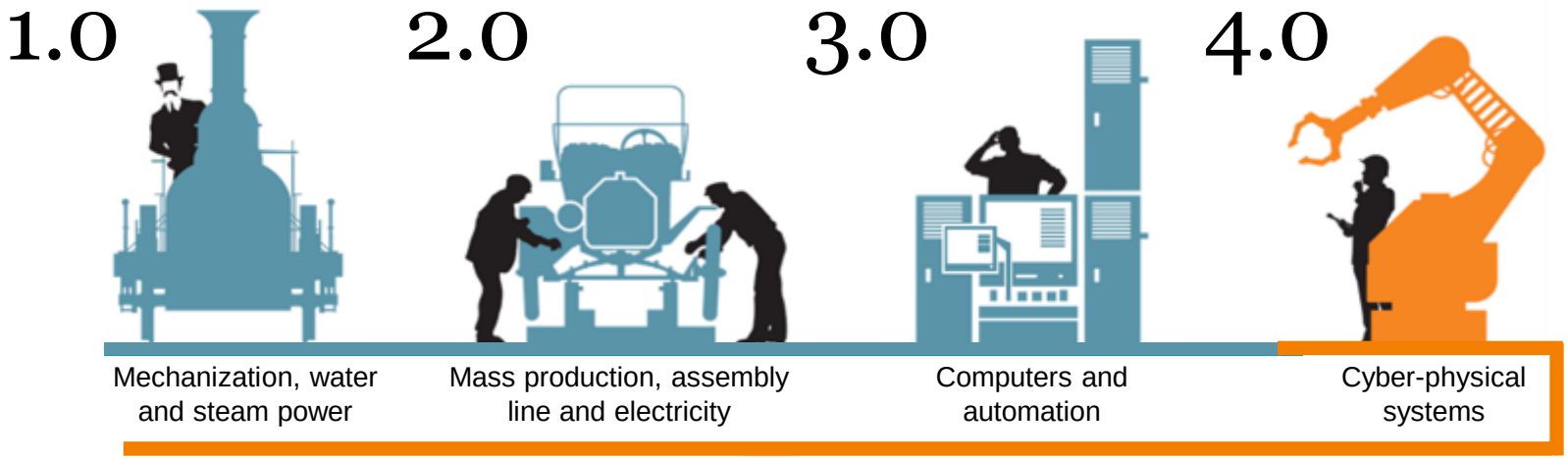
# Industry 4.0:
# Capturing value from new technologies and approaches

Digital/McKinsey

# Digital: What is it and why now?

# What is Industry 4.0?




**Digital-to-physical conversion**

**Human machine interaction**

**Analytics and intelligence**

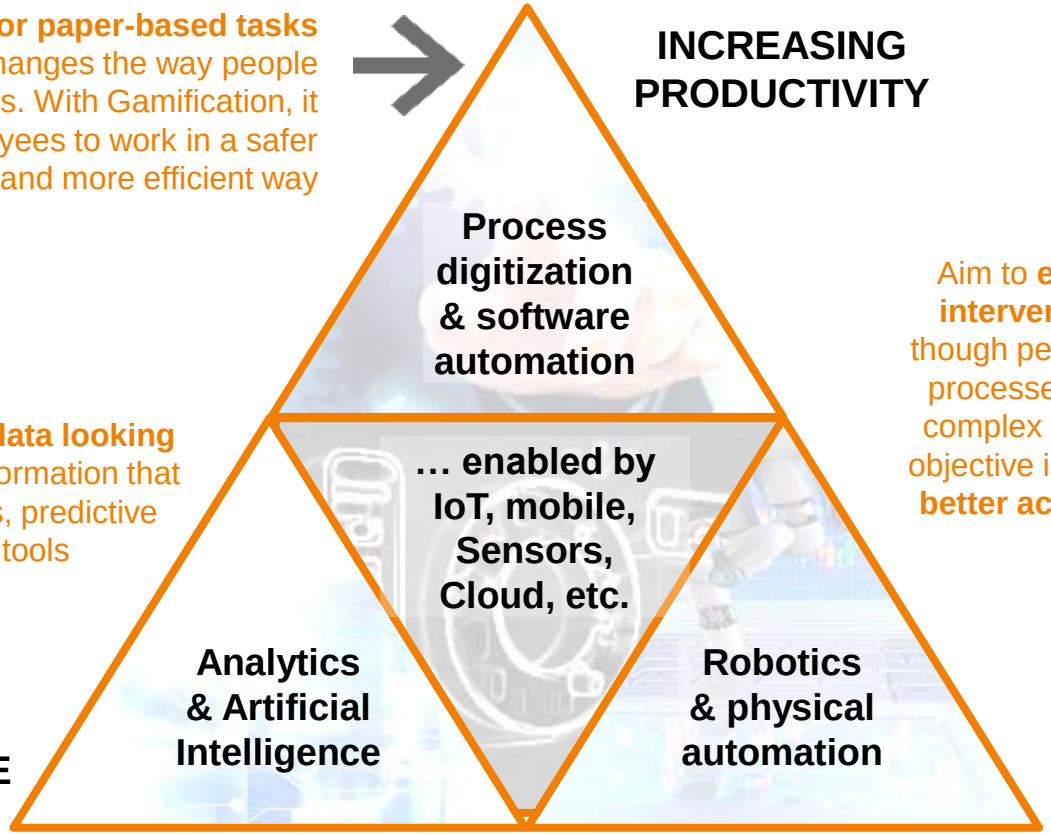
**Data and connectivity**

**Disruptive Technologies**

# What does it actually mean companies?

Aim to **bring repetitive or paper-based tasks online**. This is changes the way people interact with processes. With Gamification, it can incentivize employees to work in a safer and more efficient way

**INCREASING PRODUCTIVITY**




Aim to **collect and analyze data looking for actionable insights –** information that can be built into dashboards, predictive models, and decision tools

**GAINING ACTIONABLE INSIGHT**

Aim to **eliminate physical human intervention** from industrial tasks, though people might still supervise the processes remotely and make more complex or corrective decisions. The objective is to **improve safety**, **enable better accuracy in production, and reduce variability**

**CHANGING PHYSICAL PROCESSES**

# Technology enabling digital initiatives is getting better, cheaper, and easier to use at a rate that many companies don't recognize and/or know how to exploit

## Then

Advanced analytics and **machine learning** were in their **infancy**

**Expensive** computing, sensor, and Cloud technology precluded mass use

"Going digital" meant:

- An **"all or nothing"** investment into massive programs like an ERP system
- Complete **reliance** on a small number of **large technology vendors**

