Development Strategy of the Transport and Telecommunications Institute for 2016–2020

Approved by the TSI Senate decision on 27 October 2016, as amended by the TSI Senate meeting of 28 February 2017, as amended by the TSI Senate meeting of 11 May 2017
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Abbreviations used

AD  Administration
APAC  Academic and Professional Aviation Centre
CPC  Certificate of Professional Competence
DGSA  Dangerous Goods Safety Adviser
CTD  Computer Technology Department
EAEA  European Association for the Education of Adults
EASA  European Aviation Safety Agency
ECMT  European Conference of Ministers of Transport
ECTRI  European Conference of Transport Research Institutes
EDI  Institute of Electronics and Computer Science
ERDF  European Regional Development Fund
EU  European Union
FD  Finance Department
IFC  International Finance Corporation
ICT  Information and Communications Technologies
QMS  Quality Management System
LAS  Laboratory of Applied Software Systems
LDDK  Employers’ Confederation of Latvia
LETERA  Latvian Electrical Engineering and Electronics Industry Association
LIKTA  Latvian Information and Communications Technology Association
LLU  Latvian University of Agriculture
LCCI  Latvian Chamber of Commerce and Industry
LU  University of Latvia
MIP  International scientific and educational conference “Actual Problems of Education”
NDA  National Defence Academy
NBS  Latvian National Armed Forces
WB  World Bank
PD  Personnel Department
RelStat  International Conference “Reliability and Statistics in Transportation and Communications”
RTU:  Riga Technical University
SCS  Standing Committees of the Senate
STEM  Science, Technology, Engineering and Mathematics
OUMs  Organisational unit managers
TERC  Telecommunications, Electronics and Robotics Centre
TSI  Transport and Telecommunications Institute
TSI GA  Transport and Telecommunications Institute Graduate Association
VA  Ventspils University College
ViA  Vidzeme University
SI  Scientific Institution
SRD  Scientific Research Department
Introduction

The Transport and Telecommunications Institute (TSI) is a higher education and science institution accredited for an indefinite period. The ITS Development Strategy determines its role in society as a higher education and science institution, as well as its mission, vision, goals and tasks.

In drawing up the Development Strategy, being aware of the TSI’s role in the growth of the Baltic Sea Region and in shaping the future of Latvia, the priorities of the European Union and the guidelines of national and regional level education and innovation policy programming documents have been respected.

The strategic tasks under the National Development Plan of Latvia until 2020 include the creation of conditions for quality higher education integrated with scientific research and innovation. TSI is a key player in the achievement of the strategic objectives set by the National Development Plan of Latvia until 2020: education and knowledge for economic growth and technological excellence. Thus, the successful implementation of the university’s Development Strategy will contribute to building a knowledge-based society in Latvia.

The communication from the European Commission of 11.07.2013 “European higher education in the world” says that education plays a crucial role in individual and societal advancement; and, with its impact on innovation and research, provides the highly skilled human capital needed by knowledge-based economies to generate growth and prosperity. The TSI Strategy is fully consistent with this objective and is geared towards knowledge transfer from higher education to the science and business sectors.

Today, the overall goal of higher education is the development of the third generation university (3GU) concept, by building an integrated platform of high quality academic education and scientific research. Therefore, today, all universities are facing the challenge of how to ensure the preparation of cutting-edge future scientists, engineers, managers and economists capable of focusing on the creation of new products, services and technologies in the ever-growing global space.

The goals and tasks contained in this Strategy are aimed at increasing the number of researchers and students in TSI smart specialisation directions in the STEM fields and improving the quality of their knowledge.

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1. Future Vision of the Transport and Telecommunications Institute

Based on the analytical evaluation of TSI’s operations made during the previous programming period, the preparation and implementation of the Strategy is based on the following principles:

(1) Research as a core for setting and implementing all of TSI’s development goals and activities;
(2) Course quality as an indicator of visibility in the European Higher Education Area and a key factor for competition and realisation of TSI’s mission;
(3) Interaction with society as an open and creative process, projecting the development of society and responding to its needs.

The Strategy is an open document to be complemented during its implementation in line with the results achieved, new knowledge and experiences, problems identified and changes in the external environment.

The TSI Senate analyses the implementation of the Strategy and revises development tasks on an annual basis (at one of the first meetings of the calendar year), setting ex ante the directions and methods of the analysis.

The current Latvian and European Union programming and policy action documents, notably the Latvian Smart Specialisation Strategy (RIS3) guidelines, as well as the laws and regulations of the Republic of Latvia, whose requirements must be complied with in drawing up development planning documents, have been taken into account in the development of the Strategy.

The strategy for setting and achieving the goals is planned on 2 levels:

(1) by 2020, TSI and its organisational units will have gained competitiveness in the European Higher Education Area;
(2) by 2020, the strategic goals and tasks for the next 5–10 years will have been developed for the operation of TSI and its organisational units in the global research and study environment.

Detailed action plans (development plans for TSI organisational units, scientific disciplines and certain activities, such as doctoral studies) are elaborated for the achievement of the Strategy goals, and their types, implementation periods and other parameters are determined by the TSI Senate’s vision of the Development Strategy and tactics. The action plans must include implementation schedules of the activities and types of performance measurement.

1.1. Mission, Vision and Values

Mission

The mission of the Transport and Telecommunications Institute is to create and disseminate advanced knowledge for boosting the quality of life of society

Vision

The vision of the Transport and Telecommunications Institute is to become a European level university offering education and scientific research in ICT and transport areas

Values

The values of the Transport and Telecommunications Institute are quality, social responsibility, internationalisation and openness

Quality. We ensure a consistently high quality of research and higher education services. Our Strategy is based on a strive for excellence. Our goal is the highest quality in everything we do, evaluating the results achieved and making continuous improvements. An essential factor is having full confidence
in our employees and constructive support for the staff. Our research strategy will be ambitious, selective and growth-oriented, mirroring the context of external research and funding opportunities, since we maximise the return on research in order to create a sustainable research environment. We will build a new university structure and develop a knowledge service strategy to support the expansion of our activities and raise the prestige of TSI as an innovation-driven research service provider of choice.

**Social responsibility.** We are a socially responsible university, committed to improving our social mobility. For us, being responsible means to see challenges, search for, find and implement sustainable and true knowledge-based solutions. The fundamental values of our operations are equality, openness, tolerance and respect. We demonstrate ethical and responsible conduct and expect the same from others.

**Internationalisation.** We will improve our position as a modern university by using advanced training methods, engaging in international research and providing training services of the highest standard which will allow us to make a major contribution to social, cultural, educational and economic development.

**Openness.** We are ready for fruitful cooperation in all areas. We are open to ideas, knowledge and fair cooperation which are based on tolerance and non-discrimination.

To implement the mission and match this vision, it is necessary to enhance TSI’s operational capacity by exploiting our internal strengths and opportunities provided by external social and economic processes and take measures to improve our performance in aspects identified as hampering and restraining factors. At the same time, external circumstances which cannot be changed or avoided must be taken into account and reckoned with. An assessment of the existing situation, future prospects and challenges (SWOT analysis) has been undertaken to identify those circumstances and factors.

### 1.2. SWOT Analysis

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
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<tbody>
<tr>
<td>• TSI provides a full cycle (bachelor, master, doctorate) academic education</td>
<td>• Limited diversification of sources of financing</td>
</tr>
<tr>
<td>• The only private university offering STEM programmes</td>
<td>• Absence of doctoral and promotions boards in the field of social sciences</td>
</tr>
<tr>
<td>• The only private university with its own doctoral studies and Promotions Board in engineering sciences</td>
<td>• Absence of joint study courses with Latvian and foreign universities</td>
</tr>
<tr>
<td>• An increasing number of foreign students and guest teachers, ensuring internationalisation of the learning environment</td>
<td>• Shortage of scientific staff engaged solely in research</td>
</tr>
<tr>
<td>• Diversified and successful cooperation with foreign counterparts, active student and staff mobility</td>
<td>• Insufficient dynamics of staff renewal</td>
</tr>
<tr>
<td>• Status of a scientific institution and positive assessment in the 2013 accreditation</td>
<td>• Limited working capital hampering the development of ICT infrastructure</td>
</tr>
<tr>
<td>• Opportunities created for students to obtain professional certificates in the areas of ICT and aviation (CISCO, PART147, etc.); specialised partnership agreements signed with Microsoft and CISCO on the establishment of a Microsoft Academy and CISCO Academy on the basis of TSI</td>
<td>• Limited possibilities to subscribe to scientific databases</td>
</tr>
<tr>
<td>• A lifelong learning centre providing training of people in line with demand</td>
<td>• Insufficient digitalisation of the library impeding the development of distance learning</td>
</tr>
<tr>
<td>• The academic staff represent Latvia in international scientific organisations:</td>
<td>• Low energy efficiency of the main building</td>
</tr>
<tr>
<td>• COST — (European Commission on Cooperation in the field of Science and Technical Research)</td>
<td>• Lack of own dormitory</td>
</tr>
<tr>
<td>• Joint Transport Research Center of OECD (Organisation for Economic Co-operation and Development) and ECMT (European Organisation of Ministers of Transport)</td>
<td></td>
</tr>
<tr>
<td>• European Conference of Transport Research Institute (ECTRI)</td>
<td></td>
</tr>
<tr>
<td>• European Informatics, etc.</td>
<td></td>
</tr>
<tr>
<td>• Extensive cooperation with Latvian business entities in the field of ICT (Employers’ scholarships, scientific projects, etc.)</td>
<td></td>
</tr>
</tbody>
</table>
• TSI is the base organisation, with its management playing an active role in the management of leading public and scientific bodies:
  • Aviation Association of Latvia
  • Latvian Association of Remotely Piloted Aircraft Systems
  • Latvian Transport Development and Education Association
  • Latvian Supply Chain Cluster
  • Operational Research Society of Latvia
  • LETERA
  • LIKTA, etc.
• Good integration of higher education and science through engagement in the study process of researchers and leading researchers
• An academic staff appraisal system which takes into account scientific, academic and organisational activities, and a reserve staff system

<table>
<thead>
<tr>
<th>Favourable external opportunities</th>
<th>Negative externalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The European Union Strategy provides for a need to increase the number of people with higher education</td>
<td>• Technological revolution which requires rapid development of academic laboratories with the latest generation STEM equipment</td>
</tr>
<tr>
<td>• Medium and long-term forecasts of the labour market show a greater demand for specialists in engineering</td>
<td>• Lower level of natural science and mathematics knowledge of secondary school graduates</td>
</tr>
<tr>
<td>• Priority study programmes set at the national level that are already offered by TSI</td>
<td>• Unequal treatment of private education institutions and private scientific institutes in the national legislation</td>
</tr>
<tr>
<td>• A well-defined niche for the university in the education services market</td>
<td>• Reduction of the number of potential students due to the demographic situation in the country, migration and brain drain to other countries around the world</td>
</tr>
<tr>
<td>• An acute need for young specialists in the labour market in the fields of engineering, natural sciences and transport; increased demand for highly qualified specialists in the aviation sector</td>
<td>• Student insolvency and limited study loans resulting from increased student fees and inflation in the country</td>
</tr>
<tr>
<td>• Possibility to raise funding from EU funds and structural funds and other foreign financial instruments</td>
<td>• Different possibilities to access national and European funds and human resources and research programme funding for private and state higher education institutions</td>
</tr>
<tr>
<td>• Annual increase in the number of foreign students as a result of active marketing</td>
<td></td>
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</tbody>
</table>

1.3. The Overreaching Goal and Targets until 2020

The overreaching goal of the Transport and Telecommunications Institute is to obtain university status.

