Russia's "National Technology Initiative"

or

"Waiting for the High-Tech Tooth-Fairy"!

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This paper had its genesis during the author's participation in the 2016 "Foresight Fleet" (four boats) journey down the Volga River in May. Jointly organized by the "Agency for Strategic Initiatives" (ASI) and the "Russian Venture Company" (RVC), it aimed to consider various aspects of the "National Technology Initiative" (NTI) which is billed as "a program for creation of fundamentally new markets and the creation of conditions for global technological leadership of Russia by 2035". I found it to be (at least on my boat, the "Global Markets / World") an intellectually stifling event. The discussion groups on pre-designated topics supposedly produced considered group recommendations. But, they in fact, operated to produce forced recommendations as the generation of output quantity was prioritized over output quality. Talking to the few other foreigners (and quite a few Russians) on my boat, I found considerable agreement with my views. On 21 July, I attended a NTI forum at VDNH.

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ABSTRACT

This paper argues that Russia's National Technology Initiative (NTI), which aims to boost the country's future high-tech production and exports, is likely to achieve little and should be severely modified or even abolished.

The NTI concept of focusing on selected "new markets" that are expected to exist in 2035 is misguided. Its execution process, particularly the use of the Rapid Foresight methodology, results in recommendations that are banal or vague.

If Russia wants to make serious advances in future high-tech "production", it needs a technology policy that puts more emphasis on promoting Russian "usage" of presently available technologies. Much technological progress actually flows from the initiatives of "users" of present technologies and the feed-back they give to "producers".

The threats to Russia from increased multi-country economic/trading blocs/alliances and inaccessible "global value added chains", used to provide justification for the NTI, are overstated.

Apart from education – which is the only redeeming feature of the NTI – one of the best ways for the Russian government to improve Russia as a high-tech "producer" is to push structural economic reform because increasing competitive pressures encourage organizations to become better "users" of high-tech.

If Russia does not become a better "user" of high-tech, there is a risk that other countries will get greater benefits than Russia from any Russian developed high-tech products. If such Russian high-tech products were actually to be developed using government budgetary funds under the NTI (or any other government program), this would also mean that Russian tax-payers were subsidizing high-tech "users" in other countries.

Irrespective of government policy actions (including the NTI), the rapid pace of technology change and falling technology prices (relative to other prices) means that, at the country level, "users" can easily receive greater economic benefits than "producers" because of improvements in their "terms of trade".

Keywords: National Technology Initiative, Russia, Rapid Foresight

1. What is the "National Technology Initiative" (NTI)?

(a) The Idea

The proposal for the National Technology Initiative (NTI) was first presented by President Putin in his address to the National Assembly on 4 December, 2014. He said: "On the basis of long-term forecasting, it is necessary to understand what challenges Russia will face in 10-15 years, which innovative solutions will be required in order to ensure national security, quality of life, and development of the sectors of the new technological order."[1]

Subsequently, a series of steps were taken and a report on implementation of this idea was prepared for the president in the middle of 2015, and a formal government resolution was made in April 2016: "Government of the Russian Federation, resolution from 18 April 2016 № 312, Moscow, "On the Realization of National Technology Initiative."[2]

Available evidence suggests that there were two main threads of reasoning behind the establishment of the NTI.

One thread of reasoning is a desire to escape the so-called "resource curse", or the overdependence on exploitation of natural resources for economic growth and national wealth, which is often seen as a cause of instability because of resource price volatility. Such an escape requires the economy to produce a greater range of goods and services with fewer cyclical swings in prices. Russia is not original in such thinking. Australia is often nominated as a "resource cursed" country, and has at times adopted various forms of "industry policy" in an attempt to achieve economic diversification – although, on the whole, it has learnt to live with its "curse' and take maximum advantage of it.

The other thread of the NTI reasoning was a very explicit Russian desire to take advantage of rapidly changing technology to produce new goods and services for both economic growth and for national security purposes. The national security aspect of this reasoning is strong – particularly compared to Australia – and reflects a view of the world that is overtly hostile to Russia.

A NTI forum and exhibition was held at VDNH beginning 21 July, 2016. A number of Russian language documents were available, including two Versions of "National Technology Initiative, Strategic Study, Key Hypotheses of NTI – Preliminary material to develop the NTI Strategy" [3]

Version 1 stated: "Russia faces a very difficult task in overcoming the 'resources curse', diversifying its economy and increasing its global competitiveness." It also states: "The nation must resolve the issue of securing technological independence." "Those countries which can develop global high-tech companies substantially increase their influence on world events and global processes."

Under the heading "International Cooperation", Version 1 provides a rationalization for the existence of the NTI based on a specific view of international conditions and future developments.

The world is seen as being increasingly divided into closed "economic-trade" blocs formed on the basis of a combination of economic and political issues. These blocs, or "alliances, aim to develop and retain production "value added chains" that are protected from outside competition by ensuring that their rules and standards become the norm – while those of the World Trade Organization are swept aside when it is to the advantage of bloc/alliance participants.

According to Version 1, much of this bloc/alliance formation process is being driven by the demands of large corporations which use their money and power to influence governments. It then relates these blocs/alliances to technological developments. Countries and companies which are outside these blocs/alliances and their value added chains cannot break into them because the

technological standards (and IP protection etc) have already been set to disadvantage them. This is seen as particularly the case with advanced technology.

The arguments of Version 1 then move on to technological "breakthroughs" which are transforming existing markets and creating new markets. NTI is given the goal of making Russia "one of the 'big three' major technological states by 2035, and having its own high-tech specialization in the global chain of creating additional value".

In order to achieve this, Russia will need its own bloc/alliance or participate in others in such a way that it becomes a leader in "developing and confirming international technical standards".

The overall tone of these arguments in Version 1 suggests few possibilities for cooperation with existing economic-trade blocs. However, some other statements by various influential people are not so negative.

A 18 May Russian language posting on the "Agency for Strategic Initiatives" internet site says:

"Scientific super-states are being formed, which collect talents from all over the world. There is European, American and Chinese science, which gathers talents like a vacuum cleaner. We can either cooperate with them or lose talents." "New systems of global blocs and technological alliances with their own jurisdictions are being formed, and Russia needs to join." "Global technology monopolies influence the world more than states, but players in our country do not cooperate with those players who dictate the rules of the game."[4]

This less negative tone also seemed to be the message that was delivered by President Putin to the St. Petersburg Economic Forum on 17 June 2016:

"Today we see attempts to secure or even monopolize the benefits of new generation technologies. This, I think, is the motive behind the creation of restricted areas with regulatory barriers to reduce the cross-flow of breakthrough technologies to other regions of the world with fairly tight control over cooperation chains for maximum gain from technological advances."[5]

At the same time, Putin said that "holding back that or another technology, even in a big geographical area, is not possible."

Whatever the exact Russian view on international trade and technology issues (and, of course, different individuals and organizations in a country often have differing views), it is clear that it contains a strong dose of economic autarchy which is seen as a necessary precursor to strengthening Russia's international economic position and security.

(b) Technology Targets

The Merriam-Webster dictionary defines "high technology" as the "use or creation of new scientific methods or materials especially when they involve computers or electronic devices".

