

# Certificate I: Understanding AI and Machine Learning in Africa

Course AIMLO2: AI and Machine Learning in Africa

Module 3: AI Business Strategy

Lecture 3: Collaborative Intelligence – Humans and AI are Joining Forces

**Carnegie Mellon University**  
Africa

# Learning Objectives

1. Highlight the value of **collaboration** between humans and artificial intelligence, and identify **five principles** that can help companies benefit from optimizing collaboration
2. Explain the **three roles** performed by **humans**, when humans assist machines
3. Explain the **three roles** performed by **machines**, when machines assist humans
4. Identify **five elements of business processes** that companies often seek to improve
5. Explain why reimagining business processes to exploit **collaborative AI** also creates **a need for new roles and talent** among employees

# Lecture Contents

1. The value of collaboration
2. Humans assisting machines
3. Machines assisting humans
4. Reimagining your business
5. The need for new roles and talent
6. Lecture summary
7. Recommended reading & references

# The Value of Collaboration

As a powerful tool, AI will fundamentally change how work is done and who does it

"Never before have digital tools been so responsive to us, nor we to our tools."

[Wilson and Daugherty, 2019]

AI will have its biggest impact in **complementing** and **augmenting** human capabilities, **not replacing** them

# The Value of Collaboration

"In our research involving 1,500 companies, we found that firms achieve the most significant performance improvements when humans and machines work together."

(Wilson and Daugherty, 2019)

# The Value of Collaboration

When humans and AI work together successfully, using **collaborative intelligence**, they **actively enhance** each other's **complementary strengths**

Human Strengths	AI Strengths
Leadership	Speed
Teamwork	Scalability
Creativity	Quantitative capabilities
Social Skills	

What comes naturally to humans is often difficult for machines;  
What is easy for machines is often virtually impossible for humans  
**Business needs the capabilities of both**

# The Value of Collaboration

To be successful in adopting AI, companies must understand

- How humans can effectively complement machines
- How machines can enhance human capabilities
- How to redesign business processes to support the partnership



[https://en.wikipedia.org/wiki/Yin\\_and\\_yang](https://en.wikipedia.org/wiki/Yin_and_yang)

# The Value of Collaboration

**Five principles** can help companies benefit from optimizing collaboration between humans and artificial intelligence

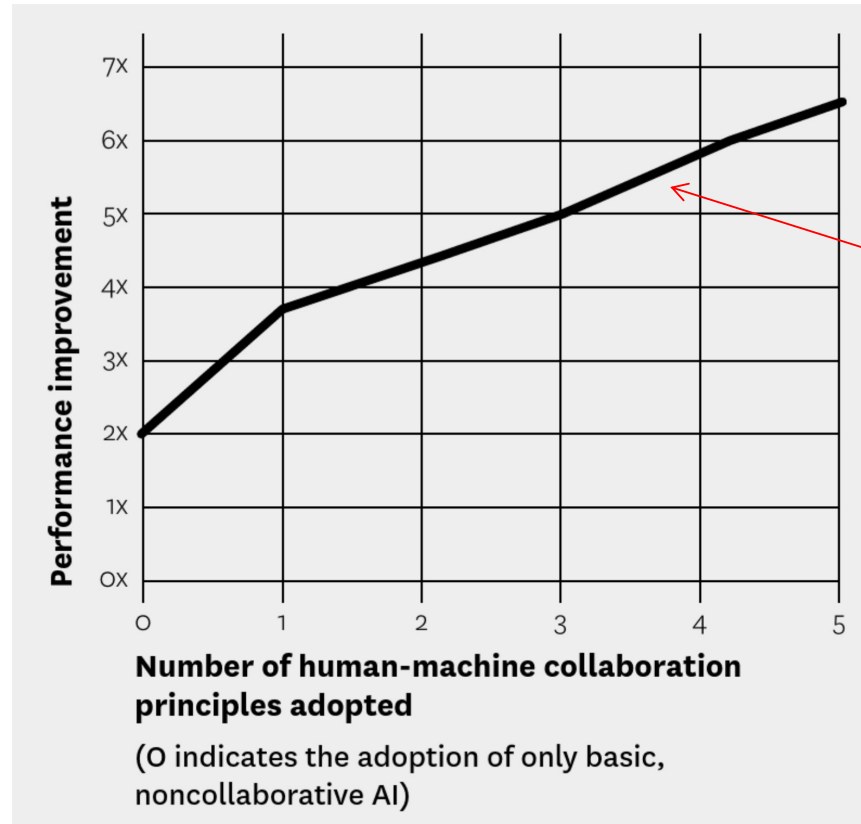
1. Reimagine business processes
2. Embrace experimentation and employee involvement
3. Direct AI strategy actively
4. Collect data responsibly
5. Redesign work to incorporate AI and cultivate related employee skills



[https://en.wikipedia.org/wiki/Yin\\_and\\_yang](https://en.wikipedia.org/wiki/Yin_and_yang)



# The Value of Collaboration

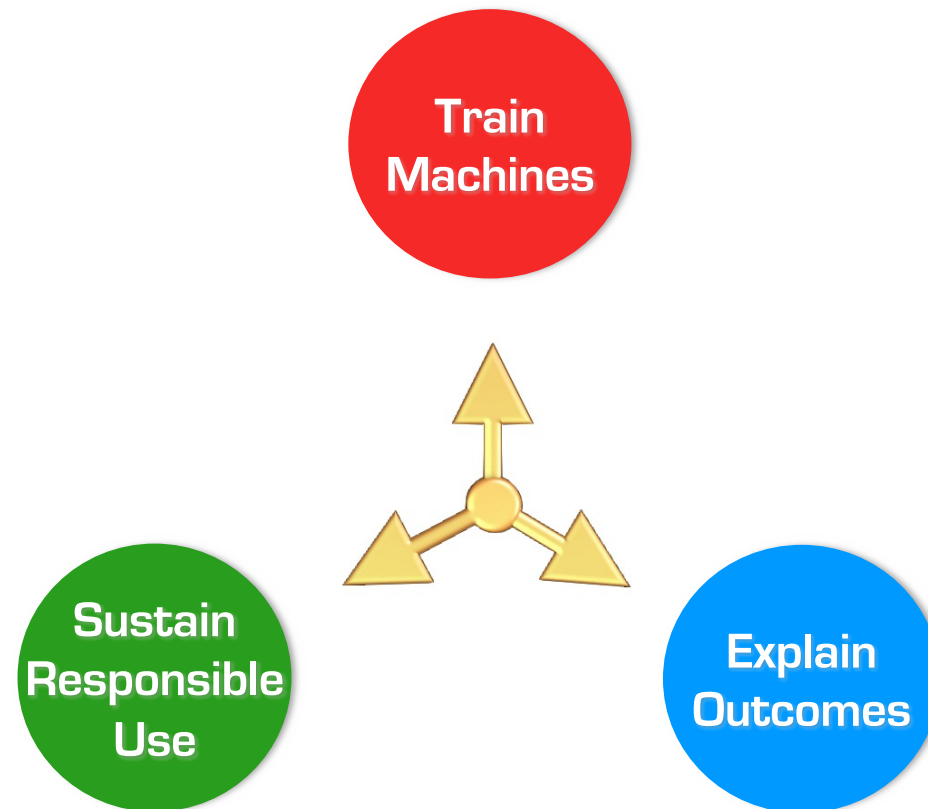


Performance of AI initiatives increases with the number of principles adopted in terms of speed, cost savings, revenue, and other operational measures

Based on a survey of 1,075 companies in 12 industries

(Wilson and Daugherty, 2019)

