Russia and Germany:
the mutual interests of economic cooperation
14-15 September 2018

Industry 4.0 and a competitiveness of the countries in digital economy

Kapustina L. Dr.Sc.(Ec.), Prof.

Issues

- 1. Industry 4.0 and the effects of industry digitalization
- 2. The results of industry 4.0
- 3. Definition of “Smart factory”
- 4. The IMD World Digital Competitiveness Ranking

(IMD -International Institute for Management Development)

The purposes of the research

- to analyze the main signs of the Industry 4.0 and the potential effects
- to determine the most significant features of "smart factory"
- to identify the leading countries in Industry 4.0: Digital competitiveness of the countries, 2018

1. Industry 3.0 and Industry 4.0

- The concept "Industry 3.0" is directed to automation of separate products and processes
- "Industry 4.0" provides digitalization of all physical assets and their integration into a digital ecosystem together with the partners participating in a chain of value creation

Industry 4.0 - Schwab, 2016.

- The term "Industry 4.0“ has been introduced in 2011 in Germany at the Hanover industrial exhibition.
- “The fourth industrial revolution creates the world in which the virtual and physical systems of production flexibly interact among themselves at the global level.

Industry 4.0 - Schwab, 2016.

- Communication between physical and digital reality provides "The Internet of Things" (IoT)

  - interaction between things (products, services, places and other) and people which is provided with the interconnected technologies

McKinsey & Co, Forbes, 2018

	Industrial revolution	Increase of GDP per capita
1	**The first (1780-1820): steam engine**	**16 %**
2	**The second industrial revolution (1870-1920): electricity, automobile industry**	**80 %**
3	**The third industrial revolution (1970-2010): electronics, computers, means of communications, Internet**	**101 %**
4	**The fourth industrial revolution (2010- ?): digital technology, artificial intelligence**	**?**

2. McKinsey & Co forecast

- By 2025 the Industrial Internet of Things technologies will cover from **80% to 100%** of the world processing industry.

World Economic Forum, 2017: results of "Industry 4.0“ till 2025

- 30 trillion US dollars of income for global economy:
- - in the field of production of goods of consumption (10,3 trillion dollars),
- - in automotive industry (3,8)
- - in logistics (3,9 trillion dollars),
- - in the electrotechnical industry (3 trillion dollars)

The forecasts of the EU in case of industry digitalization

- The European producers by 2030 can reach increase in production

  from **15 to 20%**

[Strategic Policy Forum on Digital Entrepreneurship, 2016].

“Industry 4.0”, PwC

- The level of digitalization in metallurgy will be **67 %** by 2020.
- Annual decline of the costs in global industry will be **3.6 %** (average)

State programs on Industry 4.0 in EU

- Germany, “Information and Communication Technology Strategy“
- Netherlands –Smart Factory,
- France – Alliance Industrie du Futur,
- the United Kingdom – High Value Manufacturing Catapult,
- Italy – Fabbrica del Futuro,
- Belgium – Made Different.

Plattform Industrie 4.0, Germany, 2015

- The coverage of existing pilot projects and their consistent implementation in business model (more than 7 thousand enterprises).
- In Germany “Information and Communication Technology Strategy“ suggests accelerated development of digital technologies, solving the issues of cyber-security.

The benefits of digital transformation EU

ENORMOUS GROWTH POTENTIAL

Companies making use of a newly available set of accelerating technologies are performing 10 times better than their peers

10x better

THE POTENTIAL FROM THE CREATION OF THE DIGITAL SINGLE MARKET

+6% of GDP from a fully realised DSM

+3.8m The DSM could create 3.8m jobs and reduce the cost of public administration by 15-20%