To achieve the overreaching goal of obtaining university status in 2020, it is necessary to restructure all the areas of TSI’s activities and resources. This affects all categories of staff.

The long-term strategic goals of the Transport and Telecommunications Institute include:

• **Excellence of scientific activities**: quality scientific research integrated in the study process, with broad involvement in international, national and sectoral research programmes promoting technology transfer and innovation.

• **Excellence of studies**: high quality, prestigious and internationally recognised studies teaching to view information critically and process it creatively, to think analytically, develop innovation capacities and engage in life-long self-education through the preparation of specialists competitive in the international labour market.

• **Organisational excellence and visibility**: a democratic, effective and modern work organisation of the university promoting excellence of studies and scientific activities, and visibility of TSI in the world.
- **Excellence of infrastructure**: an integrated and modern information and territorial complex promoting training and scientific activities, with the centre in Riga and a developed branch network.

To achieve the defined overarching goal, the long-term objectives and future vision, the Transport and Telecommunications Institute sets 5 interrelated and synergetic medium-term **objectives**:

1. Supply the Latvian and European economy with demanded specialists: engineers, ICT experts, researchers, analysts and managers possessing flagship competences of intellectual and management resources.
2. Establish a European level research centre specialising in ICT, transport and logistics.
3. Participate in dissemination of innovative knowledge and experience.
4. Develop a personnel base required for the operation of a research university.
5. Build an education and research infrastructure at the level of the best science and education centres.

The total number of students at the Transport and Telecommunications Institute with a perspective up to 2020

An increase in the number of students is expected on the way towards the objectives.

<table>
<thead>
<tr>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of students</td>
<td>2,814</td>
<td>3,000</td>
<td>3,300</td>
<td>3,700</td>
</tr>
</tbody>
</table>

To achieve those objectives and the projected number of students, the following **tasks** need to be addressed by 2020:

1. Build a research and education environment ensuring quality preparation of human resources and realisation of Baltic level research and development in the priority development areas of the university.
2. Take the lead in the Baltic science and higher education area through continuous preparation of specialists and researchers in the following areas: information and communications technologies, and transport, including aviation transport.
3. Establish a qualitatively new cooperation between education, science and business, including the development of a university cooperation system with leading Latvian, European and Asian scientific institutes and associations.
4. Based on the integration of the university’s education process and research in the interest of the Latvian economy, prepare technical scientific staff with European level competences.
5. Strengthen the prestige of technical education by gathering competitive scientific and academic staff at the university, including the best young professionals, and building an attractive science and education environment.
6. Develop a targeted planning and internal budgeting system for all types of activities.
7. Develop an organisational infrastructure in line with the university level priority development directions.
8. Create, exploit and disseminate high-level interdisciplinary knowledge.

To achieve the goals set for the TSI, 6 action programmes targeted at long and medium-term objectives have been developed: the Education Programme, Research Programme, Cooperation Development Programme, Human Resources Development Programme, Resources and Supply Programme, and the Management Programme.
2. Compliance of the university’s activities with European and national level strategic documents

The European Commission’s “EUROPE 2020: A strategy for smart, sustainable and inclusive growth”4 puts forward key development priorities for Europe in various directions. The three key priorities of the EU strategy are mutually interlinked and apply to the operations of higher education institutions:

- Smart growth: developing an economy based on knowledge and innovation.
- Sustainable growth: promoting a more resource efficient, greener and more competitive economy.
- Inclusive growth: fostering a high-employment economy delivering social and territorial cohesion.

As a university and scientific institute, TSI is an integral part of this system, and due to its scientific capacity, also an innovation catalyst. TSI contributes directly to the following headline targets:

- at least 40% of the younger generation should have a tertiary degree.
- 3% of the EU’s GDP should be invested in R&D.

TSI creates educated human capital for the labour market and contributes indirectly to the following EU’s headline targets:

- 75% of the population aged 20-64 should be employed.
- 20 million fewer people should be at risk of poverty.

The Guidelines for the Development of Education for 2014–20205 state that, in view of the mounting global competition in higher education and science while the number of potential students decreases in Latvia, a necessity arises to develop a flexible higher education system which would be internationally open, widely accessible and qualitative, i.e. capable of meeting the demand for adequately qualified specialists in line with the development needs of the Latvian economy and the global education market trends, at the same time promoting the personal growth of individuals and the development of society. The Guidelines set key priorities such as people-oriented education, education for sustainable growth, and knowledge-based education promoting society. In its operational Strategy until 2020, TSI follows these principles set out in national strategy documents.

The smart specialisation targets of Latvia are set out in the Smart Specialisation Strategy 6 (hereinafter RIS3), which is an economic development strategy. One of the key RIS3 components is building human capital in knowledge areas important for Latvia, taking into account the potential of the existing sectors of the economy, and aimed at increasing mobility of those sectors in order to modernise research and education. RIS3 and the “Guidelines for the National Industrial Policy for 2014–2020”7 hereinafter NIP) are in fact two mutually coordinated components of the economic development plan ensuring the achievement of a common objective: structural changes in the economy to increase the share of higher added value products and services in export.

RIS3, together with NIP, the National Development Plan of Latvia for 2014–20208 (hereinafter NDP) and the National Reform Programme, constitute a joint programming document system for the achievement of Latvia’s national goals, where RIS3 and NIP targets provide for a joint contribution of 1.5% to research and development by 2020. The NDP defines the headline target as an ‘economic break-

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6 Smart Specialisation Strategy. Available at: petijumi.mk.gov.lv/sites/default/files/file/IZM_Viedas_Specializ_strategija.doc
through’ to be achieved through a developed system of research, innovation and higher education, as well the development of competences.

Within RIS3, Latvia needs to build innovation capacities in five areas, including information and communications technologies, as they represent an area supporting the growth of all sectors of the economy, and in engineering (including electronics). In the academic year 2016/2017, TSI offered training under 11 STEM programmes in the following study directions:

a) Information technologies, computer hardware, electronics, telecommunications, computer control and computer science (3 bachelor, 3 master, 1 professional and 1 doctoral programmes)

b) Mechanics and metalworking, thermal power engineering, heat engineering and machinery (2 bachelor and 1 professional programmes).

In the next coming years TSI is planning to increase the range of its STEM programmes with opening of a new Aviation Faculty and creation of a separate master programme in the field of aviation.

Two of the earmarked RIS3 ecosystems — “Information and Communications Technologies” and “Smart Materials, Technologies and Engineering Systems” — apply to TSI. The ecosystems reflect players in each smart specialisation area and their mutual relationships. The scheme of ecosystem players is shown in Figure 1 and is identical for all five ecosystems.

Universities are serious players of the ecosystem, since they contribute to the performance of tasks such as increasing the number of specialists in the areas “Computer Science and Information Technology” and “Electrical Engineering, Electronic Technology, and Information Engineering”, and to increasing the capacities of the existing specialists in the area of computer science and information technologies. TSI actively cooperates with sector companies as direct employers, thus keeping its education programmes in line with the theoretical and practical needs of the industry and ensuring training posts for students.

The analytical description of the smart specialisation area “Information and Communications Technologies” ecosystem concludes that the ICT area faces an acute and growing demand for employees of various qualification levels in IT development and service provision, and in education and science. The Ministry of Economics’ Informative Report on Medium and Long-Term Labour Market Forecasts® (2016)

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also states that even with a relatively high wage level, in some occupations it is already hard to satisfy the growing demand for labour force with appropriate qualifications. Labour supply and demand forecasts show that in 2022 the deficit of specialists in the thematic group “Natural Sciences, Mathematics and Information Technologies” will reach 133% of the current supply and 138% in 2030. Labour market forecasts at the European Union level show a similar trend: demand will increase in sectors related to progressive industry, mainly nanotechnology, material sciences, electronics, ICT and biotechnology. Therefore, the interest of employers to recruit new employees having knowledge in digital technologies, computer science, and people with analytical thinking will grow. The European Commission has deemed the specialisation in high technology and knowledge-intensive sectors as one of the key advantages of the EU’s competitiveness in the global markets. These changes will also determine that demand will increase for specific skills and knowledge.

**RSI3 defines a national level action plan for building future innovation capacities, and the activities taken by TSI correspond to several measures under the common national framework.** With regard to the renewal and development of human capital, TSI is planning to develop new doctoral programmes, including through company grants for doctoral students, and encourage the attraction of young scientists from the sectors, and to implement post-doctoral projects. With regard to increasing the quality of education aimed at quality smart specialisation, in addition to the existing cooperation with several universities abroad, TSI is planning to develop a joint doctoral programme and continue providing the learning process in English. Whereas from the viewpoint of promoting the commercialisation of innovation, university students and future researchers are actively involved in business; this process is also furthered by TSI’s participation in centres and competence clusters. The establishment of a technology transfer system on the basis of the Investment and Development Agency of Latvia will provide in the nearest future for additional opportunities for closer cooperation between the university and research organisations and businesses. With regard to the creation of new jobs and provision of quality workforce, TSI uses several instruments: organises Career Days, provides grants financed by businesses and training posts at several companies.

With regard to the directions for transformation of the national economy, priorities and areas of specialisation defined by RIS3, it must be said that higher education and science are sectors with a significant **horizontal impact on the development process of the national economy.** Investment in TSI infrastructure development will have a direct and indirect impact on the achievement of the overreaching objective and macrolevel indicators of RIS3, as shown in Table 2.1.

<table>
<thead>
<tr>
<th>Performance indicators of the RIS3 overreaching objective</th>
<th>Base value</th>
<th>Value in 2020</th>
<th>Impact of TSI on the achievement of targets/indicators as a result of the implementation of STEM programmes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment in R&amp;D (% of GDP)</td>
<td>0.6 (2013)</td>
<td>1.5</td>
<td>Indirect impact. TSI role: preparation of human resources for science and doing business in a modernised infrastructure, research in cooperation with companies.</td>
</tr>
<tr>
<td>Private sector investment in R&amp;D (% of total investment)</td>
<td>21.8 (2013)</td>
<td>48</td>
<td>Direct impact. Role of TSI:</td>
</tr>
<tr>
<td>Share of innovative companies (% of all companies)</td>
<td>30.4 (2012)</td>
<td>40</td>
<td></td>
</tr>
</tbody>
</table>

Table 2.1: Impact of the modernisation of TSI infrastructure on the achievement of the overreaching objective and macrolevel indicators of RIS3
### Share of high-tech and medium-high-tech companies in Latvian exports of goods (%)

<table>
<thead>
<tr>
<th>Year</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>23.8</td>
</tr>
</tbody>
</table>

- preparation of human resources for scientific activity and innovative business in the modernised infrastructure,
- company grants,
- research in cooperation with companies,
- prospective establishment of spin-offs,
- university’s participation in centres and competence clusters,
- implementation of national and international level projects.

### Number of scientific personnel in research and development (public, private sector)

<table>
<thead>
<tr>
<th>Year</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>5,593</td>
</tr>
</tbody>
</table>

- Direct impact. Role of TSI: preparation of human resources for scientific work in the modernised infrastructure, grants, and post doctoral support.