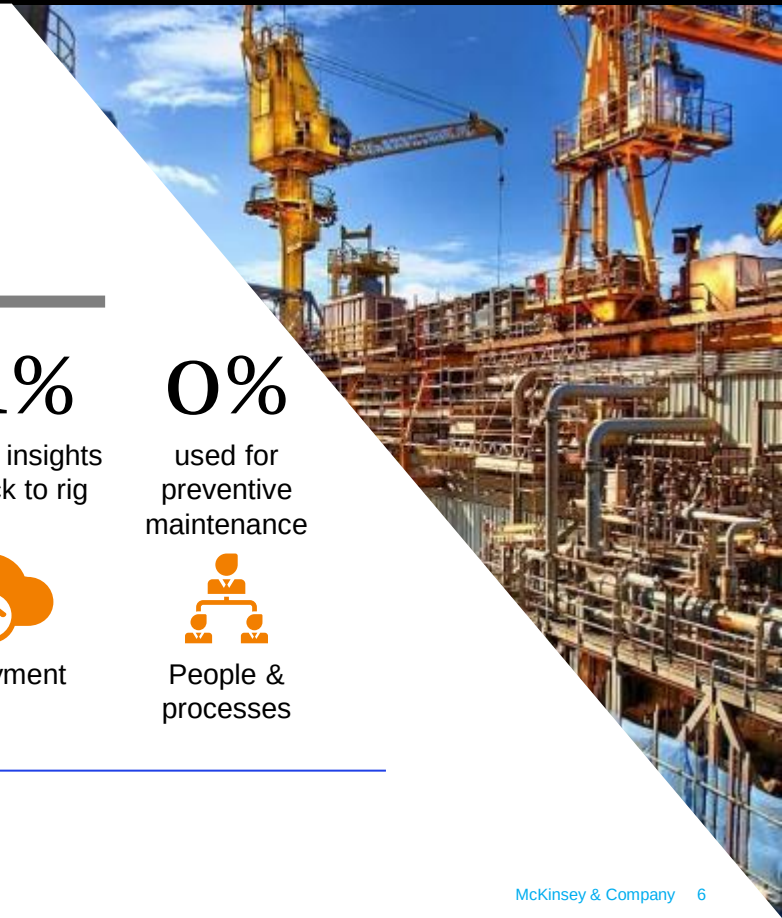
## Now

**92% CAGR in number of machine learning algorithms** since 2014

- **Laser sensors** for autonomous vehicles **cost 1/100th** of what they did in 2015
- **Cloud costs fell 66%** from 2014-2016

- **Modular approach** to digital solutions with smaller, more customized packages
- **Hundreds of new vendors** entered the market in the last 5 years
- **150% more computer science grads** between 2010 and 2015

# Today, 99% of all production data is not used for decision making…

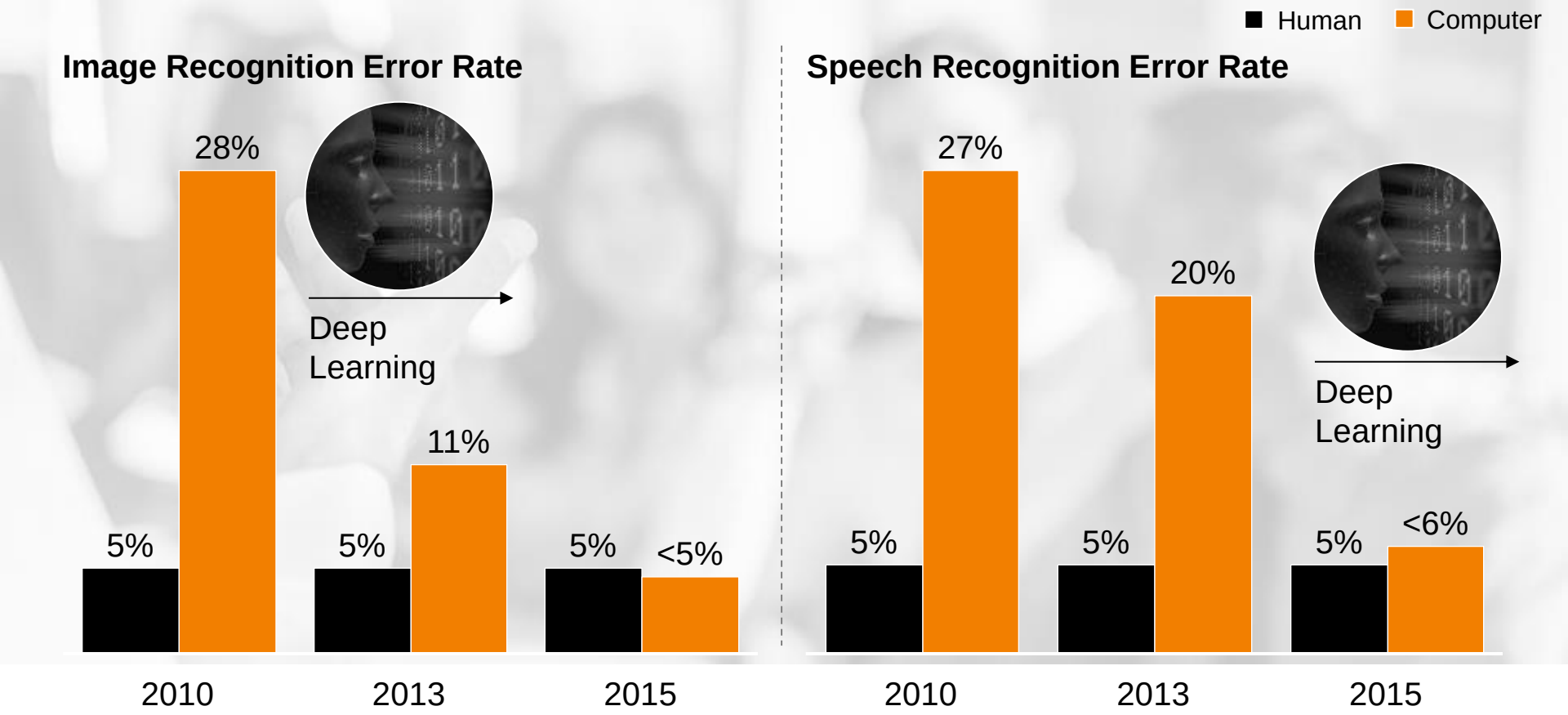


| 100% | 40% | 1% | ~1% | <1% | 0% |
|---|---|---|---|---|---|
| data captured | data stored | streamed on shore | monitored post hoc as KPIs | analytical insights sent back to rig | used for preventive maintenance |
| Data capture | Infrastructure | Data Management | Analytics | Deployment | People & processes |

