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AI powering Digitale Transformations

Over two decades and still on a journey

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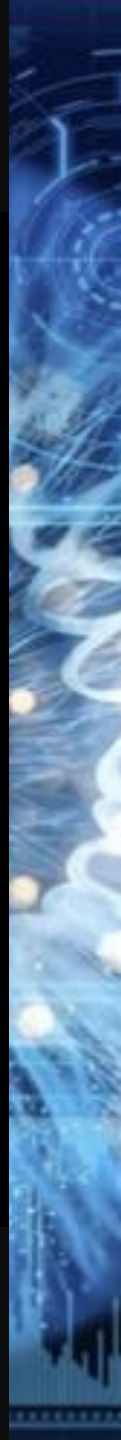
17 June 2024



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Agenda

1. Historic perspective Digital Transformations
2. Artificial Intelligence explained
3. Artificial Intelligence use cases
4. Artificial Intelligence governance

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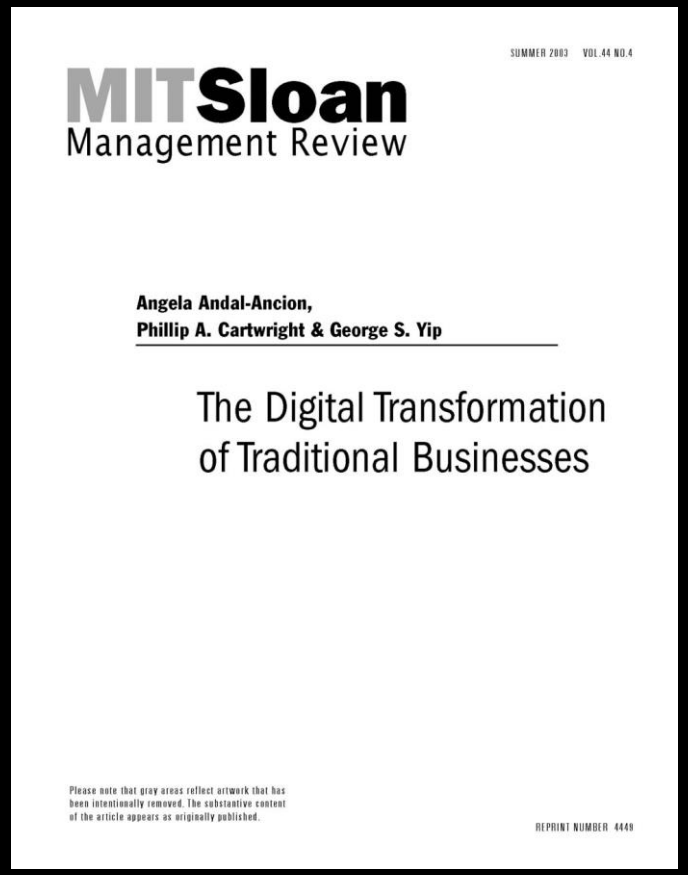
New business models & adjustment of processes, focus on improving the topline

Digital Transformation



Early 2000's fast forward to 2024

From digitisation to digitalization

A Digital Transformation as **an initiative to improve business performance** by making an organization more responsive and enable the introduction of **new business models and innovation**, by **leveraging data and data analytics**.

To change business models and to innovate products and services, **change management and adoptive ways of working are essential**. Most organizations have adopted agile ways of working. By embracing agility, organizations can **respond much faster, make incremental decisions, and adopt to changes in the market and/or changes customers need or new regulatory requirements**.

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2030 Perspective Digital Transformations

1. **Investing in talent and partners**
   Digital transformations are a **capability play**, technology is important, but access to talent is more important. Organizations need to balance between **training their employees and recruiting, outsourcing, and partnering**.
2. **Focusing on sustainability**
   Many organizations have embraced the **United Nations Sustainability Development Goals**. These provide good guidance on how sustainability can be achieved and can be used to explore partnerships and promoting the organization in **retaining and recruiting employees**. In addition, as these goals are widely adopted, organizations can use the goals to **position and profile their organization**.
3. **Empathizing in connecting**
   This is becoming more important as the online communication matures from portals and online chat and online video chat to more **immersive communication** on, for example, the metaverse. This is a new era and requires a **more personal and inclusive approach**, which is not straightforward in a global setting with different and blending cultures and norms and beliefs.

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Definitions

Artificial intelligence (AI) applies advanced analysis and logic-based techniques, including machine learning, to interpret events, support and automate decisions, and take actions.