### Share of graduates (ISCED 5 and 6) in STEM areas of the total number of graduates, %

<table>
<thead>
<tr>
<th>Year</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>19</td>
</tr>
</tbody>
</table>

-Direct impact. Role of TSI: preparation of human resources in the modernised infrastructure. The concrete deliverables in each STEM programme direction are specified in Section 3 of the Strategy.

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Implementation of the STEM education programmes in the smart specialisation areas of “Information and Communications Technologies” and “Smart Materials, Technologies and Engineering Systems” by TSI will have a positive impact on results, such as the number of innovative employees in the industry, P&A jobs, the capacity and number of researchers in research organisations, as well as the intensification of cooperation with the industry.

Universities are indicators of applied knowledge; with regard to TSI it is the ICT area, as well as the use of smart technologies and engineering systems in logistics and transport. Contribution to the university’s infrastructure is a contribution to human capital and increase in the number of researchers, and RSI3 defines that those two criteria are decisive in decision-making on infrastructure investments, while the existence of infrastructure required for research and training is a precondition for building innovation capacity.

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### 3. Education Programme

The TSI education programme is based on its vision, mission, description of the current situation and evaluation of future prospects. The goals and tasks of the education programme are planned to:

- increase the TSI’s capacity to generate competitive intellectual potential, especially in those sectors of the economy which are included in the Latvian Smart Specialisation Strategy;
- further TSI’s internationalisation by becoming a provider of higher education and scientific research services which is visible, recognised and demanded in the international environment;
- ensure the prestige of STEM education, concentrate competitive scientific and academic staff, including young professionals and guest trainers, thus creating an attractive higher education and scientific research environment.

The Transport and Telecommunications Institute offers higher education, lifelong learning and scientific research in areas of the economy where education and research competences have been accrued over many years. The university undertakes a regular compliance assessment of each study direction and course with regard to their relevance to the sectors of Latvian economy and labour market demand. Since its very creation, TSI has put a special focus on the development of study courses preparing specialists in areas included in the ecosystems “Information and Communications Technologies” and “Smart Materials, Technologies and Engineering Systems” specified by the Latvian Smart Specialisation Strategy. This also justifies the goal of TSI’s education programme: to prepare internationally competitive specialists — engineers, ICT professionals, researchers, analysts, and managers with skills and competences required for a knowledge-based economy.

**Tasks** to achieve the university’s education programme target:
- Establishment of new interdisciplinary programmes in response to changes in the labour market that require new professional skills in the increasingly competitive world.
- Involvement (engagement) of stakeholders in the development of education programmes.
- Development of information and communications technology-based education.
- Increasing the availability of lifelong learning through the development of modern distance learning methods to make learning more available.
- Establishment of a career management centre and offering of career advice to students for their intellectual development in the form of lifelong learning.
- Improvement of foreign language training in the context of international cooperation in education and research.
- Involvement of foreign students and teaching staff.

Three faculties of the Transport and Telecommunications Institute currently study programmes in 5 study directions, with two of them including STEM programmes:

1. Information technologies, computer hardware, electronics, telecommunications, computer control and computer science (8 STEM programmes);
2. Mechanics and Metalworking, Thermal Power Engineering, Heat Engineering and Machinery (3 STEM programmes);
3. Transport services;
4. Economics;
5. Management, administration and real estate management.

All study directions have been accredited for a maximum term of 6 years, i.e., until June 2019.

Figure 3.1 below shows study directions with the study programmes implemented.

3.1. Faculty of Computer Science and Telecommunications
The “Information technology, computer hardware, electronics, telecommunications, computer control and computer science” study direction of the Faculty of Computer Science and Telecommunications (FCT) determines the specialisation of the Transport and Telecommunications Institute as an engineering university. In this study direction, study programmes focusing on the requirements of information and communications technologies (ICT) and electronics industry of the RoL are implemented. The study direction comprises academic bachelor, professional, master and doctoral programmes in engineering.

- Professional study course “Electronics”, 42523
- Bachelor programme “Bachelor of Natural Sciences in Computer Science”, 43481
- Bachelor programme “Bachelor of Engineering Sciences in Electronics”, 43523
- Bachelor programme “Telecommunications systems and computer networks”, 43523
- Master programme “Master of Natural Sciences in Computer Science”, 45481
- Master programme “Information System Management”, 45526
- Master programme “Master of Engineering Sciences in Electronics”, 45523
- Doctoral programme “Telematics and logistics”, 51526

3.1.1. Continuity of study programmes

The below figure shows the continuity and compatibility of study courses with higher level study programmes.

![Figure 3.2: Continuity of study programmes offered by the Faculty*](image)

*Higher level study programmes also admit students from other study directions, provided that a written test has been passed in the selected field

3.1.2. Study direction “Information Technologies, Computer Hardware, Electronics, Telecommunications, Computer Control and Computer Science”

The study direction offers programmes aimed at:

- preparing highly qualified specialists in the field of information technology, computer science, electronics and telecommunications, able to develop, maintain, diagnose, analyse and optimise information technologies, computer systems, electronic and telecommunications systems in production and commercial companies of any form, and public administration institutions, and capable of taking responsible decisions in accordance with the needs of the economy;
• ensuring preparation of top level specialists, which after graduation would be able to undertake experimental, research and technological exploitation activities in production, public administration institutions or companies using information technologies, computer systems, electronics, robotics or telecommunications systems;
• preparing master’s graduates for independent scientific, design and pedagogical work in the field of technology, electronics and telecommunications;
• ensuring the quality of the courses is in compliance with the European standard of education in both organisational and methodological terms (awarding of credits and performance evaluation — ERASMUS ECTS project), as well as the integration of academic and professional education, by offering students a free choice of subjects, type of studies and a possibility to continue education.

3.1.2.1. Students studying in the direction

In the 2016/2017 academic year, in study programmes in the direction “Information technology, computer hardware, electronics, telecommunications, computer control and computer science”, there are 129 master, 17 doctoral and 992 first cycle (bachelor and professional training) students accounting for a total of 1,138 students, including 107 (or 9.4%) foreign students.

![Figure 3.3. Student dynamics of the study direction from 2008–2016.](image)

In the 2015/2016 academic year, 78 students graduated from the study direction “Information technology, computer hardware, electronics, telecommunications, computer control and computer science” and received higher education diplomas. The decrease in the number of students in the study courses relates to demographic factors, difficulties to master the programme content (knowledge and skills in mathematics, physics and programming, which today are not fully acquired due to emphasising the humanities in secondary schools), as well as the loss of prestige of engineering sciences among the youth.

3.1.2.2. Structure, management and resources of the study direction

The management of the study direction is ensured by the Faculty of Computer Science and Telecommunications (FCT), whose Dean is the Director of the study direction. To address operational management issues, the Director of the study direction, Directors of programmes implemented by study directions and Faculty Department Heads participate in the council of the study direction.

Issues concerning development of the study direction are addressed and discussed by the FCT Council. The Faculty Council consists of 14 members, 4 of which represent the electronics industry. The Council of the Faculty of Computer Science and Telecommunications include the following external
representatives: the Head of Accenture Latvia computer technology company, M. Jegorovs, the Head of OPTRON telecommunications company, A. Ivanovs, Leading Engineer of Rīgas Siltums VAS Energotīkli department, Dr.sc.ing. I. Radčenko, and Leading Specialist of Siemens Latvia, Dr.sc.ing. V. Samoilenko. Strategic decisions are approved by the Training Methods Commission (TMC) of the TSI Senate and the TSI Rector.

Three Faculties and their reporting Departments, as well as other organisational units ensuring, within their sphere of competence, the achievement of the results envisaged by the programmes, are involved in the implementation of the study direction. Involved in the study process are:

1. Faculty of Computer Science and Telecommunications:
   - Department of Computer System Software;
   - Department of Electronics and Telecommunications;
   - Department of Mathematical Methods and Modelling.

2. Faculty of Management and Economics:
   - Department of Economics, Management and Finance;
   - Department of Humanities.

3. Faculty of Transport and Logistics:
   - Department of Transportation and Logistics

4. Corporate Services Department (organisation of traineeships).

5. Studies Department (organises work with students).

6. Research Department (organises and supports research activities).

7. The TSI Telecommunications, Electronics and Robotics Centre with its laboratories, the Laboratory of Applied Software Systems, Cisco Networking Academy, and Microsoft Academy.

The Telecommunications, Electronics and Robotics Centre (TERC) comprises 9 laboratories equipped with hardware and software. Each laboratory is a complex of technical, software and methodological support, enabling courses to be conducted at a high level. The following laboratories have been established and equipped within the Centre:

- Laboratory of Physics and Electrical Machines,
- Laboratory of Modelling of Electronic Systems,
- Laboratory of Embedded Systems and Digital Signal Processing,
- Laboratory of Industrial Automation,
- Laboratory of Subsurface Radiolocation,
- Laboratory of Robotics and Students’ Research Work,
- Laboratory of Designing and Prototyping,
- Laboratory of Telecommunications and Electro-Optical Systems,
- Laboratory of Electronics.

The technical and methodological support of the laboratories enables the achievement of the programme targets. The computer classrooms used are auditoriums 303–306, 505, and 226(CISCO Networking Academy) and 227 (Microsoft Academy). In total, over 100 computers with the necessary software are used.

3.1.2.3. Academic staff involved in the implementation of the study direction

Implementation of the programme in the study direction “Information technology, computer hardware, electronics, telecommunications, computer control and computer science” is ensured by 37 teaching staff (PLE 23.1), of which 35 (95%) are elected and employed by TSI as their main job. 24 people (65%) have obtained habilitated doctor’s and doctor’s degrees. 10 teachers (27%) hold professor and associate professor positions, 14 teachers (38%) are assistant professors, 10 lecturers (27%), 3 assistants (8%), and 2 guest teachers (5%). The composition of academic staff includes few young teachers, which, however, are essential for the future existence of study courses. 9 teachers (24%) have reached retirement age or will reach it in the next 2 years. Young teachers, including TSI graduates, are
invited. The young teachers participating in the programme implementation are TSI graduates, who have already completed their studies in the doctoral programme “Telematics and logistics” and defended promotion papers leading to a doctoral degree. In 2015/2016, 3 teachers of the study direction obtained doctoral degrees. This can be considered a good indicator of the renewal of academic staff. Most of the teachers carry out active scientific and research activities, participate in scientific projects, publish works in scientific journals and present reports at conferences.

3.1.2.4. Evaluation of the Latvian labour and education market in terms of availability of jobs for programme graduates

The Faculty prepares specialists in the most demanded sectors of the Latvian and EU economy: “Natural Sciences, Mathematics and IT” and “Engineering, Production and Construction”.

The Ministry of Economics Informative Report on Medium (until 2020) and Long-Term (until 2030) Labour Market Forecasts states that “such a situation could emerge sooner in the group of natural sciences, mathematics and information technologies. If the education structure does not change, a shortage of specialists with higher education in engineering, production and construction, agriculture, as well as health and social welfare might arise by 2020. There is an expected shortage of senior science and engineering professionals and information and communications technology professionals” (see Figure 3.3), while the demand for professionals with secondary education will see a relative decline.