Offshore oil rig example

~30,000 tags measured

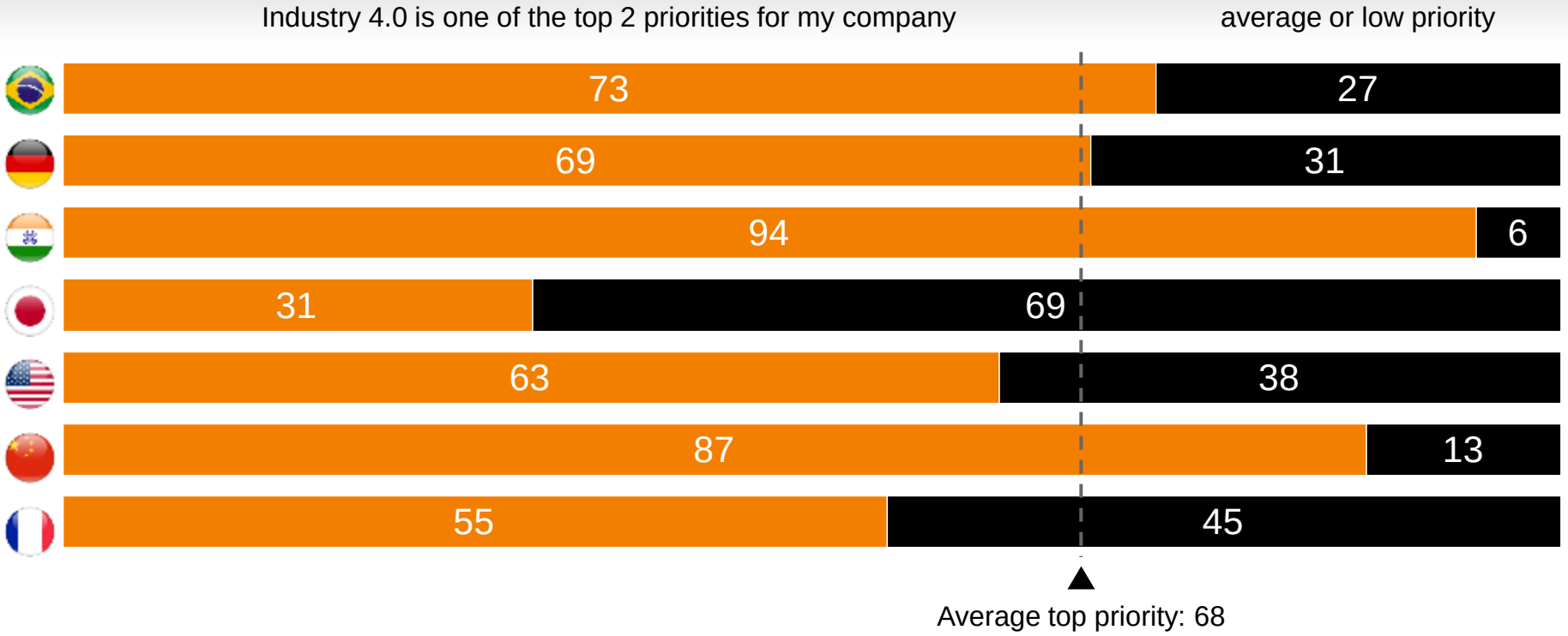
# … data management, analysis and AI is starting to change that



# Where are the opportunities?

# Respondents cite Industry 4.0 as a high priority on the majority of company agendas

How much of a priority is Industry 4.0 on your company's agenda?, Percent

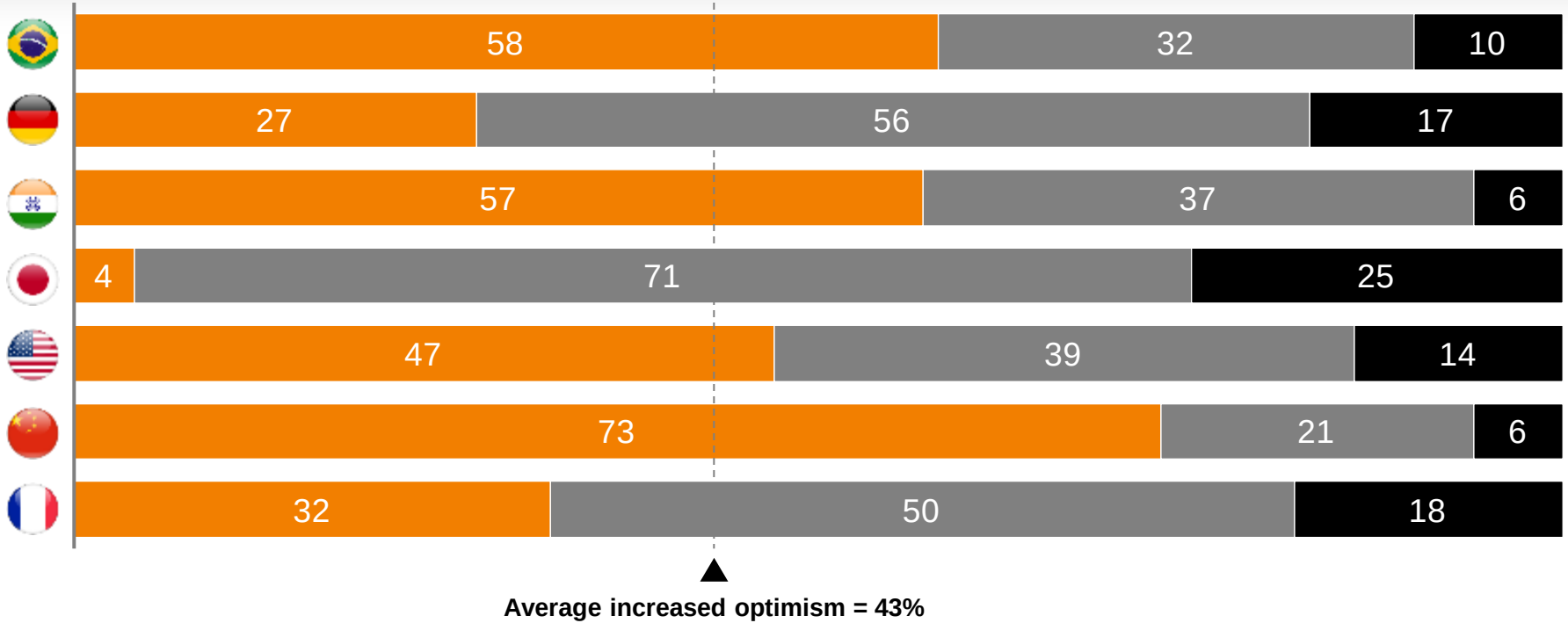



SOURCE: McKinsey Industry 4.0 Global Expert Survey 2018

# Optimism around Industry 4.0 seems to be continuing to grow although some are frustrated with challenges in capturing value

Percent

To what extent has your view concerning the potential of Industry 4.0 changed compared to 1 year ago?