400,000 to **1.5 million** new jobs

unexploited potential

Number of new jobs the EU could create in the internet economy

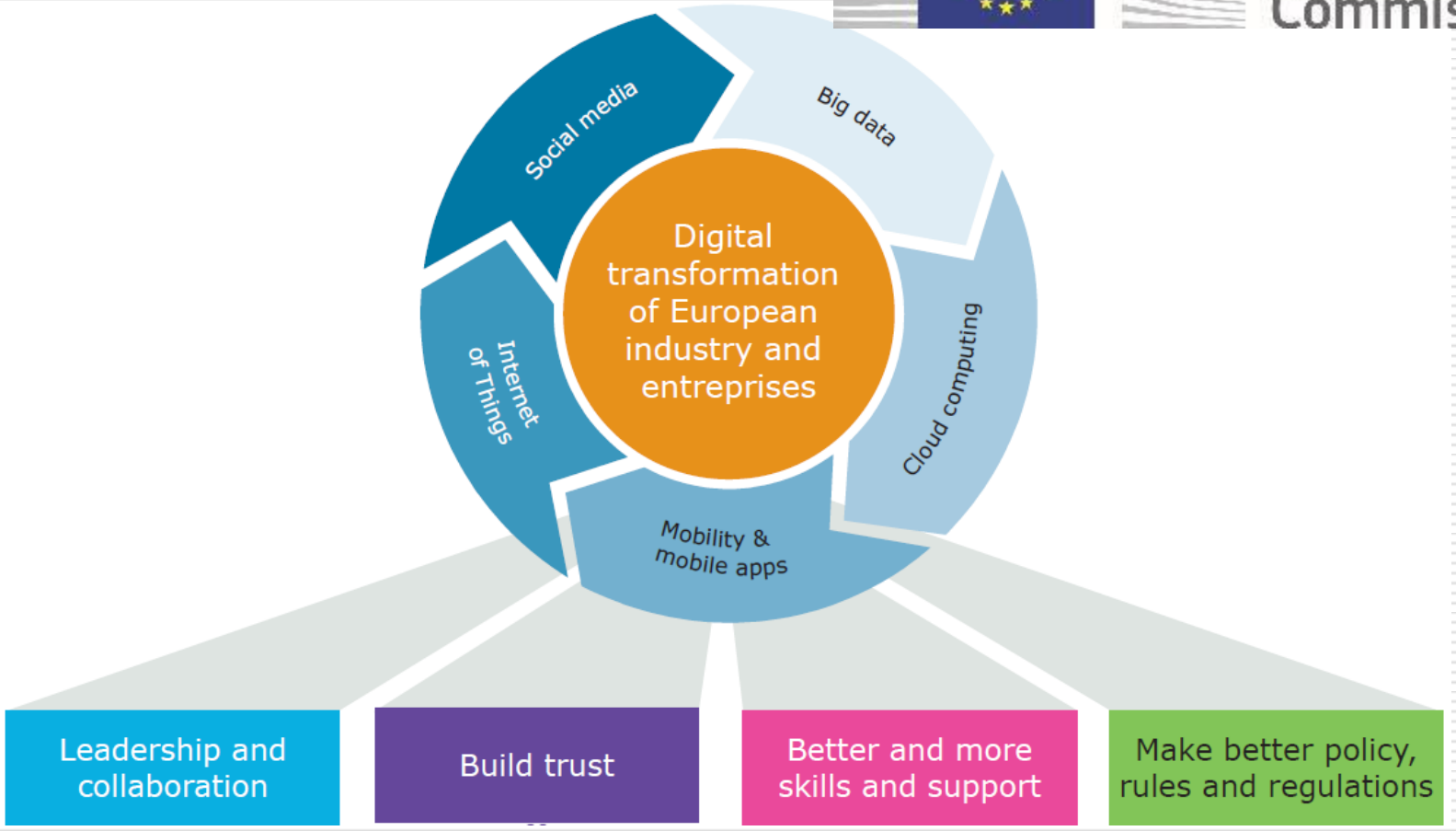
THE TRANSFORMATIVE POWER OF DIGITAL

Digital technologies are fundamentally **changing** the way people live, work, communicate and play

