R&D Potential of Regional Digitalization

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Abstract. This paper analyzes the R&D potential as a key factor of regional digitalization.

The goal hereof is to comprehensively research the R&D potential of Tyumen Oblast, to outline its digitalization prospects.

To assess the regional R&D potential, the paper proposes a set of indicators that reflect the state of the art, the research funding, the human resources and infrastructures available to science, and the effectiveness of the regional innovation system.

Conclusions: Tyumen Oblast has everything to unlock its digital potential and to speed up digitalization. The region has intellectuals and scientists; it continues to build up its intellectual potential and broaden the horizons of pure and applied research. Technological advancements will positively affect business and regional governance while also raising the living standards; they are also expected to create a synergistic effect of general economic growth.

1. Introduction

Digital tech invades business structures, economy, and most aspects of life to open up ample and unprecedented opportunities for management, manufacturing, and services while also restructuring consumption, labor, entrepreneurship, etc. Meanwhile, a continually advancing R&D potential is necessary to keep the momentum of digitalization and fully reap its fruit on the national and regional level. It is the state-of-the-art as well as the advancement of regional R&D that give rise to a region's competitive advantages in terms of economic digitalization pace.

Companies that make use of digital technologies become the points of growth; they take the economy further and saturate it with digital resources. Digital economy's contribution to the GDP grows by 18% per annum on average, by 7% in developed economies [5]. According to the World Bank, if the broadband Internet userbase grows by 10%, the GDP will grow by 0.4% to 1.4% per annum [2].

As of today, digital economy only accounts for 3.9% of Russia's GDP, which is several times less than in the US, the EU, or China. This is further confirmed by I-DESI, an international digital economy development index that is based on such indicators as the availability of broadband high-speed Internet access, use of online services, human capital, employment of digital tech in business, and e-government.

What hinders the development of digital economy in Russia is the inefficient tools for the transfer of innovation to the manufacturing process, the unpreparedness of some parts of the population to use cutting-edge technologies, lackluster entrepreneurial environment and regulatory frameworks, as well as lack of appropriately qualified specialists [1].

Meanwhile, experts believe the transition to a digital economy is a high priority, if the country's GDP is to grow. By 2025, the projected economic effects of digitalizing the economy will account for

a third of GDP growth. This is due to process automation, breakthroughs in business technologies, use of Industry 4.0, big data, and higher productivity.

However, Russia's regional discrepancy in terms of economic digitalization is prohibitive. While Moscow and St. Petersburg are on par with developed economies, some regions lag far behind. The leading regions are Moscow, the Republic of Tatarstan, St. Petersburg, Khanty-Mansi Autonomous Okrug (Yugra), Tyumen Oblast, Yamalo-Nenet Autonomous Okrug, Moscow Oblast, the Republic of Bashkortostan, Leningrad Oblast, and Chelyabinsk Oblast. The trailing regions are Sevastopol, Pskov Oblast, the Republic of Adygea, the Republic of North Ossetia — Alania, Chukotka Autonomous Okrug, the Republic of Kalmykia, the Karachay-Cherkess Republic, the Republic of Tyva, the Republic of Ingushetia, and Jewish Autonomous Oblast [3].
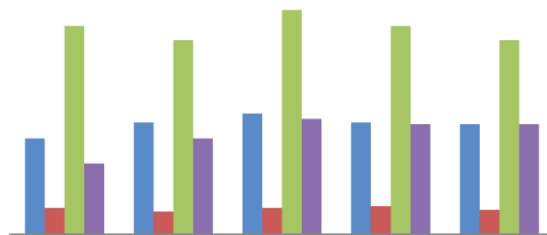
The Ural Federal District ranked first in 2018, as 4 out of its 6 regions scored above 70 and made it to Top 10 regions [6]. What makes the UFD a leading macroregion is the availability of research and education centers, an advanced R&D network, and a large-scale effort to digitalize cities and regions. Three of its regions (Sverdlovsk, Kurgan, and Chelyabinsk Oblasts) have Priority Development Areas.

Thus, the single most important aspect of regional and national economic digitalization consists in utilizing the R&D potential and advancing the human resources.

2. R&D Potential of Tyumen Oblast

To assess the regional R&D potential, the authors hereof propose a set of indicators that reflect the state of the art, the research funding, the human resources and infrastructures available to science, and the effectiveness of the regional innovation system.