SOURCE: McKinsey Industry 4.0 Global Expert Survey 2018

# Industry 4.0 can impact manufacturers significantly

**20-40%**
inventory holding cost reduction

**15-30%**
improvement in labor productivity

**30-50%**
reduction of machine downtime

**85%**
forecasting accuracy improvement

**10-30%**
reduction in design engi-neering costs

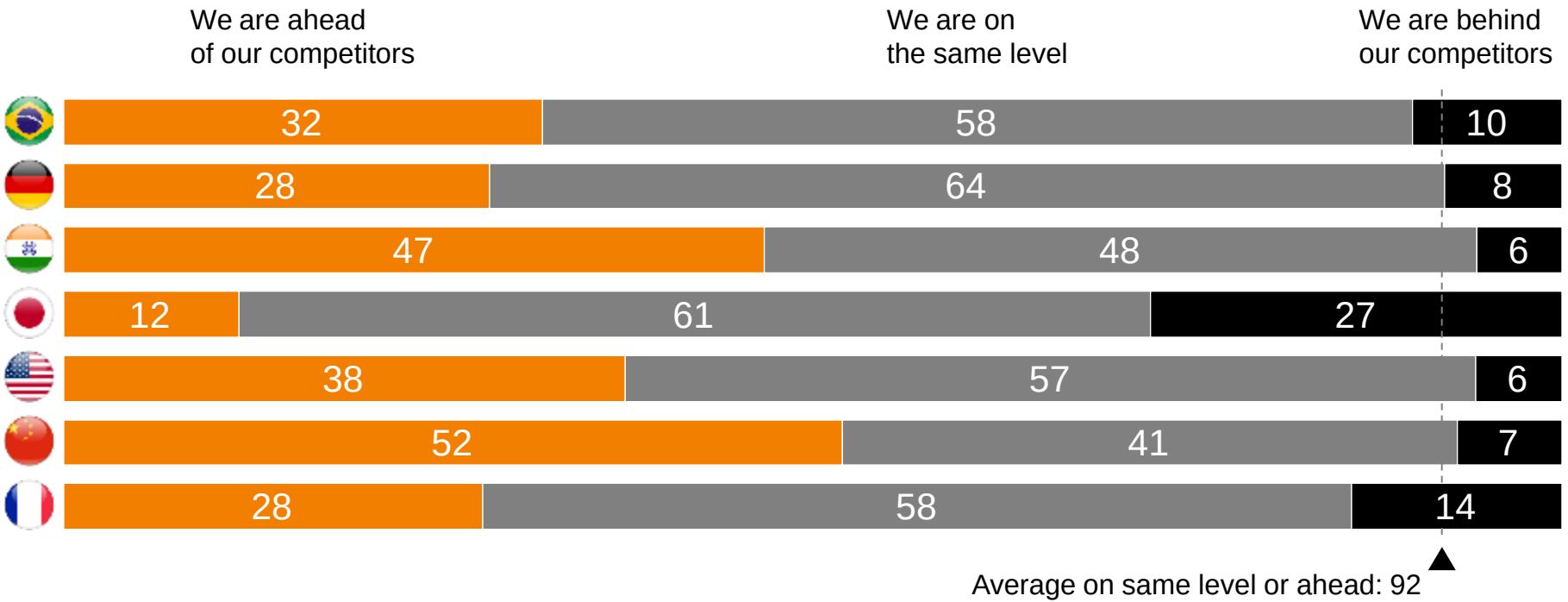
**10-20%**
cost of quality improvement

Additional impact being seen with secondary impacts across SC (e.g., minimized FP&A labor through improved forecasting)

# Overconfidence slowing progress? Most organizations think that they are ahead of, or at the same level as, their competitors

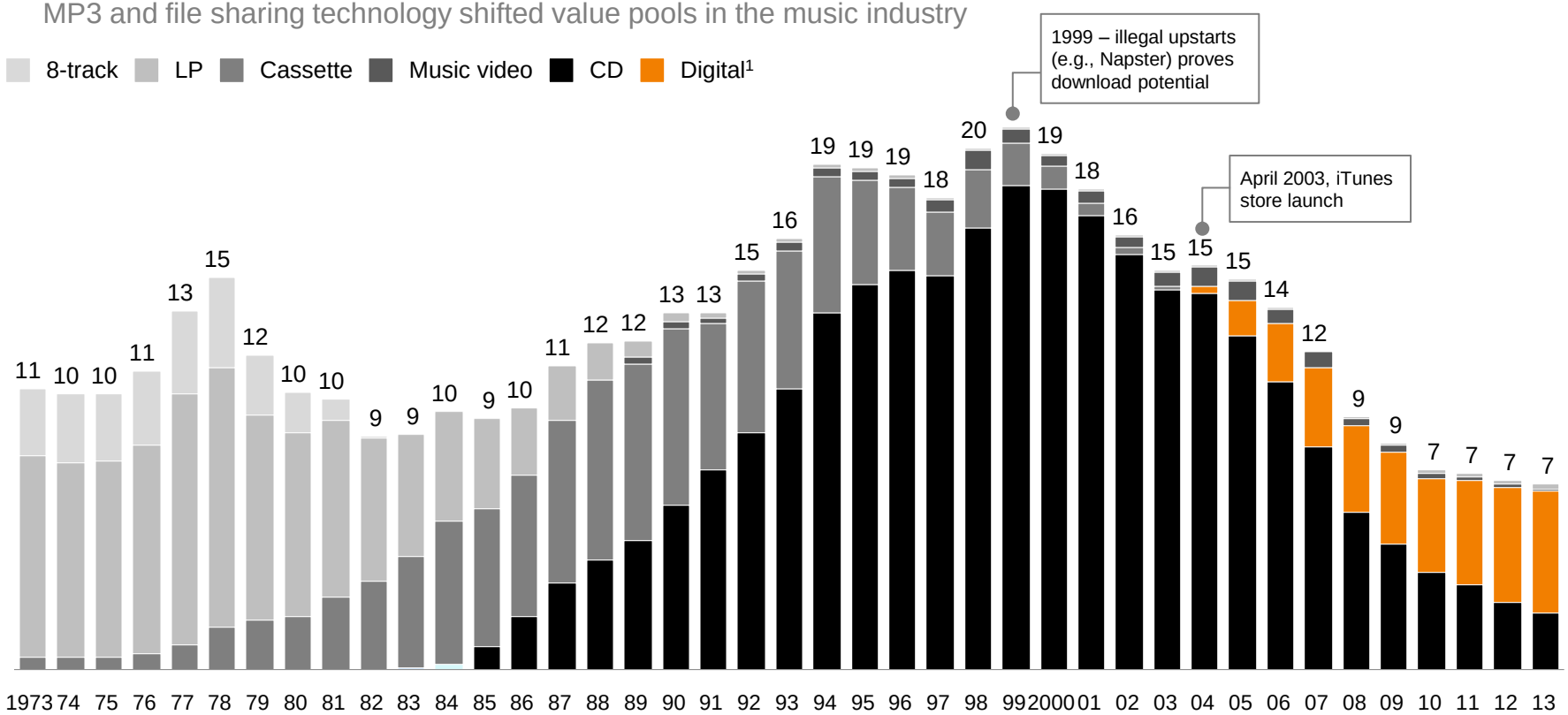
How do you feel you are placed relative to most of the competitors in your industry with respect to implementing and capturing value from Digital Manufacturing?

