
Transition towards an entrepreneurial university: a case study of the Tyumen State University

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Abstract: The University of Tyumen (UT) or Tyumen State University is examined as a case study of how Russian regions are responding to the global trends in education and research. UT's rapidly growing research output also positions it as an important research university, but in the case of entrepreneurship it is failing to establish profitable start-up and spin-off firm formation as well as technology commercialisation. We conclude by identifying future needs for fostering innovative and entrepreneurial behaviour in order to strengthen the university's competitiveness.

Keywords: Triple Helix; entrepreneurial university; academia-industry collaboration; innovation entrepreneurship; regional innovation system; Tyumen State University.

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1 Introduction

The development of the Tyumen region has been conducted under the logic of industrialisation, that has been based on relations with the federal centre and developing oil fields' major companies. All other areas of regional development, including science or education, are held in a subordinate position. The model of regional development has undergone some changes, but the core design has not changed dramatically. Meanwhile, the economic history of developed countries clearly draws that the only way to succeed is to ensure innovative development by improving the quality of education; finance and tax systems; research funding; minimising administrative barriers to doing business; providing efficient process of technology transfer and commercialisation. As argued by Farinha et al. (2014) the growing importance of technology, entrepreneurial and innovative capacity to economic growth and competitiveness currently represents a strong concern for policy makers, scientists and managers. The institutional framework of building an effective innovation system is based on the establishment and maintenance of equal partnership relations between the three main actors: academia, industry and government. The new configuration of society, the so-called big innovation cycle is fully represented in Etzkowitz et al. (2000) model of Triple Helix.

Combining the innovative efforts of academia, industry and government, the Triple Helix model assigns the driving force to universities. Moreover, the most important role in the model belongs to the entrepreneurial university that extends the research (Etzkowitz, 2003) and acts as a natural incubator, the commercialisation engine of research, and a source of new knowledge and technology. The entrepreneurial university encompasses a 'third-mission' of economic and social development in addition to research and teaching.

Uvarov and Perevodchikov (2012) argue that the Triple Helix model of the academia-industry-government relations has been virtually non-existent in Russia until recently. The system of higher education and science was organised in the USSR in such a way that the interaction of science and education was carried out by administrative methods, which ultimately fragmented. Because of low funding higher education institutions focused mainly on teaching (Kozmina, 2014). The primary research institutions were Academies of Sciences focused on basic research, while its branch institutes conducted applied research. The universities, research institutions and industry had little incentives to innovate and collaborate given in the realms of the Soviet economy (Uvarov and Perevodchikov, 2012). The first academic revolution made research the university' function in addition to the traditional task of teaching in Russia only in the end of 1990th, a century later than in developed countries. Over the last decade, the Russian government has proposed a series of initiatives to develop the concept of an entrepreneurial university, build innovation infrastructure, and develop

entrepreneurship education. The second academic revolution is underway, as the government has been providing federal grants to transform some of the universities into teaching, research and economic development enterprises in accordance with the Russian academic excellence project 5/100. So academia in Russia is encouraged to become active drivers of the Triple Helix system, to produce world-class intellectual products and to integrate education, entrepreneurship and innovations. As argued by Wong et al. (2007) the pre-conditions for Triple Helix dynamic interactions are much weaker in the newly industrialised economies than in the advanced. The Russian case is even worse than those of Korea, Hong-Kong, Singapore or Taiwan because of the so-called 'natural resource curse' and comparatively weak institutions.

This situation is worsened by the conservative system of higher education based on out-of-date methods. Thus, Russian universities have even greater urgency to take on an entrepreneurial role than universities in the advanced and newly industrialised economies, in order to compensate for these less favourable pre-conditions in which they start.

