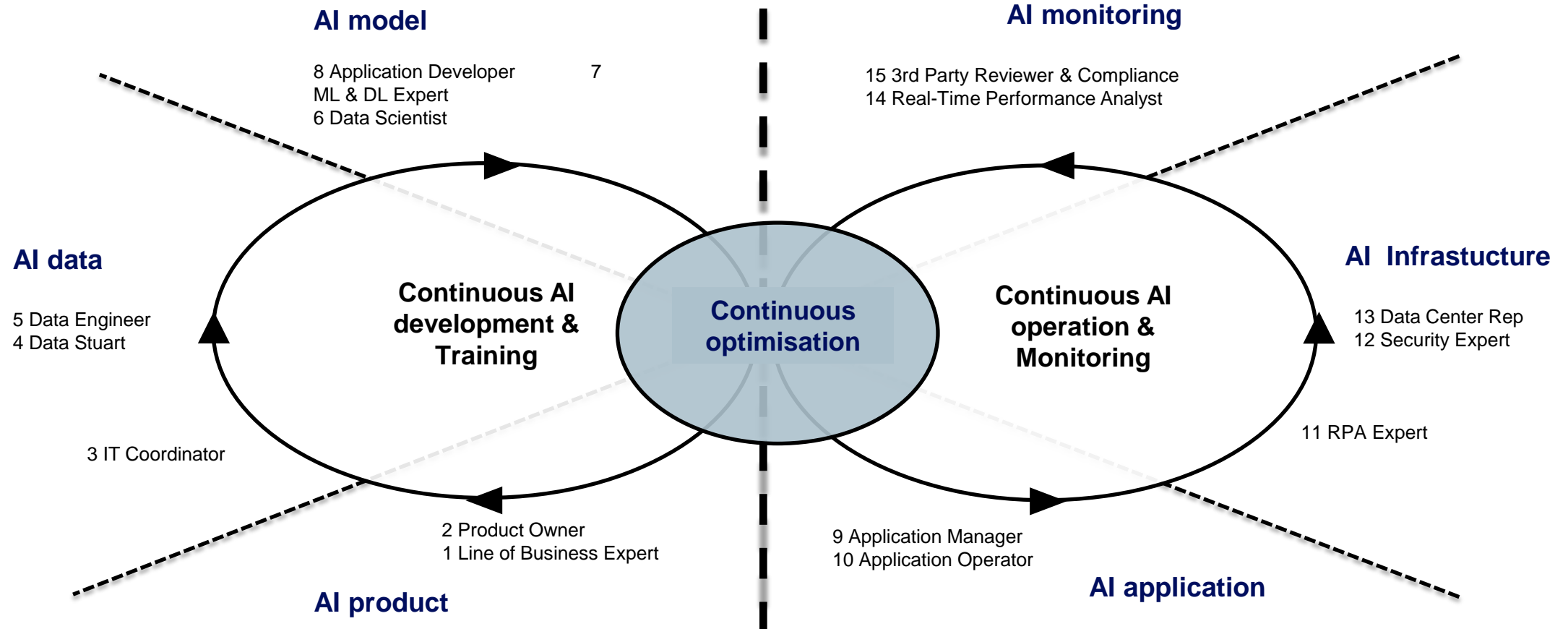


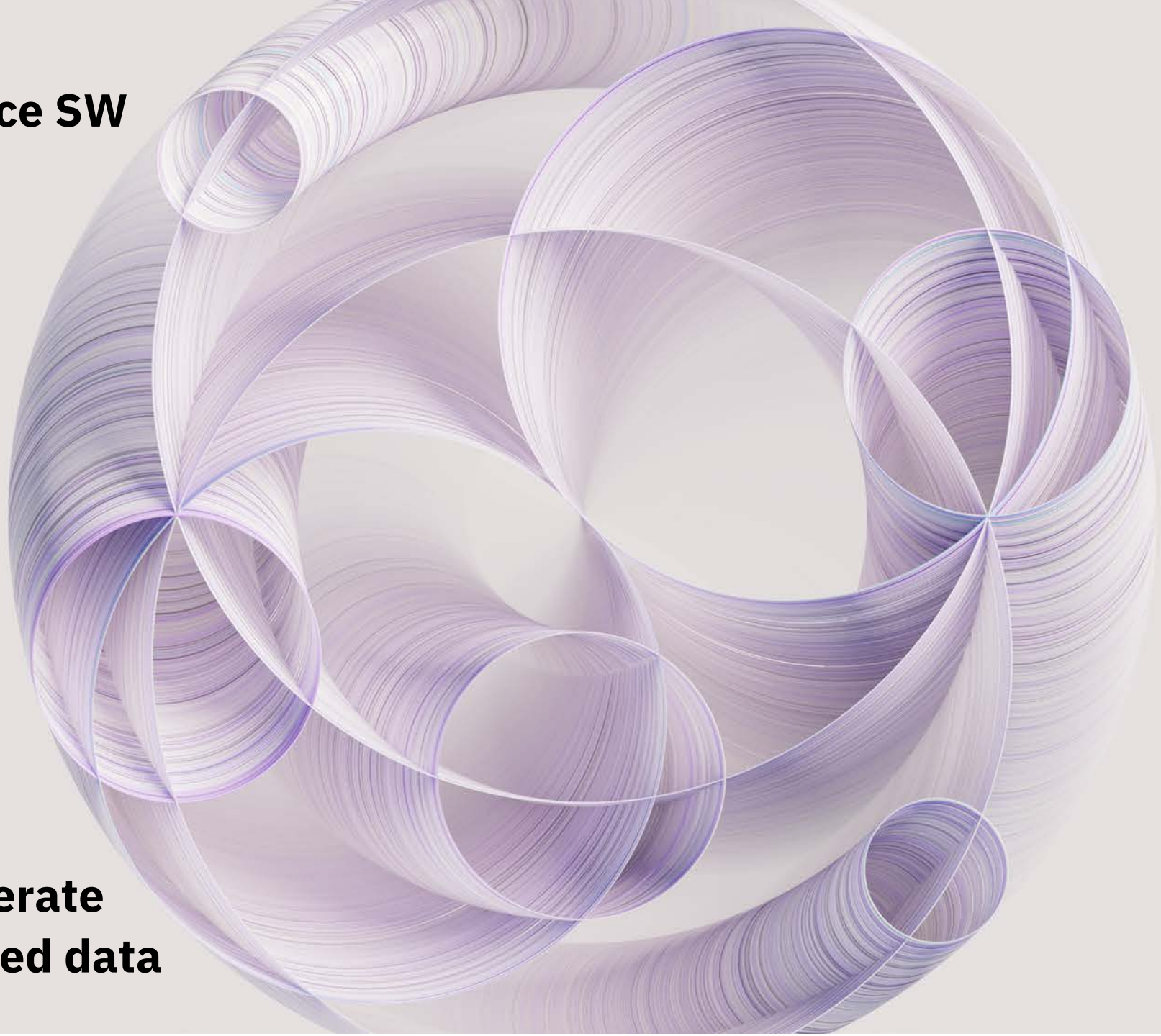
Figure 3.2: Life cycle of an AI application and relevant workflows.

IBM watsonx & open source SW

Elements of the platform



**Scale, test & run
AI & Foundation Models
customize them and accelerate
the impact of AI with trusted data**



Put AI to work with watsonx

Scaling and accelerating the impact of AI – including FM`s - with trusted data.



Leverage foundation models to automate data search, discovery, and linking in watsonx.data



Leverage governed enterprise data in watsonx.data to seamlessly train or fine-tune foundation models



watsonx +  Hugging Face

Enable fine-tuned models to be managed through market leading governance and lifecycle management capabilities



Watsonx.ai

building, training, validating, tuning and deploying AI models



Multi-model & Multi-Cloud

Own customized models & MLOps

The screenshot displays the IBM Watsonx.ai interface. On the left, a 'Select a foundation model' dialog is open, showing a grid of model cards. Each card includes the model name, a brief description, and the provider and source. On the right, another 'Select a foundation model' dialog is shown, displaying a search bar and a list of custom models.

Model Name	Provider	Source
flan-ul2-20b	Google	Hugging Face
starcoder-15.5b	BigCode	Hugging Face
mt0-xxl-13B	BigScience	Hugging Face
gpt-neox-20b	Google	Hugging Face
flan-t5-xl-3b	Google	Hugging Face
flan-t5-xxl-11B	Google	Hugging Face
granite-13b-chat-v1	IBM	IBM
granite-13b-chat-v2	IBM	IBM
granite-13b-instruct-v1	IBM	IBM
granite-13b-instruct-v2	IBM	IBM
mpt-7b-instruct2	Mosaic, tuned...	Hugging Face
llama-2-70b-chat	Meta	Hugging Face





Multi-model & Multi-Cloud

Data Science & MLOps

The screenshot shows the 'Select a foundation model' interface in IBM Watsonx. It features a search bar and a grid of model cards. Each card includes the model name, a brief description, the provider, and the source.