Zweck et al., 2014 in "International Foresight of the 2000s: Comparative Analysis", ABSTRACT, summarized "the experience of technology Foresight studies carried out since 2004 in China, Japan, France, UK, USA and the EU" and found that all studies assumed that "ICT (information and communications technology) was a prerequisite for progress in other areas". [6] Thus, the reality is that most contemporary high-tech issues are really about the possibilities offered by digitalization.

Rather than produce a definition of "high-tech" or the "new technological order" (specified in Putin's December 2014 address) the NTI documentation essentially tells us what these things are by giving some general criteria about their future importance and prospects for development in Russia.

According to Version 1 of the "National Technology Initiative, Strategic Study, Key Hypotheses of NTI": "NTI focusses on developing new technology markets, the so-called Blue Oceans, which are appearing as a result of the technological revolution. The choice of NTI projects arises from their prospects and dynamics of growth."

A document headed, "About the National Technology Initiative" (under logos of the Agency for Strategic Initiatives and the Russian Venture Company), was sent to me before I participated in the May, 2016 "Foresight Fleet" (this "Fleet" will be discussed in detail later in this paper). It indicates that "the choice of markets for NTI is based on the following criteria":

"The market will become significant and globally recognizable: its size will exceed $US 100 billion by 2035"; "at the moment the market is in its infancy or there are no generally accepted/established technological standards"; "the market is primarily focused on the needs of human consumers as end users (the priority of B2C over B2B)"; "the market will look like a network in which intermediaries will be substituted by controllable software"; "the market is important for Russia from the standpoint of ensuring its basic needs and security needs"; "in Russia, there are conditions for achievement of competitive advantage and skills for securing significant market share"; "in Russia, there are technology entrepreneurs with ambitions to spearhead leading companies for this high-tech market."

The same document identified nine "new technology markets":

1. AeroNet: "Market for distributed systems of pilotless aircraft."

2. MariNet: "Market for maritime intellectual system, which includes a number of interrelated segments: digital navigation, innovative shipbuilding, technologies for the procurement of ocean resources, space and satellite technologies."

3. AutoNet: "Market for unmanned road transportation based on the development of sensor systems, and software for recognition of road situations and transport management."

4. NeuroNet: "Market for man-machines communications devices based on advanced developments in neuro-technologies."

5. EnergyNet: "Energy market based on technology solutions which ensure intellectualization and distributed nature of electricity grids (the so-called "smart grid")."

6. FoodNet: "Food market which provides for intellectualization, automation, and robotization of technology processes along the entire lifecycle of food products as well as the advancement of biotechnology."

7. HealthNet: "Market for personalized medicine which includes segments of IT devices and platforms for sustaining health and treatment, sports, health, preventative medicine, new medical materials, bioprosthetics, artificial body organs, personal pharmacological drugs, ageing diseases and preventative care for the elderly."

8. SafeNet: "Market for new personal security systems including such segments as protected communications channels and biometric systems for authentication."

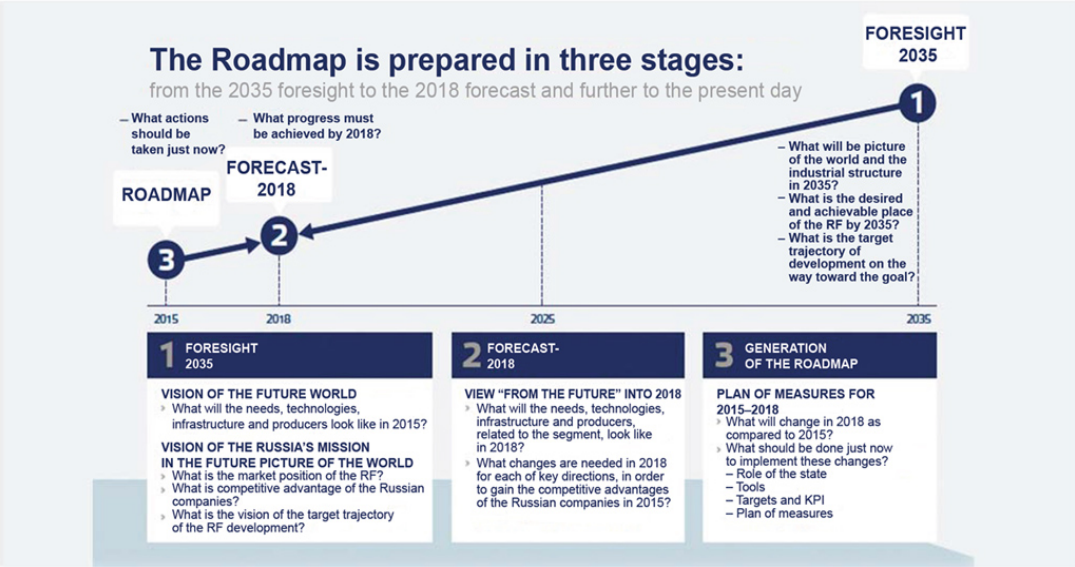
9. FinNet: "Decentralized financial currencies. Payment financial infrastructure will play a key role in increasing the efficiency of market transactions. Due to the increasing number of financial settlement systems payments are becoming increasingly decentralized".

The NTI aims to make Russia a global technology leader by 2035 by creating conditions for increasing the competitiveness of Russian business in these nominated new markets. The year 2035 is described as a "planning horizon" – that is, "the extreme point to which we extend our forecasts projects".

The "About the National Technology Initiative" document also reported that the "main tool for NTI development is a system of roadmaps" which are "documents for the strategic planning which contain a set of activities which are interrelated in terms of goals, tasks, and resources, as

well as the state policy tools". "Meanwhile, the NTI roadmaps will be built at the level of practical actions for 2015-18 with control of their implementation every six months."[7]

The methodology is shown in the form of the following diagram taken from the NTI internet site:



Source: Agency for Strategic Initiatives, 2016 (Available at https://asi.ru/eng/nti/)

Version 1 contains another diagram which shows how the NTI will be used to nurture "technology champions". Up until 2025, the NTI will essentially be putting in place a framework for supporting the process, and after that the process of creating such champions will be more specific.

The NTI says (on its internet site) that it "has no task of import substitution" but emphasizes "the creation of strategies to develop fundamentally new markets". "However", it says, "a part of key technologies that form precursor markets may appear within the process of import substitution".

Version 2 contains a diagram showing the supposed cumulative effect of the NTI on economic indicators. Among these, the share of Russian high-tech exports in world trade must exceed 1%. The number of "NTI companies" should grow from 25,000 in 2025 to 500,000 in 2035, and the share of private investment in the research program of the NTI should rise from 50% to 80%. By 2035, the "NTI market" should be equal to 50% of the Russian economy, and Russia should rank in the top-10 countries in terms of "exporting intellectual property", and in the top-5 (using the Bloomberg Innovation Index) of the number of people per 1 million of population engaged in R&D.