![Figure 3.4: Distribution by thematic groups of education of the number of university and college students in the academic year](https://www.em.gov.lv/files/tautsaimniecibas_attistiba/dsp/EMZino_06_160616.pdf)
Figure 3.5: Number of students enrolled and the share of students expelled by thematic groups of education (source: “Informative Report on Medium and Long-Term Labour Market Forecasts”, Ministry of Economics, 2016, p. 132)

Figure 3.6: Labour market supply and demand dynamics by thematic groups of education (source: “Informative Report on Medium and Long-Term Labour Market Forecasts”, Ministry of Economics, 2016, p. 132)
In line with the Latvian labour market development forecasts until 2030 ("Informative Report on Medium and Long-Term Labour Market Forecasts", Ministry of Economics, 2016, p. 132) the share of the economically active population with higher education continues to increase gradually, and in 2015 it was 7.6 percent higher when compared to 2008.

Labour market supply and demand mismatches in that sector are expected in the nearest future. Since the study programmes are complicated and students obtaining secondary school education are poorly prepared, the number of university students of STEM thematic directions has decreased during the period between 2008 and 2015 from 27% to 19% (see Figures 3.3 and 3.4).

According to forecasts, in 2022, the increasing demand of the economy in the thematic groups of natural sciences, mathematics and IT and engineering, production and construction education with high value added, and service development based on the use of ICT in line with the Smart Specialisation Strategy, will lead to the demand for professionals with higher education exceeding supply by 18–33% (Figures 3.5 and 3.6).

However, according to the Council of the European Union, in Employment and Social Developments in Europe 2012, January 2013, it follows that at the European Union level, “the greatest skill shortages will be observed among professions where employees require specific qualifications, such as natural science and health care professionals, and education institution specialists and IT professionals”. It can be concluded that in the next 10–20 years the European and global labour market demand for professionals will further increase in ICT and electronic engineering, thus increasing the export potential of the programme’s study direction. Demand for STEM programmes from foreign students is increasing year by year (by an average of 30% per year), and this demonstrates that the existing programmes have an export potential (this applies to bachelor, master and doctoral level programmes).

When looking at the relevance of programmes in the study direction, it can be concluded that in line with contemporary worldwide trends in the field of ICT and engineering sciences, as well as the most important development directions of the Latvian national economy, corresponding to smart
specialisation, the Faculty has certain perspectives in the study direction “Information technologies, computer hardware, electronics, telecommunications, computer control and computer science”, i.e.:

- Embedded Systems,
- Internet of Things (IoT),
- Big Data Analysis,
- Information Security.

TSI programmes in the study direction of the Faculty of Computer Science and Telecommunications have a certain significant market share in the territory of Latvia (TSI is among the universities implementing STEM programmes, but not receiving government budget financing). Similar ICT professionals are prepared by approximately 15 universities, the biggest of which are RTU and LU. Professionals for electronics and telecommunications sectors are prepared by 4 universities: RTU, TSI, RA and VA. The quality of the competences acquired by TSI graduates ensure them possibilities to find jobs not only in Latvia, but also abroad (EU, USA, Russia, etc.).

3.1.2.5. Development of the study direction

The annual discussions and the results of questionnaires received show that graduates of the TSI study direction “Information technology, computer hardware, electronics, telecommunications” are demanded in the labour market. However, in light of the rapid development of the ICT area, it is necessary to ensure continuous development of the STEM programmes in order to follow global trends and offer students knowledge of the latest technologies. Due to the need to continuously develop the STEM programmes, the following development plan is under implementation, taking into account all the development dimensions of the STEM programmes.

<table>
<thead>
<tr>
<th>No.</th>
<th>Activity</th>
<th>Time-line</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><strong>Increasing the efficiency and quality of the studies</strong></td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>Modification of the study programme in the direction</td>
<td>Annually</td>
</tr>
<tr>
<td>1.2</td>
<td>Self-assessment and discussion of the implementation of study programmes</td>
<td>Annually</td>
</tr>
<tr>
<td>1.3</td>
<td>Involvement of external specialists and employers in the work of Faculty Council and in the development and evaluation of study programmes</td>
<td>Annually</td>
</tr>
<tr>
<td>1.4</td>
<td>Improvement of the Education Quality Management System</td>
<td>In compliance with the QMS improvement programme</td>
</tr>
<tr>
<td>2.</td>
<td>Improvement of subjects and study programmes</td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>Monitoring of the education system, professional market, and labour market</td>
<td>In accordance with the faculty’s Action Plan</td>
</tr>
<tr>
<td>2.2</td>
<td>Cooperation with employers</td>
<td>Continuously and in accordance with action plans (part of cooperation agreements)</td>
</tr>
<tr>
<td>3.</td>
<td>Improvement of the methodological base</td>
<td></td>
</tr>
<tr>
<td>3.1</td>
<td>Improvement of distance learning training in separate programmes of the study direction.</td>
<td>From 2016</td>
</tr>
<tr>
<td>3.2</td>
<td>Provision of the Library with current literature and regulatory documents in the field of the direction.</td>
<td>In accordance with the faculty’s Action Plan</td>
</tr>
<tr>
<td>3.3</td>
<td>Intensified use of modern technical means of teaching.</td>
<td>Continuously</td>
</tr>
<tr>
<td>4.</td>
<td>Improving the quality of the diploma, bachelor and master papers</td>
<td></td>
</tr>
<tr>
<td>4.1</td>
<td>Involvement of external experts and employers in the selection of final test subjects</td>
<td>Continuously</td>
</tr>
<tr>
<td>4.2</td>
<td>Inclusion of external experts and employers in the State Examination Commission</td>
<td>Continuously</td>
</tr>
<tr>
<td>4.3</td>
<td>Introduce expert evaluation of master papers</td>
<td>2018</td>
</tr>
<tr>
<td>4.4</td>
<td>Introduction of rules for a new design of the final examination papers and new procedures for the verification of the new design of final examination papers</td>
<td>2018</td>
</tr>
<tr>
<td>5.</td>
<td>Ensuring openness and the freedom to select studies</td>
<td></td>
</tr>
<tr>
<td>5.1</td>
<td>Participation in the ERASMUS ECTS project</td>
<td>Annually</td>
</tr>
<tr>
<td>5.2</td>
<td>Entering into agreements with foreign universities on training and scientific activity matters and their performance</td>
<td>Continuously</td>
</tr>
</tbody>
</table>

Table 3.1: Development plan of the study direction
| 5.3. | Preparation, dissemination and development of subjects of studies and methodological guidance | From 2016 |
| 6. | Improvement of qualifications | |
| 6.1. | Improvement of teaching staff qualifications: | At least every 3 years |
| | • internships, | Annually |
| | • participation in scientific seminars, | Annually |
| | • methodological work, | Annually |
| | • participation in national and international scientific and consultancy projects | |
| 6.2. | Invitation of leading scientists from other universities and professionals, incl. from abroad | At least 3 each year |
| 7. | Increasing the professional proficiency | |
| 7.1. | Professional certification courses by Microsoft | Continuously |
| 7.2. | Professional certification courses by CISCO | Continuously |
| 7.4 | LCCI Business English course | Continuously |
| 7.6. | Professional certification courses by Siemens | Continuously |

The plans are to increase, by 2020, the number of STEM programmes of the TSI Faculty of Computer Science and Telecommunications (FCT) by one programme. There are no plans to close any study programmes, since FCT programmes are attractive in both Latvian and external markets.

The TSI Faculty of Computer Science and Telecommunications is planning to open a new professional bachelor programme “Robotics” from 1 September 2017. The programme will have two specialisations: Industrial Robotics and Autonomous Robots. The programme will focus on professional knowledge and practical skills in technical and science areas that serve as the basis for contemporary robotics: embedded electronics, mechatronics, smart systems and programming, and automatic control and information processing algorithms. Besides base and mandatory courses, the “Robotics” programme will cover the following specialisation courses: robot kinematics and dynamics, methods of artificial intelligence in robotics, smart robots, autonomous embedded robot systems, movement planning of autonomous robots, development of technical devices for autonomous robots, and technical and computer vision systems. A Laboratory of Mobile Robots and Laboratory of Embedded Systems and Smart Technologies will be necessary to conduct the practical and laboratory work of the above courses. The plans are to deliver the programme in Latvian, English and Russian.

The other study programmes will be modernised, taking account of the existing market demand and technological progress. To increase the quality of mastering the study programmes and ensure the expected learning outcomes, plans from the academic year 2016/2017 include:

- With regard to bachelor programmes in engineering, in order to harmonise the structure of the study programmes and offer students a logical sequence of training from a theoretical base to professional skills, and to synchronise the study process with the similar engineering science TSI bachelor programmes “Electronics” and “Telecommunications Systems and Computer Networks”, move the professional specialisation subjects from semesters 1-4 to semesters 5–8.
- Include in the study process of the engineering science bachelor programme, sessions of laboratory practice during which students work independently with laboratory equipment under the guidance of a trainer, acquiring professional skills and competences regardless of the number of students in the group.
- During the summer holidays, as an additional practical opportunity to familiarise with telecommunications companies to the extent of 2–4 credits, to organise the bachelor programmes “Bachelor of natural science in computer sciences” and “Telecommunications systems and computer networks” at the students’ choice.
- Establish a specialised Accenture Department (in perspective also the X-Infotech and SAFtehnik laboratorys) at the Faculty and envisage opening new specialisations upon request from cooperation partners (within the framework of the existing programmes).
• With regard to the master programme “Master of Engineering Sciences in Electronics”, the plans are to update the content of the study programme “Algorithms and Digital Signal Processing Systems” on the basis of modern field-programmable gate arrays (FPGA).
• Transform the content and structure of the “Information System Management” programme by including the following subjects: Cloud Technologies and Services (2 credits), Human-Machine Interaction (2 credits), Decision Making Tools And Methods (2 credits), Business Psychology (2 credits).
• Update the software and technical support, and purchase new equipment for the Laboratory of Applied Software Systems (LAS) and TERC, which is the main laboratory ensuring implementation of the Faculty’s programmes.
• With regard to the master programme “Master of Natural Sciences in Computer Science”, create a “Big Data Analytics Technologies” specialisation with the help of the University of Murcia (Spain). This specialisation will include the following blocks of study courses: “Big Data” and “Data Science”. The following study courses are planned within the “Big Data” block: Large Scale Databases, Massive Data Computation Technology, Non-Structured Information Management Technology, Internet of Things in the Context of Big Data; whereas the “Data science” block envisages the following study courses: Statistical Learning, Data Visualization, and Data mining.

With a special focus on the attraction of students, active work is ongoing and intended to continue with young school-goers in Latvia:
• Young people are invited to the Career Week organised by TSI, and are acquainted with work of the existing laboratories;
• Career Days are organised, during which young people can learn about labour market developments and demand;
• The annual maths and informatics olympiad is organised in cooperation with major ICT companies;
• We actively attract schoolchildren’s interest through thematic Open Door Days;
• For the second year in a row, we have organised preparatory courses in mathematics, English and informatics;
• In cooperation with TSI partner companies, scientific and research competitions (with a pecuniary prize fund) are organised for secondary school pupils and our students;
• Representatives from companies of the Faculty profile are attracted to support the best students and award scholarships, etc.