Model Name	Provider	Source
flan-ul2-20b	Google	Hugging Face
starcoder-15.5b	BigCode	Hugging Face
mt0-xxl-13B	BigScience	Hugging Face
gpt-neox-20b	Google	Hugging Face
flan-t5-xl-3b	Google	Hugging Face
flan-t5-xxl-11B	Google	Hugging Face
granite-13b-chat-v1	IBM	IBM
granite-13b-chat-v2	IBM	IBM
granite-13b-instruct-v1	IBM	IBM
granite-13b-instruct-v2	IBM	IBM
mpt-7b-instruct2	Mosaic, tuned...	Hugging Face
llama-2-70b-chat	Meta	Hugging Face

The screenshot shows the 'AutoAI - predictive model option 2' interface for a 'Credit Risk Experiment'. It displays a 'Progress map' showing the workflow from data source to pipeline selection, and a 'Pipeline leaderboard' table.

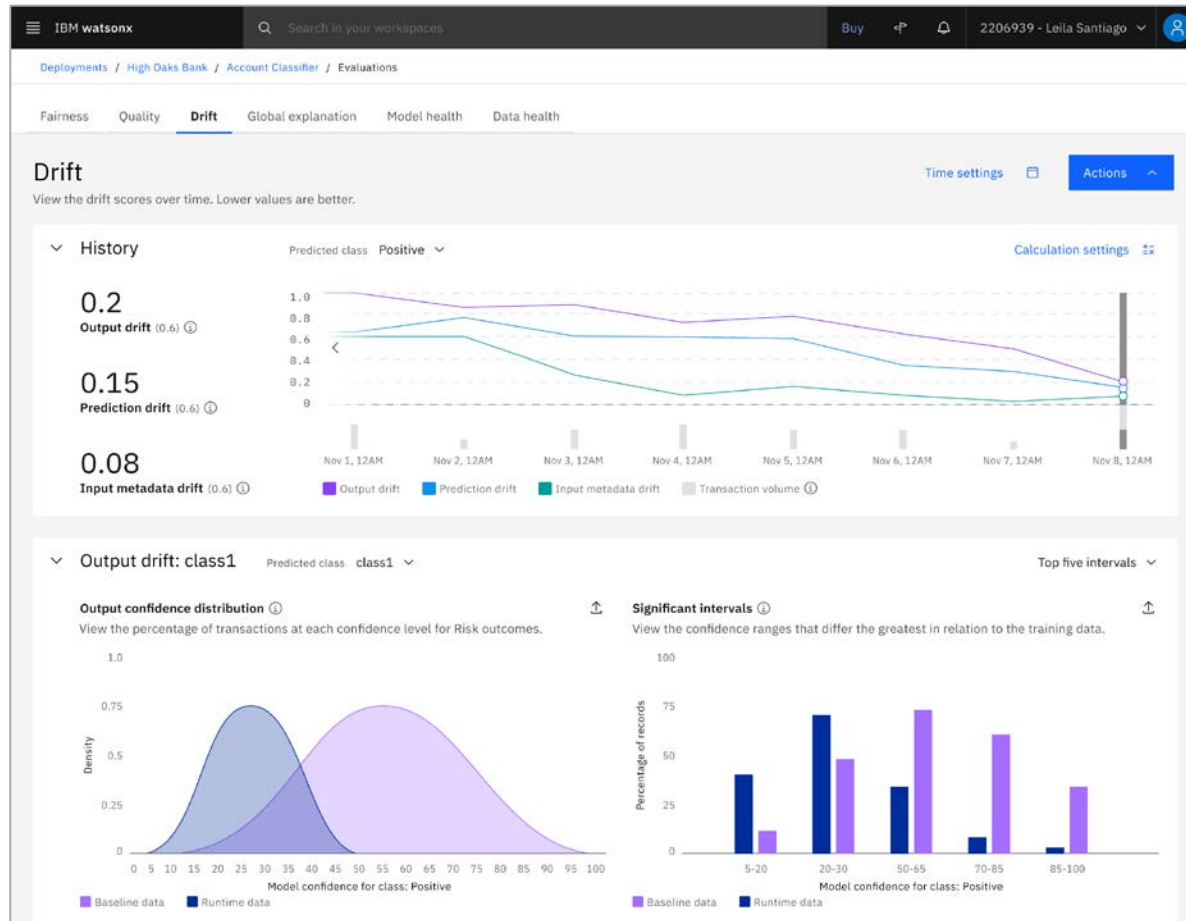
Rank	Name	Algorithm	ROC AUC Cross validation	ROC AUC Holdout	Enhancements	Build time
★ 1	Pipeline H-4	Gradient boosting estimator	0.882	0.891	HPO-1 FE HPO-2	00:00:00
2	Pipeline G-4	Random forest classifier	0.881	0.889	HPO-1 FE HPO-2	00:00:00
3	Pipeline H-3	Gradient boosting estimator	0.879	0.875	HPO-1 FE	00:00:00

