Forecasting of long-term innovation development in Russian economy sectors: main results, lessons and policy conclusions

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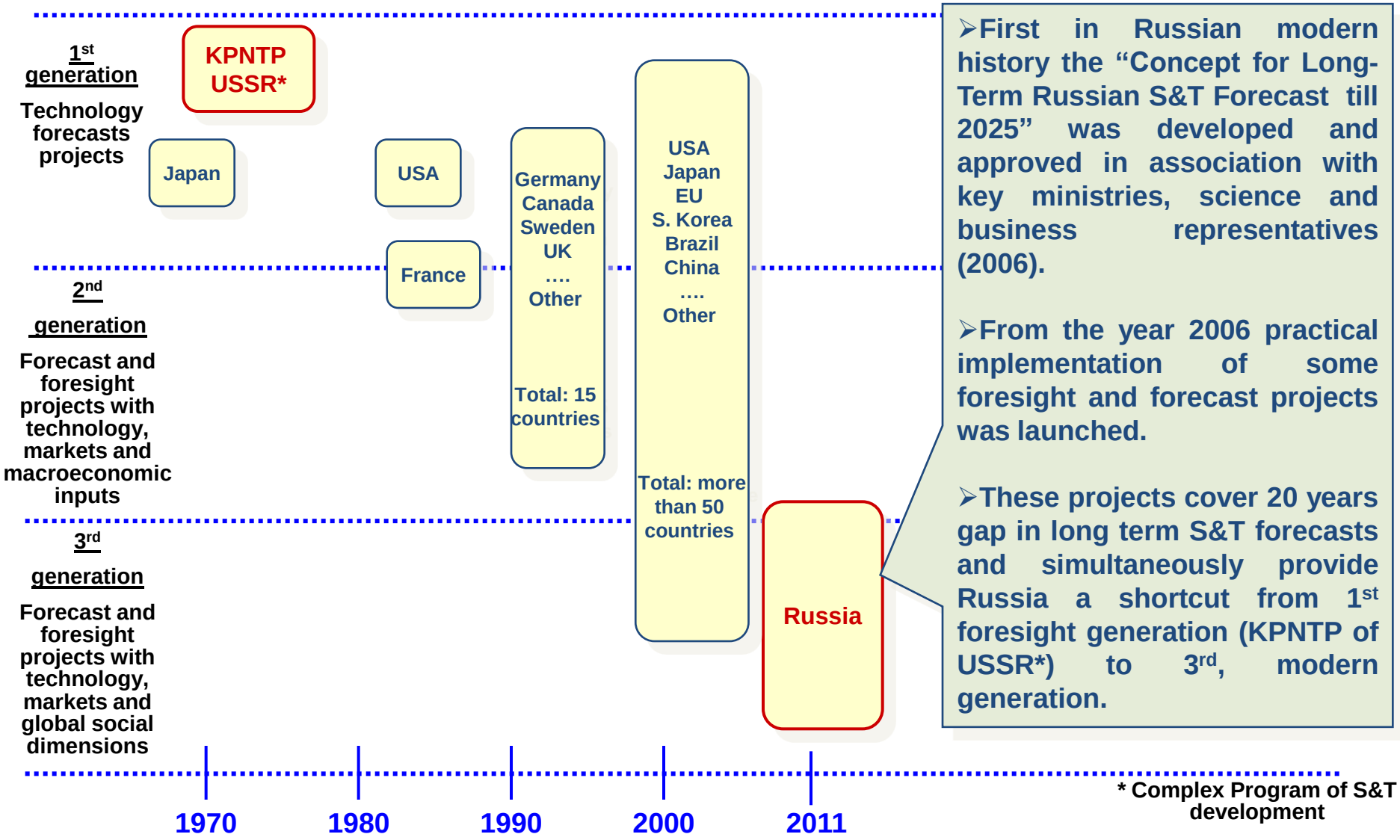
Foresight generations: Russia and foreign countries



- First in Russian modern history the "Concept for Long-Term Russian S&T Forecast till 2025" was developed and approved in association with key ministries, science and business representatives (2006).
- From the year 2006 practical implementation of some foresight and forecast projects was launched.
- These projects cover 20 years gap in long term S&T forecasts and simultaneously provide Russia a shortcut from 1st foresight generation (KPNTP of USSR*) to 3rd, modern generation.