(https://www.gartner.com/en/information-technology/glossary/artificial-intelligence)

Generative Artificial Intelligence (AI) refers to AI techniques that learn a representation of artifacts from data, and use it to generate brand-new, unique artifacts that resemble but don't repeat the original data. These artifacts can serve benign or nefarious purposes. Generative AI can produce totally novel content (including text, images, video, audio, structures), computer code, synthetic data, workflows and models of physical objects. Generative AI also can be used in art, drug discovery or material design.

(https://www.gartner.com/en/information-technology/glossary/generative-ai)

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Business perspective on AI

Figure 5: AI priorities for executives

78% AGREE

Scaling AI/ML use cases to create business value is a top priority

DISAGREE 8%
NEUTRAL 14%

68% AGREE

Unifying our data platform for analytics and AI is crucial to our enterprise data strategy

DISAGREE 12%
NEUTRAL 20%

72% AGREE

We favor a multi-cloud approach as a flexible foundation for AI/ML

DISAGREE 12%
NEUTRAL 16%

72% AGREE

Data problems are the most likely factor to jeopardize our AI/ML goals

DISAGREE 9%
NEUTRAL 19%

Source: MIT Technology Review Insights survey, 2022.

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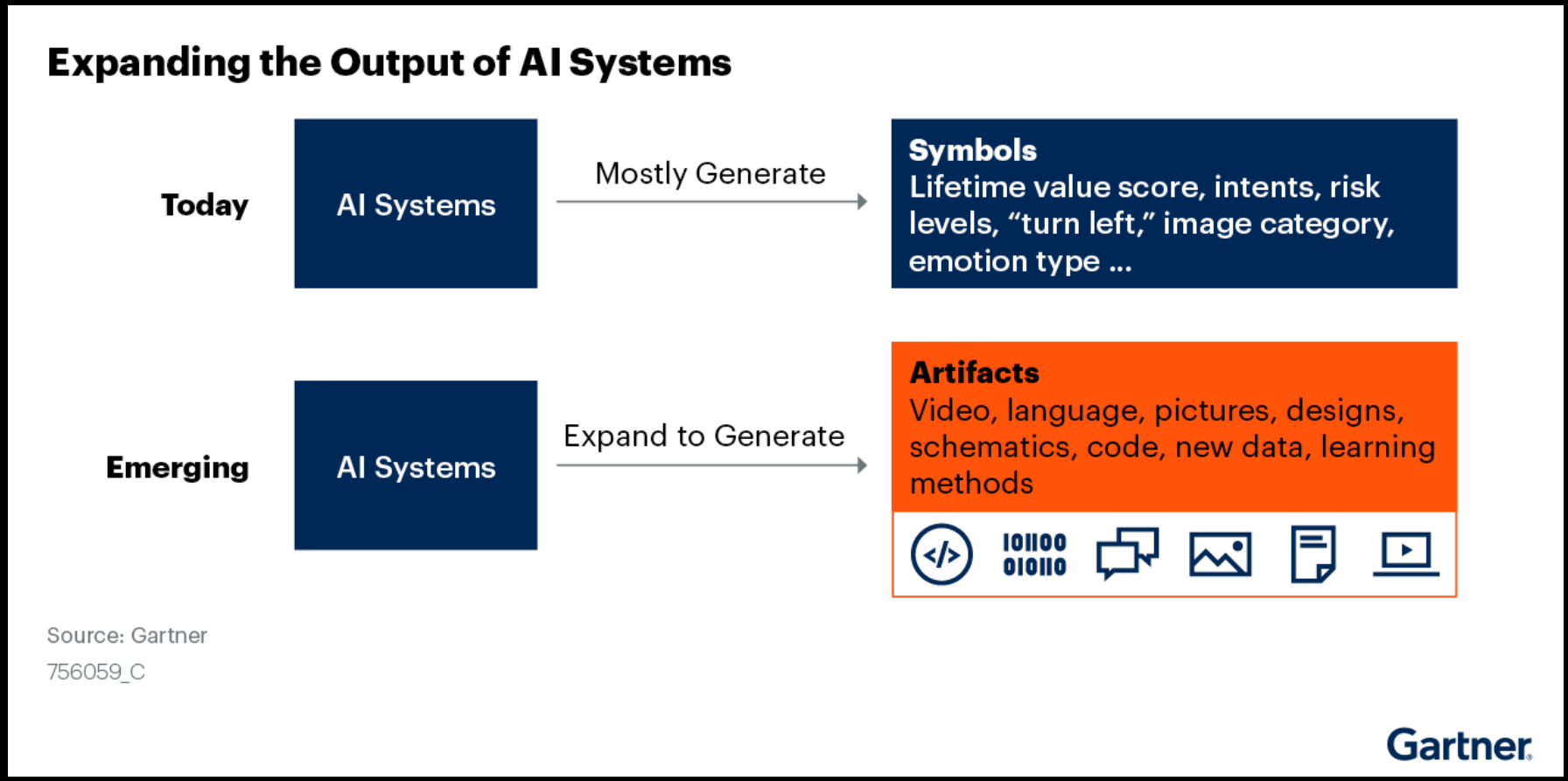
Trends in Artificial Intelligence