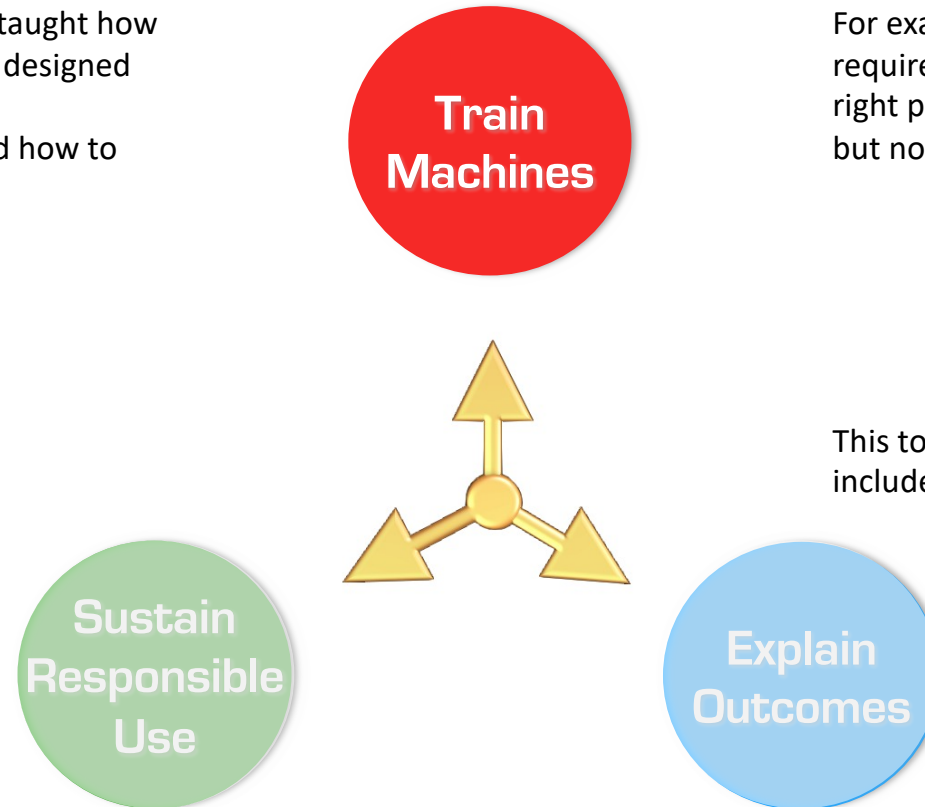
# Humans Assisting Machines



# Humans Assisting Machines

Machine learning algorithms must be taught how to perform the work for which they're designed

In addition, AI systems must be trained how to interact effectively with humans.



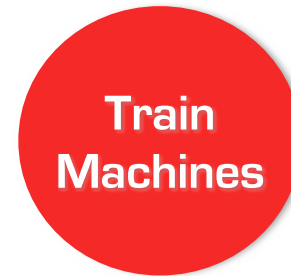
For example, Microsoft's AI assistant, **Cortana**, required extensive training to exhibit just the right personality: "confident, caring and helpful, but not bossy."

This took many hours of work by a team that included a **poet**, a **novelist**, and a **playwright**.

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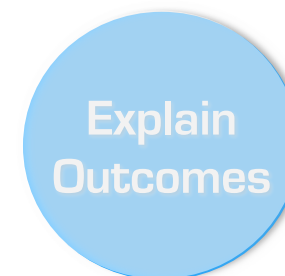
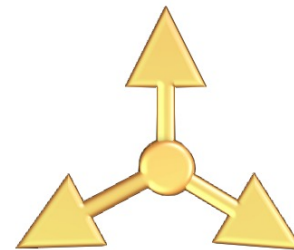
Human trainers were also involved in training the personality of Apple's **Siri**



and Amazon's **Alexa**



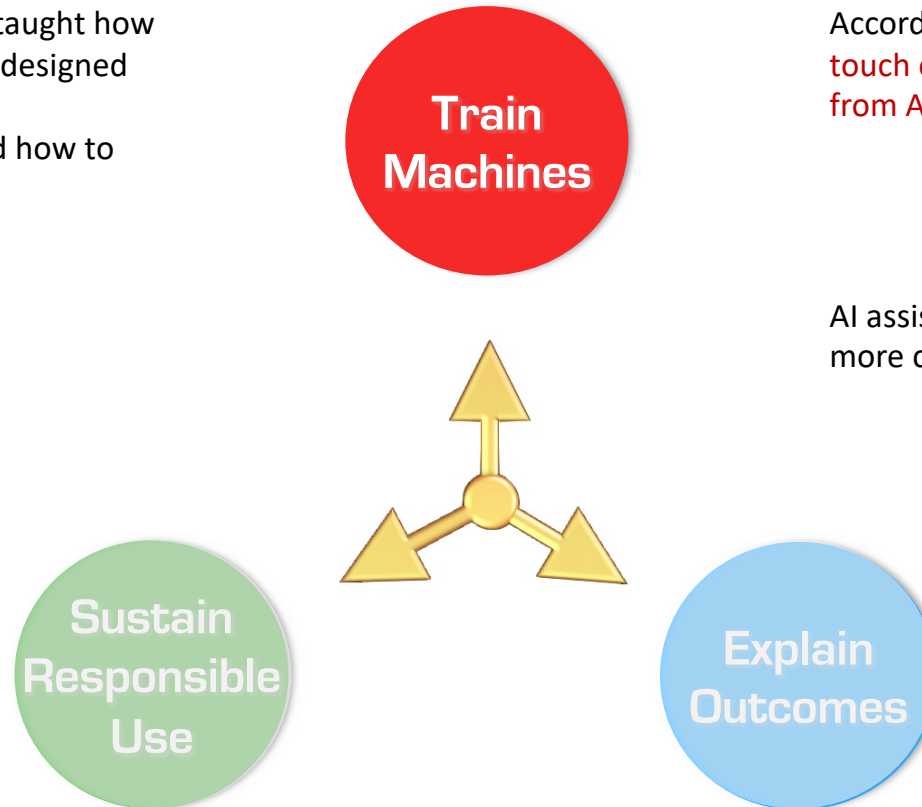
to ensure they reflected the brand image of these companies



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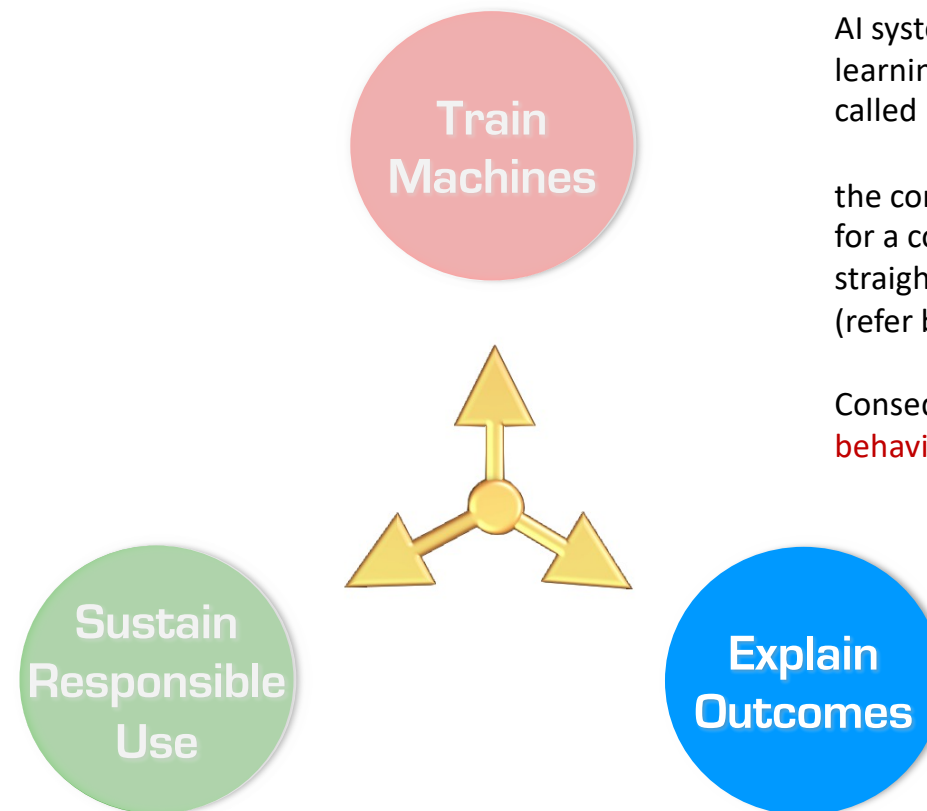


According to Wilson and Daugherty, Siri has "just a touch of sassiness, as consumers might expect from Apple"



AI assistants are now being trained to display even more complex and subtle traits, such as **sympathy**