Characteristics of Russian foresight projects: main framework

- Lack of foresight and forecast culture – as a result initially negative perception of the initiatives
- Historically there are some serious gaps between science and business (as a result- gaps in supply and demand for innovations, mutual complaints (see special slide))
- Business shows low interest in foresight projects, lack of receptivity to innovations caused by niche markets and low level of competition
- Key actors (government and business) are not completely ready to develop long-term plans and strategies ("habit" to plan more than 2-3 years has been lost) (see special slide)
- While conducting foresight and forecasts projects you have to orient on estimates of "innovation minorities" more than "listening" to the majority
- Real working, sustainable, systematic communication platforms for discussing different foresight and forecast results are just conceiving (on the basis of national universities, technology platforms, ect.)
- Formally almost all recognized foresight methods are used, but practically emphasis is on those instruments that address to a decision making by narrow circle of high qualified experts (like BOGSAT)
- Lack of certain competences in expert society- the results are fragmented and need to be linked with each other
- Experts do not will to participate in collaborative work, they try to lobby and push their individual interests
- Government innovation policy is non-systematic and suffers from disconnectedness: key positive initiatives have just been launched (e.g. Strategy 2020)
- Some Russian economy sectors obviously need core modernization that assumes strong government influence
- Russian economy is a multistructure in technological and institutional aspects (some technologies are 100-150 y.o.)
- Formally Russia has all elements on National Innovation System, but they are poorly linked and there is a need for increase to "critical mass" to start working
- From other side, we can see opportunity to force development of foresight projects and use the "catch-up advantage"

Characteristics of Russian foresight projects: interactions between business and science*

Awareness and interest from business

Estimations of importance from science

- Some technologies with low importance estimation from science side are highly important to business and visa-versa

Demand for technologies from business

Supply of technologies from science

- A huge part of technologies has demand from business right now,

<u>BUT:</u>

- Science can supply them only in 4-7 years (in 2015-2017)
- Some technologies that could be interesting fro business only in distant prospective (after 2017) can be supplied by science significantly earlier (2013-2015)

Willingness of business to finance R&D

Expectations of science on R&D financing

- Development of some technologies business finances right now (15-20% of technologies)
- Some technologies business is ready to finance but only within public-private partnership framework (about 10-15% of technologies)
- For more than 60% of technologies business is not ready to participate in financing anyway and will be waiting fro them to purchase on the market

* Based on results of the project "Forecast of S&T development of Russian economy by the period of 2030"

Characteristics of Russian foresight projects: Forecast horizons of Federal Programs (FP) and strategic plans of business

2030
2029
2028
2027
2026
2025
2024
2023
2022
2021
2020
2019
2018
2017
2016
2015
2014
2013
2012
2011

Only 12% of the largest enterprises plan more than for 13 years

- Energy strategy in RF before year 2030
- Transport strategy in RF before year 2030
- National Foresight (Ministry of Education and Science), Industry Foresights (Ministry of Industry, Ministry of Connection and Mass Communication, Government Corporations), Foresight by Russian Academies

Innovation strategies of 18% of the largest enterprises are drawn up for 8-12 years

- Concept of long-term socioeconomic development if RF
- Strategy 2020
- Federal program «Development of pharmaceutical and medical industry in RF for period before year 2020 and for further perspective"
- Timber complex development strategy in RF for the period before year 2020
- Automobile industry development strategy in RF for period before year 2020
- Metal manufacture development strategy in RF for period before year 2020