Applying AI — Key Trends and Futures - 12 March 2024 - ID G00775829 - Bern Elliot, Jim Hare and Frances Karamouzis

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Gen AI top performers - 1/2

Exhibit 1 - Ten Percent of Companies Are Already Scaling GenAI, Benefiting from Higher Predictive AI Maturity

	~40% of companies No-action	~50% of companies Piloting	~10% of companies Scaling
	Taking no action on GenAI yet Majority have lacked predictive AI project execution capability	**Developing a few focused MVPs to test value from GenAI** Majority have piloted several predictive AI projects, but few have successfully scaled	**Scaling one or more GenAI applications across functions/ enterprise** Majority have scaled several predictive AI initiatives in a few functions
% of companies with high predictive AI maturity	25%	46%	61%
% who have realized significant value from scaled predictive AI cases	7%	10%	44%

Source: BCG Build for the Future C-level GenAI survey, 2023, n=159

https://www.bcg.com/publications/2024/what-gen-ais-top-performers-do-differently

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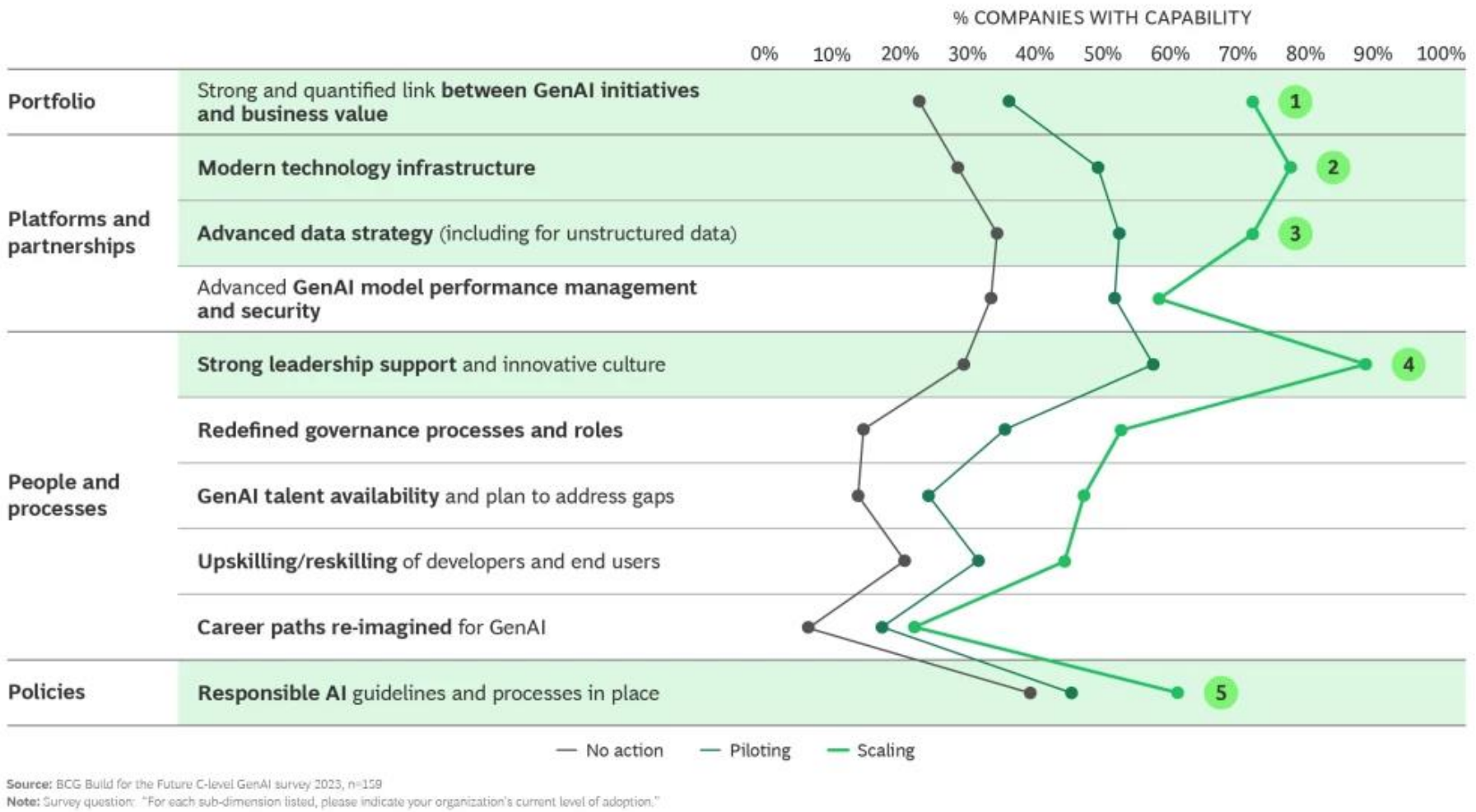
https://www.bcg.com/publications/2024/what-gen-ais-top-performers-do-differently

