Recent Political Considerations for Technological Development in Russia

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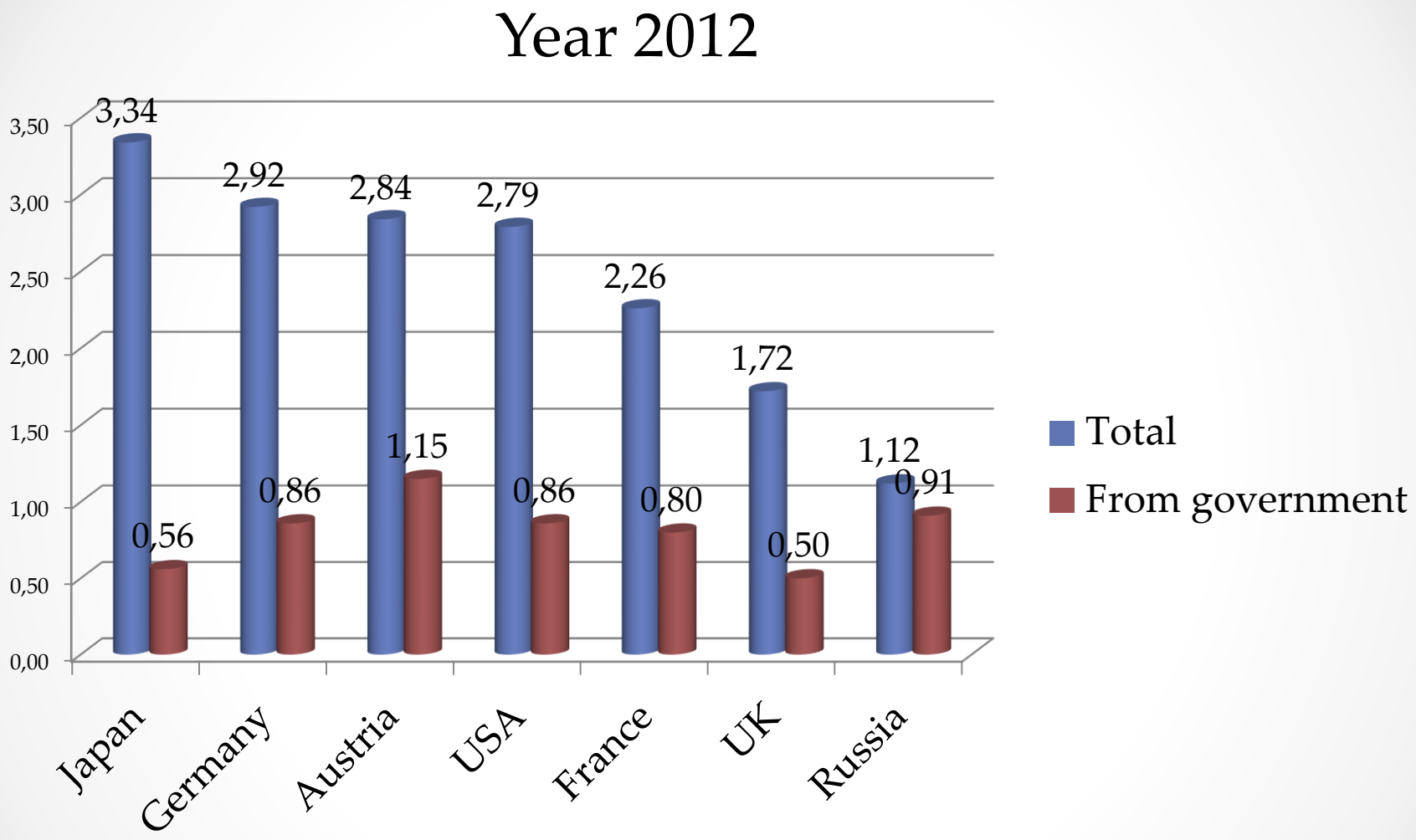
Expenditures on R&D (% of GDP)



Main Science and Technology Indicators, OECD, 2014. P.21, 31.

State of Russian Industry

- Manufacturing as driver of innovative development: share of R&D – 15% (resource-extracting industries – 2-5%); BUT: *Western Europe – 40-60%*
- Large companies: 98% of total business expenditures on R&D
- Orientation towards import of high tech (in machine-tool manufacture – 95%; radio electronics – 80-90%);
- Few small innovative companies (less then 2% of business expenditures on R&D). Some success stories.