# Humans Assisting Machines

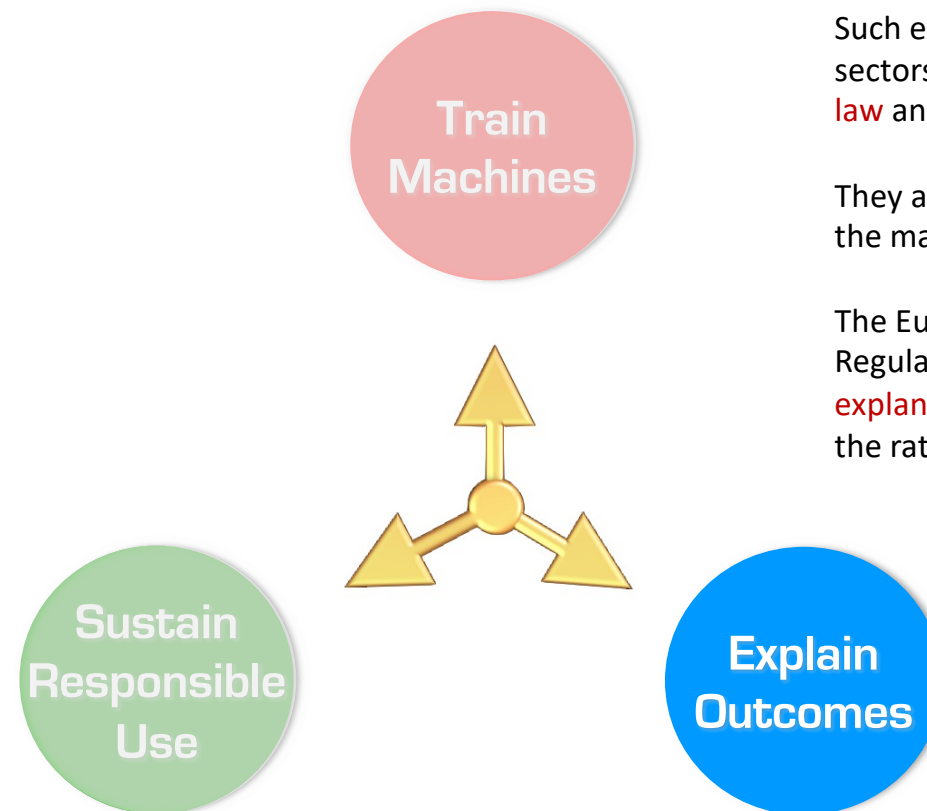


AI systems, and deep neural network machine learning systems, in particular, suffer from the so-called **black-box problem**:

the conclusions they reach are **opaque** and the basis for a conclusion is **not open to scrutiny** in any straightforward manner  
(refer back to AIML01, Module 1, lecture 3)

Consequently, **humans are required to explain the behavior of the AI system to nonexpert users**

# Humans Assisting Machines



Such explanations are particularly important in sectors and industries that require evidence such as **law** and **medicine**

They are also needed in **regulated industries** where the machine's output could be challenged in court.

The European Union's General Data Protection Regulations (GDPR) gives consumers the **right to an explanation for any algorithm-based decision**, such as the rate charged on a credit card or a mortgage

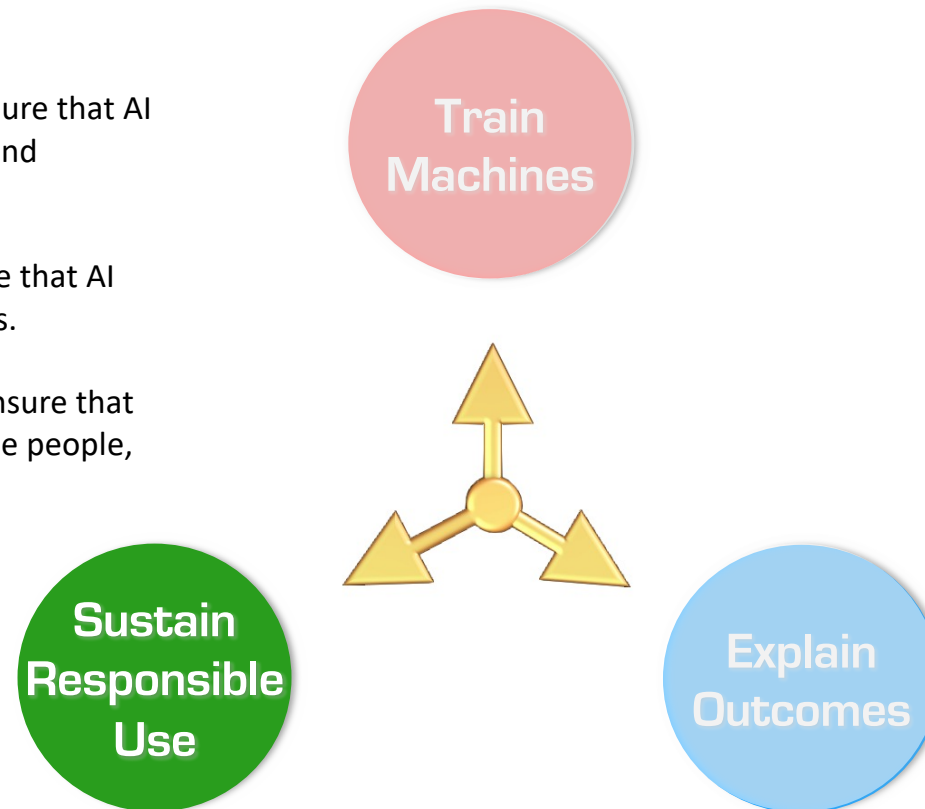
# Humans Assisting Machines

Companies also need "sustainers"

These are the people who work to ensure that AI systems are working **properly, safely, and responsibly**

Expert safety engineers work to ensure that AI systems don't pose a threat to humans.

For example, they might be need to ensure that cobots, i.e., robots that work alongside people, don't perform dangerous movements