Table 3.2: Key target indicators

<table>
<thead>
<tr>
<th>Indicators</th>
<th>2016</th>
<th>Indicator value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction of distance learning in study programmes and development of e-courses</td>
<td>25%</td>
<td>50% of programmes</td>
</tr>
<tr>
<td>Number of students in the study direction:</td>
<td>1,138</td>
<td>1,672</td>
</tr>
<tr>
<td>1. Level 2 professional study programme “Electronics”, 42523</td>
<td>40</td>
<td>53</td>
</tr>
<tr>
<td>2. Bachelor programme “Bachelor of Natural Sciences in Computer Science”, 43481</td>
<td>808</td>
<td>1,176</td>
</tr>
<tr>
<td>3. Bachelor programme “Bachelor of Engineering Sciences in Electronics”, 43523</td>
<td>59</td>
<td>93</td>
</tr>
<tr>
<td>4. Bachelor programme “Telecommunications systems and computer networks”, 43523</td>
<td>85</td>
<td>112</td>
</tr>
<tr>
<td>5. Master programme “Master of Natural Sciences in Computer Science”, 45481</td>
<td>49</td>
<td>63</td>
</tr>
<tr>
<td>6. Master programme “Information System Management”, 45526</td>
<td>74</td>
<td>100</td>
</tr>
</tbody>
</table>
3.1.2.6. External cooperation between programmes of the study direction

TSI has signed a range of cooperation agreements with cooperating universities and organisations from the European Union countries, Russia and Kazakhstan on participation in joint research and innovation projects, provision of consultancy services, exchange of teaching staff, etc., of which 7 agreements are directly linked to the direction profile.

Studies of the programme performance results are carried out through both employer questionnaires and analysis of the materials available on the internet and in publications. Studies are organised by the Corporate Services Department and the results are presented in the form of an annual report. TSI cooperates with the following companies: Lattelecom Ltd., Latvian Mobile telephone, Microsoft Latvia, Optron, Latvijas Gaisa satiksme, Triatel, Tele2, Versija, IBM Zurich, Alfa RPAR, BNS, Volburg, Atalnt, Cisco Corp., Exigen Latvia, Accenture, Siemens, CityCo, Amber Games, and associations: LaTAIA, LIKTA, LETERA, etc. An especially close cooperation has been established with X Info Tech SIA and Accenture Latvia. Both companies take an active part in the events organised by TSI. Career Days, open lectures. X Info Tech SIA also supports the best TSI students through training scholarships, and organises research competitions for TSI students. Whereas a cooperation agreement was signed in 2016 with Accenture Latvia on the following activities:

- provide TSI with training aids for a programming course;
- cooperate with TSI representatives in the development of scientific and research projects;
- cooperate with TSI representatives on matters related to the preparation of IT professionals;
- as necessary and according to realistic opportunities, offer training to students and training and internship posts to TSI teachers;
- provide TSI information about vacancies and training posts at the cooperation partner’s company;
- support attraction of their professionals to give lectures in TSI profile directions, provide TSI students with mentors from amongst their professionals;
- announce student scientific and research competitions on topical subjects of the industry;
- propose subjects for graduation papers for TSI students;
- implement joint marketing activities aimed at popularising the IT area;
- establish in the TSI structure an Accenture Latvia Department aimed at ensuring close cooperation in academic and research areas.

The academic staff of the study direction take an active part in and also manage multiple scientific projects both at national and international level. Over the last years, 17 scientific works of students have won prizes in competitions organised by the Riga City Council, Exigen Services AS, DATI, the Latvian Academy of Science, and Latvijas Gaisa satiksme VAS; students were awarded distinctions, premiums and scholarships.
3.1.2.7. Scientific and academic activity development plan for academic staff of the study direction

In line with the TSI Research Strategy (2015–2020), FCT has been identified as the core of the research ensuring research activities within the framework of the STEM programmes. The current STEM programmes provide the required knowledge for students to have the possibility to fulfil their potential not only in the professional environment, but also to become scientists. TSI students from the STEM programmes are engaged as assistants in a variety of national and international projects. STEM programme students also participate in contractual research performed by TSI.

Activities planned in 2016–2020 for the development of the Faculty's scientific and academic staff:

- Increase the participation of TSI master and doctoral students and academic staff in scientific research, including in international conferences, the Horizon 2020 programme and other projects, as well as in contractual research for enterprises and organisations.
- Increase the number of scientific publications in the internationally quoted Scopus and Web of Science databases to 36–40 articles by 2020, and at least 2 (two) PhD theses defended, which have been prepared by order of enterprises and organisations.
- By 2020, increase the number of staff with doctoral degrees to 80% of the elected academic staff.
- Organise teaching staff internships at ICT and electronics industry companies.
- Enhance cooperation with foreign universities (through cooperation agreements, incl. within the ERASMUS+ programme, in order to improve the qualifications of teaching staff).
- Organise joint scientific research with Fraunhofer IFF (Germany), Wroclaw Technical University (Poland), the Institute of Electronics and Computer Science, etc.

Currently the number of teaching staff aged up to 35 years is the smallest age group, whereas the largest group is those teachers aged 60 and above. Development of the academic staff is planned at the expense of master and doctoral programmes. Each faculty has a master programme, and all of them include pedagogical practice. Moreover, some Departments invite master students to deliver individual practical study courses within bachelors programmes. This provides for the possibility to select and incentivise the right graduates for pedagogical work. If competitive salaries are offered after graduation, those people can become qualified assistants loyal to the university, and later also lecturers.

Attraction of foreign teachers, researchers and lecturers for the implementation of TSI Faculty of Computer Science and Telecommunications programmes

To ensure the quality and continuous development of the existing TSI STEM programmes in the light of the worldwide globalisation trends and intense technological development, it is necessary to actively engage foreign teachers, researchers and lecturers in the study process. The National Development Plan of Latvia for 2014–2020 includes mobility of academic and research staff and attraction of foreign lecturers as a means to achieve the target of ensuring qualified and internationally competitive academic staff for higher education. TSI attracts foreign teachers, researches and lecturers to ensure:

- inclusion of new courses in study programmes or the development of the existing study courses, taking into account the global best practice;
- improvement of the qualifications of the existing teaching staff and an intensive knowledge sharing process;
- implementation and development of new study directions and research avenues at TSI.

Out of the overall annual Faculty budget of EUR 12,000, a special budget line of EUR 4,000 was included for each of the Faculty’s Departments (the Faculty has 3 Departments) for the attraction of foreign teachers, researchers and lecturers. The plan is that each Department will attract 2 foreign specialists, or 6 in total, within a year. TSI is planning to make use of the opportunity to submit a project within the SO 8.2.2 programme “To strengthen the capacities of academic staff of higher education institutions in the areas of strategic specialisation”, and to use other programmes for financing invited
guest teachers, as well as increase the number of foreign trainers, researchers and lecturers to up to 10 visits per year.

In the academic year 2015/2016, master students of the Faculty were given guest lectures and seminars by professor Jusas Vacius, PhD, Kaunas University of Technology (Software Security Engineering course); Rubens Neil, Ph.D., Associate Professor, MediaX, Stanford University; Radin Michael Alexander, PhD, Rochester Institute of Technology (Data Science scientific seminar); Mathematics, Discrete Mathematics course, Alfonso Bahillo, DeustoTech (University of Deusto).

The TSI Faculty of Computer Science and Telecommunications is planning to continue attraction of foreign specialists in areas such as Cloud Computing, Data Science, Big Data, High Performance Computing, Human-Machine Interaction, Artificial Intelligence, Image Processing, etc.

### Table 3.3: Key target indicators

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Indicator value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of publications per year / per FTE of elected academic staff</td>
<td>88 (3.8)</td>
</tr>
<tr>
<td>Share of academic staff with a PhD from the total number of academic staff</td>
<td>65%</td>
</tr>
<tr>
<td>Number of academic staff</td>
<td>18</td>
</tr>
<tr>
<td>Number of scientific staff with a PhD</td>
<td>14</td>
</tr>
<tr>
<td>Number of high class industry professionals attracted</td>
<td>5</td>
</tr>
<tr>
<td>Number of young scientists</td>
<td>6</td>
</tr>
<tr>
<td>Number of foreign visiting professors compared to elected academic staff</td>
<td>6.7%</td>
</tr>
</tbody>
</table>

#### 3.2. Faculty of Transport and Logistics

Two study directions are pursued by the Faculty of Transport and Logistics: “Mechanics and Metalworking, Thermal Power Engineering, Heat Engineering and Machinery”, and “Transport Services”.

##### 3.2.1. Continuity of study programmes

The figure below shows the continuity of the study programmes and their compatibility with higher level study programmes.

![Figure 3.8: Continuity of study programmes offered by the Faculty*](image)

*Higher level programmes also admit students from other study directions, provided that a written test has been passed in the selected field.
3.2.2. Study direction “Mechanics and Metalworking, Thermal Power Engineering, Heat Engineering and Machinery”

The following programmes are pursued in the study direction “Mechanics and Metalworking, Thermal Power Engineering, Heat Engineering and Machinery”:

- Bachelor programme “Aviation Transport”, 43525
- Professional study programme “Technical Maintenance of Aircraft Transport”, 41525
- Bachelor programme “Transport Commercial Operation”, 43525

Programmes pursued within the study direction are aimed at:

- preparing highly qualified professionals in the field of operation of aviation and land transport, capable of research and development related to the optimisation of materials, financial and information flows, or a combination of the above, provision of transport logistics services in production and commercial companies of any form, and public administration institutions, as well as taking responsible decisions in accordance with the needs of the economy;
- meeting the need of society for technical aviation specialists conforming with international requirements and capable of taking technical, organisational and other positions at aviation companies in line with Commission Regulation (EU) No 1321/2014 and the requirements set by the Civil Aviation Agency as to their knowledge, skills and competences;
- providing a full course of high quality professional education, theoretical knowledge and resolution skills in practical tasks in business and optimisation process management, the ability to master independently and make creative use of the accumulated and newly acquired knowledge in professional activities, and continued education in the relevant higher level academic or professional programme;
- ensuring preparation of top level professionals who after graduation are able to carry out experimental research, as well as the technological operation, implementation and management of transport related activities in production, at a public service or enterprise;
- preparing professionals capable of independently developing their professional knowledge and continuing master studies in aviation or a similar field.

3.2.2.1. Students studying in the direction

In September 2016, the total number of students in the direction was 177, of which 95% were enrolled in the bachelor programme “Aviation Transport”. 44% of students in the direction are from other countries.
Possibilities to increase the number of students

Owing to the introduction of new specialisations and improvement of the material, the plans are to increase the number of students in aviation programmes by 25% each year.

As a result of the improvement of the content and material of the “Transport Commercial Operation” programme and with closer cooperation with the Ljubljana School of Economics and Innovation, and possible transformation of the programme into a double diploma programme, its attractiveness will increase, and an increased number of students can be forecast. Plans from 2019 include a full-time group of more than 12 students starting studies in the programme each year.

With a special focus on attraction of students, active work is organised with young school-goers in Latvia:

- Young people are invited to the Career Week organised by TSI, and are acquainted with work of the existing laboratories;
- Career Days are organised, during which young people can learn about labour market developments and demand;
- The annual maths and informatics olympiad is organised in cooperation with major ICT companies;
- We actively attract schoolchildren’s interest through thematic Open Door Days;
- For the second year in a row, we have organised preparatory courses in mathematics, English and informatics;
- In cooperation with TSI partner companies, scientific and research competitions (with a pecuniary prize fund) are organised for secondary school pupils and our students;
- Representatives from companies of the Faculty profile are attracted to support the best students and award scholarships, etc.

3.2.2.2. Structure and resources of the study direction

Study programmes focusing on the technical and commercial operation of transport (aviation and land transport) are implemented in the study direction “Mechanics and Metalworking, Thermal Power Engineering, Heat Engineering and Machinery”. The direction includes bachelor programmes of the 1st professional level.