Percent



# Digital forces can shift value quickly and dramatically, often destroying significant value pools

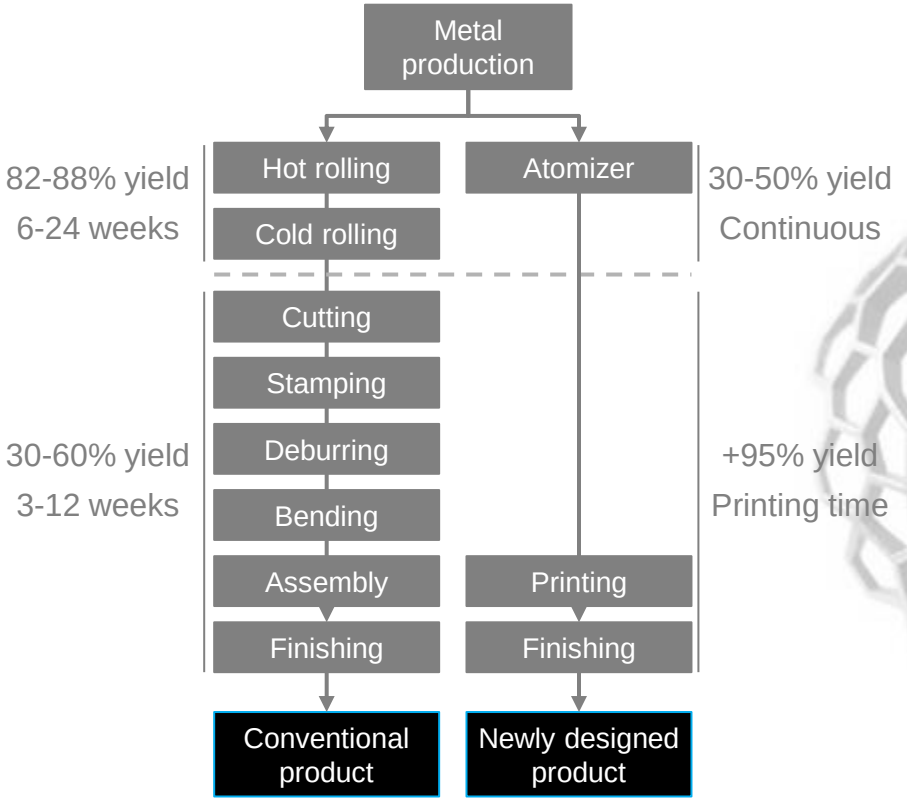
MP3 and file sharing technology shifted value pools in the music industry