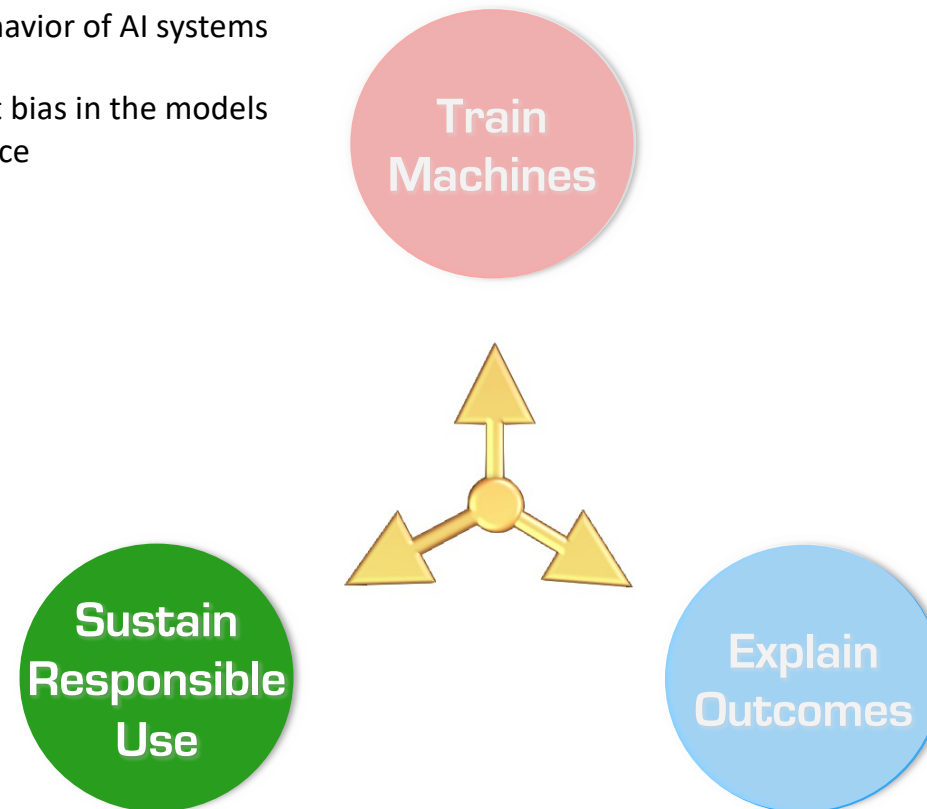




# Humans Assisting Machines

Other experts focus on the ethical behavior of AI systems

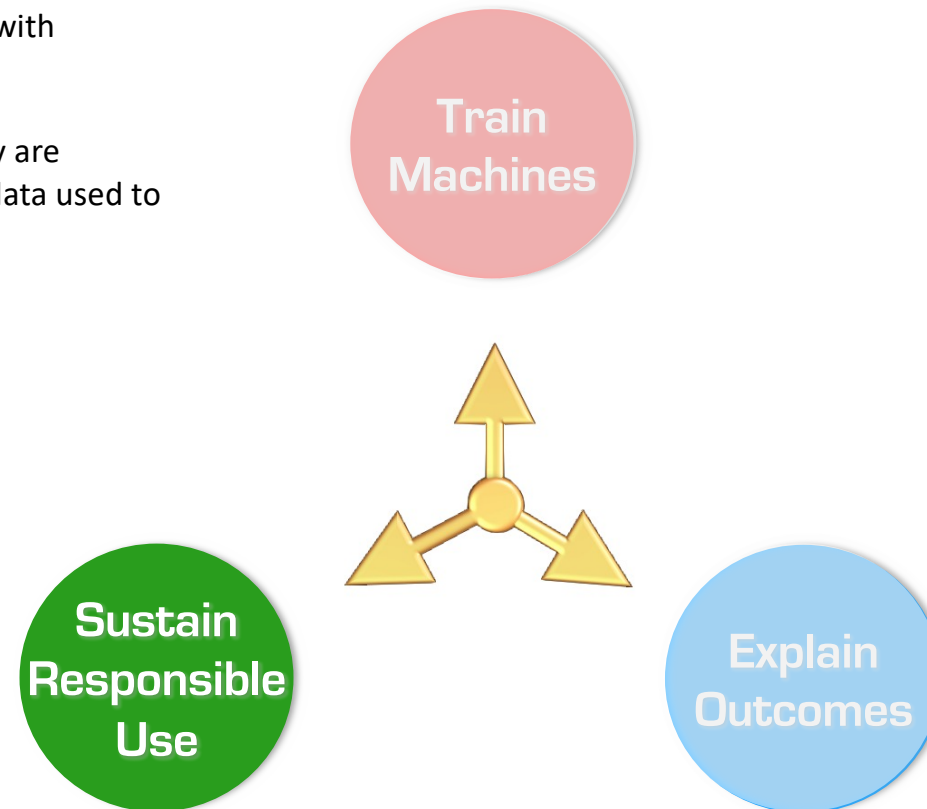
Ensuring there is no implicit or explicit bias in the models or the decision that the models produce



# Humans Assisting Machines

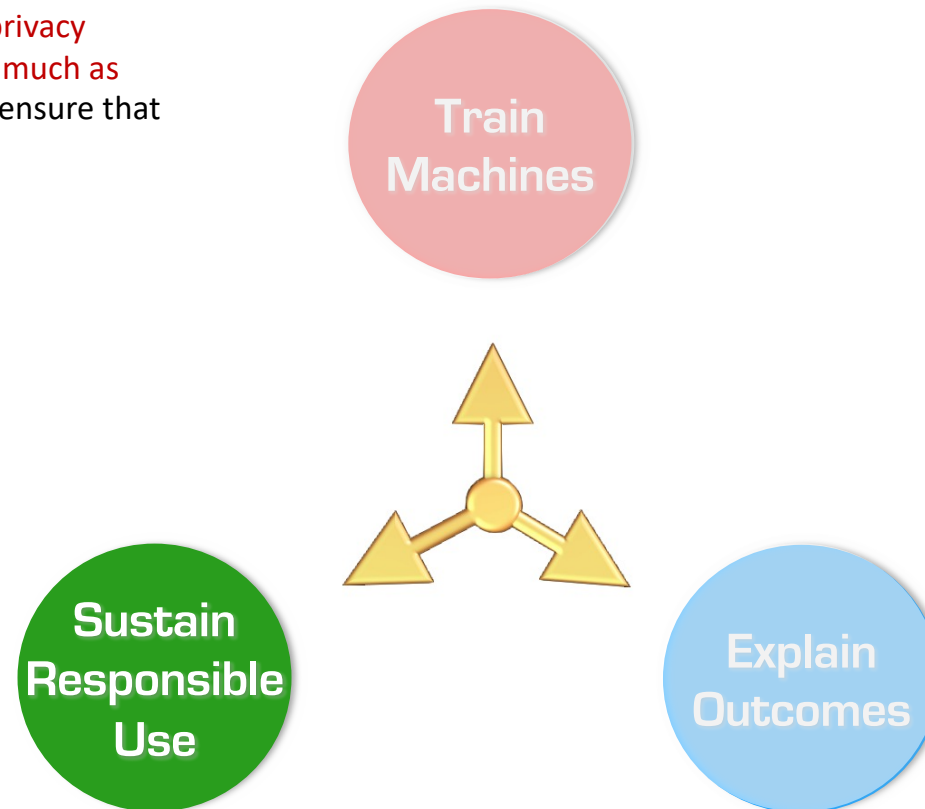
Ensure that AI systems are compliant with regulations, such as GDPR

Ensure that privacy and confidentiality are respected, especially concerning the data used to train the system



# Humans Assisting Machines

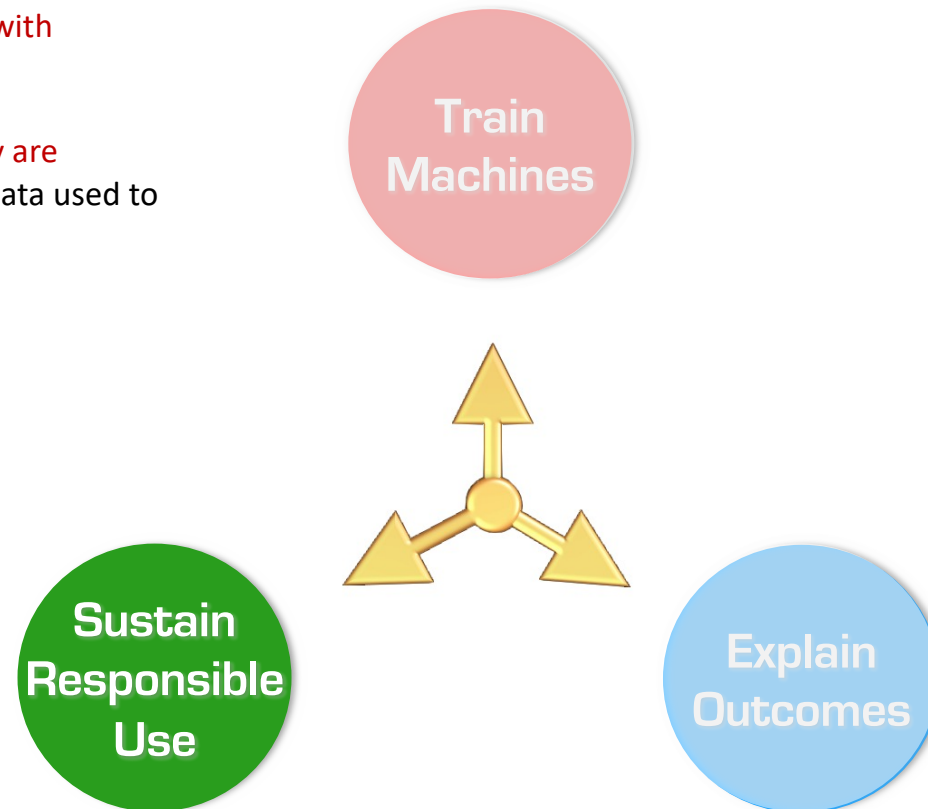
The goal of a company's "differential privacy team" is to ensure AI systems learn as much as possible from, say, user data, but also ensure that the user data remains private