Gen AI top performers - 2/2

Exhibit 2 - Top GenAI Performers Stand Out in Five Main Capabilities



Source: BCG Build for the Future C-level GenAI survey 2023, n=159
Note: Survey question: "For each sub-dimension listed, please indicate your organization's current level of adoption."

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Business perspective on AI

What are concerns with regards to Generative AI?

Overview Generative AI concerns[1]:

1. Distribution of harmful content
2. Copyright and legal exposure
3. Data privacy violations
4. Sensitive information disclosure
5. Amplification of existing bias
6. Workforce roles and morale
7. Data provenance
8. Lack of explainability and interpretability

1.https://www.techtarget.com/searchenterpriseai/tip/Generative-AI-ethics-8-biggest-concerns

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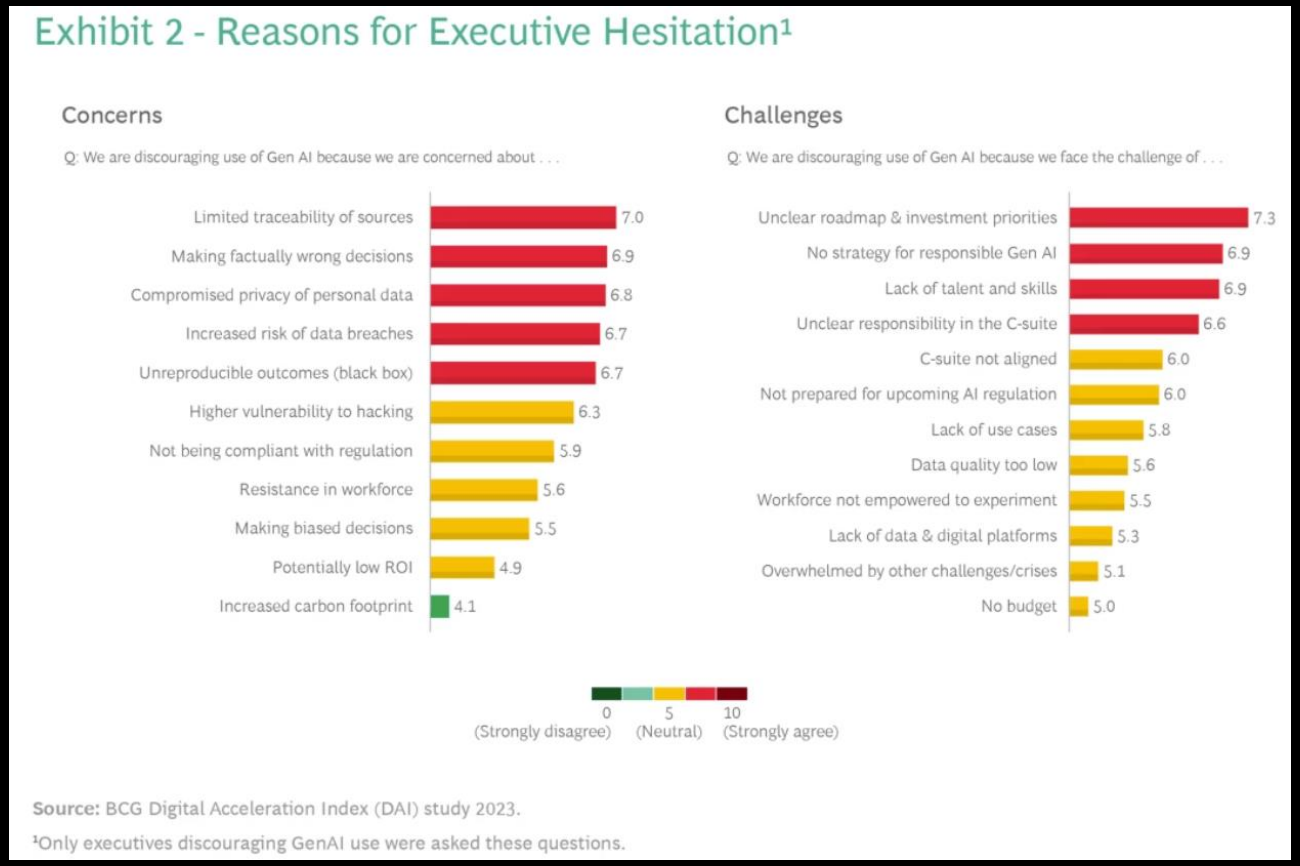
GENERATIVE AI / ARTICLE