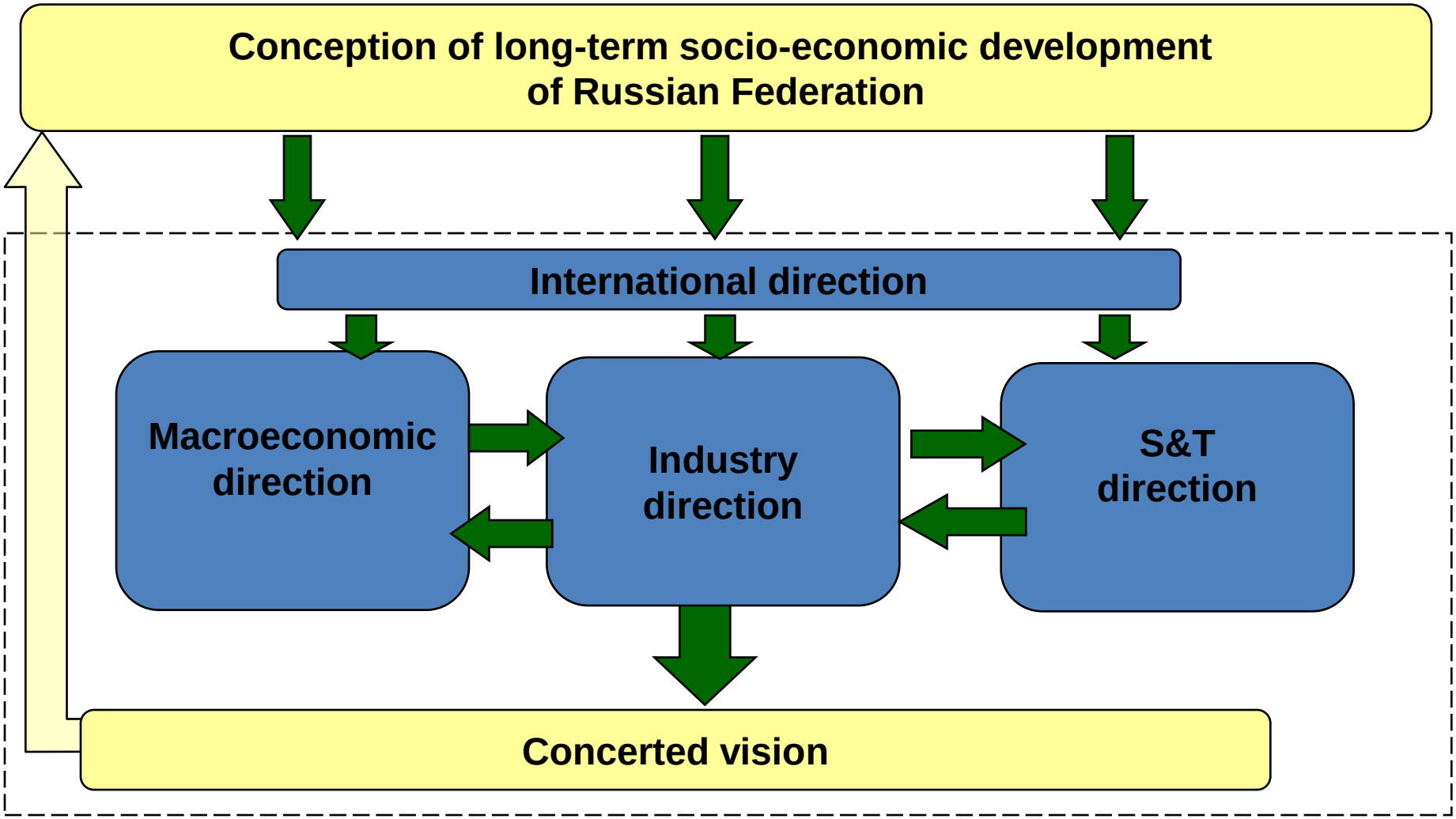
Innovation strategies of 70% of the largest enterprises don't overpass 7 years

- Science and innovation development strategy in RF
- Chemical and petrochemical industry development strategy in Russia for the period before year 2015
- Vehicle industry development strategy
- Metal manufacture development strategy
- Commercial aviation development in Russia
- Atomic energy industry complex development in Russia
- Federal space program in Russia

- The main directions of Russian Federation Government activity for the period before year 2012
- Federal program of research and development in priority-oriented directions of scientific-technology complex in Russia before year 2012
- Federal program National engineering capability before 2011
- Federal program "Development of infrastructure in nano-industry in Russian Federation for years 2008—2011»