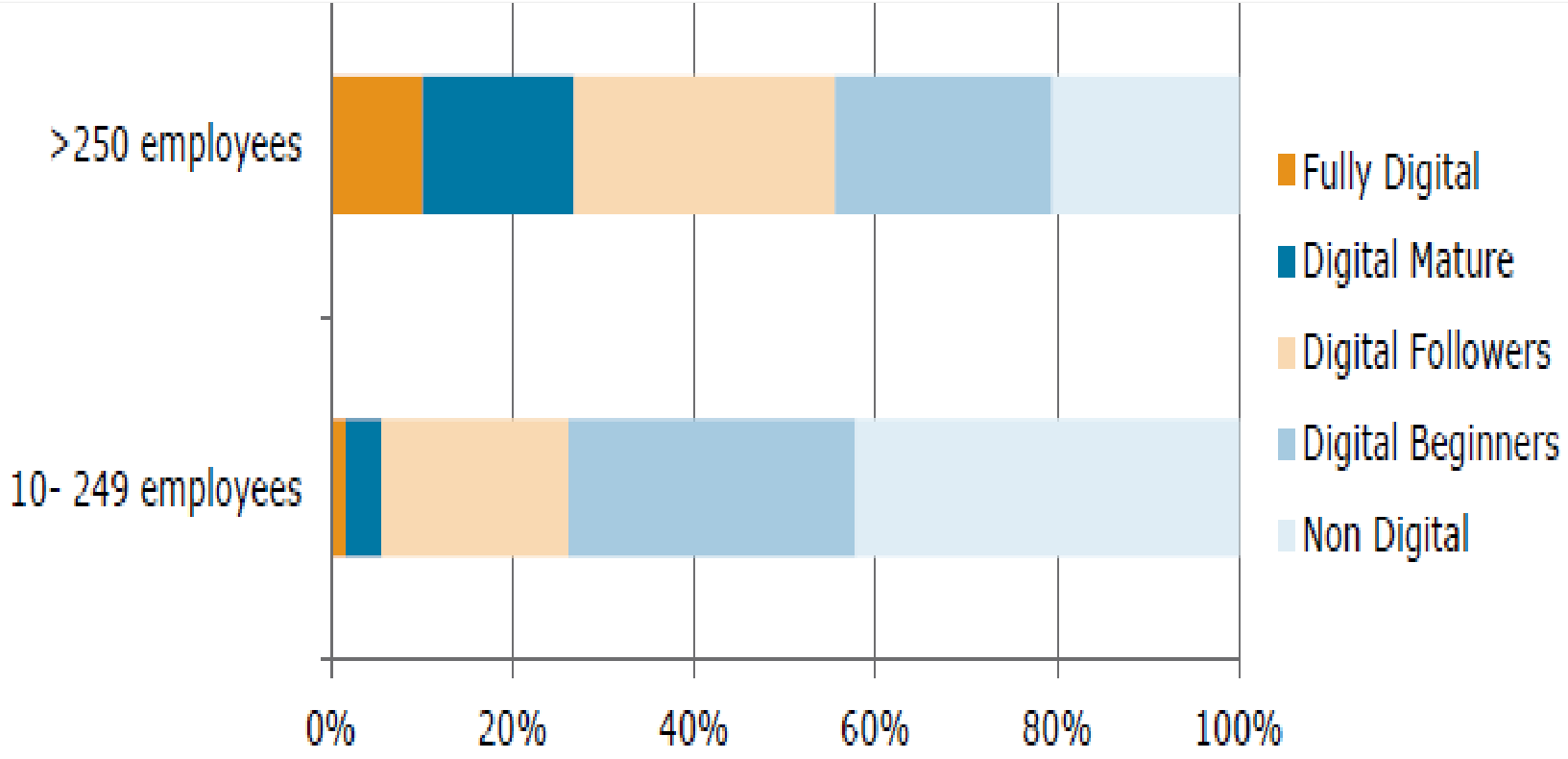
Big data technology and services are expected to grow worldwide to **USD 16.9 billion** in 2015 at a compound **annual growth rate of 40%**. Companies using that data become **5-6% more productive.**