What's Dividing the C-Suite on Generative AI?

SEPTEMBER 28, 2023

By Nicolas de Bellefonds, Djon Kleine, Michael Grebe, Caleb Ewald, and Clemens Nopp

Business perspective on AI



https://www.bcg.com/publications/2023/c-suite-genai-concerns-challenges

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Large Language Model definitions - 1/2

A large language model (LLM) is a specialized type of artificial intelligence (AI) that has been trained on vast amounts of text to understand existing content and generate original content.
(https://www.gartner.com/en/information-technology/glossary/large-language-models-llm)

A large language model (LLM) is a type of artificial intelligence (AI) algorithm that uses deep learning techniques and massively large data sets to understand, summarize, generate and predict new content. The term generative AI also is closely connected with LLMs, which are, in fact, a type of generative AI that has been specifically architected to help generate text-based content.
(https://www.techtarget.com/whatis/definition/large-language-model-LLM)

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Large Language Model definitions - 2/2

Company	Model	Launch Year	# Parameters in billions	#GPUs & Training Time
Open AI	GPT 3.5	2022	175	10k V100 GPUs/ 3500 A100 running for 240 Hours
	GPT 4	2023	1700	30K A100 GPUs, 34 days
Google and Deep Mind	Gopher	2021	280	-
	Chinchilla	2022	70	-
Google	PaLM	2022	540	6144 v4 TPUs/ 10,000 A100 GPUs for 1200hrs
	LaMDA	2022	137	-
Meta	OPT-175B	2022	175	1024 Nvidia A100 80 GB/2918 A100 40GB GPUs for 792 hrs.
	LlaMA	2023	65	2048 Nvidia A100 GPUs, 80GB for 500 Hours
Nvidia	NeMo ™	2021	530	-
Baidu	ERNIE 3.0	2021	260	-
BAAI [4]	Wu Dao	2022	1750	-

Wu Dao - 'road to awareness' is a multimodal artificial intelligence (text & images) developed by the Beijing Academy of Artificial Intelligence

https://www2.deloitte.com/content/dam/Deloitte/in/Documents/Consulting/in-consulting-nasscom-deloitte-paper-large-language-models-LLMs-noexp.pdf?id=in:2sm:3fb:4Nasscom%20LLM%20genAI::6cons:20231006113802::11499260188:5&utm_source=fb&utm_campaign=Nasscom%20LL%20genAI&utm_content=cons&utm_medium=social&linkId=239690396 (**September 2023 – NASCOM and Deloitte - Large language Models (LLMs) – A Backgrounder**)

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Large Language Models explained - 1/2

Parameters are the number of variables in the LLM's neural network (model size). These variables represent the weights and biases that are used to learn the relationships between the input and output data. The more parameters an LLM has, the more complex it is and the better it can learn to generate text that is similar to the text it was trained on.