Tyumen's case is of particular interest because of its circumpolar peculiarities (Nalimov and Rudenko, 2015). Arctic projects should create a powerful momentum of innovation in the whole range of areas and industries. The logic of resource development of the Tyumen region in many ways has been determined by the relative underdevelopment of institutions and the absence of incentives for improving them. The regional administration sets ambitious targets for the transition to the economy of knowledge and innovative production. However, the presence of such challenges as conservatism of the education system and the regional institutions weakness imposes additional restrictions on the innovative development of the Tyumen region and the formation of a Triple Helix. The question arises, what changes should occur in order for Tyumen State University to become the locomotive of the regional innovation development and in order to surmount the global lack of generators of the key knowledge, competencies, and innovation? We are motivated to study how the mission and governance of a regional university in Russia may need to be reformed toward an entrepreneurial university model to enable the innovation based economic growth according to the idea of Triple Helix. The first purpose of the paper is to identify the features of the Triple Helix in resource-rich regions (Tyumen region as an example). The second one is to consider the challenges and opportunities of an entrepreneurial university as an actor of Triple Helix in resource-rich regions (Tyumen state University as an example).

The article consists of three parts. The first part describes the notion of an entrepreneurial university. The second section analyses the problems of the Triple Helix implementation in the Tyumen region and examines the new university's role, transition, and initiatives to establish successful trilateral interactions using the University of Tyumen as an example. Finally, some key challenges are described, policy recommendations are proposed, and the future of the entrepreneurial university in Tyumen is discussed.

2 Literature review

University's opportunities for the region's development are reviewed in the following area: universities are the main base for fundamental scientific research, creating conditions for regions' technological and socio-economic development in most countries. University studies are an important part of the scientific personnel training, of the scientific and pedagogical potential of the region's accumulation.

Modern universities are expanding goals and enriching features. Universities are not limited to the task of ensuring the highly qualified personnel to the economy; they are stepping up the activities in the field of research and development (R&D), ensuring the innovative development, becoming the regional centres of entrepreneurial activity. The concept of 'entrepreneurial university' is used in a variety of studies published since the mid-1990s. Clark (1998) considers that the main feature of the entrepreneurial university is the lack of fear to commercialise the generation and dissemination of knowledge. According to Filonovich and Konstantinov (2007), an entrepreneurial university is a higher educational institution, which systematically makes efforts to overcome the limitations in three areas – the generation of knowledge, teaching and transforming knowledge into practice – by initiating new activities, transforming the internal environment and modifying the interaction with the environment. Etzkowitz (2003) analyses the transition from the research university to the entrepreneurial university. He argues that "the internal organization of the Research University consists of a series of research groups that have firm-like qualities, especially under conditions in which research funding is awarded on a competitive basis. Thus, the Research University shares homologous qualities with a start-up firm even before it directly engages in entrepreneurial activities". Tijssen (2006) introduces a measurement model for identifying (the early stages of) a university's entrepreneurial orientation within a quantitative analytical framework. The most systematic review of research on the commercialisation of academic knowledge, involving the patenting and licensing of inventions as well as academic entrepreneurship is presented by Perkmann et al. (2013).

Sternberg (2014) argues that empirical findings on entrepreneurial university are primarily based upon US and English universities, although growing academic interest in the mechanisms of academic entrepreneurship in the form of spin-offs can be observed in other countries. Jacob et al. (2003) analyse entrepreneurial transformations in the Swedish University system by the case of Chalmers University in Gothenburg confirming the thesis that creating an entrepreneurial university takes several years as both infrastructural and cultural changes are necessary to achieve success. Looy et al. (2011) consider the role of entrepreneurial universities in European regional innovation systems. Bramwell and Wolfe (2008) studying the case of the Canadian University of Waterloo argue that "beyond generating commercializable knowledge and qualified research scientists, universities produce other mechanisms of knowledge transfer, such as generating and attracting talent to the local economy, and collaborating with local industry by providing formal and informal technical support". Universities also ensure sustainable growth of start-ups and spin-offs (Ratten et al., 2007; Hebllich and Slavtchev, 2013; Ljungberg et al., 2015). The importance of entrepreneurial universities' activities for regional development has been summarised by Guerrero et al. (2015).