New Technological Priorities

- Several lists of various importance
- Approved by the President in 2011 – had to be revised in 2014. New deadline – mid-2015
- Arise of **National Technological Initiative**
- New priority topics:
  - **Advanced manufacturing**
  - Photonics
  - Neurotechnologies

Advanced Manufacturing

Advanced manufacturing

'Makes extensive use of computer, high precision, and information technologies integrated with a high performance work force in a production system capable of furnishing a heterogeneous mix of products in small or large volumes with both the efficiency of mass production and the flexibility of custom manufacturing in order to respond rapidly to customer demands.'

Paul Fowler, Research Director of the US National Council for Advanced Manufacturing (NACFAM)

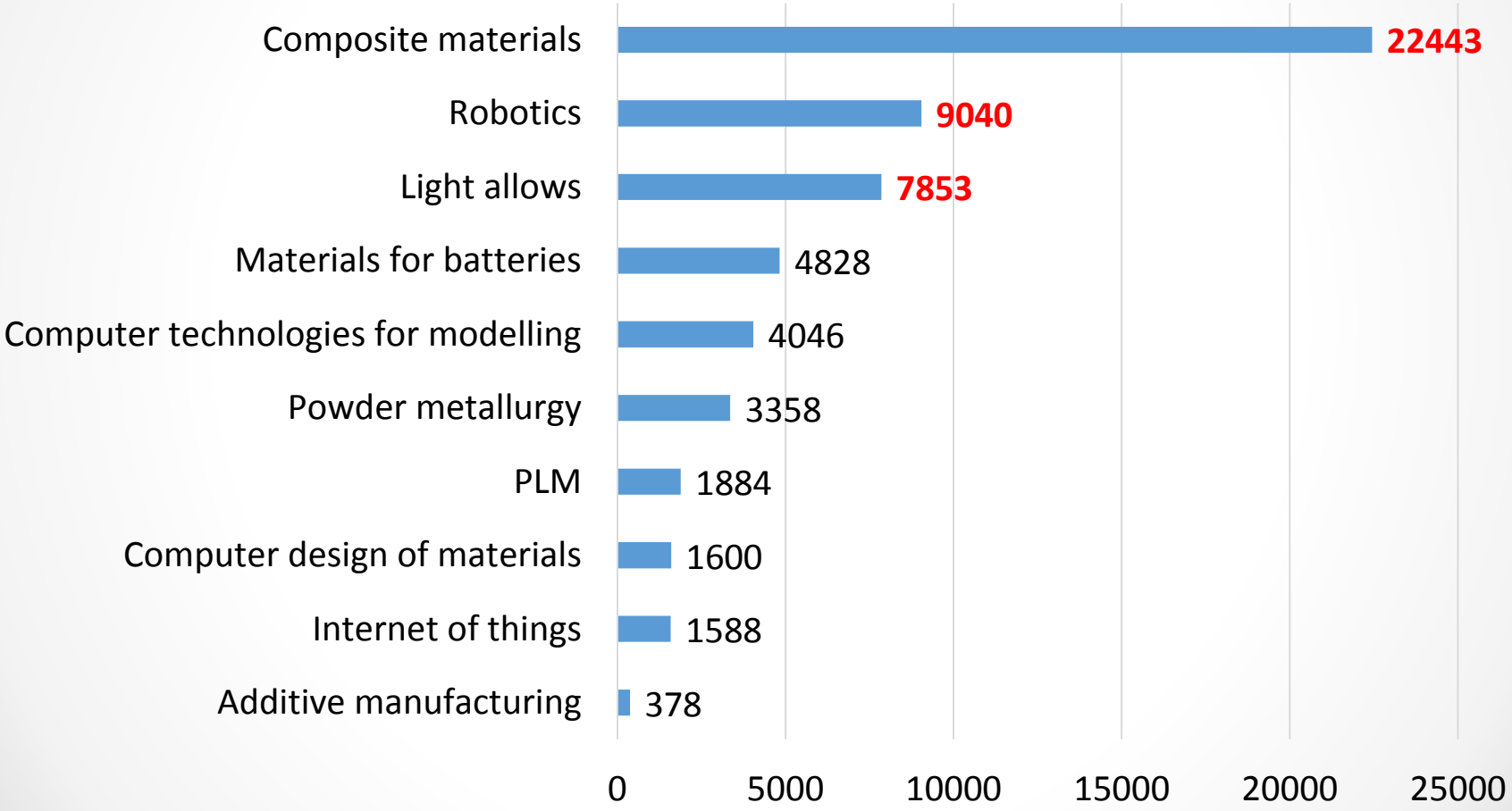
Drivers for Advanced Manufacturing

- Advanced manufacturing technologies create new markets and industries, promote operational efficiency, competitive growth in certain industries and national economies in general
- Re-shoring and localization, i.e. cutting down costs by procurement savings and ensuring proximity to the consumer (customer)
- Customization of production facilities i.e. their flexible adaptation to customer needs
- **Russia:** import substitution

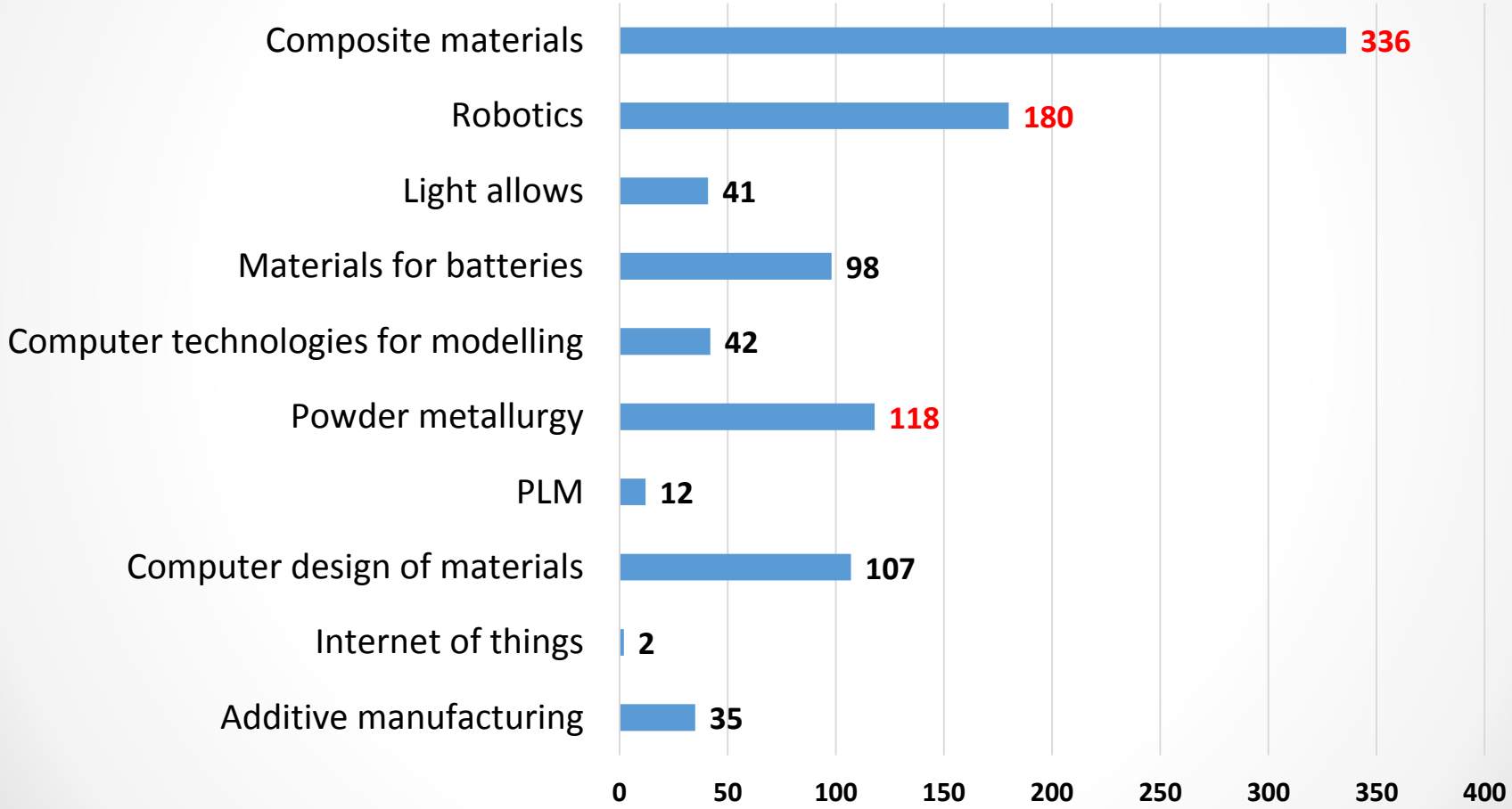
Examples of Initiatives

- USA - Advanced Manufacturing Partnership (AMP), 2011
- UK - Catapult Centres (High Value Manufacturing), 2012
- Germany - Industry 4.0, 2013