There is also a "NTI indicator" which is not elaborated on, but would seem to suggest extreme speed in some decision making involving specific projects:

"Maximum speed in making decisions: from idea to taking a decision and administrative activity will be no more than 60 minutes (currently takes up to 1 year)"

(c) The Particular Role of "Foresight" and "Foresight Fleet"

The "foresight methodology" is very intertwined with the NTI and gets a specific mention in the above mentioned 18 April 2016 government resolution concerning the NTI.

It says: “Recommend that independent non-commercial organization ‘Agency for Strategic Initiatives on Advancement of New Projects’: within 6 months of the day of this resolution entering into force, prepare a long-term strategic plan for development of the National Technology Initiative and proposals for its over-sight; provide arrangements for expert analysis, including the foresight method, with the aim of preparing proposals for the formation of an action plan (‘road maps’) and the creation of working groups on their development and realization; participate in the development of the planned measures (road maps) and projects with the aim of implementation of the measures (road maps).”[8]

So, what is the “foresight-method”?

Dezhina and Ponomarev, trace the emergence of the foresight method “back to the 1950s, when the RAND Corporation in the US developed the Delphi method to identify priority science and technology areas.” [9] The RAND Corporation says: “The method entails a group of experts who anonymously reply to questionnaires and subsequently receive feedback in the form of a statistical representation of the ‘group response’, after which the process repeats itself. The goal is to reduce the range of responses and arrive at something closer to expert consensus.”[10]

The essence of the method is that each forecaster has the opportunity to privately spend time to make an initial forecast, then privately reconsider their views in the light of what the group is saying and, if they wish, to anonymously express a changed view which is used to calculate an updated group view. Olaf Helmer, “Analysis of the Future: the Delphi Method”, described the process in more detail.[11]

The “foresight method” which is actually being used as part of the NTI initiative is a simplified version of what the RAND Corporation developed. It is called “Rapid Foresight” (RF), and a 70 page Russian language manual is available online.[12]

According to the manual[13]: “This new method does not need a budget as large as more traditional (classical) foresight methods, but allows the achievement of comparable or even better results than produced by various classical combinations. Achieving valuable or verifiable results using this method takes only days or even hours.”

According to the manual, “RF participants work together using a time map, which is a reference scheme placed on a large sheet of paper. It includes three sections based on event horizons: the near (next five years), the average (in the next ten years) and the long-range (15-20 years ahead). With the assistance of a moderator, participants place cards on parts of the “time map”. Each card contains some written idea about the essence of some aspect of the future which could be related to the subject being considered: trends, technologies, formats, threats, etc. Step by step, this creates an image of the future. This RF approach differs from the majority of traditional foresight methods in a number of ways. Firstly, the joint work of participants is carried out not with the texts (as described above in the Delphi method), but with images and diagrams. Secondly, the work takes place around common images and patterns, unlike, for example, the method of expert panels and round-table discussion; work thus becomes truly collaborative and collective. Moreover, the use of carefully designed maps and charts allows each participant to overcome the limits of their ordinary subjective thinking, so creating a unique environment for new thoughts.”[14]

The RF method is also claimed to be better that the traditional Delphi method because it is “proactive in relation to future events”. “Authors and participants of foresight do not only individually and simply estimate the probability and risks of certain things in the future, but actively and jointly plan current and future activities in order to strengthen positive trends and weaken undesirable trends.”

The manual says that RF “a visually rich space that allows the whole subject area to be viewed. The future map can be easily transformed by the participants into the goal-oriented "road map" – not only an easy-to-use visual image of the joint future, including key trends, forecasts of technology developments, events, strategic forks in the road, but also points of decision-making and

launching of the specific social or technological activities or projects, and plans for legislative and lobbying actions."

According to the NTI internet site, Foresight Feet "became a key point of designing and assembling of 'Roadmaps' of the NTI in 2015. For 5 days, over 600 participants – technology entrepreneurs, venture investors, scientists, representatives of scientific environment and development institutes, business and social associations, leaders of enterprises in the real sector economy, federal executive bodies – have been designing the prospective markets and developing "roadmaps" for Russian technological companies – national champions – to emerge in these markets by 2035."

There are various official internet sites covering aspects of the NTI and the more recent 2016 Foresight Fleet. An overview is presented in a 30 May Russian Venture Company (RVC) English-language press-release headed: "Foresight Fleet 2016 introduced 70 projects for NTI strategy"[15]

It says: "The fifth Foresight Fleet completed its work on May 19, 2016. During 5 days, more than 700 participants on ships "Business", "State" (which was sometimes referred to as "Government"), "World" (which was sometimes referred to as "Global Markets") and "Society" have been designing a development and management strategy for the NTI. Foresight Fleet navigated the Volga from Samara to Astrakhan, with a stop in Volgograd where ship participants exchanged opinions on the projects. More than 150 initiatives were presented. Many of them were included in the final presentations of 70 projects."

(d) Role of Private Sector in the NTI

The English language version of the NTI internet site says: "Up to now, all the major issues of innovation development have been solved by smart officials, it has been a sphere of bureaucratic regulation. The NTI must create the conditions in which private money will be more important than public money – and we believe that projects with private investment will be more efficient."[16]

The earlier mentioned document, "About the National Technology Initiative", says that the NTI "is a long-term program for public-private partnership (PPP)" which sees "Russia taking an ever more active role in setting of standards of future global markets, while ensuring that Russian companies will secure a significant market share. Public-private partnership will be the priority form for ensuring cooperation within NTI and implementation of joint interests of businesses, sciences and education, as well as public governance." "NTI is to be initially built as a coalition which stipulates for the formation of project groups consisting of technology entrepreneurs, leading universities and R&D centers, major business associations of the Russian Federation, institutes for development, expert communities, as well as relevant stakeholders representing national executive authorities."

Version 1 of "National Technology Initiative, Strategic Study, Key Hypotheses of NTI", has a section entitled "Attracting private participants and co-financiers". The private sector is to be attracted in a number of ways, including:

"Give grants for financing NTI companies which already are receiving financing from alternative sources"; "support creation of corporate and sector venture funds within the scope of NTI markets with participation of management companies chosen on a competitive basis"; "increase access to borrowed funds from commercial banks and lower the interest rate on borrowings by companies associated with the NTI"; "cross-over to a practice of developing infrastructure objects for the NTI only on the basis of private-public partnerships".

(e) Other NTI Support Measures

Version 1 of "National Technology Initiative, Strategic Study, Key Hypotheses of NTI" has a section entitled "Creating comfortable jurisdiction for NTI companies". A number of forms of "taxation stimulation" are suggested, including a "non-budget fund" for companies involved in NTI exports, VAT concessions, income tax concessions etc.

There are also suggestions ("needed decisions") for "increasing the competitiveness of the Russian jurisdiction from the point of view of quality and convenience of the legal environment for conducting business in markets of the NTI" including: "Envisage state and state companies purchasing products from 'quasi-monopoly' supplier companies in order to stimulate demand for the products of NTI companies" and the need to "create a specialist arbitration court for NTI companies".

Suggested "Special mechanisms of support" include: "Financial instruments to allow Russian investors to obtain foreign technology which is critically necessary for the development of individual companies of the NTI and markets of the NTI."