Four areas of recommendations

European Commission



Slow progress –of smaller EU companies, only 28.5% and 25.7% use social media and cloud solutions, respectively



Source: IDC European Vertical Markets Survey 2012

USA, Industrial Internet Consortium, 2014

- a non-profit organization with open membership (AT&T, Cisco, General Electric and Intel)
- to provide maximum access to big data and to improve the integration of physical and digital environment
- the unification of digital network of manufacturing equipment with virtual world

State strategy ‘Made in China 2025’, 2015.

- The priorities of Chinese industry on the grounds of modern smart technologies
- Digital economy transformation and cloud platform building,
- the expansion of interconnections within the industrial companies
- Creation of global leaders of smart economic growth

2. Digital factory

- Goal: to “see” the product before it is produced
- Means: Software for the digital representation and test of products prior to their manufacture and use
- The expected result: reduce design errors, better products, less waste + rework, faster time-to-market

Filos E., Helmrath C., Riemenschneider R. “Smart factories” with next generation of production systems ICT Objectives 7.1/7.2. - PPP InfoDay. 11 July 2011, Brussels

Smart factory

- Goal: more automation, better control and optimization of factory processes
- Means: software, lasers and intelligent devices embedded in machines and factory infrastructure
- The expected result: less waste, less energy use, faster time-to-market, better quality

Virtual factory

- Goal: to manage supply chains; to create value by integrating products and services
- Means: software to holistically interconnect and manage factory assets; new business models
- The expected result: high-value products, keep jobs in Europe, process transparency, security, lower CO2 footprint

Factory of the future

- Purpose: increase in productivity and promotion more products into the market
- A creative component - the main source of innovations,
- ability to quickly change technological processes, reacting to market demand and wishes of customers

Фойер З. Предприятия будущего: генераторы рабочих мест.

Germany Trade & Invest Report, 2017

- The “smart” production or "Industry 4.0” is connected with cyberphysical systems, the decentralized artificial intelligence.

3. The examples of smart factories

- the Philips plant on production of razors in Holland which works in the dark room where there are 128 robots.
- the tools producer “Stanley” and “Black & Decker” which after introduction of IoT has reduced amount of defects and errors of marking by 16%.