Tokens are the basic units of text that the LLM uses to process and generate language. Tokens can be characters, words, or subwords, depending on the chosen tokenization method. The more tokens an LLM has, the more expressive it can be in its output.

word, but also number of characters and includes punctuation signs or emojis

of tokens impacts the performance of LLMs

Metric	Description	Equivalence
Parameters	Number of variables in the LLM's neural network	More Parameters = More Complex LLM
Tokens	Basic units of text that the LLM uses to process and generate language	More Tokens = More Expressive LLM

https://www2.deloitte.com/content/dam/Deloitte/in/Documents/Consulting/in-consulting-nasscom-deloitte-paper-large-language-models-LLMs-noexp.pdf?id=in:2sm:3fb:4Nasscom%20LLM%20genAI::6cons:20231006113802::11499260188:5&utm_source=fb&utm_campaign=Nasscom%20LL%20genAI&utm_content=cons&utm_medium=social&linkId=239690396
(**September 2023 – NASCOM and Deloitte - Large language Models (LLMs) – A Backgrounder**)

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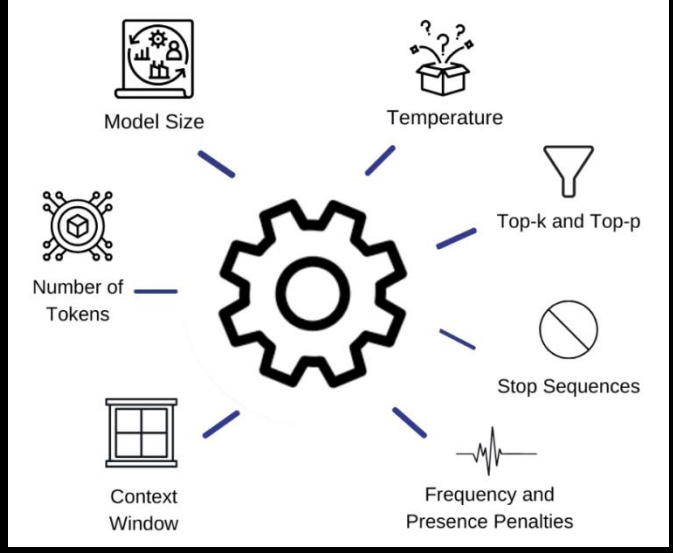
LLMs explained - 2/2



- **Temperature** = degree of factual (low temperature) versus degree of creativeness and imaginativeness (high temperature) - probability distribution of potential words
- **Top-k and top-p** = filtering tokens - Top-k to 5, the LLM will only consider the 5 most probable next words, were setting Top-p to less than 1 diversity will increase (more diverse and less fluent text) – both cutoff
- **Stop Sequence** = blacklisting content generation – to avoid unwanted and/or sensitive text generation
- Frequency and Presence penalties
- **Frequency penalties** penalises LLMs for generating words that are frequently used - avoiding repetitive text.
- **Presence penalties** penalises LLMs for generating words that have not been used recently – avoiding irrelevant text.
- **Context window** = number of words that the LLM considers when generating text, if the context window is set to 4, the LLM will consider the 4 words before and after the current word when generating the next word - 1024 ensures consistency and context preservation

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Case study – sales opportunity prioritisation

- **Support response use case** : B2B “webshop”- +1m Stock Keeping Units - multi country
- **Pilot** : single country : +500 e-mails per day / 25 agents`-> focus on both revenue & profit
- **Impact**
  - Increased sales – no predictable measures yet
  - Improved response times 25-50%
  - Improved customer satisfaction – unmeasured yet (note : NPS is not suitable KPI -> equires specific surveys to capture feedback)
  - Reduced agents 20-25%