Based on the learning outcomes, the academic bachelor programme “Transport Commercial Operation”, 43525 has been aligned with admission requirements to the TSI master programme “Master of Social Sciences in Transport and Logistics”, 45840. Based on the learning outcomes, the 1st level professional higher education programme “Technical Maintenance of Aircraft Transport”, 41525 has been aligned with the academic bachelor programme “Aviation Transport”, 43525. Based on the learning outcomes, the academic bachelor programme “Aviation Transport”, 43525 has been aligned with the TSI academic master programme “Master of Social Sciences in Transport and Logistics”, 45840.

The academic bachelor programme “Aviation Transport” was licensed for two specialisations: bachelor in mechanics and bachelor in avionics. Having mastered these programmes, students acquire systemic theoretical knowledge in the field of aviation and skills to diagnose and repair parts of various aircrafts and units and their life supporting systems. In 2015, one more specialisation, aircraft flight operation, was introduced. Within this specialisation, compliance of students with the requirements of European aviation education for theoretical preparation of pilots is ensured, which in addition to the above competences allows graduates who have passed practical flight training to apply for civil aviation pilot licences.

Aviation programmes are implemented on the basis of the TSI Academic and Professional Aviation Centre (APAC), which in 2009 was certified as a technical maintenance training organisation in compliance with Annex IV (Part 147) of Regulation (EU) No 1321/2014. Thus graduates of the above programme have a possibility to apply for B1 or B2 licences. (See Section 7.2.1 for details)
In addition, students are provided a possibility to acquire the necessary work experience at aircraft technical maintenance organisations (a mandatory requirement to receive the relevant licence).

To meet the market demand for aircraft technical maintenance professionals, the content of the study programmes is developed taking into account the requirements of EASA Part-66 (EU Regulation 1321/2014). This enables students to pass the B1 (Technician Mechanics) and B2 (Technician Avionics) professional module exams during the study process and to receive European Aviation Safety Agency (EASA) model certificates of international qualifications.

The first level professional programme “Technical Maintenance of Aircraft Transport” includes practical training. Students undergo practical training at sector companies. Trilateral agreements have been signed with those companies. Practical training is conducted by specially designated university and company representatives. Practical training is governed by methodological materials and regulations. Overall management of practical training at the university is ensured by the Corporate Services Department.

The “Aviation Transport” programme includes practical training which students undergo on the equipment of the Academic and Professional Aviation Centre (APAC). Practical training is governed by methodological materials and managed by the teaching and staff of the Faculty and APAC.

**Infrastructure and information resources** (for detailed information see Chapter 9 of the Strategy)

Around 100 various programme packages are used during the study process, including: Matlab, Mathcad, Statistica, GPSS World, AnyLogic, ExtendSim, ArcGIS, ARIS SIDRA INTERSECTION, 3D Max, AutoCAD Civil 3D, VISUM/VISSIM, etc. Laboratory training sessions take place in specialised auditoriums: The Laboratory of Applied Software Systems, Laboratory of Intelligent Transport Systems, etc.

Laboratory training sessions take place in specialised auditoriums: flight simulation on A320 aircraft at APAC, the Laboratory of Modelling of Electronic Systems and the Laboratory of Applied Software Systems. Virtually all auditoriums and computer classrooms are equipped with stationary video projectors and LCD panels. Two auditoriums are equipped with the latest tools for organising video conferences and ensuring distance learning broadcasts.

<table>
<thead>
<tr>
<th>Aud. No.</th>
<th>Laboratory</th>
<th>Laboratory equipment:</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-03</td>
<td>Aircraft Control and Repair Laboratory</td>
<td>Engines AI-24, GTD-350, M-14, TA-6 Laboratory equipment for riveting, welding, soldering, drilling, folding and stamping</td>
<td>4 6</td>
</tr>
<tr>
<td>4-512</td>
<td>Laboratory of Computer Modelling and Electronic Systems</td>
<td>PC Pentium II (with Electronic Workbench 5.0 modelling software, and MatCad and MatLab applications);</td>
<td>8</td>
</tr>
<tr>
<td>4-609</td>
<td>Laboratory of Telecommunications Equipment and Measurement Machines</td>
<td>Radio stations: Polet 2, Baklan, Mayak Laboratory equipment: Oscil. C1-49, C1-55, C1-70; Voltm. B3-38, B3-57, B7-37; Generators: G3-102, G5-54</td>
<td>11 3 5 2</td>
</tr>
<tr>
<td>4-113</td>
<td>Laboratory of Electrical Devices</td>
<td>Laboratory stands LO-20; Power supply units: BNN4, B5-50, Generators: G6-26, LHN-207B, G3-18; Oscillographs: C1-77, C1-83, Hameg HM504-2; Voltmeters: B7-16A, B7-22A, B7-35, B7-37; Modulators: UM-2; Measuring device: E7-11</td>
<td>12</td>
</tr>
<tr>
<td>4-112</td>
<td>Laboratory of Physics and Electronics</td>
<td>Defectoscope UDM-1, Quality gauge E9-4 Microscope MIM-7 Stroboscope Electrical machines (stand)</td>
<td>3 3 3 1 3</td>
</tr>
</tbody>
</table>
The university’s Library ensures a centralised supply of textbooks, scientific and methodological literature for the programmes in the study direction. Library patrons have at their disposal an electronic catalogue and electronic library with electronic bookshop available at the address [www.tsi.lv/library](http://www.tsi.lv/library). TSI Library is also supplemented by a variety of methodological materials prepared by TSI teachers. These books are also purchased by students (up to 80% of the print run). With the introduction of the Moodle distance learning system in the study process, electronic use of methodological materials increased several times.

All Faculties and their reporting Departments, as well as other organisational units of the university ensuring, within their sphere of competence, the achievement of the results envisaged by the programmes, are involved in the implementation of the study direction. Implementation of the study direction is basically ensured by the Faculty of Transport and Logistics, with its constituent Departments: Department of Transport and Logistics; Department of Aviation Transport. Also involved in the study process are:

- Faculty of Computer Science and Telecommunications: Department of Electronics and Telecommunications; Department of Mathematical Methods and Modelling; Department of Computer System Software.
- Faculty of Management Science and Economics: Department of Humanities and Department of Economics, Management and Finance.
- Corporate Services Department (organisation of traineeships).
- Studies Department (organises work with students).
- The TSI Telecommunications, Electronics and Robotics Centre with its constituent laboratories and the Laboratory of Applied Software Systems.
- Academic and Professional Aviation Centre (APAC).

### Training facilities

1. The A320 simulator is used for training on the following academic subjects:
   - Aircraft liquid-gas systems;
   - Aircraft avionics systems;
   - Aircraft avionics systems;
   - Technical maintenance of aviation technology;
   - Aviation engine control systems.
   It is also used in the Academic and Professional Aviation Centre (APAC) course on A320 type aircraft as well as other professional courses.

2. Hydraulics stand. Laboratory works on the subject Aircraft Liquid-Gas Systems are performed on this stand. A possibility to include Basic Hydraulics in the engineering study programmes is considered.

### Table 3.5: Technical resources of partner organisations used by TSI to ensure the study process

<table>
<thead>
<tr>
<th>Name of organisation</th>
<th>Type of technical resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Latvijas Gaisa Satiksme”</td>
<td>Telecommunications, radio navigation and radio location equipment used in air traffic control, incl. on the basis of artificial earth satellite technology</td>
</tr>
<tr>
<td>RAF-AVIA Airline</td>
<td>Airplanes and an aircraft technical maintenance base</td>
</tr>
<tr>
<td>Concors company</td>
<td>Airplanes and an aircraft technical maintenance base</td>
</tr>
<tr>
<td>Aviatest LNK-1</td>
<td>Aircraft structure investigation base</td>
</tr>
<tr>
<td>GM Helicopters</td>
<td>Helicopters and an aircraft technical maintenance base</td>
</tr>
<tr>
<td>Baltic Business Aviation Centre</td>
<td>Airplanes and an aircraft technical maintenance base</td>
</tr>
<tr>
<td>KS AVIA</td>
<td>Airplanes and an aircraft technical maintenance base</td>
</tr>
<tr>
<td>Lufthansa Bombardier Aviation Services GmbH</td>
<td>Airplanes, aircraft training and a technical maintenance base</td>
</tr>
<tr>
<td>Air Maintenance Estonia AS (AME)</td>
<td>Airplanes, aircraft training and a technical maintenance base</td>
</tr>
<tr>
<td>Airline Support Baltic</td>
<td>Airplanes and an aircraft technical maintenance base</td>
</tr>
</tbody>
</table>
3.2.2.3. Academic staff involved in the study direction

TSI academic staff ensuring the implementation of the programmes in the study direction include 22 teachers of which 21 are employed by TSI as their main job. 4 of which are professors, 1 associate professor, 12 assistant professors, 5 lecturers; 17 members (77%) of the teaching staff have PhD degrees. Of these teachers, 4 professors and 1 associate professor, 10 assistant professors and 5 lecturers have been elected on the basis of competition. Assistant professors, lecturers and assistants are elected by the TSI Senate, while professors and associate professors are elected by the Council of Professors (of the University of Latvia or Transport and Telecommunications Institute). Besides the permanent TSI academic staff, a total of 2 university teachers (assistant professors) also participate in the training process of students.

3.2.2.4. Evaluation of the Latvian labour and education market in terms of availability of jobs for programme graduates

The National Development Plan of Latvia for 2014–2020 sets a priority: sustainable transport infrastructure that ensures domestic mobility and international accessibility.

As a key sector of the Latvian economy, transport is a priority area. Aviation transport is developing at a very rapid pace. The further development of Riga Airport, allowing it to become a significant aviation hub of the European Union, will be accompanied by a steep increase in demand for aviation professionals. With intensification of air traffic, a need emerges for airlines to employ a larger number of airplane service staff.

At the same time, with increased air traffic in Latvia, in order to maintain aviation safety in the light of new EU regulations introduced by the Civil Aviation Agency, effective action is necessary to prepare and certify young professionals.

Continuous and stable evolution of the aviation industry to a large extent depends on whether the demand for employees with the relevant qualifications will be ensured. Although theoretically it is possible to serve the overall European market by attracting foreign specialists, the development interests of the Latvian national economy are associated with the possibility of creating as many highly paid jobs in the country as possible.

Air traffic in Latvia is increasing at a rate of 10–15% per year. Over the last three years, the number of passengers transported from Latvia has increased by 44%. The modernisation of the airport in accordance with the Riga Airport Business Plan and Action Plan for 2016–2036 will lead to an increase in the number of passengers from 5,162,675 to 5,580,000, with an annual growth of flights from 68,078 to 72,700.

Sector development trends are closely linked to the creation of new jobs and the need for qualified specialists. Currently Latvian airlines are facing a shortage of qualified staff in the market, for the 10 technical maintenance organisations at Riga Airport as well as in other regions that carry out technical maintenance of aircraft. If new technical maintenance centres are opened in Latvia, the demand for specialists will keep growing. One of the most important factors for the opening of such centres is the supply of qualified aviation professionals.

When analysing aviation education in Latvia, the following problem can be mentioned: compared to Estonia, a rapid growth of the sector can be observed, whereas a shortage of adequately prepared specialists with aviation education exists.