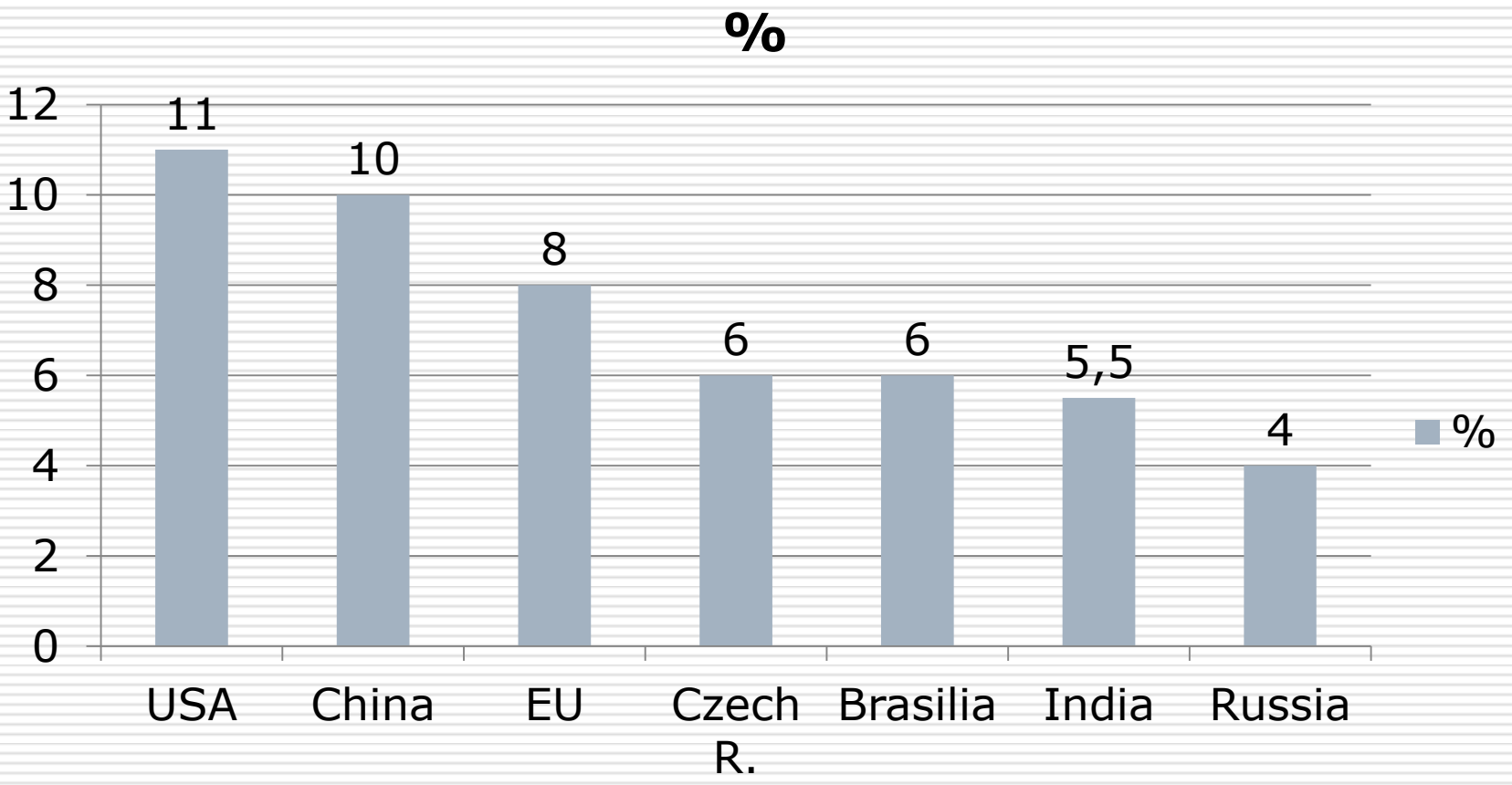
The examples of smart factories

- The plant of electronics Siemens in Amberg where industrial controllers are issued. Production is most automated, more than 75% of works are performed by machines and computers. Daily at the plant over 50 million records of production and technological information are created that allows to track all life cycle of each product.

The examples of smart factories

- The Bosch group of companies develops technologies and the software to create network production base for "Factory 4.0", creates the intelligent equipment for the smart factories in the pharmaceutical and food industry

Share of digital economy in GDP, % (Russia)