Watsonx.governance

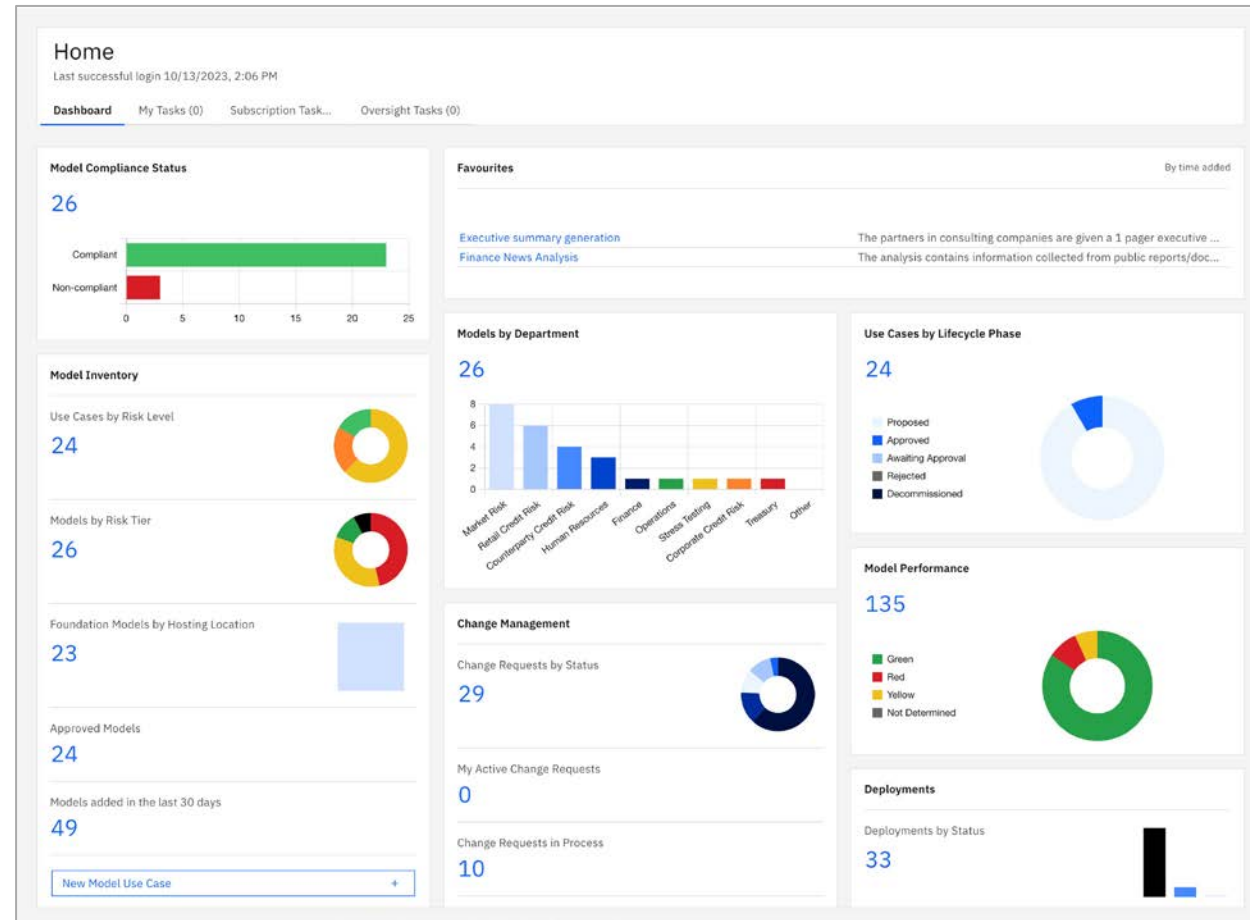
controlling the performance of your models & AI governance via dashboards



Evaluation and monitoring



Manage risk and best practices



Important aspects of an AI ecosystem from any Organisation

Every societal partner should participate:

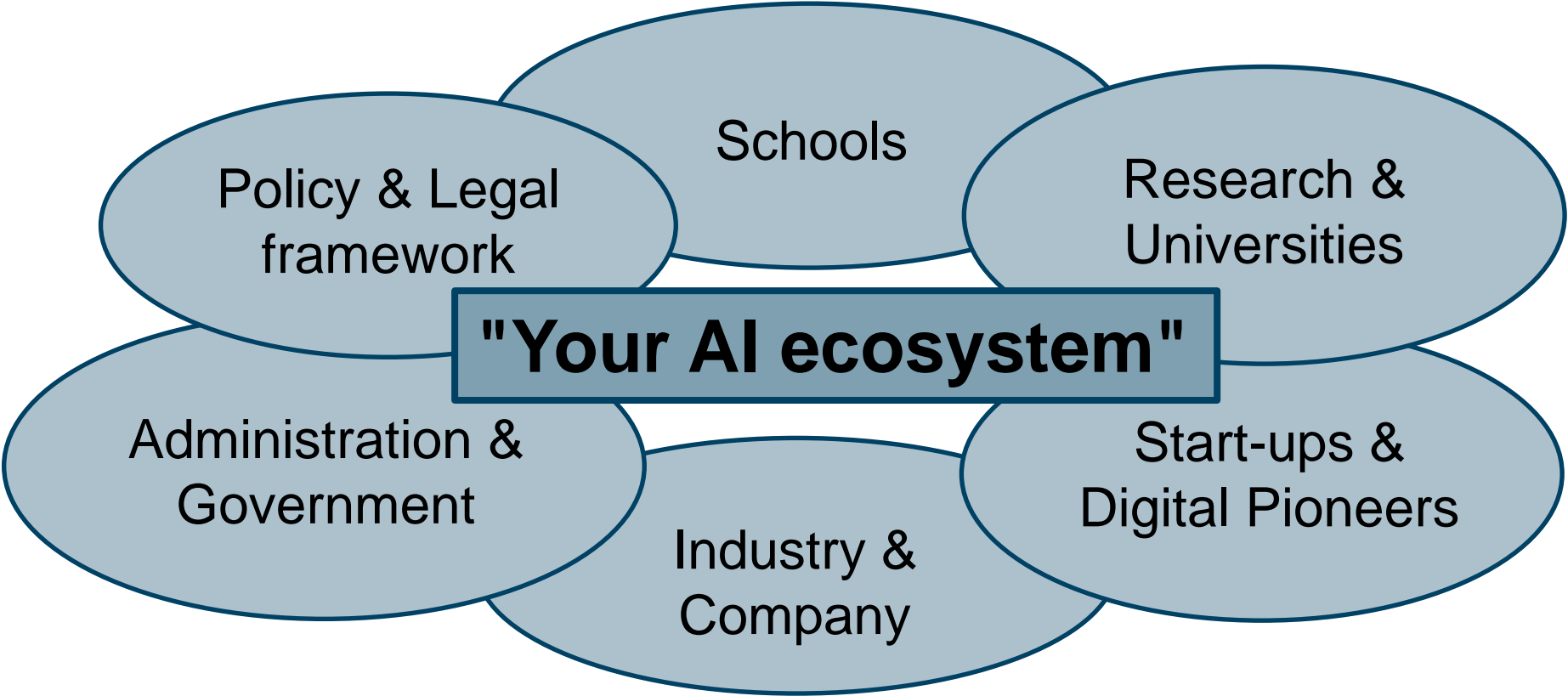


Figure 4.3: An AI ecosystem should involve every societal partner, that matters.

3 - Testen und Ökosystem als Erfolgsfaktor

Hochrisikoanwendung & Testing

Wenn Sie eine High-Risk KI-Anwendung haben, wie testen Sie diese?

	Herausforderungen/Probleme	Chancen/Vorteile
Vor Betrieb		
Im Betrieb		
Nach Betrieb		