In Russia, the awareness of the fact that the universities can and should be the core element of regional innovative development has recently appeared. Research conducted in this area has involved only major federal universities. Vasil'ev et al. (2014) analyse

ITMO University developments as a research-led university of entrepreneurial type after having been included into the 5-100 Program. Thurner and Novoseltsev (2012) illustrate the new commercialisation of research results and entrepreneurial thinking in the *Higher School of Economics* (Russia) as the largest research-led institution in the domains of social and economic sciences in Eastern Europe. There is a shortage of papers on the development of regional universities, especially universities from recourse-rich regions. The only paper by Ketova et al. (2014) describes development experience of Tomsk State University of Control Systems and Radioelectronics as an entrepreneurial university according to the criteria of the British National Centre for Entrepreneurship in Education.

3 Case study: the University of Tyumen as the core element of regional innovation system

Successful transition towards an entrepreneurial university in the region depends on domestic demand for R&D. Tyumen region has various natural resources and great economic strength. The region produced 316.4 million tons of oil, and 597.6 billion m³ of gas, which is respectively 60.5 and 87.4% of the total national production in 2013. According to gross regional product data the Tyumen region holds 9% of the Russian production. The rapid growth of the oil and gas industry has made the Tyumen region and the city of Tyumen the most prosperous in Russia (Rudenko, 2014). High standard of living, developed social and transport infrastructure, low unemployment, dynamic economy, presence of a large number of major companies are the peculiarities of the region. However, the analysis of innovative development indicates a weak position of Tyumen in the area.

The analysis of the regional innovation system effectiveness in the region reveals two trends. First, the Tyumen region leads in terms of GRP per capita, which is associated with the extraction of natural resources and a very high share of energy complex in the industrial structure. Second, there is a low innovative activity of industry and academia, which hinders the implementation of existing small potential. According to the rating of innovative development of the Russian Federation in 2014, published by the *Higher School of Economics* (Hochberg, 2014), Tyumen region ranks 19th, and is classified among the second group of regions. A strong position in the region is the socioeconomic conditions of innovation, according to the criterion the Tyumen region occupies 6th place in the rankings. Some of the weaknesses are: innovation (36th) and the quality of innovation policy (32nd place).

We can conclude that the Tyumen region is characterised by low innovative potential (Table 1). The values of only three indicators are above the Russian average, these indicators are a share of young researchers, a share of private expenditures on RnD and the number of used advanced manufacturing technologies per 100,000 economically active population. Tyumen region is the region with low productivity of innovation activity. Moreover, the dynamics of almost all indicators is flat or even negative (Table 1). The sharp decline in gross expenditures on R&D as well as in the share of innovative goods, works and services in the total volume of shipped goods, works, services and the share of organisations implementing technological innovations may be observed even taking the distortions in the statistics into account.

Table 1 The innovative potential and performance of the Tyumen region

<i>Innovation potential and performance indicators</i>	2010	2011	2012	2013	2014	<i>Russia (2014)</i>
Number of students at organisations of higher education per 10,000 population	138.0	134.0	132.0	124.0	122.0	129.0
Number of PhD students per 10,000 economically active population	15.3	15.1	12.3	10.9	9.5	15.9
Number of employees engaged in research and development per 10,000 economically active population	37.8	35.2	35.6	36.5	40.6	97.0
Number of researchers with degree per 10,000 economically active population	4.0	4.8	4.7	4.4	4.8	14.5
Share of young researchers (39 and younger), %	56.0	55.5	55.8	58.7	57.1	41.3
Gross domestic expenditures on research and development, % of GRP	0.23	0.15	0.19	0.18	0.18	1.4
Share of private expenditures on RnD, %	84.0	77.9	83.0	82.9	83.3	32.9
Number of patent applications (Rospatent) per 10,000 economically active population, units	1.7	2.5	1.8	2.0	2.2	4.9
Number of patent filed (Rospatent) per 10,000 economically active population, units	1.6	1.6	1.5	1.6	1.7	4.7
Share of organisations implementing technological innovations, %	9.8	9.8	8.2	8.1	8.4	9.9
Share of innovative goods, works and services in the total volume of shipped goods, works, services, %	0.9	1.8	0.6	0.3	0.6	8.7
Share of expenditures on technological innovations in the total volume of shipped goods, works, services, %	0.9	0.8	0.7	1.2	1.4	2.9
Number of developed advanced manufacturing technologies per 100,000 economically active population	0.6	0.5	0.4	0.9	1.4	1.9
Number of used advanced manufacturing technologies per 100,000 economically active population	432.2	348.4	372.5	389.5	349.2	271.0