2. Reasons the NTI will Fail

The NTI is very unlikely succeed in its objectives a for a variety reasons. At the highest level, the concept of choosing "national champions" is misguided. But, even if an attempt is made to do this, the Rapid Foresight and Foresight Fleet methods for identifying these possibilities are greatly flawed, and the follow-up steps for developing such possibilities would seem to multiply the changes for misallocation of scarce resources.

(a) The NTI Concept is Misguided

As noted earlier, rapidly advancing technology is really associated with digitalization. McKinsey, when discussing its broad concept of "digitalization" says:

"Given the speed with which new innovations, new markets, and new disruptions appear, creating a five- or ten-year plan is becoming an exercise in futility. Long-term forecasting exercises are less relevant and reliable, while agility is more critical than ever. Large incumbents cannot afford to maintain cumbersome decision-making processes and slow-moving corporate cultures. Borrowing a page from winning tech firms, they need a new mindset that focuses on learning, experimenting, and iterating. Even the most successful tech giants never stop innovating, pivoting, and adjusting their platforms".

McKinsey also say that "digitization seems to intensify competitive churn. Today's market leaders are vulnerable to being knocked off by the next wave of innovation."[17]

The NTI envisaged designation of high-tech "national champions" – whether it be companies or products – means that someone must make a decision on which high-tech issues are to be pursued. The rapid changes in technology make this selection process very difficult – and mistakes can be very costly.

Who will be the final arbiter here? Would the arbiter of only a few years ago have designated Nokia and Research in Motion (manufacturer of the BlackBerry) as national champions if they had been Russian companies? "National champions" can quickly become "national failures".

Moreover, a "national champion" for high-tech / digitalization is unlikely to set sufficiently high standards for high-tech exports. Michael Porter's book, "The Competitiveness of Nations"[18], extensively examined the impact of domestic competition in increasing the international

competitiveness of companies – and it is very positive. The NTI says nothing about subjecting "national champions" to such domestic competition.

President Putin, in his 17 July speech to the St. Petersburg Economic Forum said: "Our import replacement program is also aimed at manufacturing goods that are competitive on the global market. And in this sense, I would also like to stress that import replacement is an important stage for expanding exports in sectors other than raw materials and finding a place for our companies in global manufacturing and technological alliances – and not in secondary roles, but as strong and effective partners."

The danger is that every domestic producer of what-ever technology will want to be nominated as a "part of key technology". Which then takes us back to the issue of "key technology" national champions. Even "part of key technology" import-substitution is likely to impede increasing high-tech producer standards by reducing competition.

In this view of this author, the long-time perspectives and the Rapid Foresight methodology for choosing NTI projects (more will be said about this later) mean that the "private-sector" is only likely to become significantly involved if there are various very significant financial concessions for doing so.

It should be noted that nowhere in any of the publicly available NTI documentation (as far as this author can see) is there an attempt to set out a detailed mechanism for determining when a company is an "NTI company" or working in an "NTI market". This is not surprising for the simple reason that the task will often be very difficult, and there will be many companies making bogus claims for NTI status in order to get access to the various taxation and financial concessions and other measures of government support.

(b) The "Foresight Procedure" is Flawed

In the view of this author, the "foresight" methodology (whether it be the Delphi or later versions such as Rapid Foresight) does not seem to produce results any better than what might be produced by a few well-read people in a round-table discussion.

Dezhina & Ponomarev, (2016)[19], note that certain issues continue to arise: "Continuous forecast and Foresight studies make it possible to identify global trends affecting S&T development up to 2030. These include: regionalization of energy markets, expanding the use of alternative energy sources, improving energy saving methods while maintaining a significant share of hydrocarbons in global energy consumption, and a possible major change in the structure of hydrocarbon fuel supplied to the market; regionalization of goods production and reindustrialization of developed countries; change in the demographic structure of developed countries amid ageing populations; growing financial and intellectual stratification and the formation of new stable social strata; new stage of digitalization in the social and economic spheres."

They say: "Global experience in identifying priority S&T areas shows that they are similar in many countries, despite their different levels of industrial development. As a rule, these priorities include: biotechnology; next-generation information technologies; energy and energy saving technologies; new materials.

Others have come to similar conclusions. Zweck at al., (2014), ABSTRACT: "The article summarizes the experience of technology Foresight studies carried out since 2004 in China, Japan, France, UK, USA and the EU. Despite the many differences observed between the studies, we note some significant common issues. All the foresight studies we analyzed gave priority to energy; health, medicine, nutrition; biotechnology / life sciences; nano- and microsystems technology; and also to ICT, electronics, manufacturing, process and material technology, environment, defence and space technologies."[20]

While there will be many views on the listing, the view of this author is that any reasonably intelligent person who was a conscientious reader of higher-quality daily newspapers and journals could have easily come-up with this list!

(c) "Rapid Foresight" and "Foresight Fleet" is a Doubly Flawed Combination

The various official internet sites covering aspects of the 2016 "Foresight Fleet" paint a very positive picture of the process and results. In the view of this author, who participated in various groups on the "World" ship, little of this is justified.

Instead of letting the (flawed) Rapid Foresight (RF) process work as well as could be expected, there was great pressure on the various groups to come up with a view and produce a recommendation. The discussion leaders (so-called moderators) worked to ensure that RF was the only method of discussion in the groups (although, of course, there was free discussion between people at meal times).

This author is very uncomfortable with the central role of visual aspects in the RF process. Visual aids can be very useful in helping the mind understand complex issue, but their extensive role in the RF process risks them becoming the main drivers of thought.

Moreover, the overall description of the work and possible outcome of RF seems very close to the words of Olaf Helmer when making the case that the Delphi method is better than round-table discussion:

"Perhaps the traditional way and in many ways the simplest method of achieving a consensus has been to conduct a round-table discussion among the experts and have them arrive at an agreed-upon group position. This procedure is open to a number of objections. In particular, the outcome is apt to be a compromise between divergent views, arrived at all too often under the influence of certain psychological factors, such as specious persuasion by the member with the greatest supposed authority or even merely the loudest voice, the unwillingness to abandon publicly expressed opinions, and the bandwagon effect of majority opinions."[21]

In the view of the author, the only unusual feature of RF is that it is more visual than a normal round-table discussion would generally be. Compared to more "classical" foresight methods (such as Delphi), RF offers the advantages of speedy results. However, it cedes the advantages of more "classical" foresight methods which give more time for participants to reconsider their views in private.[22]

What follows is an edited version of a 2 June Russian language posting on the "Foresight Fleet" internet site entitled: "Everyone participated in considering how Russia can move to technological leadership."[23]

According to Evgeny Kuznetsov ("World" ship director, and deputy general director of RVC), the 2016 Foresight-Fleet was dedicated to developing a strategy for implementation and management of the NTI.