4. Example of Application of the EU-AI Act using AI norms to create advantage

Image recognition in medicine

Help with diagnosis



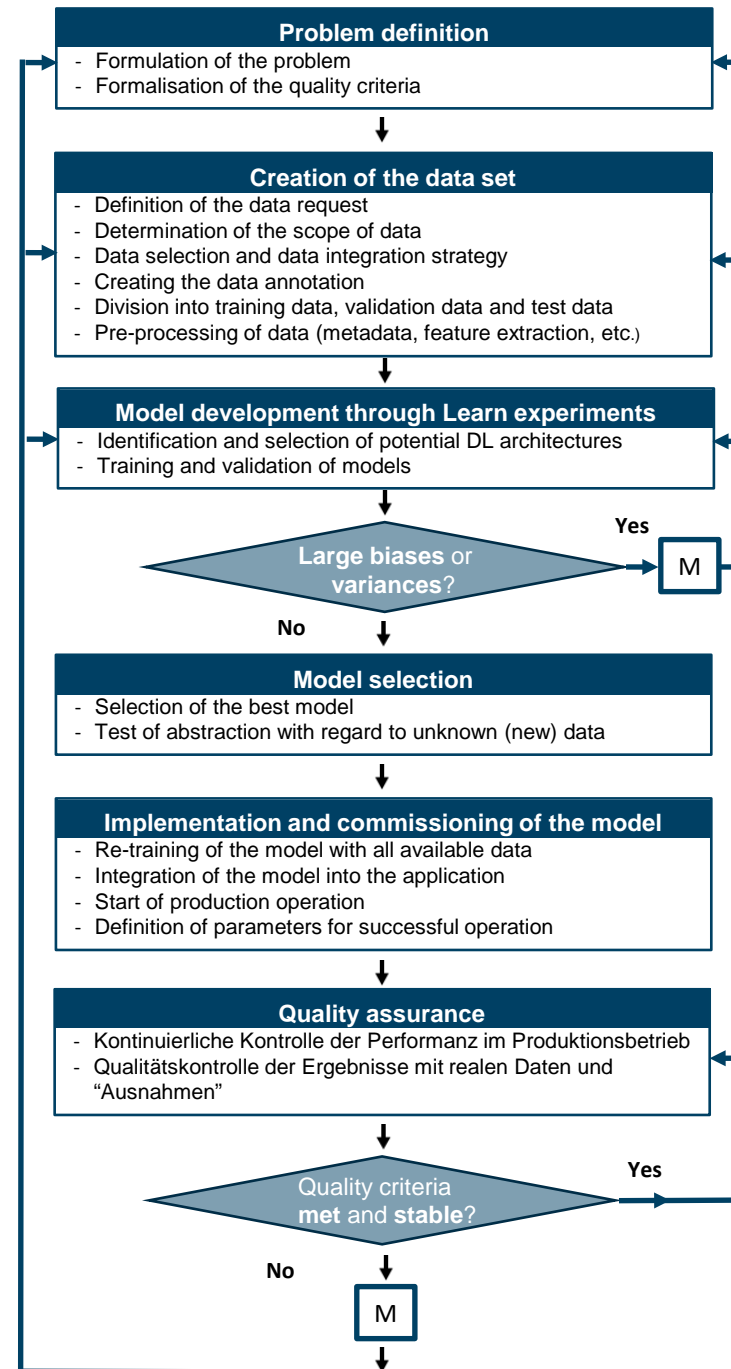
Figure 18.2: AI-assisted analysis of medical image data.

Image recognition in medicine

Help with diagnosis



Figure 18.3: Flow chart for the development of a deep learning system according to DIN SPEC 13266.



- M** Management decision
- Q** Regular quality assurance loop

4 – KI Normen als Wettbewerbsvorteil

Was muss passieren, damit die Nutzung von KI-Normung Wettbewerbsvorteile bieten kann?

Welche offenen/ungelösten Fragen gibt es zum EU AI Act?

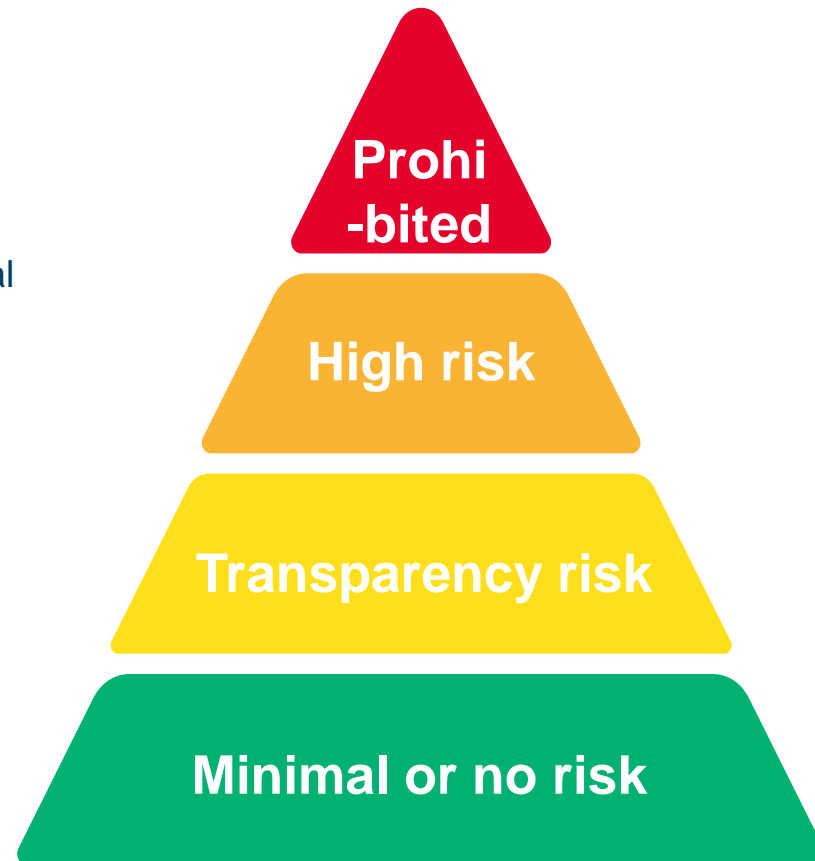
5. Implications of risk class according to the EU AI Act

Prohibited



Examples

- Systems that deploy subliminal techniques to manipulate users.
- AI systems used for social scoring by public authorities.
- AI systems used for real-time biometric identification in public spaces (with certain exceptions for law enforcement).