All elements of the regional innovation system are imbalanced, the system is unlocked. The reasons for this situation are the following. First of all, the industry avoids large expenses on the development of new technologies and products, limiting the improvement of existing production facilities, reducing the demand for innovations. Secondly, export (largely due to the first) is dominated by technological materials not brought to any specific projects and not protected by international patents. As a result, the Tyumen region is noticeably inferior to the efficiency of the regional innovation ecosystem. The effectiveness of the Triple Helix model in such circumstances is difficult to assess. There is no stable system of academia-industry-government, and each helix has

been active in its own separate, but sluggish way. The challenges for Triple Helix implementation in the region are the following:

- 1 Regional universities lose out to large research centres and federal universities at attracting federal and corporate resources. Regional universities are on the periphery of the national programs of innovative development. Bureaucracy and lack of resources at the university fail to commercialise its research. Thus, higher school is not the leader in intellectual property generation in spite of the concentration of the largest number of researchers: share of universities in total number of developed advanced manufacturing technologies is just 20.15%.
- 2 The subject matter of scientific researches in Tyumen universities is not associated with the implemented investment projects and is not relevant to the modern world frontier. The catch-up modernisation, typical for transition economies, implies the development of technologies that have already been created in the leading counties. As the result, the space for innovation activities at universities has narrowed. In these conditions, universities have to seek their own niche in highly competitive environment or service adaptation of existing technologies to the realities of the Russian business.
- 3 The academia activities alone isolated and unrelated to the industrial policies but devoted to the incubation of companies, creation of science and technology parks, and knowledge commercialisation are unable to produce significant impact on the system of innovation.
- 4 The lack of priority directions of science and innovation development squanders limited resources. There was no strategy of innovation or technological development in Tyumen in comparison with leading regions of Russia.
- 5 Claims of universities to a leading role in the innovative development of regions weakly supported by the financial resources for research and innovation. The regional support is focused only on the co-financing of federal programs 'Egghead' and 'Start' whose effectiveness is very low. The regional technology park and business incubator do not generate much spin-off activities. The local innovation infrastructure is dysfunctional.
- 6 The lack of highly qualified specialists in the promotion of innovative products.
- 7 Institutional gaps that hinder the effective application of the Triple Helix system. The region suffers from a shortage of culture of trust, transparency collaboration, and effective governance. The absence of regional tax incentives and benefits for innovative companies and investors.

The regional administration ambitiously sets targets for the formation of innovation clusters mainly in the petrochemical industry. High-tech clusters tend to occur near the leading universities that engage fundamental and applied research, closely interact with industry and implement the knowledge into practice. The universities' inclusion into the region's clusters enables competitive advantages to the region: investors can make investments both in the real economy and in education and research. There are only two universities that can act as anchors in that process, these are Tyumen State University and Tyumen State Oil and Gas University.

Established in 1930, University of Tyumen is the oldest academia in the Western Siberia, with a total student enrolment of over 30,000 and a total number of employed staff of 1,963. It fulfils functions of the basic centre of personnel training with doctoral programs in most disciplines and professional faculties including engineering, geography, biology, law, business, and education with the only exception of medicine. The university implements large-scale research projects, introduces innovative educational projects, provides multi-level and ongoing training. Although there are five other universities in the Tyumen region, UT is the most dynamic and up-to-date. Like most other classical universities, UT has in the past been following the traditional model of considering teaching as its primary mission, with research as a secondary function. While now there is increasing emphasis on research and UT is seeking to play a large role in knowledge creation. The program of strategic development of the University for the period up to 2020 was adopted in 2010. The program has initiated a shift toward an entrepreneurial university model.