"Work on the "World" ship quickly determined several tasks. First of these – create effective channel and instrument for promoting Russian products on global markets. Such a program is in use in most developed countries, but in Russia is implemented with significant gaps, particularly in the technology area. "The second task – is a search for Russia's place in global technology policy, although the very concept of global technology policy is still missing; and, basically, we are talking about the economic, political, military and other cooperation between

countries." "And the third direction - it is the globalization of Russian science and education, creation of a 'knowledge society' and knowledge-based economy in Russia, which is not only provides talents for the global economy but also become attractive for talents to travel to Russia and work at our universities and scientific centers. In all these three directions, we have particular projects that we expect to start implementing now."

"An important step was taken on this fleet towards understanding the existing specific role for universities in implementing the NTI and in creating the infrastructure for a knowledge economy. The main conclusion is that the university should be designed not only as modern knowledge corporations, but to be "University 3.0" – that is, to work not only in education and science, but also in business and be involved in creating new markets."

The English language version of the 30 May press-release says: "Evgeny Kuznetsov highlighted several projects out of those developed by the participants. "15000 scientists" project. Its objective is to engage perspective scientists from abroad and to create comfortable conditions for research work in Russia."

The same press-release also says: "In the opinion of Evgeny Kuznetsov, the Russia Go Global project of public and private initiative to support high-tech NTI exports is also promising. Russia Go Global will consolidate representatives of business communities, business, institutes of development and special state authorities to achieve the complete set of NTI objectives. Specific projects presented by the task force are being developed. For example, the project aimed at providing assistance to companies participating in NTI in transforming into transnational corporations and support of high-tech transnational corporations of Russian origin. The project related to creation of a single window to reduce administrative barriers in export of services provided by the Russian high technology companies."[i]

The APPENDIX to this paper contains reported results of work of the "Business", "State" and "Society" ships. They are included in an Appendix mainly for the record.

In the view of this author, the results 2016 "Foresight Fleet" are hardly inspiring. Banality, vagueness and duplication dominate and the few of the specific recommendations are original.[24]

I would also note a particular issue using the example of "FinNet".

The English version of RVC press-release of 30 May says that the Venture Capital subgroup of the "FinNet" group "proposed to bring Russia to Top-5 global venture markets by 2035 through creation of the global venture hub with a portfolio of financial tools that will provide

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[i] Toward the end of the whole trip I was invited to join the "Export" group, where a reasonable attempt was being made to bring focus to the task at hand. Here it was explicitly recognized that the "Rapid Foresight" methodology did not allow any other form of discussion. I had been asked by the "Foresight Fleet" organizers to give a presentation in Samara on 14 May (the day before the fleet began sailing), possibly on the expectation that, given my background (working on financial issues in Australia and China) I would talk mainly about "FinNet". However, my actual speech ranged much wider than this as I used it to highlight the experience of "resource cursed" Australia as a "user" – rather than a "producer" -- of high-tech goods and services. Some members of the "Export" group wanted me to repeat some of my 14 May comments in one of their "Rapid Foresight" sessions on the ship. This became quite a tricky procedural issue because it did not fit into the "Rapid Foresight" process, and there were some discussions about "how" I could be invited to speak. With no possibility of a formal invitation, I basically took the initiative and presented myself as being there – and was allowed to speak for a specified "three minutes". The other clear problem faced by the "Export" group was the very significant pressure (from "Rapid Foresight" discussion moderators) to produce some sort of document with recommendations for presentation at the closing events of the fleet – even if the recommendations were not well considered. In the end, the "Export" group did make some recommendations but they were hardly original, including "Russia Go Global" (as described in the main text).

financing to NTI projects on all development stages. The group indicated the key performance indicators by 2035 as follows: not less than 50% of foreign investments, and 10 NTI technology companies issuing an IPO.

This is an illustration that some of the NTI recommendations rely too much on specific indicators (somewhat like KPIs) rather than considering general underlying principles that might lead to success.[25]

Indeed, this is one of the problems with the whole NTI approach. A noted earlier, there are specific numerical targets given for both 2015 and 2035 in terms of numbers of "NTI companies", the size of the "NTI market" relative to the size of the Russian economy, ranking in terms of "exporting intellectual property", ranking in the Bloomberg Innovation Index etc.

In the view of this author, less attention should be paid to such numbers (be they realistic or unrealistic), and more to some other more basic issues of how to achieve something positive (to be covered later in this report under the heading "Possible Alternatives to NTI").

According to RVC press-release of 30 May: "Results of joint work of the people participating in Foresight Fleet 2016 will be submitted for consideration to the President of the Russian Federation Vladimir Putin in July 2016."

But "what will happen if the President does not approve"? According to the NTI internet site: "This would mean that we have badly done our job."[26]

To this author (a non-Russian, Western educated analyst), this answer sounds quite childish.

In the view of this author, the fact that such work is submitted directly to the leader of a country (particularly like Russia where one person has considerable on-going power) carries the great risk that his positive reaction/notation will set in concrete the future amount of work on the project – irrespective of the reality of its success.

3. Possible Alternatives to NTI

(a) "Producer" verses "User"

There seems to be an automatic assumption in Russia that being a very significant high-tech "producer" (and exporter) is now essential for Russia's future prosperity. President Putin's address to the National Assembly on 4 December 2014 is only one piece of evidence on this.

However, given Russia's extensive natural resources, this author would argue that is equally important to be an efficient "user" of technology.

McKinsey, "Digital America: a Tale of the Haves and Have-Mores", ("In Brief" section)[27] say that in their view:

"Digitization is not just about buying IT equipment and systems. The most explosive growth is now in usage as companies continue to integrate digital tools into an ever-widening variety of business processes". McKinsey says: "This broader activity constitutes what we refer to as the 'digitization' of the US economy."[28]

Economists generally claim that a huge IT associated boost to productivity during the late 1990s/early 2000s has since significantly slowed. Industries most affected are both those that "produce" IT and those that "use" IT intensively.

According to McKinsey: "Digitization helped to fuel robust productivity gains from 1995 to 2005, but it remains a puzzle that the ensuing decade of dazzling technological progress has coincided with a slowdown in productivity growth. At least part of this disconnect could be explained by the fact that many recent technological advances have benefited consumers and

society far beyond what is captured in GDP measurements. Another issue could be that relatively recent digital adopters in sectors such as transport, government, and manufacturing have invested in digital assets but have yet to complete the organizational and process changes necessary to fully realize the benefits of technology. This would imply that the economy is experiencing a pause before the resulting productivity gains become apparent."[29]

In the view of this author, almost anyone with a high-tech "smart-phone" will realize that they are using only a fraction of its potential, and that its takes time to learn how to take advantage of that potential. Smarter use of today's version of a smart-phone could probably yield productivity benefits for several years into the future.

So, the important McKinsey point is that "users" may be on the verge of further great productivity gains based on the digitalization that has already occurred.

The late 1990s/early 2000s productivity surge was quite marked in Australia – which is a very significant exporter of natural resources, and often said to suffer (like Russia) from the "resources curse". Australia directly produces very little high-tech (or digital) product. It is however, a relatively enthusiastic high-tech "user".

Australia – as a "user" – also benefited from very advantageous international terms-of-trade. According to McKinsey, "in real terms, the price of ICT goods and services tumbled 63% between 1983 (near the beginning of the desktop and PC wave) and 2010. This decline was especially steep through the 1990's, and particularly so for digital hardware."