The 2018 IMD World Digital Competitiveness Ranking, 63

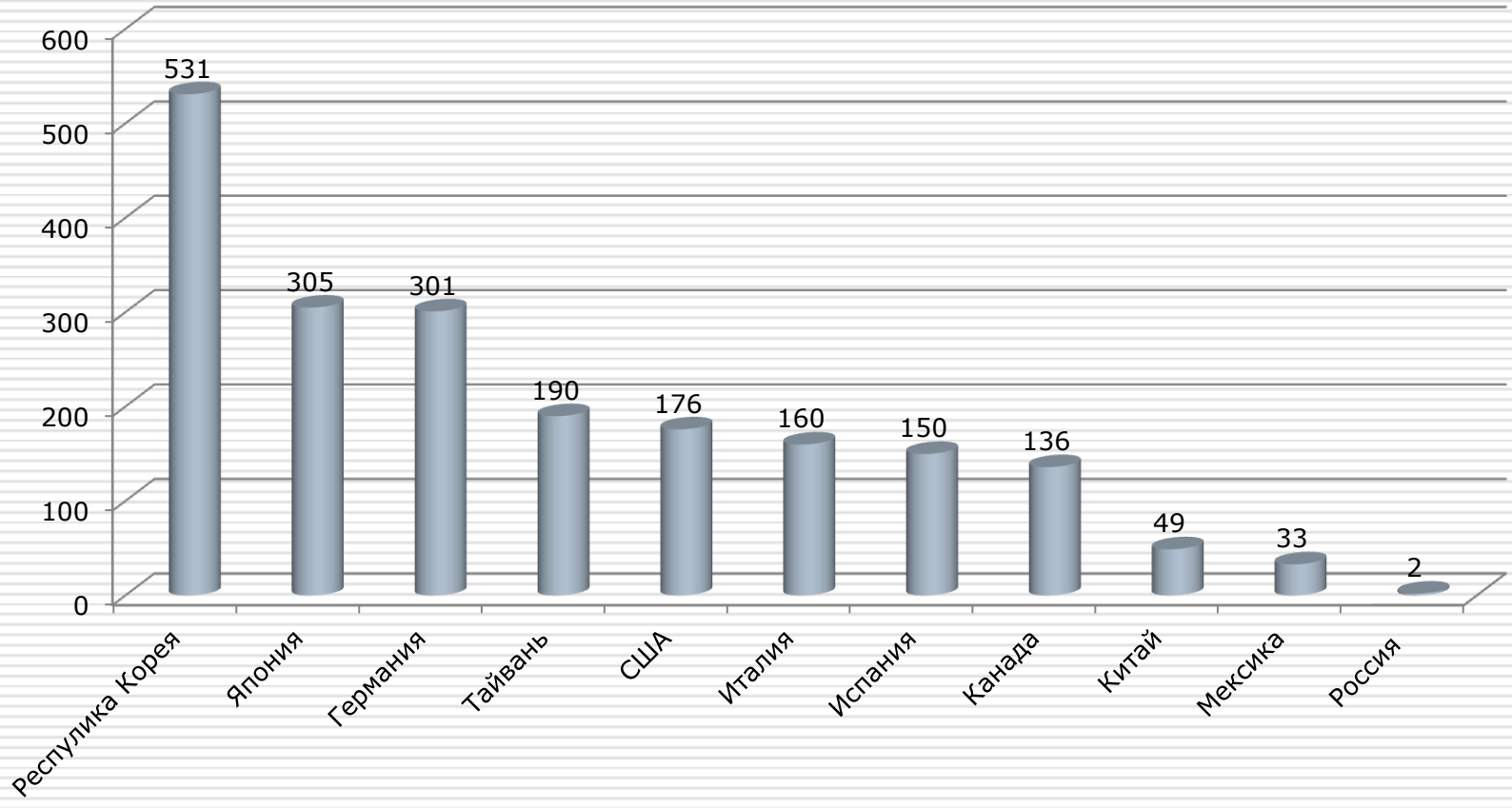
Digital Competitiveness Factors-50 criteria

- 1. Knowledge (talent, Training and Education, Scientific Concentration)
- 2. Technology (Regulatory framework, Capital, Technological framework)
- 3. Future Readiness (Adaptive Attitudes, Business Agility, IT integration)