Organization of the Project

Forecast of Long-Term S&T Development of Russia till 2030



- the Project outline

Industry direction of the Project: goals, objects, results

PERIODS	I Stage: 2007-2008 II Stage: 2009-2010
GOAL	Determination of necessary technologies and technologic solution, in accordance with scenarios of key Russian economy sectors
SECTORS	Energy, iron and nonferrous-metals industry, agriculture, chemical industry and pharmaceutics, aircraft industry, commercial shipbuilding and information sector
SELECTION CRITERIA	Share in national economy and world commerce, priorities in technologic modernization of the country and influence on other sectors
INSTRUMENTS	World trend analysis, in-depth interviews, panels, focus groups, scenario generation
EXPERTS	➢Experts – "synthetics" – high level experts, industry strategies designers, consultants ➢Industry experts – top managers and production managers of the main private and public corporations ➢Science experts – leading industry and academic institutes representatives
RESULTS	➢ Key sector development scenarios are determined taking into account institutional and technologic alternatives ➢Main technologies, which can be necessary for scenarios implementation are determined
BENEFICIARIES	➢Business (large, S&M enterprises, business associations, industry institutions) ➢Government (institutes of development, federal and regional authorities) ➢Science (system of Russian academies, science institutes) ➢Universities (leading institutes and labs in higher education system) ➢Expert society

General logic of scenario generation

1 Sector analysis taking into account global and national trends

2 The main strategic alternatives in sector development

3 Possible sector development models

4 Sectors' visions and enarios of future development

5 Perspective S&T directions and technologies

- Global and Russian trends analysis
- Sector position in economy (share in GDP, exports, employment)
- Domestic and foreign demand analysis
- Relation with other sectors (suppliers and consumers of production)
- Institutional structure and sector environment
- Technologic level
- Resource provision

- Technologic alternatives
- Institutional alternatives
- Domestic and foreign demand alternatives
- Regulative alternatives

- Sector development model formation in dependence of different alternatives combination
- Determination of the models depending on their probability

Sector vision scenarios description by the following characteristics

- Institutional structure
- Basic technologies and resource consuming
- New technologies
- Related sectors
- Home and foreign demand
- Positioning on the foreign markets
- Sub-sectors vision
- Geography
- Resources
- Effects for economy
- Risks and limitations

Perspective technologies and technologic solutions characteristics

- Invariant to selected scenario (inevitable future)
- Specific for each of concerned scenarios

Summary characteristics of key Russian economy sectors: some examples

	Ferrous metallurgy	Nonferrous metallurgy	Agriculture	Chemical industry	Medicine and pharmaceuticals	Aircraft industry	Commercial shipbuilding	Information sector
Impact on other sectors								
Demand for products and services from other sectors	Metallurgy - 55,4% Energy sector - 27,6% Machine building - 8% Transport - 1,1%	Cargo shipping operations— 15% Electric energy in all industry – 20% Fuels in all industry – 3%	Chemicals, fuels and lubricants (50% expenditures in crop production) Electricity and gas (15-20%)	Oil -producing and oil-refining industries Gas extractive industry Ore mining and processing enterprises **S&T complex**	Agriculture Special metallurgy Electronics Chemical industry ICT **S&T complex**	Almost all industries **S&T complex**	Ferrous and nonferrous metallurgy Machine building Chemical industry	Electronics Educational system **S&T complex**
Main consumers	Metallurgy - 32,9% Machine building -33% Construction - 20% Transport - 3.8% Energy sector - 1,7%	Machine building-29% Ferrous metallurgy - 5,2% Construction - 2,9%	Food industry Pharmacy Energy sector **Householders**	Machine building – 8% Construction - 7% Residential consumption -32% **Householders**	Health -care system **Householders**	Air transport	Sea and river transport	IT- electro energy , IT- finance, ICT, Oil and gas industry **Householders**
Perspectives for development of domestic market and new market niches								
Perspectives for development of domestic markets	Medium growth for mass production Rapid growth for ultimate consumpt.	Medium growth for mass production Rapid growth for ultimate consumption	Medium growth Rapid growth for crops	Rapid growth for most segments, especially in ultimate consumption	Rapid growth	Medium growth	Slow growth	Rapid growth
Possibilities of new significant niches	Low probability	Low probability	Medium probability (organics, bio fuels)	Medium probability (low tonnage and fine chemical products, packaging)	High probability (cure schemes, drugs with delivering)	Low probability	Medium probability (medium tonnage cargo boats, oil platforms)	High probability (electronic services, 5G , GRID systems)
Specificity and technological characteristics								
Level of technologies (quality/ efficiency)	High / Low	High / Low	Medium / very heterogeneous	Medium / heterogeneous	Heterogeneous/ Low	Medium / Heterogeneous	Low / Low	Medium / heterogeneous
Investment projects	Long- term projects (30-50 years)	Long- term projects	Medium-term projects (3-6 years)	Long- term projects (10-15 years)	Long- term projects (15-20 years)	Long- term projects	Long- term projects	Medium and short-term projects
Organizational structure of the sector								
Current structure in Russia	Mass demand – big vertically integrated comp. (64% of all sales) and horizontal integ. comp.	Mass demand big and huge companies, vertical integration	Big agro holdings and enterprises as well as house farms and small companies (10%)	Large-tonnage chemical- big companies	Small and medium enterprises	Big companies, vertical integration	Big companies, vertical integration	IT – SME Telecommunication sector- big companies
Main trends in Russia and other world	Mass demand-mergers; global market cartels, optimization, new global players	Combining of productions, located in different world countries	Development of farmers	New players from Asia. Increasing comp. role of small (low-tonnage chemicals)	Increasing of M&As; creation of integrated comp.; new players from Chine and India	New world players from Brazil and Chine	New players	Increasing of new small firms; Big comp. go to services markets (consulting, health-care)