Number of Publications in Russian Citation Index



Number of Publications in Web of Science, Authors from Russia



Results of Bibliometric Analysis

- Organizations-leaders according to Russian citation index are different from those in WoS
- Leaders according to WoS – mainly Academy institutes, not universities
- High level of publications on composites – due to presence of “nano** “ keywords
- The least developed area in Russia – PLM (important for new organization of industry)

Patent Data for Advanced Manufacturing

Advanced technology	Russian patents, database Orbit, %	Share of foreign applicants for Russian patents%	PCT with Russian priority, number	Countries-technological leaders
Robotics	2.83	28.23	1	**Japan, USA, China**
Powder metallurgy	2.28	**51.47**	1	Japan, China, USA, South Korea, Germany
Light allows	2.00	**73.90**	1	Japan, USA, Germany, China
Composite materials	1.87	**80.61**	**9**	France, Germany, USA, Japan, China
Computer technologies for modeling	0.81	47.88	0	USA, Japan, China, South Korea
PLM	0.58	**80.00**	0	USA, Japan, China, South Korea
Computer design of materials	0.30	**94.00**	0	China, USA, Japan, South Korea
Additive manufacturing	0.14	**89.31**	0	South Korea, Japan, USA, China

Results of Patent Analysis

- In the world major patent owners – large companies
- In Russia major patent owners – engineering centers, small companies, Academy institutes and universities
- **In Russia deficit of technological drivers due to low demand from large companies**

What to Do?

1. Create **project consortia** (similar of AM institutes in USA, catapult centers in UK or EU technology platforms) – **based on international collaboration**
2. Create Centers of Advanced manufacturing based in universities (research institutes)
3. Improve infrastructure for small and medium enterprises

Technology Platforms

- Initiative announced in 2010, concept adopted from EU experience
- Communicative instruments aimed to activate creation of new technologies and products due to synergy of business, science, government, and civil society (*Strategy for innovation development-2020*)
- Participants: research organizations, universities, state and private companies.
- 35 platforms founded during 2011-2014. Effective – 7 (assessment of the Ministry of education and science)

Technology Platforms: Major Features

- Government control and extra functions assigned to platforms. No federal support.
- Majority in platforms: government R&D institutes and universities
- **Large companies barely engaged in these activities**
- Most successful platforms had large companies constituting >50% of participants

Technology Platforms: International Cooperation (Source: RFTR, Oct. 2014)

Platform	Active in development of international linkages	Foreign organizations among members
Medicine of the future	+	+
Biotech and bioindustry-2030	+	-
Bioenergy	+	+
Photonics	+	-
Radiation technologies	+	-
Ocean	+	-
Textile and light industry	+	+
5 platforms in resource-extracting industries	-	+
Green car	-	+
Building construction and architecture	-	+

Sanctions

- Formally: S&T area in Russia is not under sanctions

Evolution:

- Spring 2014 – USA temporarily limited R&D cooperation with Russian researchers in selected National labs (NASA, DOE)
- Fall 2014 – Russia faced limits from foreign countries for import some types of equipment, supplemental materials and technologies
- Winter 2014-2015 – a number of foreign companies started to leave Russian technology parks (will cause problems with components for new technologies)

Reaction in High Tech

- Venture investments have decreased half as much during 2014
- To the end of 2014 – Russian investors started to leave the country and invest at international markets
- Growing "exit" problem for startups due to decreasing number of large foreign companies in Russian market

Conclusions

- Russian R&D complex is funded mainly by the government; government's involvement (legal and institutional) is increasing.
- Advanced manufacturing is seen as one of solutions for import substitution and technological breakthrough.
- Major hampering factors: low demand for AM; underdeveloped science base, weak linkages among actors.
- Sanctions complicate international collaboration, including creation of project consortia for AM.