An Australian "Bureau of Communications Research" report, "A Primer on Digital Productivity", says that "it is clear that it was sensible strategy for Australia to concentrate on accessing the productivity gains from using ICTs. There has been very strong international competition in the production of ICTs and Australia could effectively import spillover gains (productivity gains from ICT use) generated by overseas manufacturers. Moving into the production of ICTs is any substantial way was neither necessary nor a sensible way to access productivity gains from ICTs".[30]

The uncertain future of technology change means that the relative prices of high-tech things (be they products or services) is uncertain, but the balance of probabilities would seem to be that these prices will continue to fall – ie the "terms of trade" will continue to favor "users".

(b) Being a Better "User" Can Assist in Becoming Better "Producer"

"Using" high-tech helps boost understanding of the importance of "complementary" investments – ie those lower-tech investments that allow the high-tech to be more effectively used.

The "A Primer on Digital Productivity" report says: "Complementary investments could be in: research and development to develop suitable software systems; gathering customer information and setting up databases; training staff in new information systems; restructuring an organization and reassigning tasks and responsibilities consistent with the introduction of new business models."

The process of undertaking this complementary investments gives "users" insights into how high-tech products could be improved, and this information can be fed back to "producers".

de Jong et al, (2009)[31] reported that (Abstract) "a detailed survey of 498 'high-tech' SMEs in the Netherlands shows that process innovation by user firms to be common practice". It says:

"Empirical research by innovation scholars has now clearly documented that many of the innovative products we buy from producers are in fact developed, prototyped, tested and improved by 'lead users'. These individuals and firms often innovate in order to solve their own, ahead-of-market needs. Later, when a commercially-attractive market emerges for these products, producers adopt or learn from products lead users have already developed as an important feedstock to their own product development and commercialization efforts."

For those of a different mind-bent to understand this more fully, consider the progression of military technology during a war. The soldiers at the front give feedback to the weapons designers and producers, and a process of improvement is implemented.

A recent article "Vedomosti" seemed to support aspects of this view: "Dynamic competition, business goes forward – no time to get bored."[32]

"Boris Nuraliev, founder of 1C, says its "1C enterprise" software program can be "customized much quicker than well-known western systems". "For a holding company, it is important that a system quickly 'roll-out' when, for example, a decision is made to replicate in other factories the results of testing in one factory." [33]

Dezhina & Ponomarev, (2016) advance a more centrally-planned version of this interaction between "producers" and "users":

"Taking into account the disparate nature of corporate and state investment in advanced production technologies in developed countries and the opportunities for the Russian economy, a niche may be created by a number of measures specific to Russia. Primarily this involves stimulating in-depth, 'non-competitive', long-term cooperation between potential producers and 'initial customers'. Such cooperation can take place through vertical consortiums of major players, which may be the end-consumers of new technologies, potential developers and producers of technologies and materials, or research structures. A key role can also be played by the support offered for cooperation with 'initial customers' to develop the very best universal technological specifications for the products of potential suppliers of technologies, equipment, and materials. This makes it possible to establish a relatively large initial portfolio of orders and to concentrate small-scale initial resources on developing new products."[34]

However, in the view of this author the Dezhina & Ponomarev, (2016) may on balance actually be counter-productive. There is too much Soviet-style centralization.

Unfortunately, according to its internet site, the NTI has "no task" of "modernization of existing sectors" or, it would seem, any desire to assist Russia to become a better user of high-tech.[35]

(c) What Can Russia Do to be a Better "User"?

Thierry Tressel in "Does Technological Diffusion Explain Australia's Productivity Performance?" concluded that "technological diffusion crucially depends on domestic R&D intensity and human capital."[36]

Education (ie building human capital) is probably the most important potential government policy tool, something that some "Foresight Fleet" participants recognized, perhaps somewhat belatedly.

Boris Ryabov, program director of the "Business" ship mentioned "the unprecedented courage and freedom of mind of the task forces members" when quoted in the English language RVC press-release of 30 May.[37]

"What has changed from the previous (2015) Foresight fleet? For the first time in this year (2016), we began to talk about education a lot. This theme wasn't set by organizers, the idea was coming completely from the participants. We talked of the necessity to learn — through mentoring, from children and by creating society. We also talked about creative work: we came for the first time to the idea that creation of future is not just big companies creating their variant of future for their own benefit. This is all about the joint activity of people which is creating the future. The fact that the idea of co-creation and co-involvement appeared in conversations and thoughts of sound

and mature team of entrepreneurs, investors and representatives of institutes of development, became a real discovery for me". [38]

But why does "domestic R&D intensity" matter?

Era Dabla-Norris et al, (2016) said: "As countries move up value chains, technology transfer tends to be more skill intensive, requiring sufficient R&D in the recipient country to adapt new technologies to local conditions."[39]

"Local conditions" are important irrespective of whether high-tech is imported or domestically produced. As already noted, Australia is not a notable high-tech producer, but there is sufficient local R&D to allow it effectively use imported high-tech in a way that suits local conditions.

McKinsey also talk about the role of competition: "The threat of competition, especially from disruptive new business models, prompts firms to digitize. Digital asset intensity (in the US) rose sharply in telecom, transportation, utilities, and finance at the time that these sectors were deregulated. Tradable services such as finance, information and professional services are more exposed to global competition, and are also more digitized than other services. The threat of impending competition is a greater spur to digitize than actual degree of competition; for instance, business entry and exit rates in a sector (a measure of competitive churn) have no clear link to digitization intensity."[40]

"When digitization reaches critical mass across industries, it can spark fierce price competition, shifting profits, and competitive churn across commercial ecosystems."

The 1986 UK "Big Bang" financial sector reforms are an example of this, and the world's banking industry is presently providing a good example with its robust responses to the "threats" posed by the emerging "FinTech" service providers.

According to Meredith Angwin: "Making investments in new technologies before they are fully proven in increasingly becoming a differentiator for banking services providers."[41]

The overall message here is that is the threat (at least) of competition promotes digitization, once digitization begins it can spread very fast (most likely assisted by a "sufficient" degree of domestic R&D intensity) and has great effects on productivity.

(d) Looking Forward

McKinsey say that "most sectors across the (US) economy are less than 15% as digitized as the leading sectors. We see this pattern at the company level as well as the sector level."[42]

McKinsey (Executive Summary) also say that US "utilities, mining, and manufacturing are in the early stages of digitizing and connecting their physical assets, and they could be at the forefront of the next wave of digitization. Labor-intensive industries such as retail and health care are expanding digital usage, but substantial parts of their large workforces do not use technology extensively. Industries that are both highly labor-intensive and localized, such as construction, leisure and hospitality, also tend to rank lower in usage, notably in the way they conduct customer transactions."

In the view of this author, there would seem to be great opportunities for Russia to improve productivity in all of these sectors

According to McKinsey: "Digitization spread slowly at first, as early advances centered on computing power and affordability. While those trends continue, more recent innovation has focused on connectivity, platforms, data, and software – all of which have inherent network effects and can spread faster than hardware." [43]

The NTI certainly recognizes the importance of "networks". But, by immediately looking to leap to its imagination of how things will be in 2035, Russia risks missing out on the productivity boosting "network effects" that are more immediately, easily and realistically accessible.