Emphasising the need to make the university more research oriented and entrepreneurial the new principal Valerii Falkov has started improving the system of university management, upgrading the infrastructure and creating a comfortable environment for the unlocking of students' and staff potential. The UT's innovational infrastructure consists of 13 inner departments and 24 start-ups. Nowadays four common use centres successfully function in UT as well as the Center of Technology and Intellectual Property Transfer, the Business Incubator, the Technopark, the Center of industrial Engineering and Geoinformatics and the Center of IT-Solutions. Therefore, we may argue that there is also a transition in education, from educating individuals to shaping organisations, as well. This transition is viewed by Etzkowitz (2003) as part of the 'third mission' rather than as part of the educational function of the university. Five science-and-education centres develop the scientific and innovational projects in the main fields of Sciences and Arts (including languages and discourses, social sciences, teaching, society and culture as well as nanotechnologies). To promote students' and young scientists' innovative potential, the Center of Prototyping (FabLab) was created, which has the most advanced equipment for 3D modelling and prototyping, enabling the creation of 3D models and the production of developmental prototypes.

Table 2 provides the overview of key changes that UT has undergone since 2010. Although the dramatic expansion of UT in terms of research can be observed, education, entrepreneurship promotion and technology commercialisation do not correspond to the wide range of features of entrepreneurial university suggested by Etzkowitz et al. (2000).

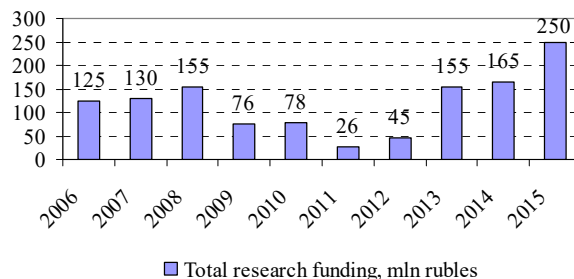
Table 2 Profile of UT (2014 and 2010)

<i>Indicator</i>	<i>2010</i>	<i>2014</i>
Staff	3,022	1,963
Teaching and research staff	1,010	869
Students enrolled	34,498	30,812
Full-time students	12,017	12,756
First-year students enrolled	2,240	1,935
PhD students enrolled	554	466
Percentage of foreign students studying	< 1	2.21
Total research funding (th rub)	118,946	222,166

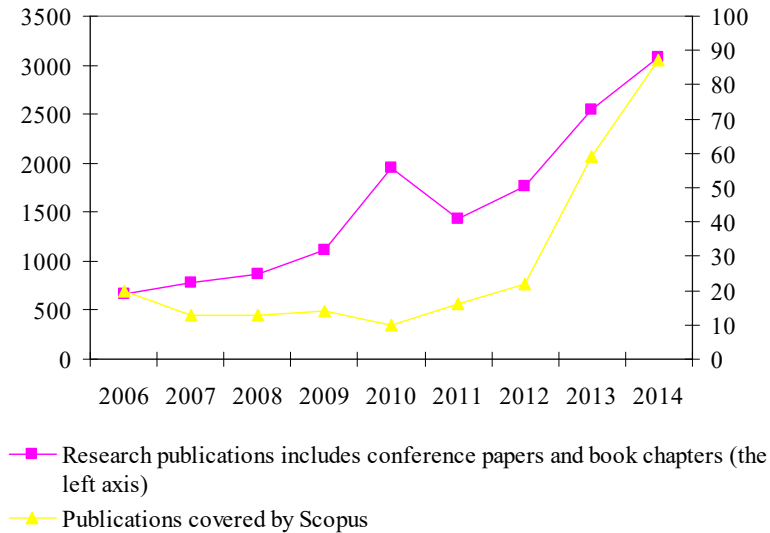
Table 2 Profile of UT (2014 and 2010) (continued)

<i>Indicator</i>	<i>2010</i>	<i>2014</i>
Of which % of industrial sponsored research	6.1	7.9
% of total spending	6.6	8.8
Research funding per researcher (th rub)	117.8	242.6
Research publications	1954	3086
Of which Scopus	10	87
WoS	7	72
Patents filed	16	36
Patents granted	14	33
Spin-offs	5	24

As publication of research and production of graduates are considered the most appropriate roles for an institution dedicated to the public good, all the features of the university are elaborated below. With an annual R&D budget of just 222 million rubles, UT alone constitutes about 3% of total R&D spending in the region. The share of industrial sponsored research amounts to 7.9%. R&D funding in UT has almost doubled last decade fluctuating from the very low level in 2011 to the highest one in 2015. The dynamics of R&D is shown in Figure 1.