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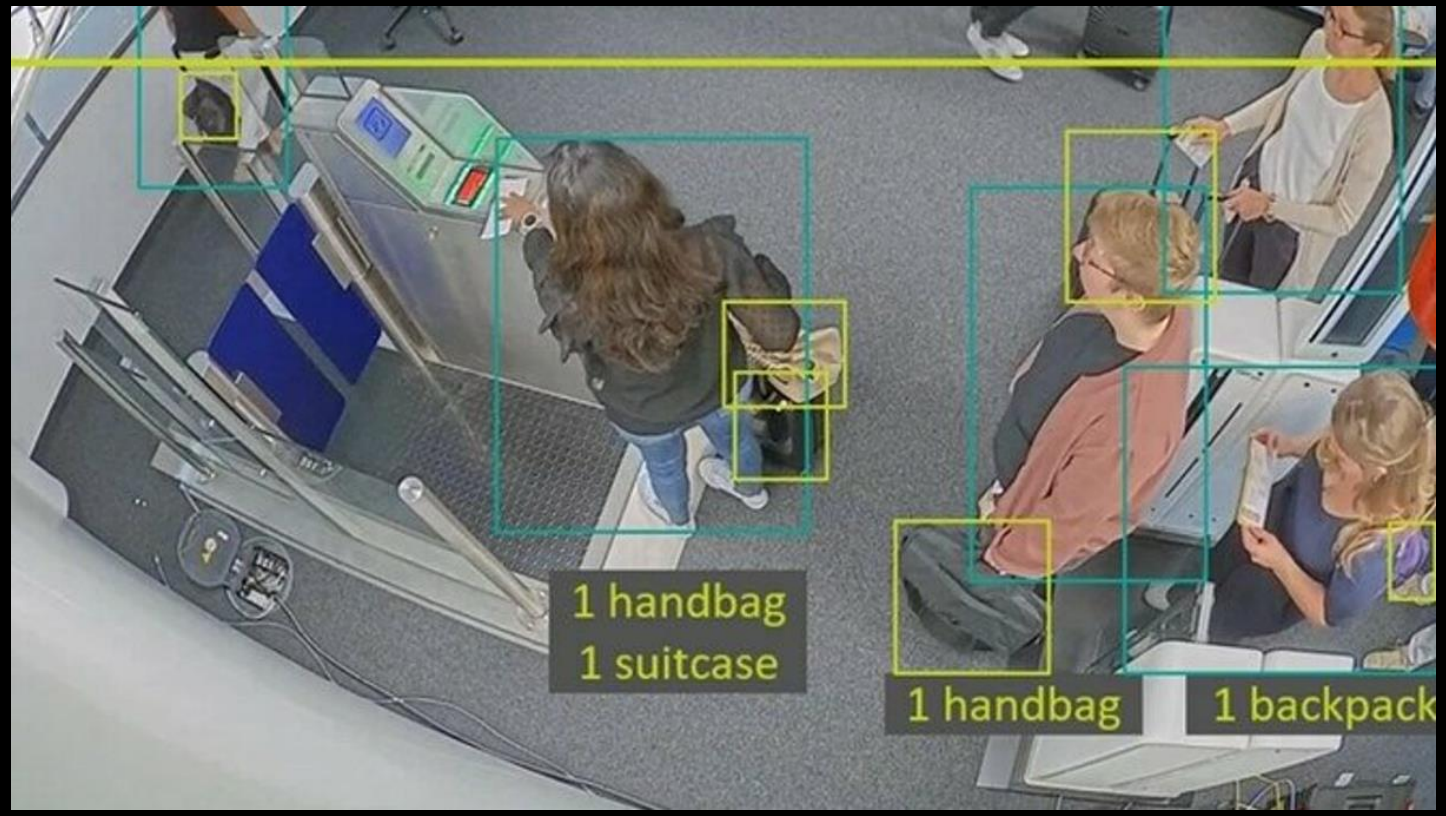
AI and GenAI use case example

Carry On Baggage Prediction Tool – Lufthansa (computer vision - pilot @ two airports)



https://innovation-runway.lufthansagroup.com/en/focus-areas-projects/use-cases/detect-hand-luggage-using-computer-vision.html

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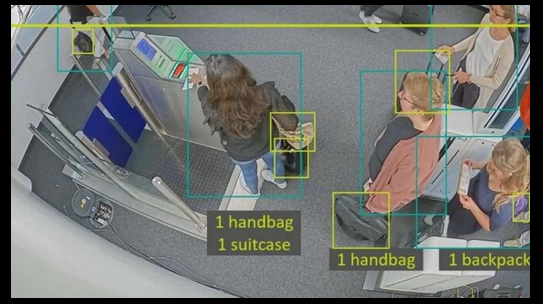

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AI and GenAI use case example

Carry On Baggage Prediction Tool – Lufthansa (computer vision - pilot @ two airports)

Every airline faces one common challenge: **Carry-on-baggage capacity is limited onboard and an additional reloading into the cargo compartment causes unnecessary delay minutes and disruptions.**
Start in the lab : ideate, plan and **run a computer vision lab use case.**
Testing a computer vision solution, which is **programmed and trained so well that it reliably counts the exact number of pieces of different hand luggage that passenger carrying when boarding**. After training the AI, the project team invited about **50 employees from the Lufthansa Group** in June to test their AI in the boarding lab at Lufthansa Systems in Raunheim. During multiple simulated boarding processes, the detection of our test passengers' luggage was tested **with 2 different camera settings (i.e. with a ceiling camera & front camera perspective) and with different hand luggage types**.
Fabian Vogel (Senior Data Scientist, zeroG) summarizes this trial as follows: "We have gained some **interesting insights after 7 weeks**, e.g. that the camera should be positioned in the **ceiling perspective** after passing the gate to get more valid images of the luggage carried and that we need more images so that the AI can better recognize more difficult luggage (incl. different types of trolleys and backpacks)."