# Humans Assisting Machines

Ensure that AI systems are **compliant with regulations**, such as GDPR

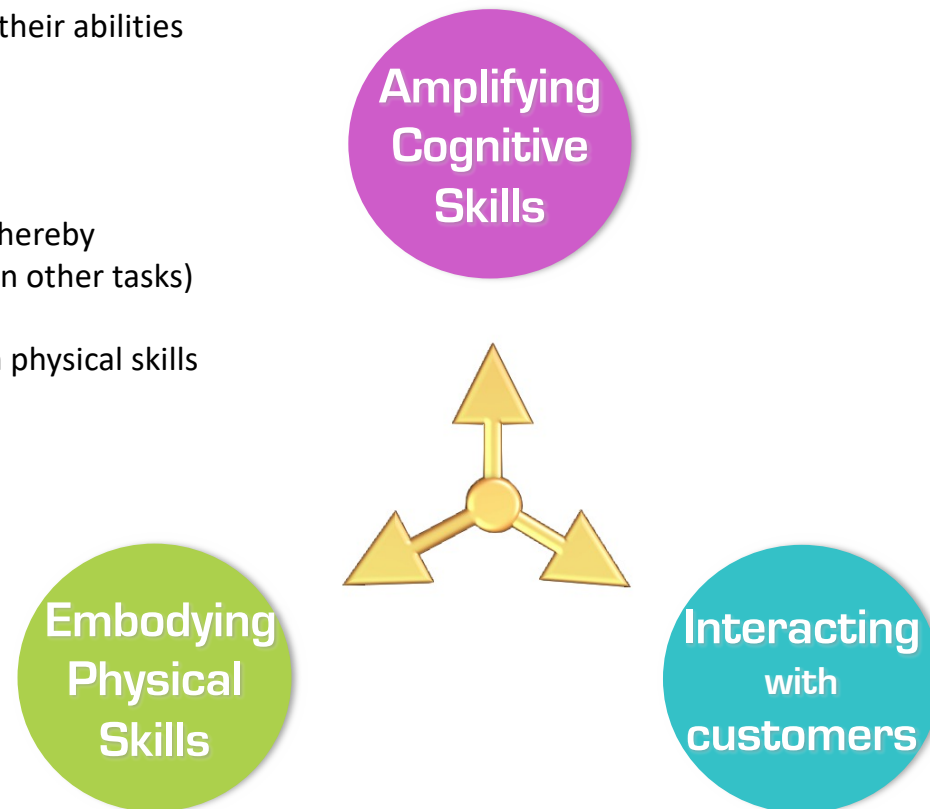
Ensure that **privacy and confidentiality are respected**, especially concerning the data used to train the system



# Machines Assisting Humans

Smart machines help humans expand their abilities in three ways

1. Amplifying cognitive skills
2. Interacting with customers (and thereby leaving employees free to focus on other tasks)
3. Embodying and extending human physical skills



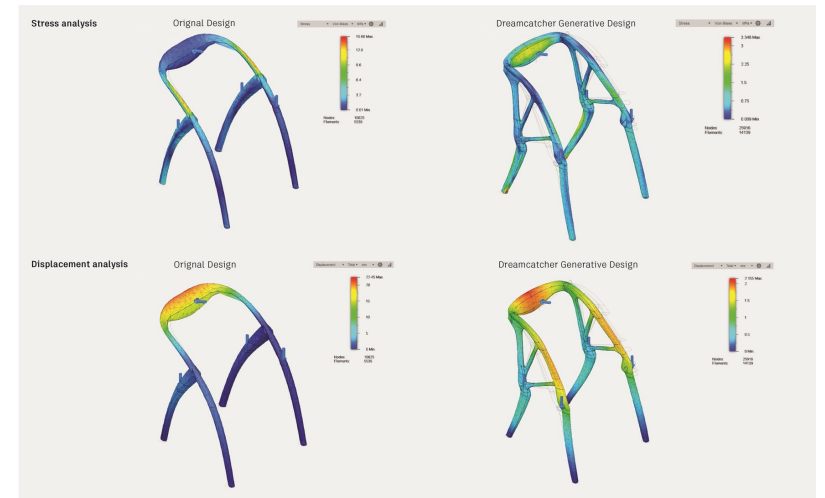
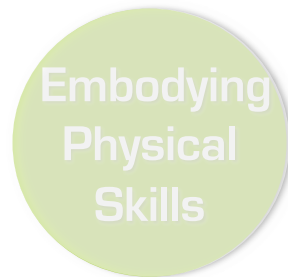
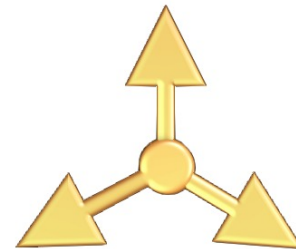
# Machines Assisting Humans

AI can boost analytical skills & enhance creativity

**Dreamcatcher** from Autodesk takes the criteria provided by a designer, and produces thousands of designs that match the criteria

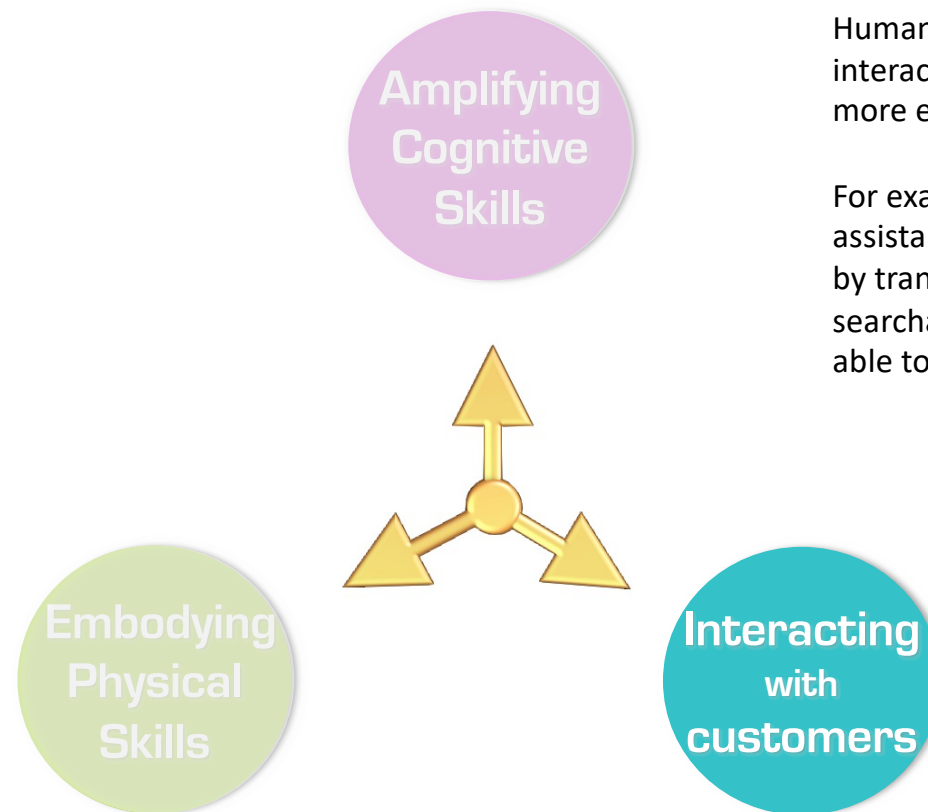
The designer iterates through new options by tweaking the criteria or flagging unacceptable results

The designer exercises **professional judgement and sense of the aesthetic** leaving the production of design options to Dreamcatcher



Compared to the original design, Dreamcatcher's solution has 18% less volume and decreases the max displacement by 90.4% as well as decreases the max von mises stress by 78.6%.  
<https://gallery.autodesk.com/fusion360/projects/elbo-chair-generated-in-project-dreamcatcher-made-with-fusion-360>

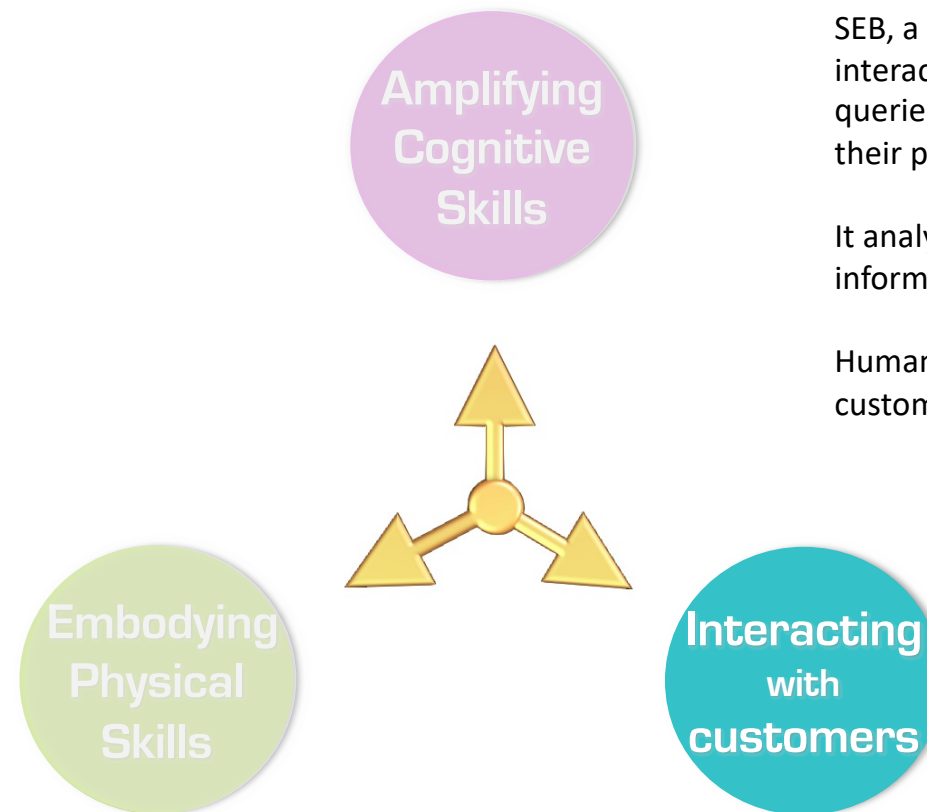
# Machines Assisting Humans



Human-machine collaboration enables companies to interact with employees and customers in new and more effective ways.