Basic development models: pharmaceutics and medical equipment*

Alternatives	Models				
	1	2	3	4	5
Domestic market protection (✓) Establishment of comprehensible principles for foreign companies access on the market, priority of companies ready to implement manufacture localization on Russian Federation territory (✗)	✓	✗	✗	✓	✓
Purchase of finished products abroad, copying medical technologies development, standards, infrastructure (✓) New technologies development, participation in new international standards creation, appearance at the world market, innovative way of medical technologies extension, standards, infrastructure (✗)	✓	✗	✓	✓	✓
Retention of existing health service management structure (✓) Creation of united health service management structure (✗)	✓	✗	✗	✗	✗
Absence of industry management by medical-economic factors (✓) Industry management by medical-economic factors (✗)	✓	✗	✗	✗	✗
Retention of national system of standards and supervising authorities activity procedures (✓) Harmonization with European standards, elaborate regulation (✗)	✓	✗	✗	✗	✓
Retention of existing system of medicine expenses compensation (✓) Introduction of contemporary methods of medicine expenses compensation – medicinal insurance (✗)	✓	✗	✗	✗	✗
Spontaneous development on account of current results accomplishment (✓) Development of directions on a priority basis of current morbidity situation (✗)	✓	✗	✗	✗	✗

1 – Inertial development model
2- Innovative development model
3 - Constructive choice model
4- Model «Transition to international system of standards with focus on domestic market»
5 - «National system of standards retention»

*Done using materials of pharmacy sector experts “Institute for Public Health Problems” - report prepared by the order of Interdepartmental Analytical Center

Pharmaceutical and medical industries*

Model «Transition to international system of standards with focus on domestic market»

- Domestic market protection
- Purchase of finished products abroad
- Copying development of technologies

Model «Global market oriented on development of technological and industrial potential»

- Global market orientation, international cooperation
- Virtually total provision of population with own medicine for the main nosologies
- Development of new technologies

- Genetic diagnostics and therapy
- Informatization of clinical and preclinical tests
- Integration of medical school development with physical, biological and IT directions

- «Domestic» medicine, remote medicine, e-health
- Elaboration of healthy life-style standards, definition of a healthy man; control and exposure of sources of danger (for instance, registration of free radicals content); adoption of standards and quotes in regulative documents, inter alia in the system of insurance medicine
- Biometrical identification
- Sensors and markers of food quality
- Remedies, preventing microbes and parasites pullulation.
- Health biomonitoring

- Products and technologies elaboration based on biomedical technologies
- Products and technologies elaboration based on bioengineering technologies
- Microbiological synthesis
- Preparation elaboration of new generation for nuclear medicine
- Personified medicine
- Molecular, cellulate level of diagnostics and manipulation, nanotechnologies
- Remodeling of human body, regenerative medicine
- Informational medical technologies

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Information sector development scenarios: possible transitions*