Due Diligence of the adopter/user

Adopters are not allowed to use or adopt these systems at all.

Any engagement with such systems is illegal under the AI Act.

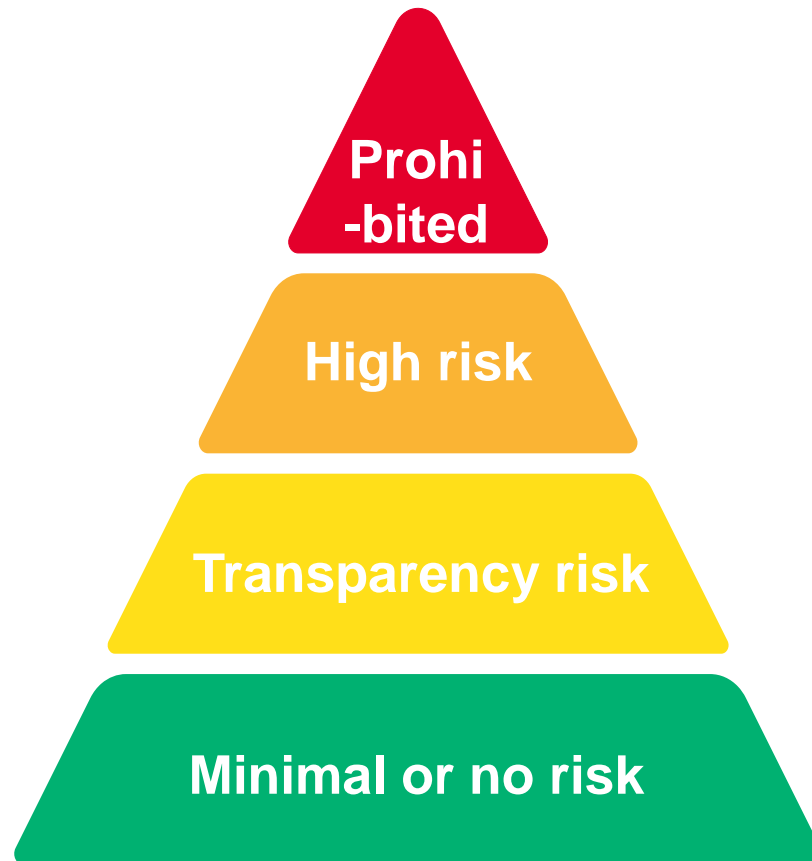
Organisations must ensure that they do not inadvertently deploy prohibited systems by conducting thorough compliance checks.

High Risk



AI used in

- critical infrastructure
- Education
- Employment
- essential public and private services
- law enforcement
- biometric identification



Due Diligence of the adopter/user

Risk Management: Establish systems to assess and mitigate risks throughout the AI lifecycle.

Data Governance: Ensure high-quality, bias-free datasets and maintain data integrity.

Transparency & Documentation: Keep detailed records on the system's design, development, and compliance.

Human Oversight: Implement measures for human intervention and monitoring.

Post-Market Monitoring: Continuously monitor performance to ensure ongoing compliance.

Notified Body Involvement:

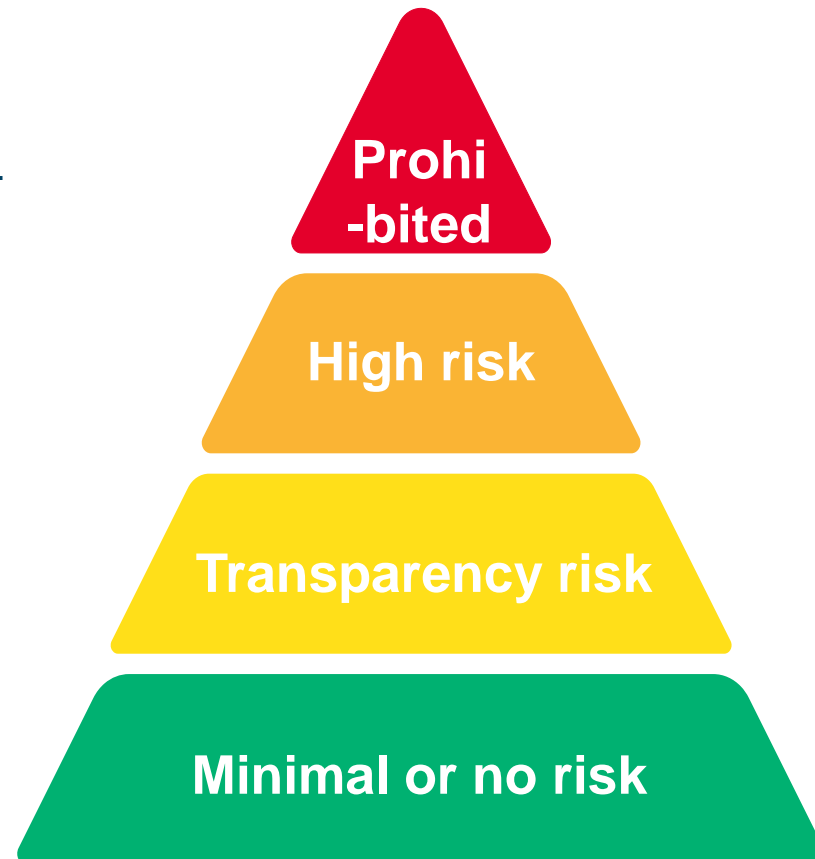
- Conformity Assessment: Engage a notified body for independent audit and certification.
- Certification & Surveillance: Obtain certification and undergo ongoing compliance checks.