3.2.2.5. Development of the study direction

The aviation transport programmes implemented within the study direction determine the role of the Transport and Telecommunications Institute as key to the specialisation, therefore, the development of the study direction is aligned with the TSI development strategy.
To achieve the set targets, TSI management ensures continuous development of the study programmes and resources. The TSI development strategy includes activities in research, training and improvement of the management and infrastructure, focussing on excellence of scientific activities and studies, excellence and visibility of the organisation, and excellence of the infrastructure.

In accordance with the TSI strategy, the tasks of the study direction include:

- systematic integration of research into the study process;
- extended participation of academic staff in international, national and sectoral research programmes in the area of transport and logistics;
- invitation of an increased number of transport and logistics specialists, including from abroad, to participate in the development and implementation of study programmes;
- enhancing multilingual education within the study direction;
- ensuring participation of students, graduates and employers in quality management of the study programmes;
- a wider use of IT resources in the study process;
- modernisation of the textbook collection offered to students of the study direction.

All the traditional training methods are used in the study programmes: lectures, practical exercises and laboratory work. Students are supported in their studies through consultations. Each teacher has planned a mandatory minimum of 2 consultancy hours per week.

The university has developed and introduced a 2-level tuition fee system encouraging students to pass the session in a timely manner. The best students enjoy tuition fee discounts or free of charge study places. Meetings with employers and graduates are also used to better motivate students. The university organises annual Career Days.

Over the last three years, training has been modernised and considerably extended through access to the e-learning environment and development of new e-courses. Student surveys show that they highly appreciate the e-learning opportunities. All the training materials for the programme are available in the TSI Moodle system.

### Table 3.6: Key target indicators

<table>
<thead>
<tr>
<th>Indicators</th>
<th>2016</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joint study programmes with Latvian and foreign universities (double diploma programme)</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Number of classes conducted by guest lecturers</td>
<td>25%</td>
<td>40%</td>
</tr>
<tr>
<td>Number of students</td>
<td>177</td>
<td>400</td>
</tr>
<tr>
<td>1. Bachelor programme “Aviation Transport”, 43525</td>
<td>168</td>
<td>365</td>
</tr>
<tr>
<td>2. First level professional programme “Technical Maintenance of Aircraft Transport”, 41525</td>
<td>8</td>
<td>20</td>
</tr>
<tr>
<td>3. Bachelor programme “Transport Commercial Operation”, 43525</td>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>Number of foreign students</td>
<td>81</td>
<td>330</td>
</tr>
<tr>
<td>Number of students studying in English</td>
<td>60</td>
<td>260</td>
</tr>
<tr>
<td>Number of persons with degrees or qualifications</td>
<td>16</td>
<td>51</td>
</tr>
<tr>
<td>Share of foreign teachers, %</td>
<td>5%</td>
<td>10%</td>
</tr>
</tbody>
</table>

#### 3.2.2.6. Development plan of study programmes in the study direction

Development plan of the training and methodological content of the programmes and the technical equipment in the study direction:

- fully prepare the training materials of all the study courses for placement in Moodle;
modernise the study programmes and create a basis for preparation of instructors in line with EASA Part-66 requirements;
conclude an agreement with the sector training and consultancy centre on preferential arrangements for obtaining CPC and DGSA certificates;
develop and offer new professional preparatory courses for aviation specialists;
enlarge the technical base (purchase of components) for practical and laboratory work in the APAC Aviation Laboratory:
  - Cessna 152 aeroplane;
  - dual aircraft engine;
  - GK avionic components;
  - helicopter reduction gear unit (helicopter transmission for creating a laboratory stand);
with an increase in the number of students in the Aviation Transport specialisation “Aircraft Flight Operation”, it will be possible to buy an aeroplane for field training;
purchase and introduce the following equipment into the study process of the “Transport Commercial Operation” programme: extensometer, hardness tester, 3D printer, metallographic microscope, ultrasonic defectoscope.

The Faculty Council has supported the establishment of a Learning and Training Centre at the Faculty. The Centre will be established jointly with logistics companies and provide the possibility to attract external business representatives to the study process as well as to bring the study process closer to the ongoing production, transport and logistics processes in the transport sector.

Consolidation of the study programmes is planned in the study direction, improving the programmes and expanding the range of specialisations offered.

The plans are to increase the number of engineering courses under the “Transport Commercial Operation” programme and to change its name to “Transport Technical Operation”. A closer cooperation with similar study programmes of other universities is planned within the programme, including with the Ljubljana School of Economics and Innovation which offers similar engineering science (STEM) programmes. If the cooperation is successful, the programme will possibly be transformed into a double diploma programme.

Another specialisation, “Flight Operation Dispatcher”, is planned within the “Aviation Transport” bachelor programme. As a result of mastering the new specialisation of the programme, operations control management specialists will be prepared and will be able to obtain professional Aircraft Dispatcher licences.

The professional “Aviation Management” master programme of social sciences is in the development stage, with submission for licensing planned by 01.09.2017 (see Section 3.3.1.2 of the Strategy).

3.2.2.7. External cooperation between programmes of the study direction

External cooperation in the implementation of the study programmes: agreements with potential employers and organisations offering training posts.

TSI undertakes regular (annual) Latvian and partially also European labour market studies. The main objectives of the study:
1. to identify companies’ needs for specialists prepared by TSI;
2. to seek the views of company managers about the professional preparedness of TSI graduates;
3. to collect information about the labour market and its development trends, expectations of and critical remarks by employers.

Employer survey results

The Transport and Telecommunications Institute organises regular employer surveys concerning the labour market demand for course graduates to receive opinions about the quality of their preparation.
Employer, graduate and student surveys are organised by the Corporate Services Department. Quite recently, electronic questionnaires were sent out to over 60 leading transport and logistics company specialists.

To assess the satisfaction with the preparedness of university graduates, questionnaires with three possible answers were offered: yes, difficult to say, no. About 56% of the employers replied that they were satisfied with the professional preparedness of the graduates, while 13% were not satisfied. Mainly it is the practical preparedness that causes dissatisfaction, including in the areas of record keeping, drawing-up documents and foreign language skills; these observations were voiced as a recommendation to pay more attention to practical training and mastering of foreign languages. Recommendations included assigning the students more tasks linked to practical application of knowledge; those will be taken into account in the study plans.

Students of the study direction actively cooperate within the EU transport and logistics projects, e.g., FP7 B2B LOCO. Twice a year discussion clubs with graduates and employers are also organised within the Research and Technology — Step into the Future conference.

The discussion and survey results show that there is a demand in the labour market for “Transport Services” programme and TSI graduates.

Active international cooperation with partner universities is continued. TSI students have successfully completed studies at foreign universities within student exchange programmes. TSI has signed and received the ADVANCED EUROPEAN UNIVERSITY ERASMUS CHARTER (No 224745-IC-1-2007-1-LV-ERASMUS-EUC-1). Foreign universities have fully recognised the quality of knowledge obtained at TSI, enabling our students to directly enrol in their training programmes. TSI teaching staff have conducted training at a variety of foreign universities (in Slovakia, Poland, Lithuania, Italy, Estonia and Belgium).

TSI cooperates with the following companies:

- AirBaltic AS, RAF-AVIA AS, Baltic Business Aviation Center SIA, KS AVIA, GM Helikopter, AVIATEST SIA, LGS, Rīgas Satiksme, LDZ, Autoosta, etc.

The Transport and Telecommunications Institute is a member of the European Association for Education of Adults (EAEA).

TSI has also signed other types of cooperation agreements to promote academic activities between partner universities. They envisage the ongoing exchanges of students and teaching staff, regular quality audits of TSI’s academic activities, and opportunities for TSI graduates to continue studies abroad. Cooperation agreements have been signed with multiple universities.

3.2.2.8. Scientific and academic activity development plan for academic staff of the study direction

Each year, TSI hosts scientific and training methodological conferences, the main ones being RelStat, Research and Technology — Step into the Future, and MIP. During the period until 2020, speeches in 20 TSI conferences and 5 international conferences are planned for the academic staff, as well as 17 publications in the internationally quoted Scopus and Web of Science databases.

TSI carries out active scientific and innovation activities. In 2012, in cooperation with private partners, TSI participated in the establishment of the Aviation Research Centre, whose principal activities include:

- non-destructive structure diagnostic methods of airplanes and helicopters;
- development of virtual airplane models;
- development of aviation technology 3D virtual reality models.

The Aviation Research Centre was completed in 2015. It was built at Riga Airport on the grounds of the RAF AVIA hangar and financed from EU funds in line with the grant allocated.
The study process is closely linked to scientific research carried out by teaching staff of the Departments. Scientists of the Faculty take an active part in and also manage multiple scientific projects both at national and international level. Employees of the Academic and Professional Aviation Centre (APAC), together with the Faculty of Transport and Logistics, carry out scientific research in the following areas:

- corporate organisational structure development;
- corporate business management;
- further development of the transport system;
- research, design and development of clean vehicles.

Development of the academic staff is planned at the expense of master programmes. Each faculty has a master programme, and all of them include pedagogical practice. Moreover, some Departments invite master students to deliver individual practical study courses within bachelor programmes. This provides for a possibility to select and incentivise the right graduates for pedagogical work. If competitive salaries are offered after graduation, those people can become qualified assistants loyal to the university, and later also lecturers.

The defence of 3 PhD theses by the Faculty Transport and Logistics teachers is planned during the period until 2020.

Attraction of foreign teachers, researchers and lecturers for the implementation of TSI Faculty of Transport and Telecommunications programmes

The National Development Plan of Latvia for 2014–2020 includes the mobility of academic and research staff and attraction of foreign lecturers to ensure qualified and internationally competitive academic staff for higher education. To ensure the quality of the FTL study programmes and their further development, active engagement of foreign lecturers and researches is required in the study process. A EUR 4,000 budget for the attraction of foreign guest lecturers has been earmarked in the budget of the Faculty of Transport and Logistics.

Currently several guest lecturers from the Baltic Aviation Academy (Lithuania) have been invited as permanent teachers to deliver such courses as Meteorology, Flight Planning and Monitoring, Common Navigation, etc. With enhanced cooperation with the Ljubljana School of Economics and Innovation and plans to transform the “Transport Commercial Operation” programme into a double diploma programme, teachers from this university will be invited as guest teachers. Cooperation with the Israeli (Beer Sheva) University and hosting of their guest lecturers is envisaged within the ERASMUS+ programme. Professionals from transport and logistics companies will be invited as guest lecturers at the Learning and Training Centre. TSI is planning to submit a project within the SO 8.2.2 “To strengthen the capacities of the academic staff of higher education institutions in the areas of strategic specialisation”, as well as to use other programmes for financing invited guest teachers, and, in light of the cooperation with the Ljubljana School of Economics and Innovation and attraction of their guest lecturers, to increase the number of foreign teachers, researchers and lecturers from 6 to 10 visits (financed by TSI) per year in 2020.

3.2.3. Study direction “Transport Services”

The following programmes will be implemented in the study direction “Transport Services”:

- Professional bachelor programme “Business Management in Transport”, 42840
- Professional bachelor programme “Transport and Business Logistics”, 42840
- Master programme “Master of Social Sciences in Transport and Logistics”, 45840

Programmes implemented in the study direction are aimed at:
• preparation of highly qualified professionals in the field of transport and logistics, capable of research and development related to the optimisation of material, financial and information flows, or a combination of the above, provision of transport logistics services in production and commercial companies of any form, and at public administration institutions, and of taking responsible decisions in accordance with the needs of the economy;
• provide a full course of high quality professional education, theoretical knowledge and resolution skills in practical tasks in business and optimisation process management, abilities to master independently and make creative use of the accumulated and newly acquired knowledge in professional activities, and continued education in the relevant higher level academic or professional programme;
• ensuring preparation of top level professionals who after graduation are able to carry out experimental research, as well as the technological operation, implementation and management of transport related activities in production, at a public service or enterprise;
• prepare graduates of master’s studies for independent scientific, design and pedagogical work in the field of management, transport and logistics;
• ensure the quality of courses and their compliance with the European standard of education in both organisational and methodological terms, and towards integration of academic and professional education, by offering students a free choice of subjects, type of studies and a possibility to continue education.