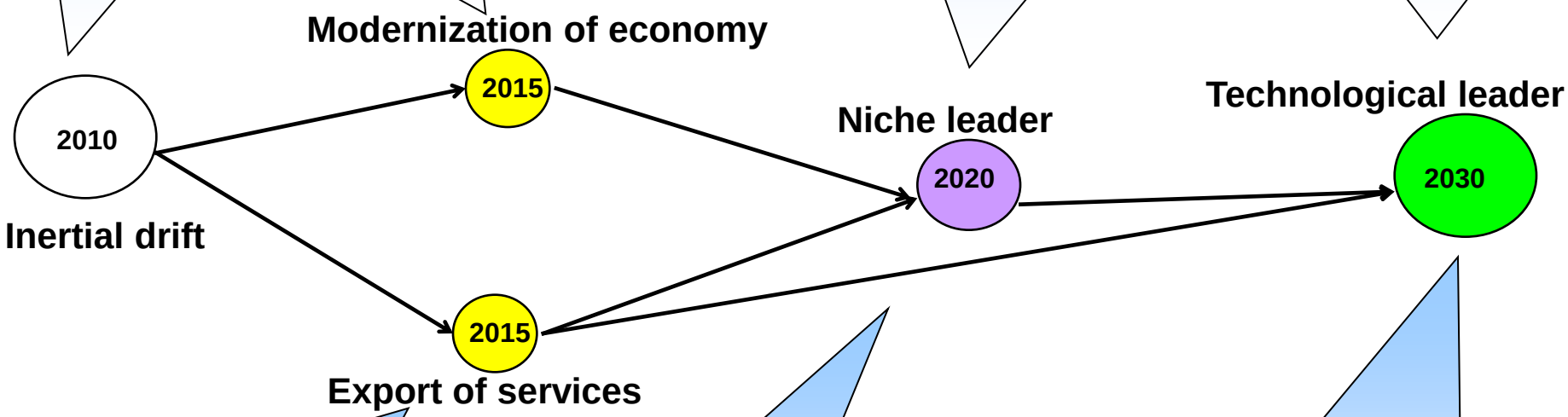
Barriers
- Low level of demand on ICT technologies from the side of companies-consumers
- Undeveloped level of eco environment for risk investments
- Deficit of expertise

Advantages
- Los risks of implementation

Policy accents
- HR problem resolution
- Stimulation of economy innovative development

Vision
- Medium and big enterprises with dominance of Russian capital, oriented on some sectors service
- Knowledge-intensive products and services orientation
- No less than 30% in companies‘ revenue comes from exports
- High level of international cooperation

Vision
- The size of companies might differ
- Complex industry solutions orientation
- No less than 30% in companies‘ revenue comes from exports
- Informational sector of the country is one of the high-ends of the world



Advantages
- Primordial orientation on external market, search and occupation of free niches

Policy accents
- Perfection of export legislation
- ICT services production cost reduction
- Development of service markets with high add value, inter alia by the state initiative

Advantages
- Usage of existing potential in separate directions of ICT
- Low barriers of entrance on the market

Policy accents
- Perfection of development institutes system
- Economic sanctions for outdated technologies usage

Advantages
- Strong positive impact on raise of overall level of competitiveness of Russian economy

Policy accents
- Knowledge generation environment development, conduction of interdisciplinary researches.
- Investment system perfection
- Professional associations and communities development, closely connected with sphere of education
- Participation in international cooperation

*Using materials of ICT experts “REAL-IT”- report done by the order of Interdepartmental Analytical Center

Some issues and lessons of industrial S&T Forecast

Scenarios of sector development cannot be constructed separately, without global trends and opportunities of new markets in global context

For a few sectors (ferrous and non ferrous metallurgy, ICT) it's not possible to get to the desired future directly: one should get a "bridgehead" fist, and then through the "switching models" archive the final vision

Difficulties with codification" of obtained results: one should construct a "meta language" of the project which could translate expert materials at list from two languages: technical and economic

Insufficient level of contribution from federal and regional authorities in formation of visions and scenarios: quality of the project depends essentially on experts involvement in application of technologic modernization policy buildup at a level of interested ministries

Lack of "success stories" and good demonstration examples restricts potential demand from business society for participation in foresight and forecast projects

Important role of actors for realization of certain innovation scenario- most strategic documents just omit description of positional actors of their strategies