The Ural Federal District contains slightly more than 6% of the country's R&D organizations. This proportion did not change much over 2010–2017. 25% of the District's R&D organizations are based in Tyumen Oblast. They are mostly concentrated in the south of the region (63% or 39 entities) [7]. The region's R&D complex comprises multiple state-funded research institutions: Russian Academy of Sciences, Russian Academy of Natural Sciences, Russian Academy of Agricultural Sciences, Russian Academy of Medical Sciences, Russian Academy of Education and their branches, industrial research centers of varying legal status, as well as university laboratories. In 2017, Tyumen Oblast had over 60 R&D institutions, see Figure 1. Research institutions comprise the bulk of the region's R&D complex, as they account for more than 60% of the total roster of organizations involved in R&D. Universities have special units to perform pure and applied research; they account for another 22%.
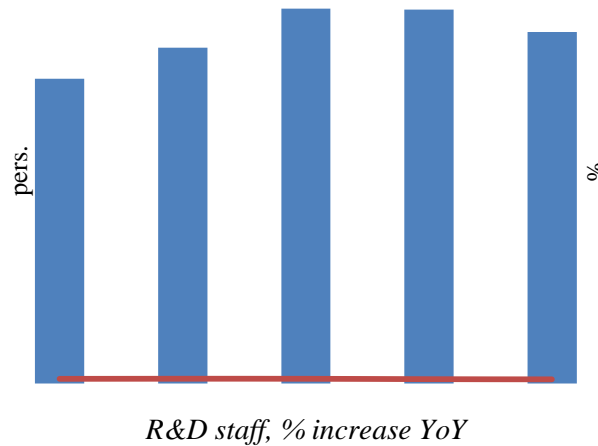

Sverdlovk Oblast, Tyumen Oblast, Chelyabinsk Oblast, Kurgan Oblast.

Figure 1. R&D organizations in the Ural Federal District.

Research institutions are increasingly numerous, a characteristic feature of digital economy today. Thus, Russia's roster of organizations involved in R&D rose by 10.6% over 2010–2017; Tyumen Oblast's roster rose by 14.8%. Digital economy's contribution to the country's GDP grew by 26% over the same period, which is indicative of the national institutions' success in providing innovative digital solutions and products [9].

While Tyumen Oblast's R&D complex continues to grow, it engages ever more people. In 2017, 8,260 persons were employed in Tyumen Oblast as researchers, a 15% increase against 2010, see Fig-
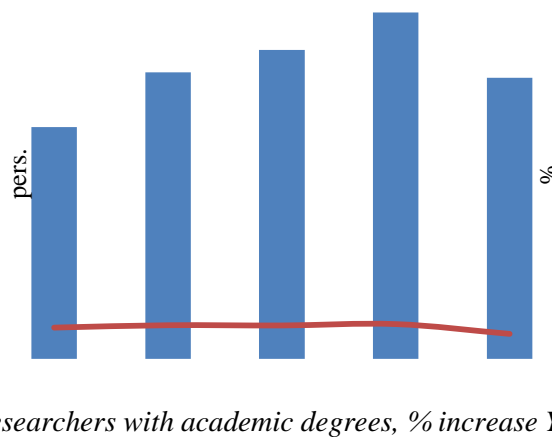
ure 2. However, the R&D complex has been shrinking since 2015, which also resulted in R&D layoffs. This is partly due to the deterioration of Russia's relations with a number of other countries as well as due to the tightening of sectoral restrictions coupled with the financial crises of many regional enterprises [1]. Many R&D bodies affiliated with transnational corporations left the region's economy.

R&D staff, % increase YoY

Figure 2. R&D staff in Tyumen Oblast.

The staff of Tyumen Oblast's research institutions is dominated by PhDs (80%). While the number of researchers with academic degrees dropped in 2017 YoY due to a reduction in the number of R&D institutions, the drop does not seem critical, as a single institution still has 14 scientists on average, same as in 2010, see Figure 3. In total, the region had 21.2% more researchers with academic degrees in 2017 than it had had in 2010. In 2017, the region had 25.7% more PhDs involved in research than it had had in 2010.

The region is heavily industrialized, which is why the R&D potential is unbalanced, with more than 60% of researchers being STEM people.