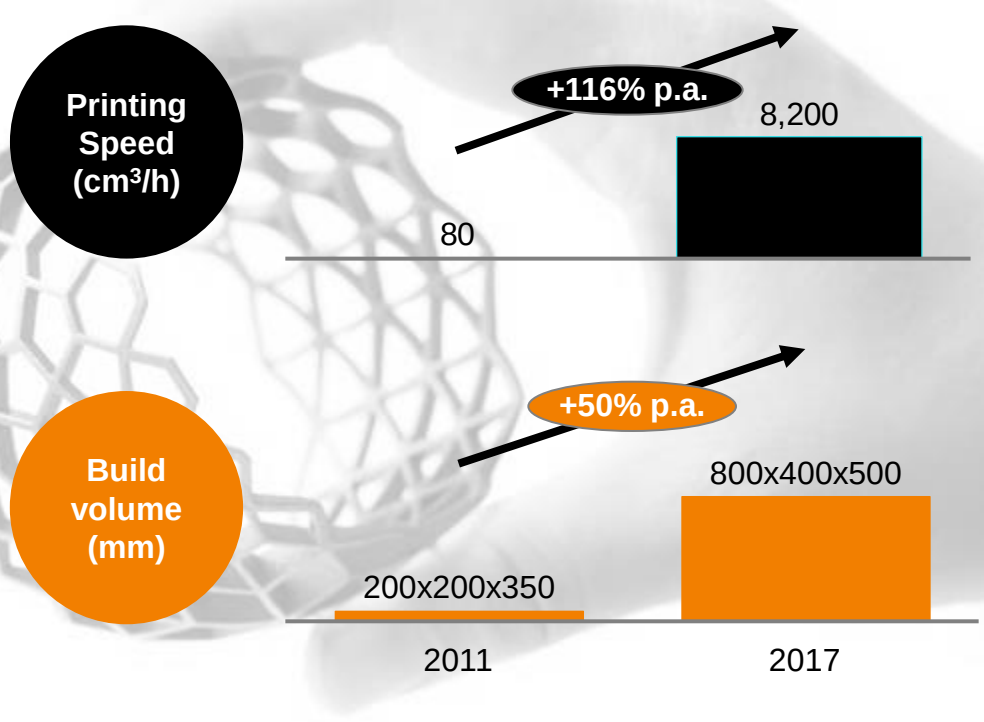



1 Includes synchronization, on-demand streaming, ringtones, kiosk, download music video, download album, download single

SOURCE: RIAA

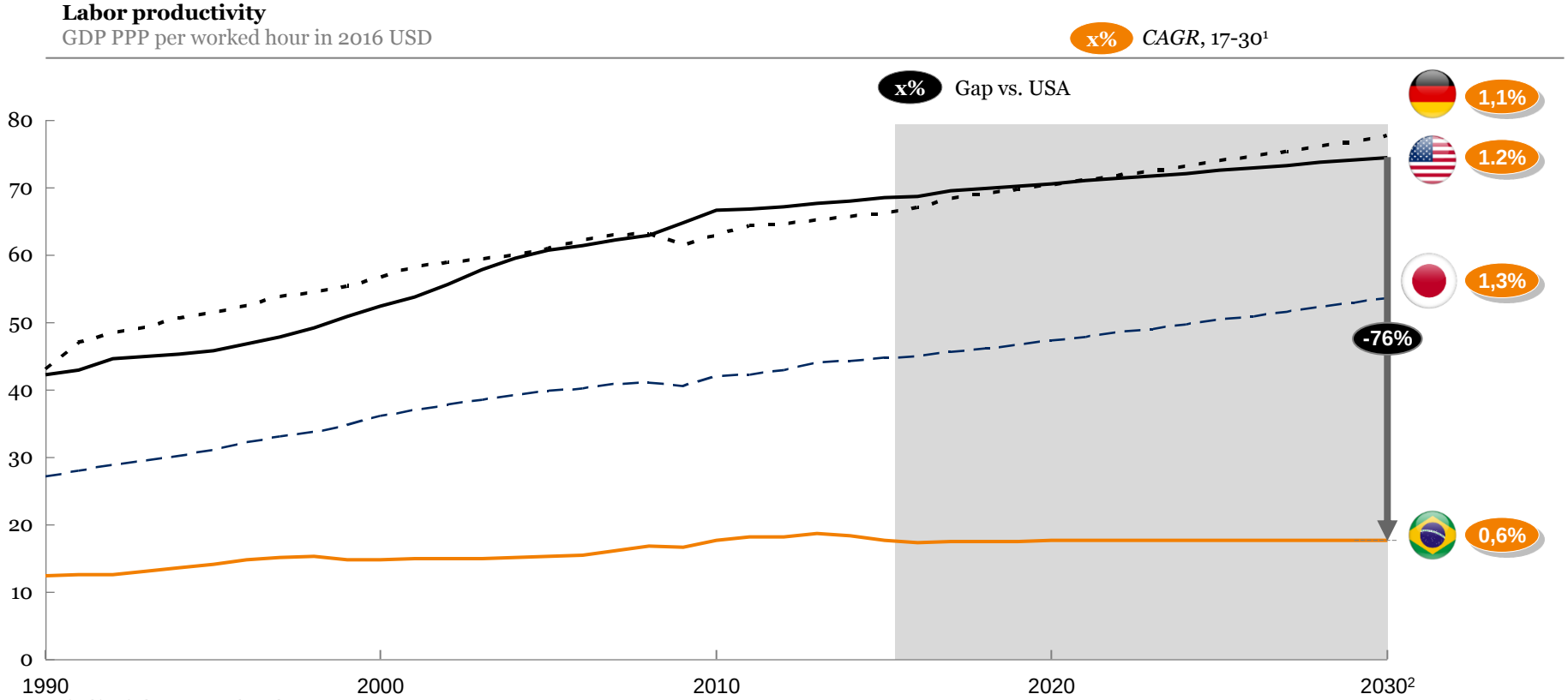
# Metal 3D printing example: Will it disrupt in the near future?



# What is the implication for our society?

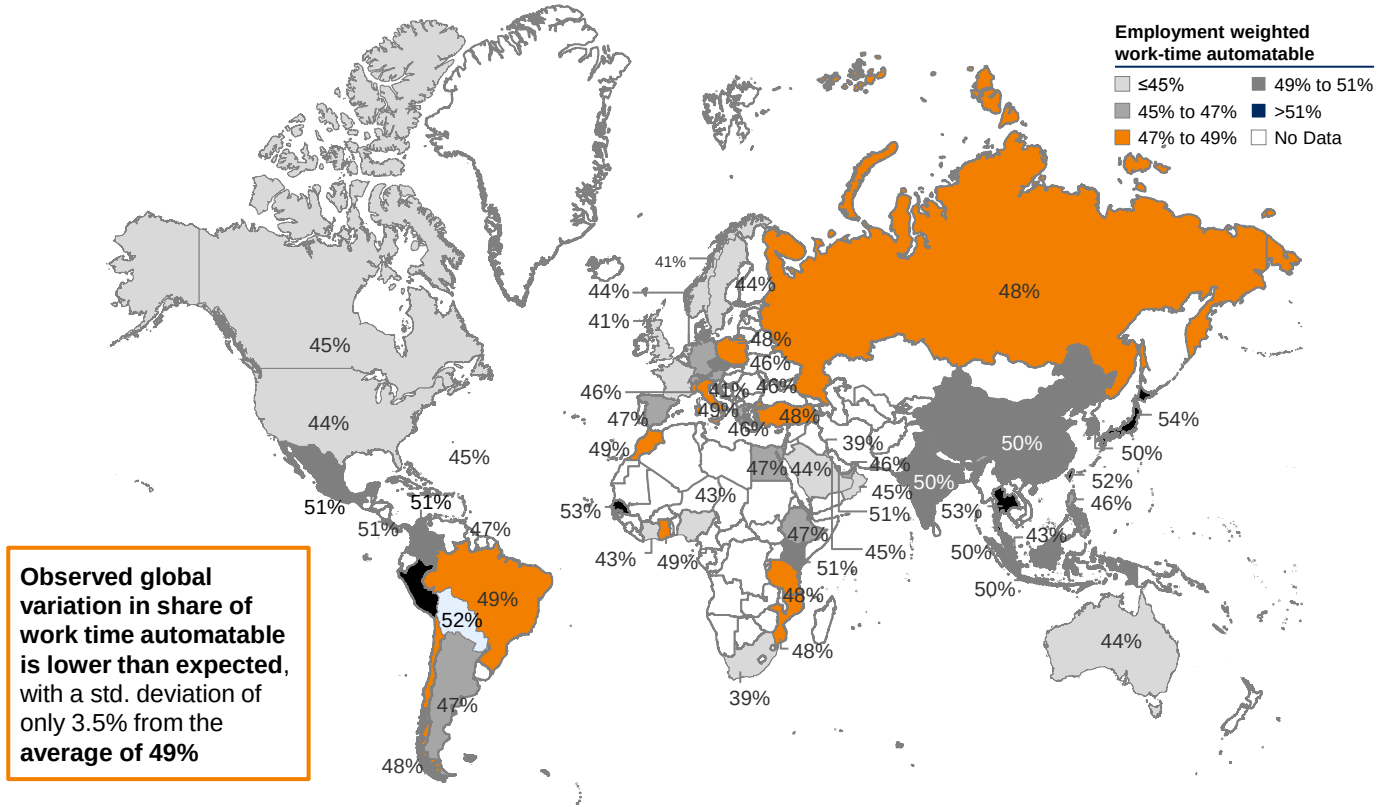
# The Brazilian productivity grows at half of the speed of that of the US increasing the already large gap of 76%