Figure 1 The dynamics of UT' research funding, 2006–2015 (see online version for colours)

In terms of research and innovations performance, UT enjoys a substantial leading position in the Tyumen region but not in Russia being far behind the leading national universities. In order to overcome this gap quickly UT should wisely choose the development priorities, to ensure concentration of resources on several cutting-edge areas of R&D. Over the past decade, UT and some leading companies in the region, primarily the trustees, have established a series of relationships involving consulting, research contracts, research and education centres. UT is completing the implementation of a large and rather complex three-year project costing 300 million rubles for creating a high-tech measuring equipment manufacturing plant together with Neftemash. During the project a multiphase research test rig that has no analogues in Russia was designed and built. Supercomputer Mendeleev was actively used at the project design stage. So among the most significant changes in the region there has been the attempt to integrate academic research groups with industrial companies. Perhaps even more significant in the long run is the development of a new industrial sector based on academic research.

Figure 2 The dynamics of UT' research publication, 2006–2014 (see online version for colours)

UT plays a significant role in the human development, producing one-third of the region's total tertiary students output. The number of enrolled students has grown from 1,936 in 2006 to 2,516 in 2015. While this number appears to have insignificantly fallen since 2012 mainly due to the chosen policy restrictions of not taking in students with low scores, the share of UT has peaked 33% of all enrolled students in Tyumen in 2015. The university is shifting towards the further education and the training of graduate students, especially skilled engineers, according to the regional economy demand (Rudenko and Morosova, 2015). However, the university is losing competition for talents every year, the number of winners of status Olympiads among schoolchildren as well as those who take 100% at the federal exam is reducing. Moreover, the share of full-time students (12,756) is only the third of the total number of students (30,812). Therefore, UT is mostly a distance learning university, poorly recognised outside the region, as nearly 90% of first-year students annually enrolling in UT are people from the Tyumen region.

The output of UT publications has been growing rapidly over the decade, from 665 in 2006 to 1,954 in 2010 and 3,086 in 2014, with an average growth rate of 16.5% per year. The number of internationally refereed journal publications was stable at around 25 per year till 2010. Since the program of UT's strategic development has been adopted, the growth of such papers has been faster, resulting in the total number of 90 in 2014. This reflects the successful recruitment of top researchers and the financial incentives for employees who had published these papers. Nevertheless, the share of international publications remains very low – at the level of just 3%. Moreover, world-class research publications are conducted by only a few research groups in four areas (acarology, photonics, the quality of fresh waters, composite materials). Vast majority of teaching staff is not engaged in R&D, or their subject matter is not relevant to the modern world frontier.

With 33 patents as of 2014, UT is one of the largest patent holders in the region. The total number of UT patent applications grew steadily over the period, reaching the peak of 36 documents in 2014. The number of patents granted also registered a distinct

increase in the period of 2010–2014, reaching 33 documents in 2014 versus 14 patents in 2010. It should also be mentioned that UT's innovative activity applies to educational process as well. Such master's programs as innovational management, strategic management, and bioinformatics are successfully developed and implemented in order to create skilled manpower.

The key agents of technology commercialisation are start up and spin-off companies. Twenty four businesses and other ventures formed in the last decade are connected with UT. Although the start-ups generate income by creating a new product or service on the basis of scientific results, improving the university's financial advantage and that of its faculties, help interacting with major industrial partners for the joint projects and update education through the participation of students in the creation of products and services on the basis of applied research, results of UT' change in policy to encouraging spin-off and start-up formation after 2010 are not evident. UT administration does not allocate space for offices, does not allow using laboratory capacities. The rules of start-ups creation are not defined. Start-ups are created just for attracting financing from 'Start' federal fund, acting as grant addicts and having no production and profit. As a result, academic firms at UT struggle to generate new products, fail to establish close links to customers and suppliers after their spinout.