For example, AI agents such as Microsoft's AI assistant, Cortana, could enhance communications by transcribing a meeting and making a voice-searchable version available people who were not able to attend.

# Machines Assisting Humans



SEB, a Swedish bank, uses Aida, a virtual assistant, to interact with millions of customers, answering their queries and asking follow-up questions to help solve their problems

It analyzes a caller's tone of voice and use that information to improve the service it provides

Human representatives can concentrate on calls from customers with more complex issues



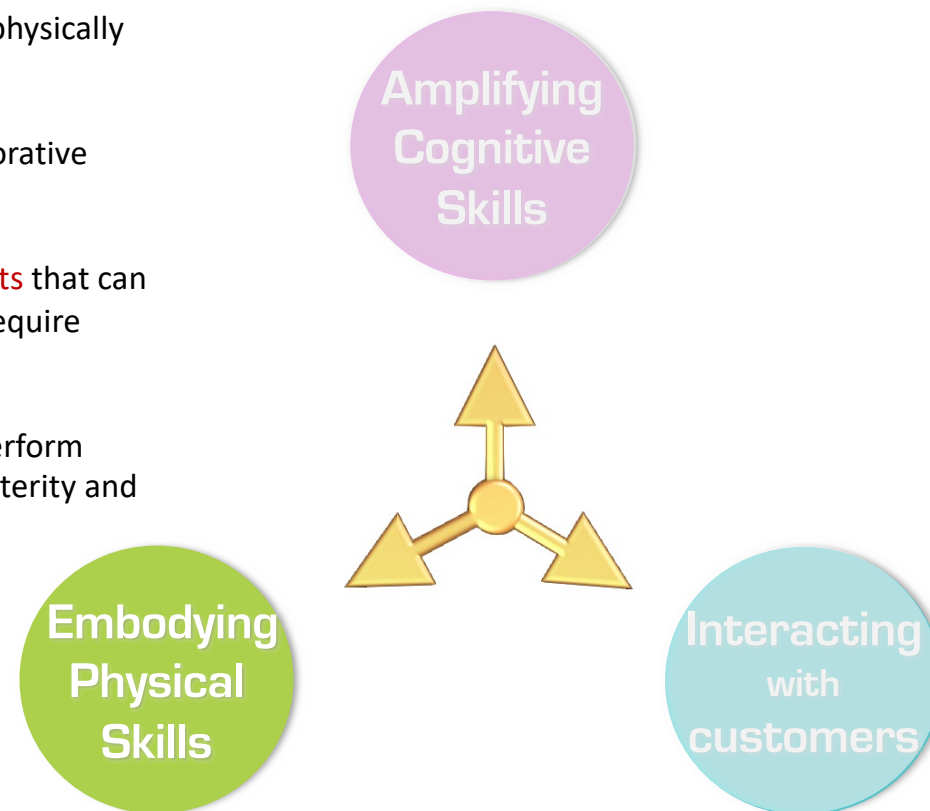
# Machines Assisting Humans

Some AI systems, such as robots, are physically embodied

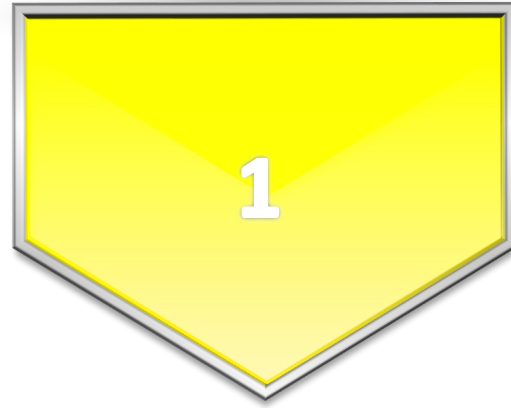
We already mentioned **cobots**: collaborative robots that work alongside people

Cobots are **smart, context-aware robots** that can handle repetitive actions that might require heavy lifting

The person it is working with might perform complementary tasks that require dexterity and human judgment



# Reimagining Your Business

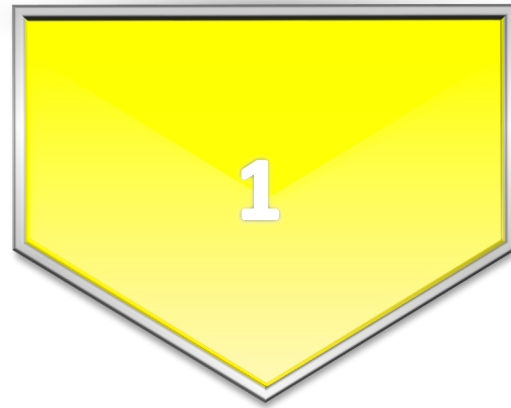


## **Identify Opportunities for Improvement**

Discover and describe an operational area that can be improved

These might involve invisible problems: opportunities one is not aware of

# Reimagining Your Business



## Identify Opportunities for Improvement

Discover and describe an operational area that can be improved  
These might involve invisible problems: opportunities one is not aware of

There are “known knows,” “known unknowns,” and “unknown unknowns”

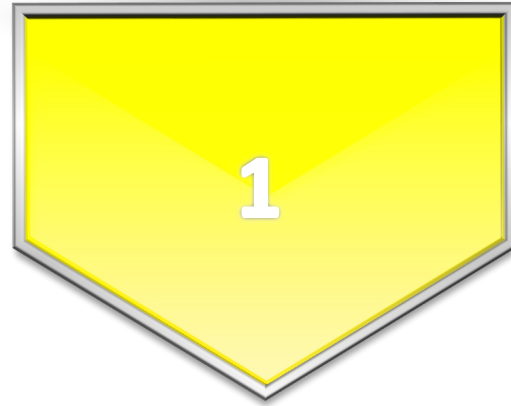
Things you are aware  
you know

Things you are aware  
you don't know

Things you are not even  
aware you don't know

**Often, the opportunities  
can be these invisible  
problems**

# Reimagining Your Business



## Identify Opportunities for Improvement

Discover and describe an operational area that can be improved  
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There are “known knows,” “known unknowns,” and “unknown unknowns”

Some companies are now using AI to uncover unknown unknowns in their businesses

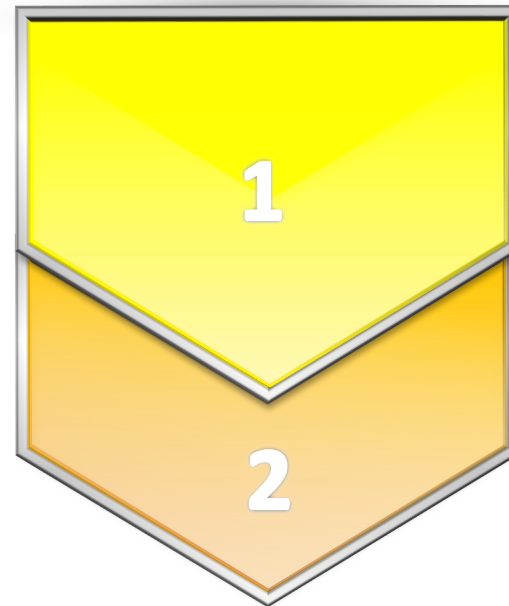
GNS Healthcare use machine-learning software to **find overlooked relationships** among data in patients’ health records

After identifying a relationship, it produces hypotheses to explain it and then suggests which of those are the most likely

This approach enabled GNS to uncover a new drug interaction hidden in unstructured patient notes

Their machine learning system didn't just mine data to identify patterns & correlations in data: **it discovered causal links**