2 Assuming historical average growth rate between 1990-2016
FONTE: Conference Board Total Economy Database 2016;

# The impact of automation will be global across both developed and developing countries

Employee weighted overall % of activities that can be automated with currently demonstrated technology



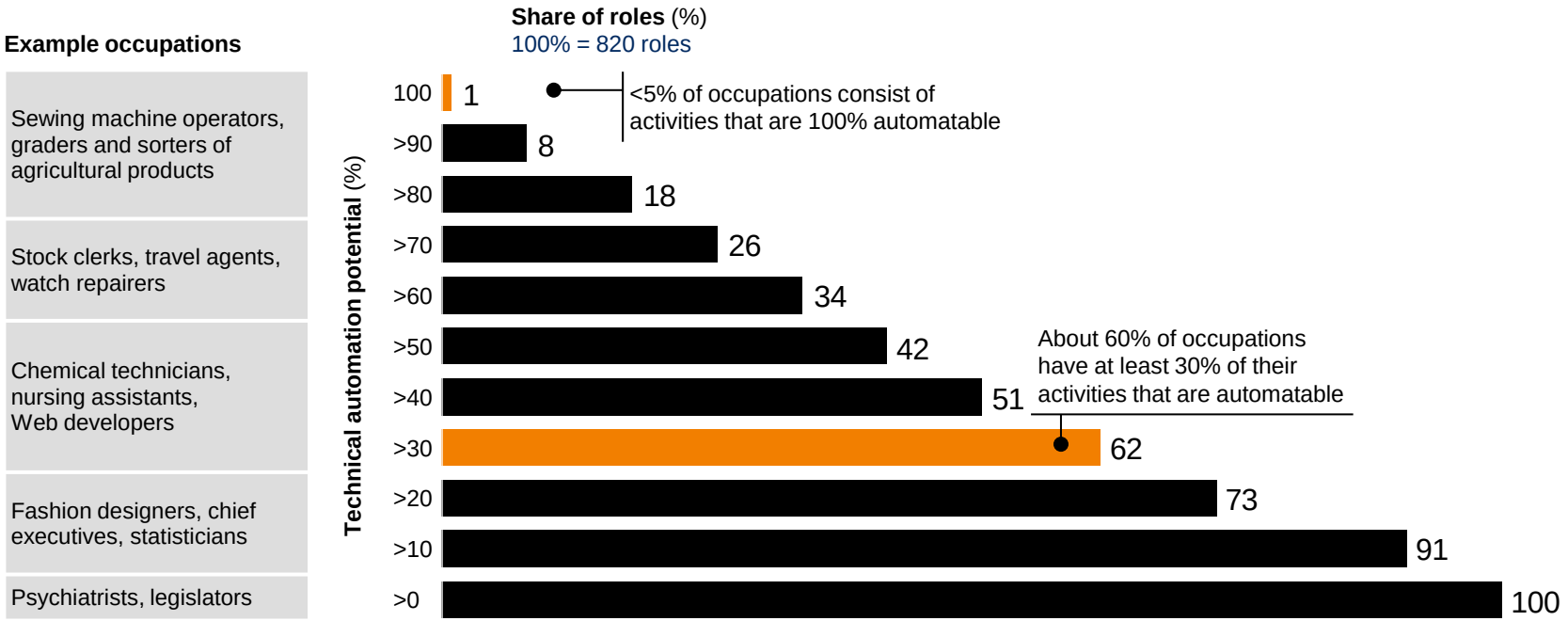

**Observed global variation in share of work time automatable is lower than expected**, with a std. deviation of only 3.5% from the **average of 49%**

1 Pakistan, Bangladesh, Vietnam and Iran are largest countries by population not included

SOURCE: OEF; EMSI; BLS; O*Net; McKinsey analysis

# While few occupations are fully automatable, 60 percent of all occupations have at least 30 percent technically automatable activities

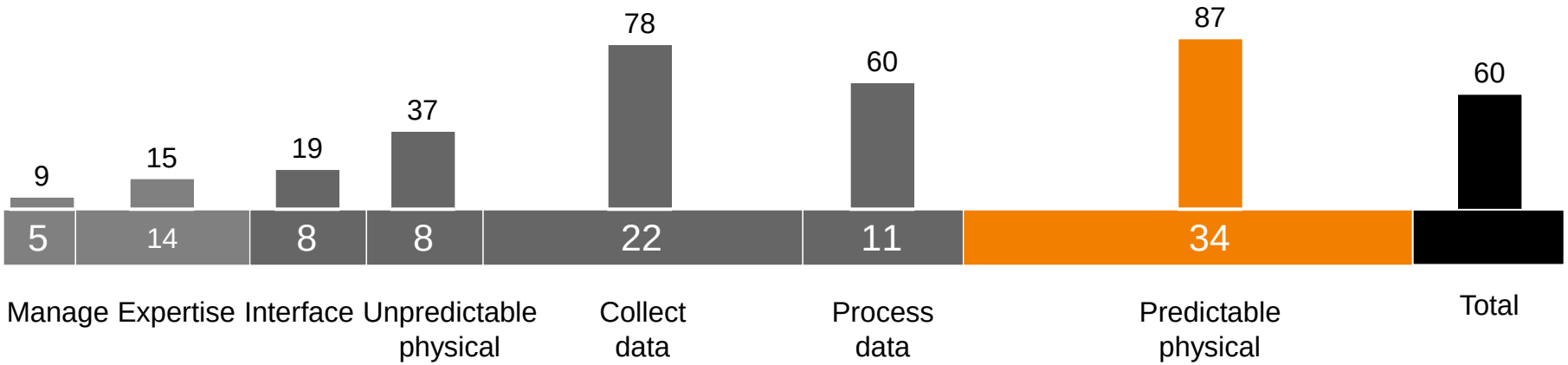
Automation potential based on demonstrated technology of occupation titles in the United States (cumulative)[1]




1 We define automation potential according to the work activities that can be automated by adapting currently demonstrated technology.