4. Conclusion

While the NTI might at first seem an attractive idea, it quickly losses its luster when it is considered in detail.

The suggested measures to allow Russia to escape the "resources curse" and diversify its output of goods and services basically come down to using a dubious forecasting methodology to identify future "new technology order" or high-tech "national champions" despite the lack of evidence of advantages, and despite the risks of failure in an era of rapid technological change. Import-substitution (even if limited to "part of key technologies") may boost some industries for a time, but the great risk is that lack of ongoing competitive pressure will impede broader "digitization" in the economy and the use of high-tech.

The Rapid Foresight methodology being used to identify trends and new markets is a very simplified version of more "classical" foresight methods – based on the Delphi approach -- which themselves are of dubious utility in that they tend toward exposing the obvious. Even if a form of foresight methodology is to be used, the Foresight Fleet would seem to be an unnecessary expense that produces banality, repetitiveness and vagueness.

The "national security" justification for the NTI cannot and should not be easily dismissed. In the view of this author, there is little doubt that proposed groupings such as the Trans-Pacific Partnership (TPP) and the Transatlantic Trade and Investment Partnership (TIIP) are motivated by a combination of economic and political aims.[44] US Secretary of State, John Kerry, makes no secret of this:

"I have worked from day one to emphasize that foreign policy is economic policy and economic policy is foreign policy. Without a doubt, these trade agreements are at the center of defending our strategic interests, deepening our diplomatic relationships, strengthening our national security, and reinforcing our leadership across the globe. And the importance, my friends, cannot be overstated." "Even as we seek to complete TTIP and strengthen our bonds across one ocean, we know that our future prosperity and security will also rest on America's role as a Pacific power. Central to that effort is the adoption of TPP." (Kerry even related the TPP to events in the South China Sea.)

While the TIIP and the TPP may not proceed given the election of Donald Trump as the next US president, the basic motivations described by Kerry will not go away.

However, the election of Trump and the recent Brexit vote in the UK occurred against the great majority of domestic and international corporate opinion, and suggest that some of the NTI arguments about economic/political blocs/alliances with closed "global chains creating additional value" are significantly overstated. Moreover, there is little evidence that China has a particular wish to form or participate in such closed blocs/alliances. China's "One Belt One Road" (OBOR) initiative is virtually the anti-thesis of this.

The one redeeming feature of the NTI is the newfound emphasis on education. This should assist Russia to become a better "user" of existing and future technologies. This would also help achieve some of the NTI "new technology order" aims by allowing Russian producers to more readily take advantage of the feedback that "users" give to "producers. Better "usage" would also allow greater advantage to be taken of existing possible network effects.

Apart from education, one of the best ways for the Russian government to improve Russia as a high-tech "producer" is to push structural economic reform – because rising competitive pressures encourage organizations to become better "users" of existing technology.

The “resources curse” is not always such a bad thing, as Australia has demonstrated by becoming a good high-tech “user” rather than a “producer”. The rapid pace of technology change and falling technology prices means that “users” can easily receive greater economic benefits than “producers” because of improvements in their “terms of trade”. This is a particular possibility when the “producers” are a very small part of the economy in one country, but the “users” are a very large segment of an economy in another country.

If Russian high-tech products were actually to be developed using government budgetary funds under the NTI (or any other government program), this would also mean that Russian tax-payers were subsidizing high-tech “users” in other countries.

Russia should radically change the NTI or abandon it. At the very least, it should not proceed with any future Foresight Fleets and abandon Rapid Foresight as a policy tool.

Appendix

Ship "Business"

During "Foresight Fleet 2016 "the first assembly of results was made - На "Форсайт-флоте 2016" сделали первую сборку результатов

According to Boris Ryabov, program director of the ship "Business", at the "heart" of all discussions was debate of the "NTI Genome" working group, which was engaged in creation of the model businessperson in the NTI context.

Technological businessperson – as carrier of "NTI gene" possess some excellent qualities: personal leadership, fanatical drive, and the capability of discussing with others the form of future society.

In the opinion of the group, features of businesses which are capable of competing in global markets of the future will be persistence, adaptability, capability of creating long-term productive ideas, and also "virusness" – the dissemination through mentorship, between generations, and through the education system.

The "Comfortable Jurisdiction" group came to the conclusion that the country needs a "understandable system of service provision between trusted subjects with minimal transaction costs and need for feed-back". Russia needs new types of incubators, and needs protected frameworks for creation of new forms of coordination in a business environment.

The group on "Intellectual Property" focused on creation of intellectual products such as the core of business and technology, based on disseminated registers and an automatic system of managing intellectual property.

The TechNet working group, already formed during the previous "Foresight Fleet", worked on the subject of technological platforms included in the global chain of creating additional value. The group on planning one of the NTI markets, HealthNet, suggested widening the framework for understanding health, focusing on a culture of personal responsibility and a market of continual health management of people and society. During discussion, the group on the AeroNet market added for further development space and multi-environment technology. MoveNet, a new group, with a wider understanding of the idea than was in AutoNet, focused on business models and technology for transport networks of goods and people.

(English version of RVC press-release 30 May 2016): The participants presented 32 projects for NTI market development: NeuroNet, AeroNet, HealthNet and cross-market sectors: TechNet, IpNet. Some projects became discoveries of Foresight Fleet 2016. (Russian version of RVC press-release 30 May 2016):

(English version of RVC press-release 30 May 2016): E.g. VCNet (venture capital — FinNet market sub group) proposed to bring Russia to Top-5 global venture markets by 2035 through creation of the global venture hub with a portfolio of financial tools that will provide financing to NTI projects on all development stages. (How is this to be done? Is it realistic?) The group indicated the key performance indicators by 2035 as follows: not less than 50% of foreign investments and 10 NTI technology companies entering IPO.

(English version of RVC press-release 30 May 2016): About 20 projects were determined in the MoveNet group (a subdivision of AutoNet market, developments in the field of logistics of unmanned motor transport). The group members suggested that an open platform is created with artificial intelligence in order to develop control systems. The created multimodal environment will ensure transportation of people and cargo without intermediaries and cost of logistics services will tend to zero. (Russian version of RVC press-release 30 May 2016):

(English version of RVC press-release 30 May 2016): IPNet group (Intellectual Property) focused on creation of an IT accelerator and development of new educational programs for school children and students. AeroNet market group prepared 2 projects with the use of outer space. The first one is an open network platform "Digital Planet" that will ensure quick and unhindered access to high-resolution geo-data. The second one is the Space TechNet project; it's all about high technology recycling of space wastes and their reuse in space programs. (Russian version of RVC press-release 30 May 2016):

(English version of RVC press-release 30 May 2016): The Jurisdiction of Trust project was presented by the Comfortable Jurisdiction group. They offered a system solution for setting up environment that will ensure support and scalability of developments made by new technology companies under the total openness condition. (Russian version of RVC press-release 30 May 2016):

(English version of RVC press-release 30 May 2016): TechNet group presented 4 projects at a time: creation of testing sites for the advanced industrial technologies; creation of centers for technology testing and certification; intellectual control system for distributed design, production and maintenance of technical facilities of arbitrary complexity; set of services for testing and promotion of business hypothesis that can significantly reduce development time required for a technological solution and bringing it to the scalability stage. (Russian version of RVC press-release 30 May 2016):

Ship "State"

During "Foresight Fleet 2016 " the first assembly of results was made. (На "Форсайт-флоте 2016" сделали первую сборку результатов

“Program director of “State” ship, Evgeny Kovnir, said that groups worked in three directions: government policy in the area of developing talent, developing technology, and supporting business. Trends, threats and possibilities were identified in the first two days.”