Transparency Risk



Examples

- AI chatbots or systems that interact with humans.
- Systems that generate deepfakes (unless they are clearly labeled).



Due Diligence of the adopter/user

Transparency: Adopters must inform users when they are interacting with an AI system. For instance, a chatbot should explicitly state that it is AI-driven.

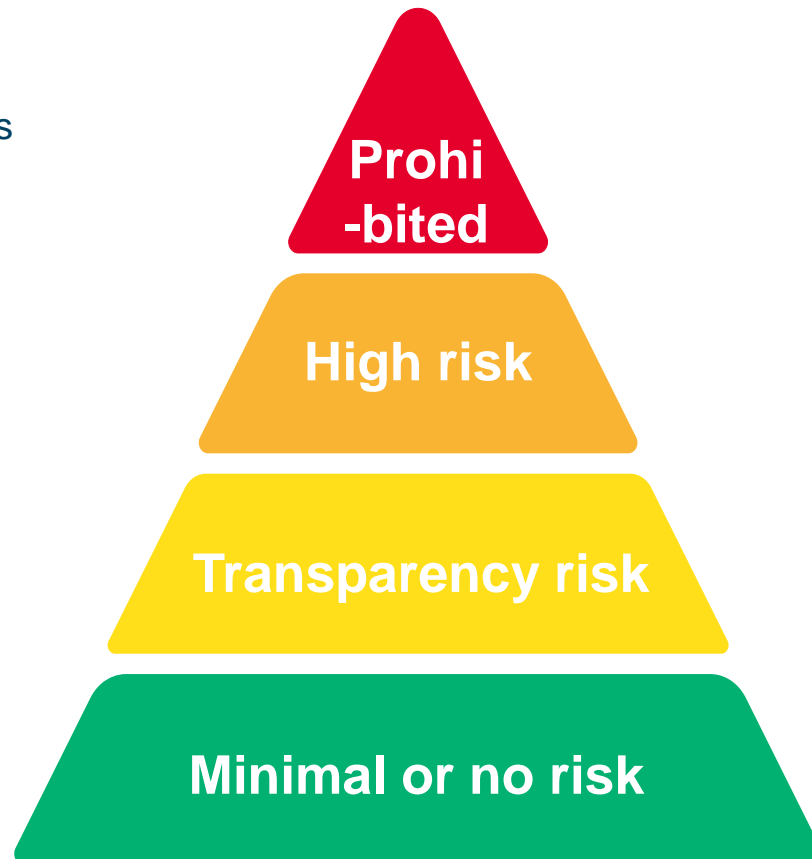
User Awareness: Ensure users understand that they are engaging with AI and provide necessary information for users to make informed decisions about the interaction.

Minimal or No Risk



Examples

- AI systems used in games or email filters.



Due Diligence of the adopter/user

Minimal Regulatory Obligation: No specific regulatory requirements or due diligence beyond general legal obligations (such as data protection under GDPR).

How to prepare for the EU AI Act



- Pledge to fully **embrace** the use of AI in the business.
- **Delegate sufficient authority** in regards to the management of the AI system.
- **Classify the risk level** of the AI system given its anticipated use.
- **Adhere** to all internal and external regulatory policies.
- Consider **specific risks** of the business aligned with AI application.
- Maintain **risk management** and **quality assurance** in an expanded manner.
- Focus on your competitive advantage provided by your AI systems
- Use conformity assessments and declarations to accelerate your EU GTM and sales.

KI managen und verstehen

Vertrauen durch Transparenz

DIN



Wie schafft man Vertrauen in KI?

Lesen Sie dazu jetzt den neuen Praxis-Wegweiser **Künstliche Intelligenz managen und verstehen.**

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<https://www.beuth.de/de/themenseiten/ki>



Thomas Schmid, Wolfgang Hildesheim,
Taras Holoyad

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