According to the data, the shift toward the entrepreneurial university model is still in its early stage. The core of the relationship between university research and regional benefit is presumed to be in various forms of university-industry collaboration (contracts, consortia and consulting) and the role of graduates. Other relationships that include spin-off firm formation and licensing of patents are downplayed. UT appears to embrace the need to inject a more entrepreneurial and global dimension to its educational mission.

4 Conclusions

The University of Tyumen has a historic chance to become globally a truly competitive university. We propose to use a target-oriented approach in order to consolidate all the resources. Rejection of simultaneous movement in all directions through the range of developmental priorities, concentration of resources on the global frontiers of R&D are noticed as priorities. Formation of entrepreneurial university requires focusing on some main directions presented in the Strategy of increasing the competitiveness of University of Tyumen (2015) and at Figure 3:

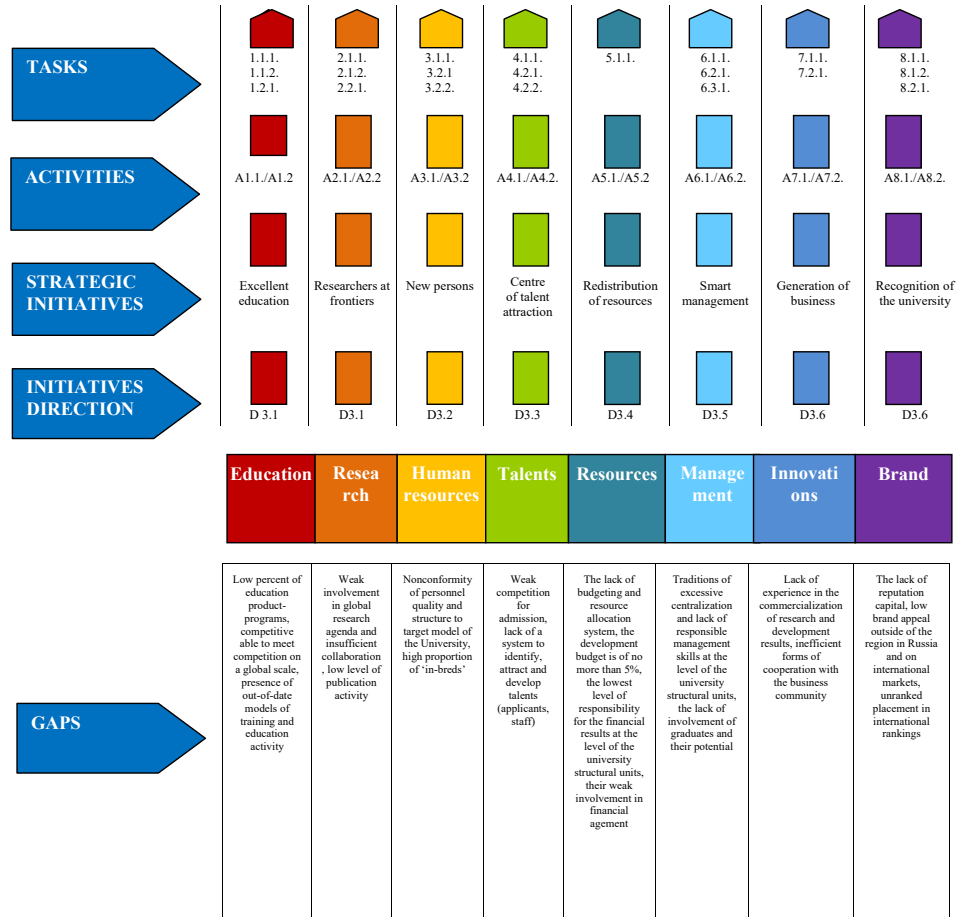
- 1 Direction 3.1. Formation of university's software and intellectual products portfolio, providing international competitiveness by:
 - A1.1: introduction of new education strategy together with leading foreign and Russian universities and scientific organisations to the higher education institutes (promotion of education strategy to international market (1.1.1) and creating a new portfolio of educational programs based on international standards, changing learning technologies and educational content, as well as students' preparation process with an emphasis on the formation of systematic business competence of entrepreneurial vision and action (1.1.2). It is necessary to train professionals with the knowledge, skills and competence that allow to professionally analyse and correctly assess the practical situations and successfully solve the real problems of the industry.