“The “Universities” group which was focused on talent development and education come up with a vision for the future, which might be expressed in the phrase “ITMO issues an IPO”. The group views universities as independent from the states area of economic activity.”

“Necessary to bring in a royalties for talents, in order to compensate for expenses of “brain drain” in the high-tech area.”

“The group on Development of Technology claimed that Russian science does not yet understand what kind of research business needs in parts of the NTI, and asked for the formation of a corresponding inquiry.”

“The group that discussed state support for high-tech business, had recommended that all services must be presented to companies on-line. We might discuss out-sourcing of such services. Evgeny Kovnir, considered that in the end we will come to this.”

“The State will not cope with the problems of implementing NTI, if other participants in the process do not meet a series of very important requirements – noted the program director of the ship. From the “Business” ship, there was an expectation of an inquiry on science research, conducted on behalf of the government. Now business and science live separately. Issue for the “Society” ship – increasing the status of businesspeople.”

(English version of RVC press-release 30 May 2016): The ship crew presented 17 projects aimed at conditions for dynamic development of new technological companies created by the state, as well as for a system of search and development of talents and universities of a new type. Participation of regions in NTI and work models for cross-group technological task forces were developed separately.

(English version of RVC press-release 30 May 2016): Both groups of "Services" (for small and medium high-tech companies) proposed to set up an intellectual service, some kind of a "single window" for all state services, "Multipurpose Center for high-tech businesses". State support services may and should be outsourced to private companies in the future.

(English version of RVC press-release 30 May 2016): "NTI Talents" group discussed how to determine, develop and support children with special abilities, stable motivation and potential to achieve great results. Participants suggested launching a number of projects including a system of targeted search and development of talents "Great Educational Funnel" or in abbreviated form "VOVO". "VOVO" is a system encouraging talents to construct individual educational trajectories, and employing companies to determine and implement requirements for talents with a set of unique competences. The project is able to transform the talents search and recruiting market. (Russian version of RVC press-release 30 May 2016):

(English version of RVC press-release 30 May 2016): "NTI Universities" group proposed the project "University of the future: EDUCOINS", devoted to improvement of the educational system in quickly changing environment. Within a framework of this project, every person's action related to acquiring of new competences or perfection of the existing ones shall be kept in his/her portfolio for the entire life.

(English version of RVC press-release 30 May 2016): "Regions" group presented 3 key services of the regional NTI management system: creation of early demand for NTI companies ("Early Demand" project), export support ("Expansion" project), legislative regulation to create pilot zones ("Roadside picnic" project). The most important mission of a region will be engagement of the talented children in technology creation process.

(English version of RVC press-release 30 May 2016): Evgeny Kovnir, program director of the "State" ship mentioned summarizing: "Task forces determined very important trends that will impact on development of the entire system of communication between the state and business for the nearest 10 years. They include outsourcing of state services to the specialized private organizations, reduction of the state role in education, joint work of the Russian Federation districts to conquer global markets and many others. We managed to review the key ideas of service and regional NTI models, design basics for search and development of talents, fundamentals for NTI management system and to formulate specific projects to implement them as well as teams able to implement them."

Ship "Society

During "Foresight Fleet 2016 " the first results were assembled. На "Форсайт-флоте 2016" сделали первую сборку результатов

“Results of two day trip on “Society” ship were made public by program director Aleksey Sitnikov. According to him, a feature of NTI – undeveloped system for assisting understanding by a wide circle of people. One of the key challenges for participants on the “Society” ship – find a common language of communication”.

(English version of RVC press-release 30 May 2016): The participants developed 20 initiatives, at the final meeting some groups consolidated and presented 8 projects.

(English version of RVC press-release 30 May 2016): Aleksey Sitnikov, program director of the ship mentioned that many projects presented by the participants have cross points and can evolve interacting with each other. To his opinion, "Russian Scientists proved" project can integrate Russian scientific and engineering ideas into the global agenda. It implies active promotion of achievements of the Russian scientists and engineers in the global information environment with the help of the latest information and humane technologies.

(English version of RVC press-release 30 May 2016): Two projects were based on the networks: "Craftsmen of the future" project that implies development of the self-organization mechanism for makers' community in Russia, and EduNet, which is a self-regulating network space for communication of customers, vendors and consumers of the lifelong learning education. According to Aleksey Sitnikov, EduNet is a ready venue for self-realization of retired people who will get an opportunity to share their experience with the others. Theme of third aged people was discussed on the motor ship and in the "NTI Silver Century" project The task force suggested to switch from the model of a retiree living out his days to the model of an active participant in technological transformation of life forming demand for technologies ensuring long healthy life and investing pension savings to their development.

(English version of RVC press-release 30 May 2016): The "Trust Protocol" project sets an objective to create an image of "NTI hero" and promote it to public, which will help to formulate new mythology and new ideology of XXI century. Aleksey Sitnikov mentioned that, in the course of initiatives development, almost all groups on the "Society" ship raised an issue of NTI ethics and undertaking responsibility for implementation of the projects and the suggested system changes.

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[22] Metaver's internet site (http://metaver.net/) gives a description of its activities: "We develop new and more effective education. Plan and test technologies which unify teaching, management, research and business. We work with students, teachers, scholars, managers and businesspeople. By common effort we create the future."

According to the Metaver internet site: "Dmitry Peskov is a member of the expert council of association "Metaver – education of the future". He developed a technique of quickly getting road-maps for the development of industry sectors ie RF- rapid foresight. Co-authored first Russian independent foresight "Education 2030". Conducts foresight-projects in the automotive and energy sectors, based on developments on individual territories"

[23] "Как вывести Россию в технологические лидеры, решали всем «миром»", АСИ 2016, Available at http://foresighttrip.asi.ru/news/kak-vyvesti-rossiyu-v-tekhnologicheskie-lidery-reshali-vsem-mirom/)

[24] On the last day of the cruise, one of the other "foreigners" (but a Russian speaker of Russian extraction) on the ship directly conveyed the widely-held concerns of the "foreigners" directly to Evgeny Kuznetsov as they sat together (and alone) on one of the decks of the ship.

[25]One of my blogs on Moscow as a possible International Financial Center (IFC) highlights the issues that really stand in the way of Russia as a "FinNet" leader. Available at http://shanghai-ifc.org/moscow-2015/

[26] National Technology Initiative, Agency for Strategic Initiatives, 2016, Available at https://asi.ru/eng/nti/

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