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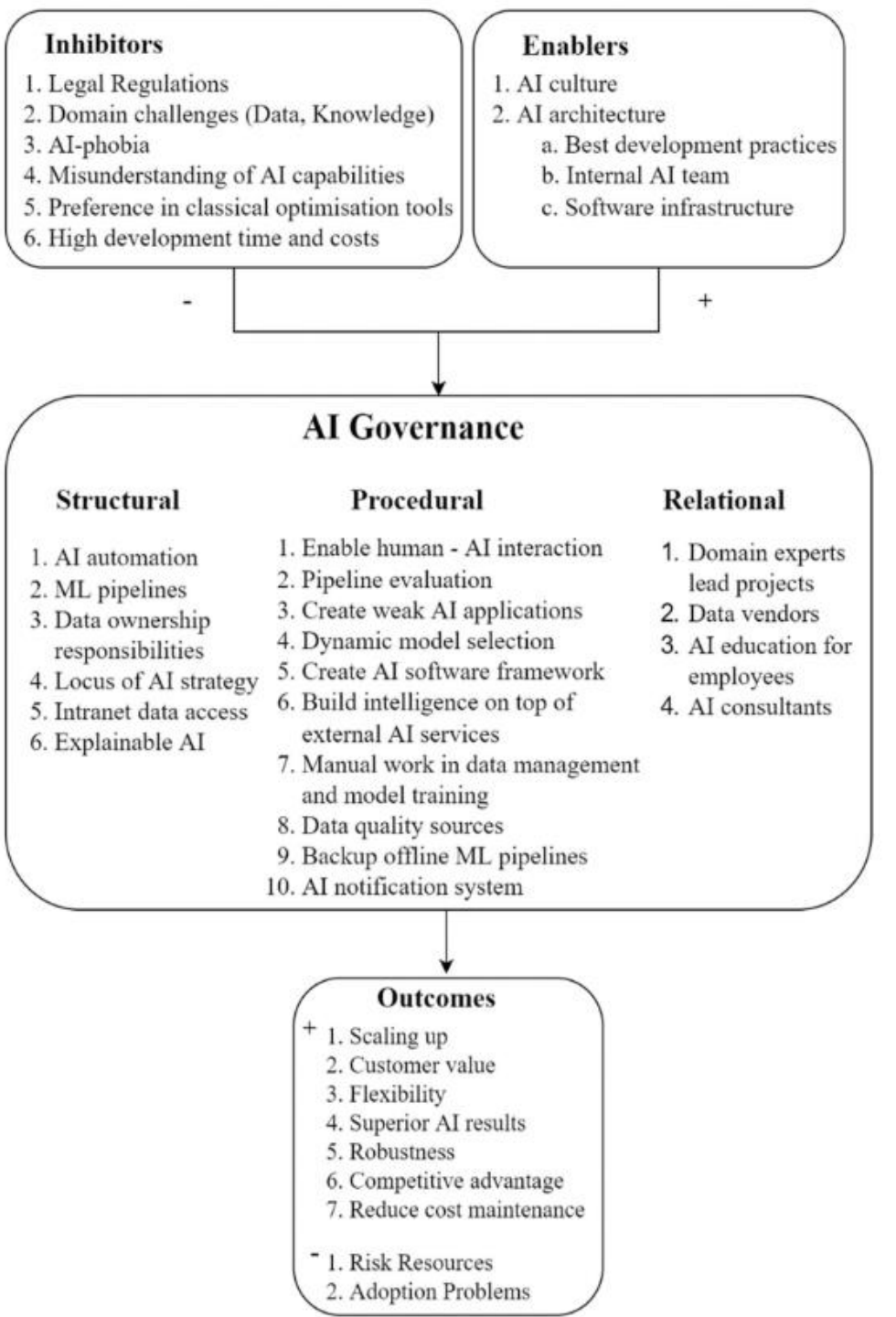
AI Governance



Papagiannidis, E., Enholm, I. M., Dremel, C., Mikalef, P., & Krogstie, J. (2023). Toward AI governance: Identifying best practices and potential barriers and outcomes. Information Systems Frontiers, 25(1), 123-141.

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Thank you for joining today!