# We are also at technology inflection point, with automation and robotics now making 60% of all manufacturing tasks automatable

**Time spent in manufacturing on activities that can be automated by adapting currently demonstrated technology,** (%)




Robots perform 15% of manufacturing tasks today, in 2020 we expect 3 times more

SOURCE: US Bureau of Labor Statistics; McKinsey Global Institute analysis , WEF

# Are we ready as a country/state for I4.0?

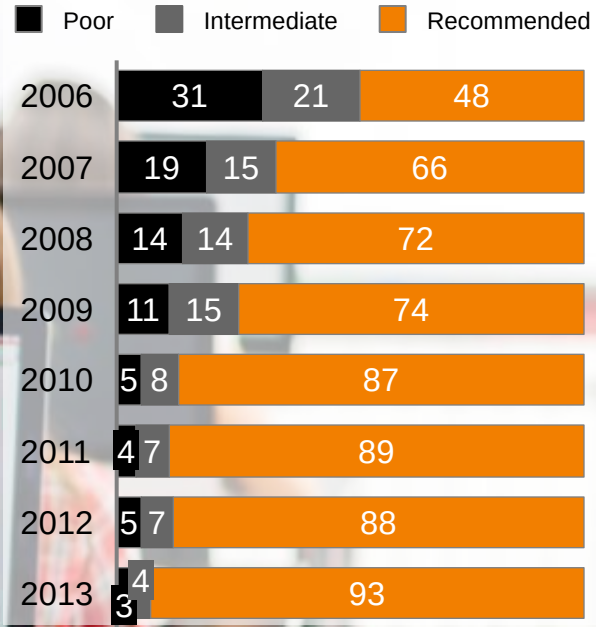
**55% of 8 year old children cannot perform the following tasks:**

- Sum 24 + 17
- Complete the sequence 10, 8, 6, _
- Recognize that four 50c coins equal 2 reais
- Understand the reference of pronouns (I, him, you) in a phrase

**93% of high school graduates are unable to:**

- Calculate percentages
- Apply Pitagoras theoreme
- Solve a second degree equation
- Calculate time necessary to move between 2 points given distance and speed

**Before discontinuing PROALFA in 2014, MG improved literacy rates by 44pp in 7 years**




SOURCE: Nacional Literacy evaluation 2016, High School SAEB 2015, SEE data

# Going after value, not hype

# Despite the opportunity at hand, manufacturers are held back by a number of implementation barriers

## Top 5 barriers

**Difficulty to coordinate** actions across different organizational units

**Lack of courage** to push through radical transformation

Lack of necessary **talent,** e.g., data scientists

Concerns about **cybersecurity** when working with third-party providers

Lack of a clear **business case** that justifies **investments** in the underlying IT architecture

## Additional top barriers mentioned by more advanced manufacturers

Concerns about **data ownership** when working with third-party providers

**Uncertainty about in- vs. outsourcing** and lack of knowledge about **providers**

Challenges with **integrating data** from disparate sources

***Level of progress in Industry 4.0***

SOURCE: McKinsey Industry 4.0 Global Expert Survey 2017

# Creating value from Industry 4.0 is a bit like an iceberg

*First of all, we need to take a critical eye to what we want to digitize*

# Don't digitize waste; don't waste digital

**Where processes are bad or broken, don't assume automating or "going paperless" will fix them. Use a digital transformation as a forcing mechanism for thoughtful process redesign**

**Don't spend time digitizing areas of the business where it won't have a tangible impact (even if it "looks cool"). Always ask how a solution will provide value and focus your efforts there**

# It requires a new set of roles in your organization – Critical roles and skillsets for Advanced Analytics, Automation, and Applications development

NOT EXHAUSTIVE

## Data Scientist/ Engineer

Runs advanced modeling on data in order to extract insights; effectively handles interfaces to large amounts of data and creates structures suitable for analysis

## Product owner

Acts as the voice of the end user; tests and reviews each iteration of the product

## Digital Navigator/ Translator

Has intimate knowledge about the manufacturing reality and the real life consequences of the issue at hand

## Team (aka squads)

Delivers potentially shippable software at every sprint

## Scrum master

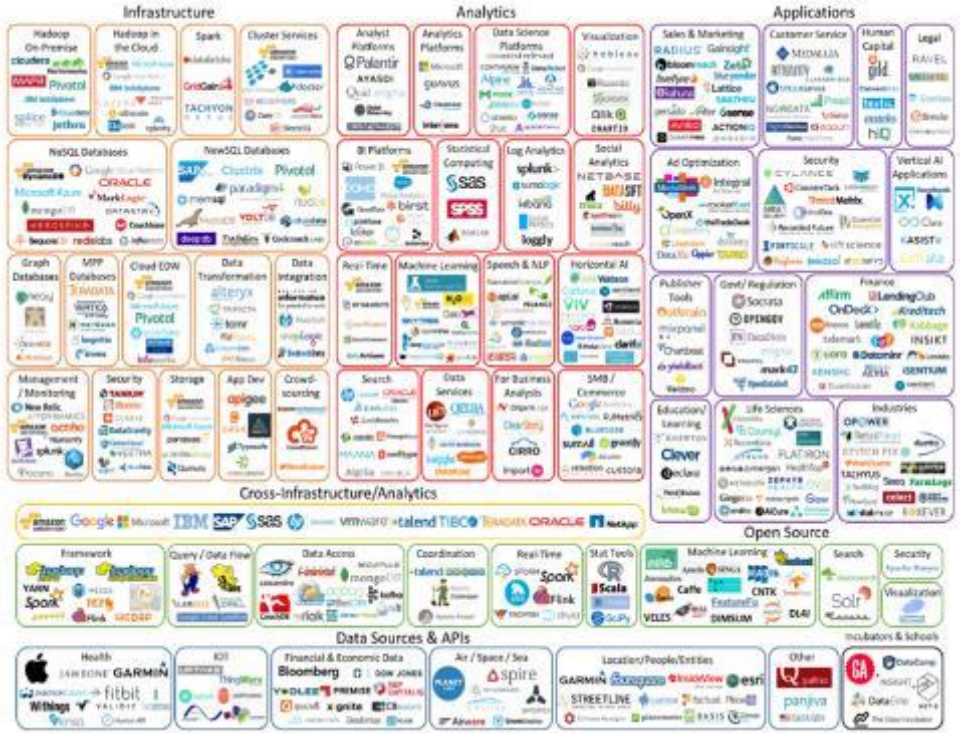
Oversees design process, fosters cooperation across roles and functions, removes obstacles

## UX designer

Conducts initial user experience walkthroughs; designs solutions to meet users' needs

# The market is full of solutions, so make sure you know what business problem you are trying to solve for

Example mass market solutions providers




Example mining-customized solutions providers

NOT EXHAUSTIVE