# Reimagining Your Business



## Identify Opportunities for Improvement

Discover and describe an operational area that can be improved  
These might involve invisible problems: opportunities one is not aware of

## Develop a solution through co-creation

Engage stakeholders to envision how they might collaborate with AI systems to improve a process

Initial plan:  
Predict crop yields



Discussion  
with farmers

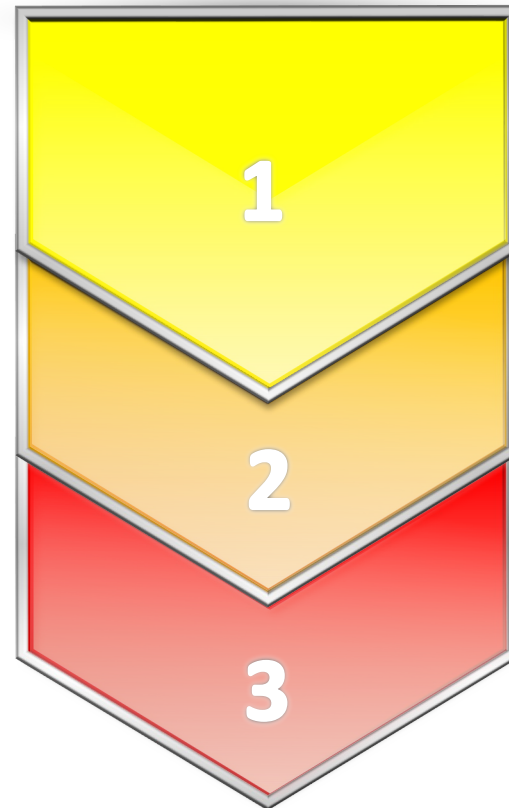


Real-time  
recommender system:  
crop, location, fertilizer



Increased crop yield  
Satisfied farmers

# Reimagining Your Business



## Identify Opportunities for Improvement

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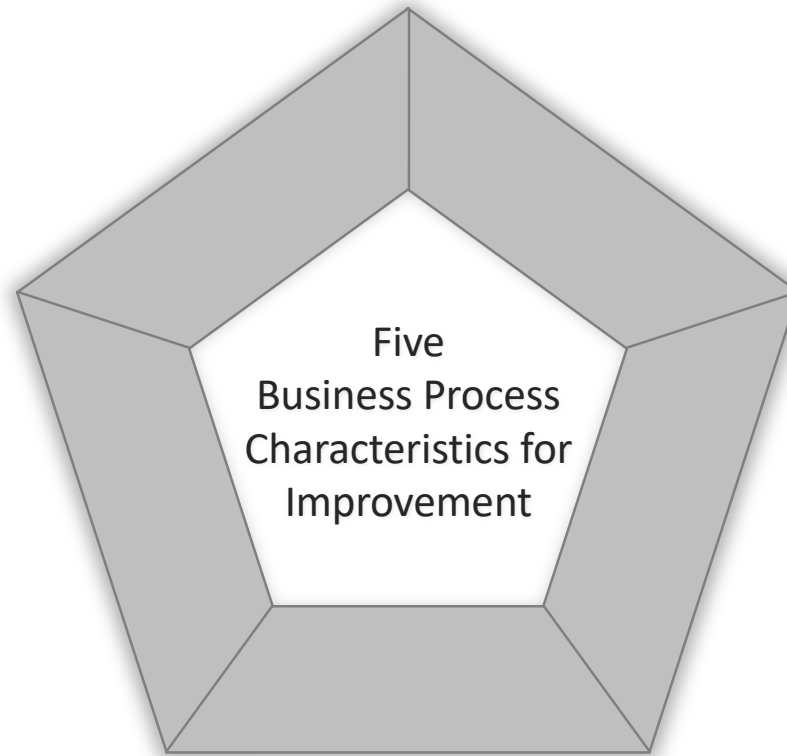
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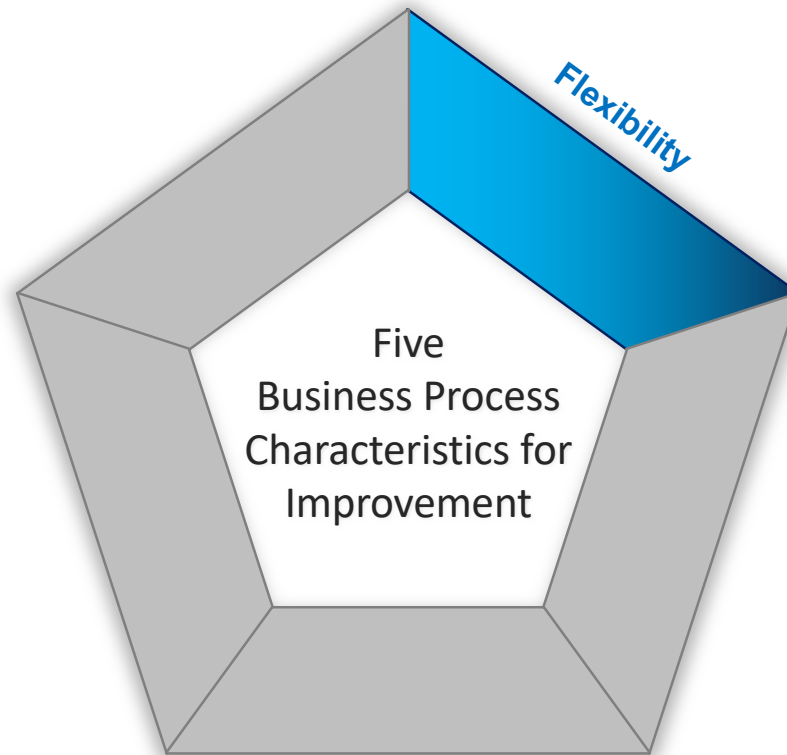
## Scale and sustain

Scale up the pilot application to deliver the product or service to a larger customer base. Learn from the exercise, adapt, and improve.

# Reimagining Your Business



# Reimagining Your Business



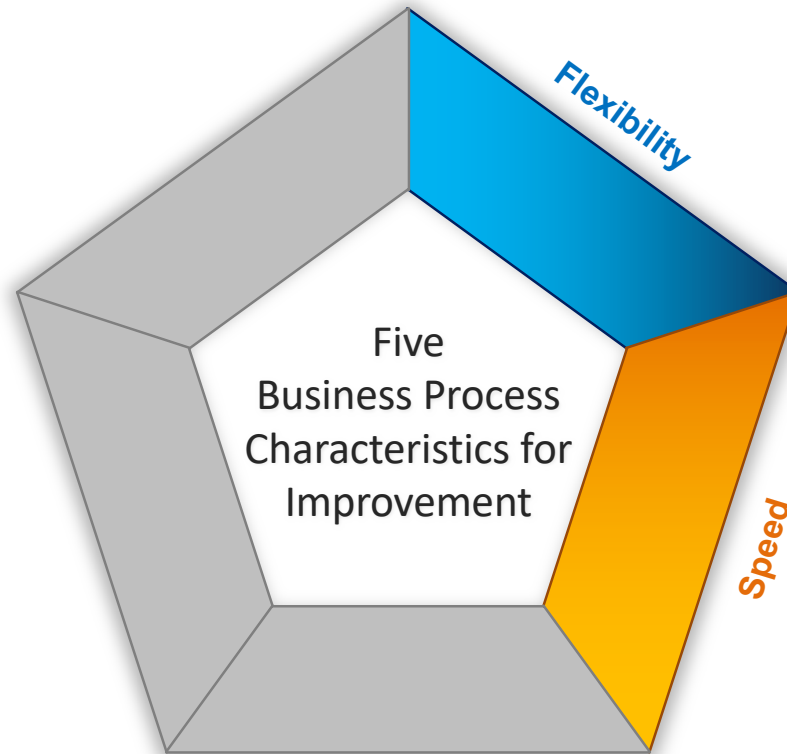
Mercedes-Benz replaced some of its conventional robots with AI-enabled cobots and redesigned its processes around human-machine collaboration

This puts the worker in control of the build of each car, doing less manual labor and “piloting” the assembly with the robot

Mercedes can individualize vehicle production according to the real-time choices consumers make at dealerships.