Digital Competitiveness, 10

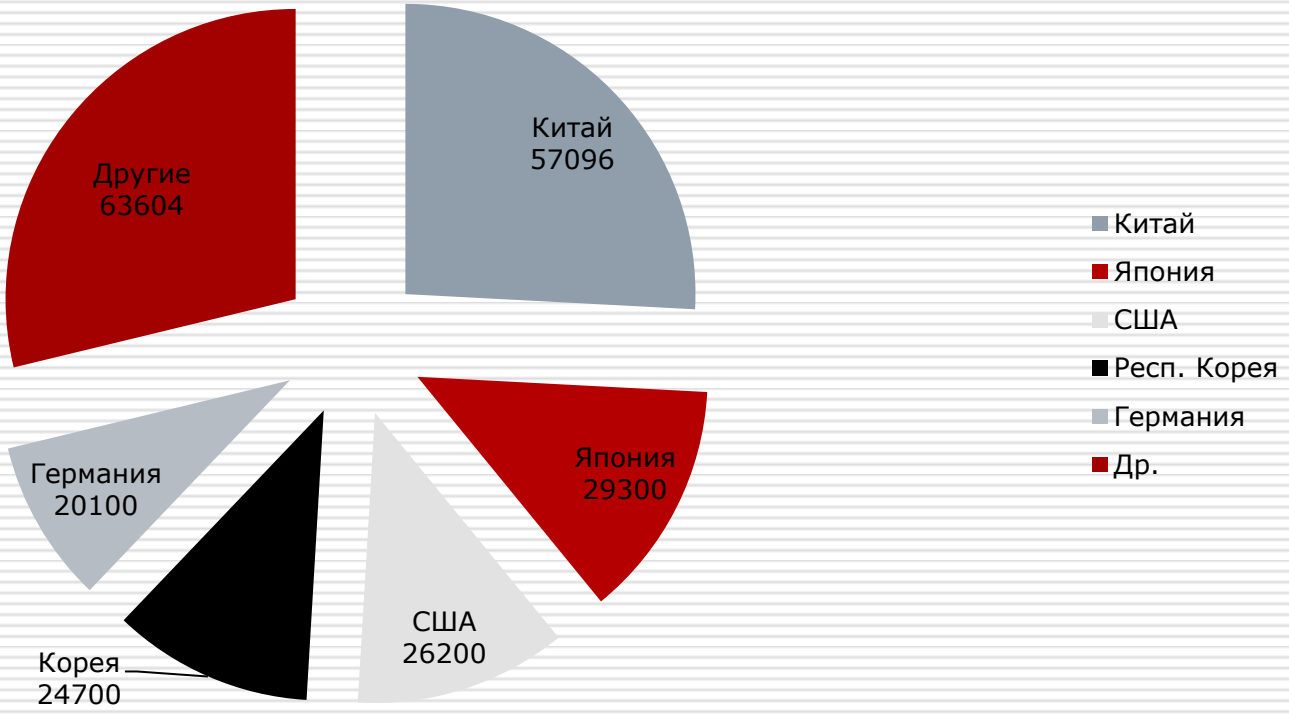
Ranking 2018	2017	Country
1	3	**USA**
2	1	**Singapore**
3	2	**Sweden**
4	5	**Denmark**
5	8	**Switzerland**
6	10	**Norway**
7	4	**Finland**
8	9	**Canada**
9	6	**Netherlands**
10	11	**United Kingdom**