- A1.2: realisation of students, postgraduates, interns, young academicians support by financial stimulation of scientific activity (1.2.1).
 - A2.1: implementation of research projects, involving leading foreign and Russian scientists and (or) together with promising scientific organisations, including possibility to create structural subdivisions in higher education institutes by: implementation of strategies for R&D for all frontier directions of researches in the university (2.1.1) and development of search and promotion method emergent frontiers of research areas (2.1.2).
 - A2.2: realisation of postgraduates' improvement training program and doctoral program by improving the performance of postgraduate and doctorate degree students, creating a system of scientific trainings (2.2.1).
- 2 Direction 3.2. Key staff recruitment and development, improvement of research and teaching staff performance through:
- A3.1: implementation of measures aimed at the engagement of young researchers and teachers with experience in research and educational spheres in leading Russian and foreign universities and research institutions by bringing in young academic staff from leading Russian universities and international academic labour market (3.1.1).
 - A3.2: recruitment and development of University's key staff, research and teaching staff performance improvement by introducing variable remuneration depending on the involvement in the process of R&D, international scientific division of labour (3.2.1) and optimising the staff schedule and reducing the share of classroom work (3.2.2).
- 3 Direction 3.3. Engagement of talented undergraduate and postgraduate students through:
- A4.1: implementation of measures for the enrolment of foreign students from leading universities to study in Tyumen through partnership educational programs with foreign universities and university associations creating an adapted and competitive university environment (4.1.1) as well as advancing infrastructure renewal, providing a solution to the shortage of places in hostels and low quality of services in most existing dormitories (4.1.2).
 - A4.2: creation of the self-identity system and attraction of the most productive and motivated pupils and students developing the system of influence on the choice of university's 'centres of decision-making' by pupils (4.2.1) and promoting unique educational and research products according to breakthrough scientific directions of the university development (4.2.2).
- 4 Direction 3.4. Mechanisms to ensure the concentration of resources in breakthrough areas, dismissal of inefficient activities by:
- A5.1: implementation of mechanisms of project financing and investment flows management in order to increase efficiency of resource use implementing the system of budgeting based on project management (5.1.1).

- 5 Direction 3.5. Establishment of a university management system (basic principles, management personnel and systems, the organisational structure of the university) to ensure the achievement of performance indicators and the target model parameters through:
- A6.1: transition to performance management system implementing new business model of the university based on divided control (6.1.1).
 - A6.2: implementation of measures aimed at creating the personnel reserve of universities' management staff and engaging specialists with experience in leading Russian and foreign universities and scientific organisations to managerial positions by further training and retraining of management staff (6.2.1).
 - A6.3: implementation of additional measures stipulated by tender documentation for the open state support tender to leading universities of the Russian Federation procuring obligatory conditions for the participation in the open state support tender for leading universities of the Russian Federation in order to enhance their competitiveness among the world's leading research and education centres (6.3.1).
- 6 Direction 3.6 Other directions as:
- A7.1: scientific research as well as design and experimental projects together with Russian and international hi-tech organisations, including the possibility of structural subdivisions creation in higher educational institutions integration of the applied research at UT regarding frontier directions to the processes of scientific and technological development of large-scale industrial projects (7.1.1).
 - A7.2: provision of the stable environment for generation and implementation of new ideas creating conditions for innovation ideas during the educational process and their entrance to the market via start-ups of the higher education institution (7.2.1).
 - A8.1: improvement of the University's position in the international ratings via the internet increasing the academic reputation of the university (8.1.1) as well as its completeness (8.1.2).
 - A8.2: formation of the brand of the University at the external markets changing the marketing strategy and promoting brand attractiveness (8.2.1).

However, the formation of such UT configuration is not possible without a balanced, coherent strategies that universities and regional authorities should implement. The creation of innovative regional clusters is a common cause, which requires mutual responsibility partnerships between major stakeholders and provides a favourable environment for the formation of regional innovation ecosystem.

Figure 3 Benchmarking the entrepreneurial university in accordance with the strategy of increasing the UT competitiveness (2015) (see online version for colours)



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