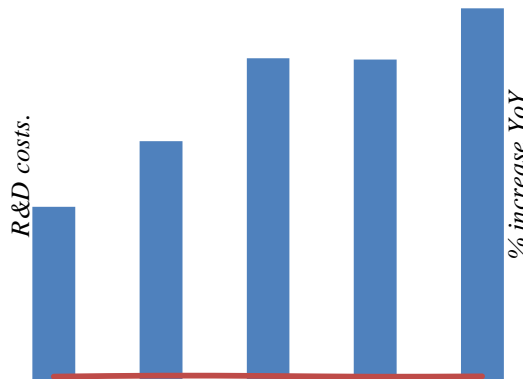*(Researchers with academic degrees, % increase YoY)*

Figure 3. Researchers with academic degrees in Tyumen Oblast.

Only Khanty-Mansi Autonomous Okrug went down in terms of researcher numbers, as in 2017, their population was 66% of the 2010 figures [4]. This is due to cutting the funding of research institutes within oil companies that have been in a crisis ever since the world's commodity markets failed.
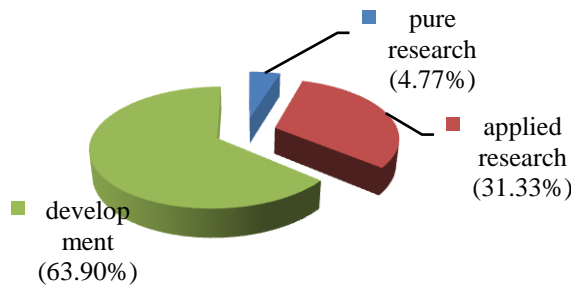
In general, Ural regions account for 7% of the Russia's total R&D spending. In Tyumen Oblast, research funding generally seems auspicious; in 2017, the region spent twice as much on R&D as in 2010, see Figure 4 [9]. With a share in excess of 56%, salaries dominate the structure of R&D costs,

which is typical for this sector of economy. A distinctive feature of the region's R&D is that over 70% of funds it receives comes from businesses.
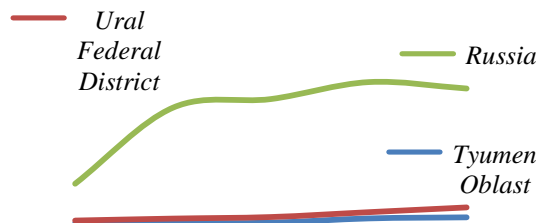

Figure 4. R&D costs in Tyumen Oblast.

Tyumen Oblast prioritizes design and engineering, which accounts for 64% of the total R&D costs. The key topics are oil-and-gas production and construction, neo-industrial development of northern territories, management of regional and industrial systems, industrial safety, and health-saving technology, etc., see Figure 5.

Figure 5. Breakdown of R&D costs in Tyumen Oblast, %.

Tyumen Oblast has an advanced R&D complex, highly qualified staff, and targeted governmental support for innovation and high-tech business and startups; thanks to this, the share of innovative goods and services in the GRP rose from 0.23 in 2016 to 0.42 in 2017 [8]. In 2017, the region's innovative product totaled 206 billion rubles, a 7.5-fold increase vs 2010, see Figure 6. Local companies make extensive use of intellectual property: 193 inventions in 2017, 91 utility models, and 100 databases. It also makes ever greater use of cutting-edge production and manufacturing technologies: 9,269 high-tech processes in 2017, cf. 6,675 in 2011. The region's research centers are highly inventive: in 2017, the applied for 245 invention patents and were granted 231; they also obtained 107 utility-model patents in the same year.

Figure 6. Innovative goods and services, million rubles.

In general, the UFD regions actively focus on supporting and bolstering the digital economy; they fully adhere to the core guidelines under the Digital Economy of the Russian Federation Program, including those pertaining to HR training.

3. Conclusions

1. The Ural Federal District has everything to unlock its digital potential and to speed up digitalization. Technological advancements will positively affect business and regional governance while also raising the living standards; they are also expected to create a synergistic effect of general economic growth.

2. What hinders the development of digital economy in the region is the lack of cooperation between regional authorities, businesses, and researchers; inefficient tools for the transfer of innovation to the manufacturing process; the unpreparedness of some parts of the population to use cutting-edge technologies; lackluster entrepreneurial environment and regulatory frameworks; and the lack of appropriately qualified specialists [1].

3. Current trends in Tyumen Oblast's R&D indicate an intensification of R&D effort. The region continues to build up its intellectual potential and broaden the horizons of pure and applied research. In general, the state-of-the-art and scale of the region's R&D complex is in line with its economic interests.

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