Число роботов на 10000 работников обрабатывающей промышленности



Структура мирового потребления промышленных роботов по отраслям

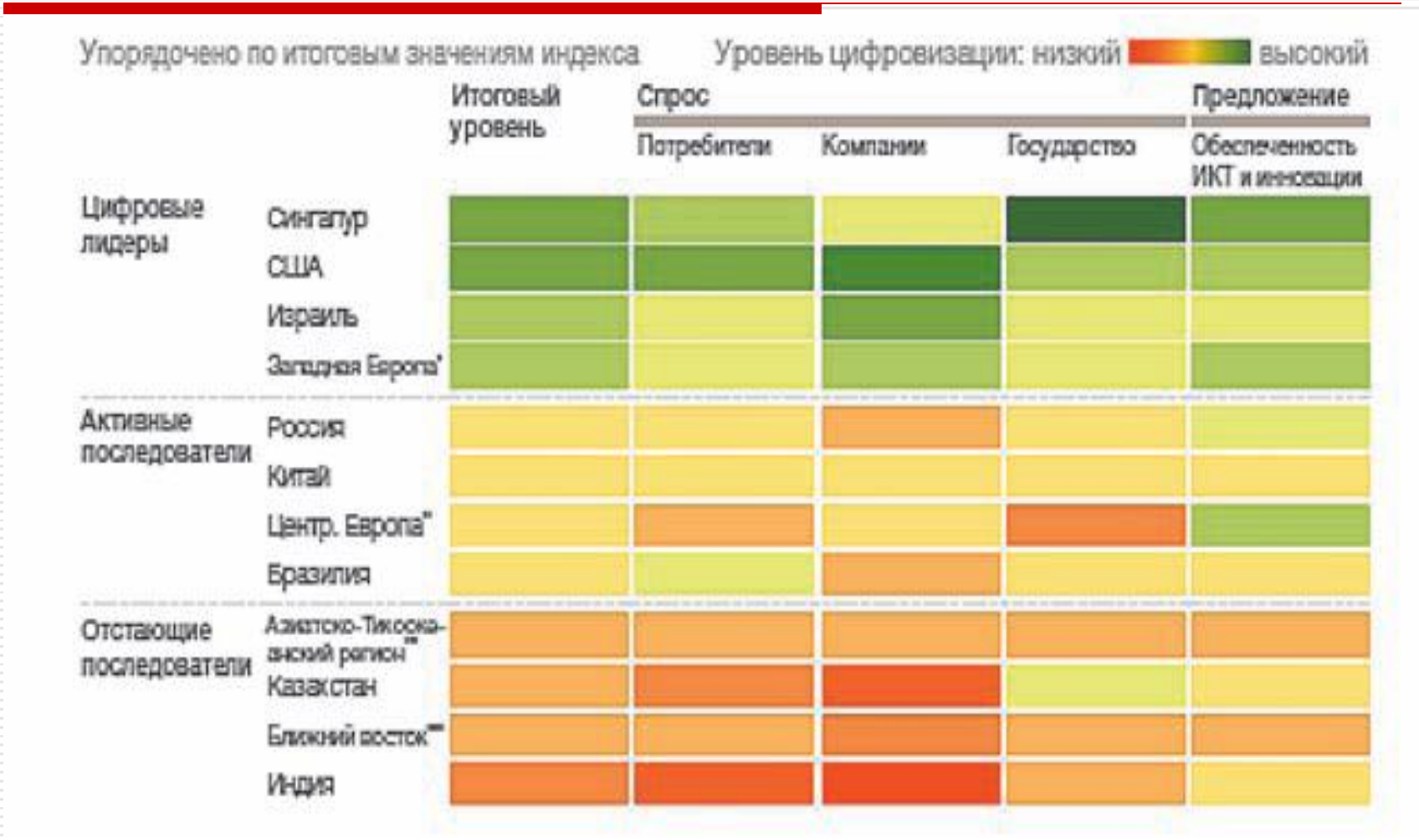
Структура потребления промышленных роботов по странам



Основные направления развития робототехники

- беспилотный пассажирский транспорт
- - роботы для коммерческих пространств;
- - роботы-собеседники (помощники);
- - логистические роботы и беспилотный грузовой транспорт;
- - промышленные экзоскелеты;
- - роботы для сельского хозяйства.
- - роботы для обслуживания клиентов;
- - роботы для домашних задач (персональные помощники).

Сравнение индекса цифровизации России с мировыми экономиками



Дифференциация в уровне цифровизации между Россией и Европой

Ежегодный эффект от внедрения элементов «Индустрии 4.0»

Smart factory

- high-tech flexible cyberphysics production,
- use of big data and advanced digital management methods
- coordination between enterprises, researchers, developers, suppliers, distributors and end users from all over the world through the global computer networks.

Thank you for attention

- lakapustina@bk.ru