# Reimagining Your Business

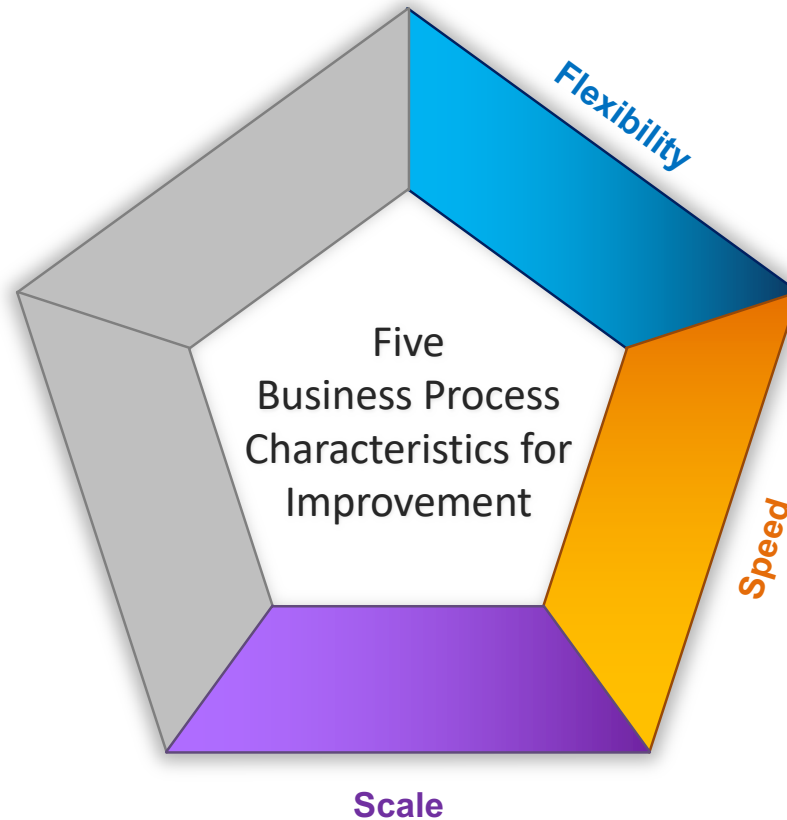


For some business activities, speed is key

An AI system used by Danske Bank improved its fraud-detection rate by 50% and decreased false positives by 60%

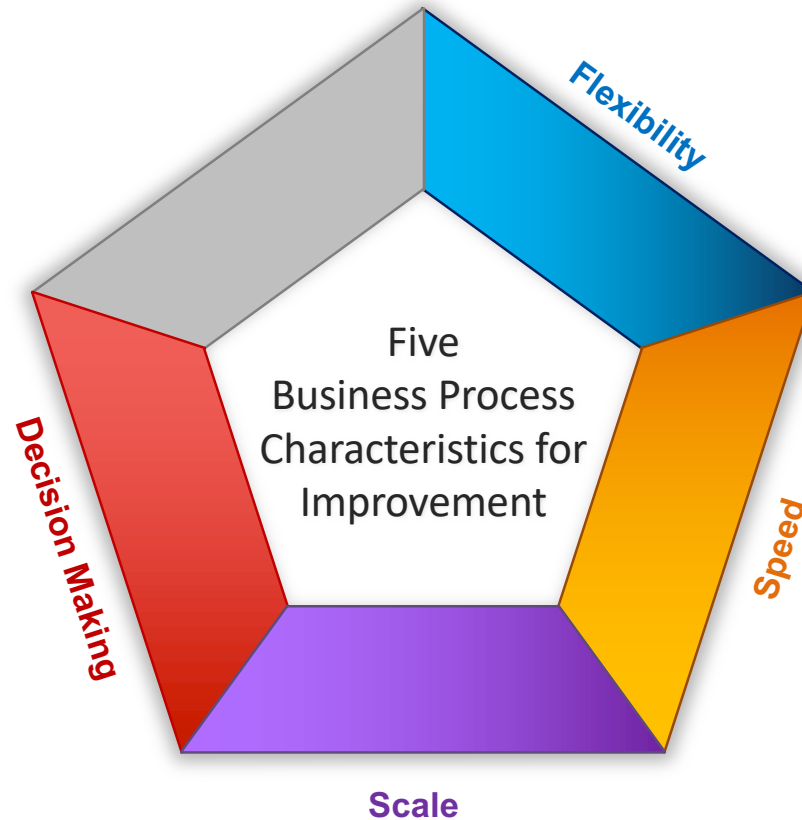
This frees investigators to concentrate on difficult-to-classify transactions the AI system has flagged and where human judgment is needed

# Reimagining Your Business



Scaling up is often an obstacle to improvement. AI can help by taking automating some of the work, leaving the critical elements to people.

# Reimagining Your Business



AI can help people make better decisions by providing them with key information and helpful guidance

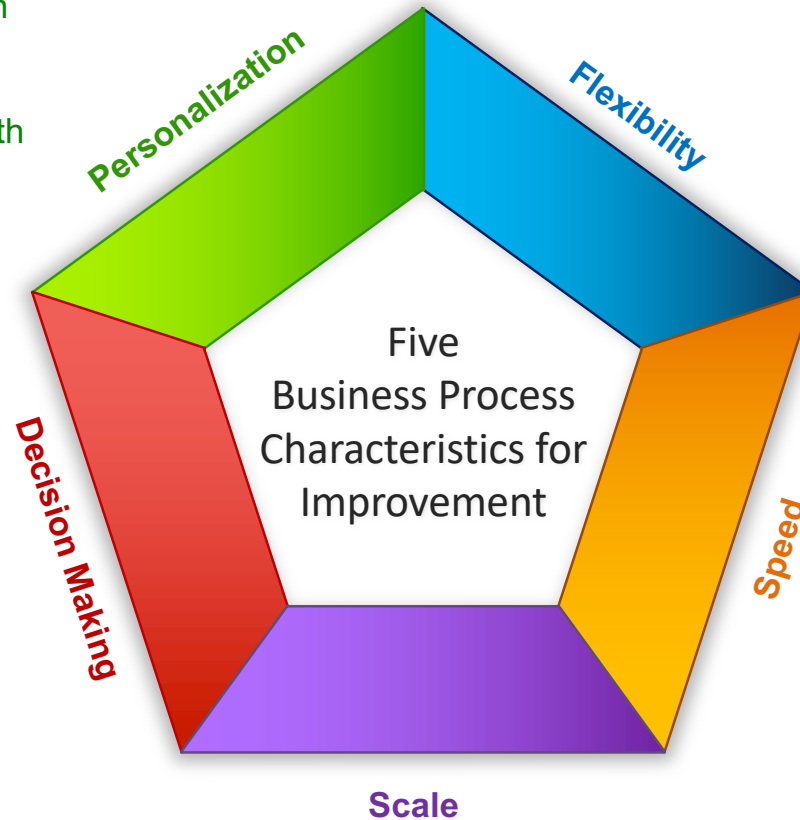
For example, digital twins, i.e., virtual models of physical systems, can be used to predict upcoming problems in a wide variety of processes, especially when linked to machine learning

# Reimagining Your Business

Companies aim to provide customers with individually tailored brand experiences

AI makes this personalization possible with great precision and on a very large scale

The key is the power of AI to analyze user data and make accurate predictions of user preferences



# The Need for New Roles and Talent

- Reimagining a business process involves more than the implementation of AI technology
- It also requires a significant commitment to employee development, helping them learn what are called “fusion skills”.
- These are the skills that employees need to work effectively at the human-machine interface.

# The Need for New Roles and Talent

"We expect that in the future, company roles will be redesigned around the **desired outcomes of reimagined processes**, and corporations will increasingly be organized around **different types of skills** rather than around rigid job titles."

(Wilson and Daugherty, 2019)

# Lecture Summary

1. Organizations that use machines merely to **displace workers through automation** will miss the full potential of AI
2. Successful companies will embrace **collaborative intelligence**, transforming their operations, their markets, their industries, and their workforces
3. Effective AI strategies will focus on
  - How humans can effectively complement machines
  - How machines can enhance human capabilities
  - How business processes can be redesigned to support the partnership
  - Targeting **flexibility, speed, scale, decision making, and personalization**

# Recommended Reading

Wilson, H. J. and Daugherty, P. (2019). Collaborative Intelligence: Humans and AI Are Joining Forces, in Insights You Need from Harvard Business Review – Artificial Intelligence, Harvard Business School Publishing Corporation, pp. 109-134.

<https://hbr.org/2018/07/collaborative-intelligence-humans-and-ai-are-joining-forces>