Huge mutual influence of the sectors was ascertain but in current strategic documents it is considered fragmentally and inconsistent

Most strategic documents of sector's development set some discrete periods (say, 2015-2020) for development, but they do not show what to do in certain moment of time (great need for timeline)

Most strategic documents of sector's development set some technological priorities without any break down on models or scenarios – as a result- it's quite hard to give a real estimate of the resources needed and the efficiency of their spending

Russian sectors are multistructural, they characterize by obviously many different beneficiaries and actors, different technological and economic structure – as a result the Government should switch from the policy of unique instruments, towards the personalized innovation policy, taking into account the specification of each sector (sub sector)

Use of the Forecast results: required steps and important directions

Required steps for the Forecast results application support in decision making in sphere of innovations

- To concentrate efforts at the limited range of instruments
- To define the sequence of operations for practical integration of the Forecast results for each of selected directions
- To work out specialized display formats of the Forecast results, which would be easy-to-use in decision-making
- To determine organization interaction mechanisms with state structure agents and expert exchange
- To provide transparency of the Forecast results applicative accounting in decision making inside of the state innovative policy

Important directions of the Forecast results application

- Specification of individual industries and sectors innovative development, inter alia agroindustrial complex, chemistry, pharmaceutics
- Determination of the complex of high-priority measures in industrial regulation enhancement for improvement of conditions for leading-edge technologies distribution
- Creation of new major initiatives in sphere of innovations, in particular national initiative of bioindustry development
- Proposals for the range of big innovative projects elaboration and consideration, connected with working out technology packages and output of fundamentally new production on the basis of it

New opportunities for interaction in the Foresight generation

Integral contribution of public authorities agents in the Forecast formation: not only at the stage of the forecast results consideration, but at the initial stages, connected with scenarios formulation, models of economy, markets and industries future development

Enhancement of expert cooperation

- Elaboration of technologic platform realization projects and their selection for inclusion into the list of the most important platforms, approved by the Governmental High-Technologies and Innovations Committee and the monitoring of their implementation
- Design of innovative development programs by major public companies and monitoring of their implementation process
- Transition to long-term state programs within budget planning process, in particular working out state program “Development of science and technologies”
- Transition to long-term planning of public purchases and step-by-step raise of requirements to the quality and new features of production (services), purchased for public needs
- Preparation and realization of pilot projects in innovative segment expansion of purchases for public needs

Roadmaps for innovation development of Russian key sectors : key aspects of the project

Roadmap definition

Roadmap is an instrument for government innovation policy, aimed at assessment of different decisions, giving the grounds for choice of various innovation development scenarios for each sector, taking into account economic efficiency in every point of decision making

Main steps

- Constructing of scenario based forecast for each sector, containing on the time line possible strategic alternatives that demand decision making and possible development models (including innovation)
- Shaping of variants for possible scenarios based on innovation
- Development of roadmaps as a scheme, connecting market, product, technology, resources, decisions and consequences layers

Some key aspects

- ✓Estimation of sector development is done on the whole period of the forecast, not only in some key points or intervals
- ✓By sector we assume not only production part of the chain, but also services (e.g. public services)
- ✓Current and short-term aspects of sector modernization and innovation we investigate equally with global trend and long-term perspectives
- ✓Intensive work with new institutional communication platforms for discussing results of foresights and forecasts, formulating certain R&D directions and projects, develop different innovation policy recommendations (state owned companies, research universities, technology platforms, ect.)
- ✓Developing and educating of expert net, containing industrial experts, representatives of business associations, typical companies, national research universities and aimed at designing, monitoring and verifying of sectoral roadmaps

Target audience and beneficiaries

- ✓Industry ministries, while developing and verifying industrial strategies, state programs, R&D projects and decisions on future visions of the sectors
- ✓Ministry for Science and Education, while verifying state programs of long term S&T development, constructing the list of critical technologies, R&D themes, agenda for educational standards
- ✓Regional authorities, while developing and verifying regional innovation strategies and programs
- ✓State owned corporations, while developing and verifying programs and strategies of innovation developing using information on possible steps and decisions from key ministries and business representatives in their sector
- ✓National research universities, while developing S&T directions, as well as the programs and forecasting centers
- ✓Technology platform groups - as a basis for future steps and decisions

Thank you!

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