3.2.3.1. Students of the programme
In the academic year 2015/2016, the total number of students in the study direction was 948, of which 90% studied in the “Transport and Business Logistics” programme. The number of students of this study direction at the Latgalian Branch is 103, with 54 distance learners.

![Figure 3.10: Dynamics of the number of Transport Services students](image)

3.2.3.2. Structure of the study direction
The study direction “Transport Services” determines the specialisation of the Transport and Telecommunications Institute as a transport university. It contains programmes complying with the requirements of the transport sector of the RoL. The direction includes 2 professional bachelor and master programmes.

Professional bachelor programme “Transport and Business Logistics”, 42840:
• Degree to be awarded: Professional bachelor’s degree in Transport and Business Logistics,
• Professional qualifications to be awarded: Transport and Business Logistics Manager,
• Possible forms of training and duration of studies: full-time studies, part-time studies (correspondence and distance learning).

Professional bachelor programme “Business Management in Transport”, 42840:
• Degree to be awarded: Professional bachelor’s degree in Transport Business,
• Qualifications to be awarded: Business Manager in Transport,
• Possible forms of training and duration of studies: full-time and part-time studies.

Academic master programme “Master of Social Sciences in Transport and Business Logistics”, 45840:
• Degree to be awarded: Master of Social Sciences in Transport and Logistics.
• Possible forms of training and duration of studies: full-time and part-time studies.
• Admission requirements: higher education (bachelor of social sciences in management science or economics, bachelor of engineering sciences or bachelor of natural sciences in computer science or mathematics, or second level professional education in logistics, transport, business, economics, computer sciences, information systems or electronics)

The professional bachelor programmes “Transport and Business Logistics” and “Business Management in Transport”, based on the learning outcomes have been aligned with the admission requirements for the master’s programme “Master of Social Sciences in Transport and Logistics”.

3.2.3.3. Academic staff involved in the study direction
Implementation of the master’s programme is ensured by an academic staff of 19. 16 of them (84%) hold elected positions at TSI: 5 professors, 2 associate professors, 8 assistant professors, and 1 lecturer. 17 (95%) of the teaching staff have PhDs.

Implementation of the “Transport and Business Logistics” study programme is ensured by an academic staff of 33. 28 of them (85%) hold elected positions at TSI: 5 professors and associate professors, 12 assistant professors and 12 lecturers. 18 (55%) of the teaching staff have PhDs.

28 teachers participate in the implementation of the “Business Management in Transport” programme. 25 (89%) of them hold elected positions at TSI, including 5 professors and 2 associate professors, 9 assistant professors and 9 lecturers. 16 (64%) of the teaching staff have PhDs.

3.2.3.4. Evaluation of the Latvian labour and education market in terms of availability of jobs for programme graduates
Successful implementation of the TSI Development Strategy is the basis for building a knowledge-based society in Latvia, with TSI as a key partner in the achievement of the strategic goal set by the National Development Plan of Latvia 2014–2020: education and knowledge for the growth of the national economy and technological excellence.

The programme provides: “In cooperation with the private sector, the state makes investments in transport infrastructure, which is crucial for business activity nationally and internationally. This is done not merely as a way of rationally taking advantage of the country’s favourable geographic position, but also to boost Latvian businesses in supplying competitive products and services to foreign markets. Multi-modal transportation corridors, consisting of transit roads, railway and ports, play an increasingly important role in transit. Electrification and modernisation of transportation corridors allows more and more goods to be shipped through such corridors and facilitates the development of new processing and service industries in Latvia, thus letting the country and its people increasingly benefit from its favourable geographical location”. This means there will be a further increase in the importance of the transport sector in Latvia, and a demand for programmes in the Transport Services study direction can be expected in the future.
3.2.3.5. Development plan of the programmes of the study direction

Implementation of the study direction should promote an increase in the number of TSI students. The task of the Faculty of Transport and Logistics is to increase the number of students in the study direction each year. To achieve this, active work is organised with young school-goers in Latvia:

- Young people are invited to the Career Week organised by TSI, and are acquainted with work of the existing laboratories;
- Career Days are organised, during which young people can learn about labour market developments and demand;
- The annual maths and informatics olympiad is organised in cooperation with major ICT companies;
- We actively attract schoolchildren’s interest through thematic Open Door Days;
- For the second year in a row, we have organised preparatory courses in mathematics, English and informatics;
- In cooperation with TSI partner companies, scientific and research competitions (with a pecuniary prize fund) are organised for secondary school pupils and our students;
- Representatives from companies of the Faculty profile are attracted to support the best students and award scholarships, etc.

The other independent target is to improve the quality of the studies at the Faculty, leading to higher satisfaction of students demonstrated in annual surveys. The following tasks are planned to be addressed in order to achieve the set targets:

- prepare in high quality and place in the Moodle e-environment a full set of materials for all training subjects;
- in compliance with Faculty Council decisions, modernise the curricula in the study direction “Transport Services”, including:
  - extend the “Logistics of Procurement and Stocks” curriculum to 6 credits;
  - extend the “Vehicles” curriculum to 4 credits;
  - extend the “Organisation of Transportation” curriculum to 6 credits, including in its content subjects related to the organisation of multi-modal transportation;
- develop the new study courses: “Complex Supply Chain Quality and Safety Management System”, “Logistics of Production Processes”;
- conclude an agreement with the sector training and consultancy centre on preferential arrangements for obtaining CPC and DGSA certificates;
- development and licensing of a new professional bachelor programme “Supply Chain Management” planned in 2018.

The Faculty Council has supported the establishment of the Learning and Training Centre. The Centre will be established jointly with logistics companies and provide the possibility to attract external business representatives to the study process and bring the study process closer to the ongoing production, transport and logistics processes in the transport sector.

### Table 3.7: Key target indicators

<table>
<thead>
<tr>
<th>Total number of students:</th>
<th>2016</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Professional bachelor programme &quot;Business Management in Transport&quot;, 42840</td>
<td>16</td>
<td>26</td>
</tr>
<tr>
<td>2. Professional bachelor programme &quot;Transport and Business Logistics&quot;, 42840</td>
<td>889</td>
<td>1,010</td>
</tr>
<tr>
<td>3. Master programme &quot;Master of Social Sciences in Transport and Logistics&quot;, 45840</td>
<td>43</td>
<td>65</td>
</tr>
<tr>
<td>4. Professional bachelor programme “Supply Chain Management” (planned to submit for licensing in 2018)</td>
<td>--</td>
<td>30</td>
</tr>
<tr>
<td>Number of foreign students</td>
<td>144</td>
<td>320</td>
</tr>
<tr>
<td>Number of students studying in English</td>
<td>30</td>
<td>87</td>
</tr>
<tr>
<td>Number of persons having obtained degrees and qualifications</td>
<td>126</td>
<td>278</td>
</tr>
</tbody>
</table>
3.3. Faculty of Management Science and Economics

The Faculty of Management Science and Economics (MSE) was created as a TSI organisational unit implementing bachelor and master programmes in the study directions “Management, Administration and Real Estate Management” and “Economics”. The Faculty carries out scientific research and gives consultations on economics and management issues related to transport, logistics, information and communications technologies and their application. The study directions offered by the Faculty are accredited until 11 June 2019.

The Faculty also focuses on the implementation of the university’s functions as a business school. This is determined by the development priority of post-bachelor programmes, innovation activities in interaction with businesses, expansion of the university’s infrastructure, targeted at the marketing of education programmes and other products of TSI’s scientific and education activities, as well as the development of international cooperation and interaction with academic and corporate partners.

The Faculty consists of two TSI units:
- The Department of Economics, Management and Finance,
- The Department of Humanities.

Continuity of the Faculty’s study programmes

![Student progression diagram]

*Figure 3.11: Continuity of the study programmes offered by the Faculty*

*Higher level programmes also admit students from other study directions, provided that a written test has been passed in the selected field.

3.3.1. Study programmes in the directions “Management, Administration and Real Estate Management” and “Economics”

Programmes of the study direction “Management, Administration and Real Estate Management” ensure obtaining knowledge, skills and competences in various functional areas of business management, including entrepreneurship, marketing, and human resources and financial management in a constantly changing environment in the context of globalisation. Two academic study programmes are realised within the study direction:

- academic bachelor programme “Bachelor of Social Sciences in Management” (43345);
- academic master programme “Bachelor of Social Sciences in Management Science” (45345).
Study languages: Latvian, Russian, English.

Study programmes in the direction “Economics” offer advanced knowledge of various economics theories and areas of business economics for understanding current day global economic, political and social life processes, as well as their impacts on the operations of companies and organisations in a globalised world. Two academic programmes are implemented within the study direction:

- academic bachelor programme “Bachelor of Social Sciences in Economics” (43310);
- academic master programme “Master of Social Sciences in Economics” (45310).

Study languages: Latvian, Russian, multilingual training.

3.3.1.1. Aim of the study directions

Management, Administration and Real Estate Management

The main purpose of the study direction “Management, Administration and Real Estate Management” is to prepare specialists meeting the modern day labour market requirements. The purpose of the study programmes is to teach the students to build efficient decision-making logic, to provide knowledge about the management, assessment and optimisation of the operations of companies in order to achieve their strategic goals and missions.

The content of both the bachelor and master programmes has been developed in the following logical sequence:

- relevance to the preparation of specialists and development of a specialist model;
- identifying the area of the specialist’s competences;
- identifying knowledge and skills necessary for the performance of professional functions;
- setting the targets and tasks for the study programme;
- designing the set of study directions in line with the programme goals and tasks targeted at acquiring the required knowledge and skills, i.e., building the structure of the study programme;
- identifying the range of persons who might be interested in the given programme.

The aim of the “Bachelor of Social Sciences in Management Science” programme is to acquire knowledge, skills and competences in various functional areas of business management, including entrepreneurship, marketing, human resources management, finance and operational management in the context of globalisation. While mastering the study programme, students learn to think, manage and work efficiently in small and medium-sized business organisations in a globalised business environment.

The selection of subjects constituting the study programme is mainly based on the objectives of the management process of an organisation focussed on productivity and efficiency, and the functional roles of the manager to ensure their attainment:

- organisational management function geared towards results, namely, the creation of a product necessary to meet the needs of customers for which the organisation was established;
- administration and management of the organisation’s resources to ensure their efficient use;
- ability to quickly respond to changes in the business environment and set the direction to follow, taking into account those changes by developing strategic plans and making innovative decisions, which is an expression of a manager’s business function;
- integration and leadership: ability to drive the organisation in one direction for the achievement of the strategic goals.

The aim of the “Master of Social Sciences in Management Consulting” programme is to acquire advanced knowledge, skills and competences in various functional areas of management of a modern day organisation; development of independent, creative and analytical thinking enabling...
the use of scientific research methods to address practical situations, develop long-term business strategies, and carry out consultancy and research activities. The study programme focuses on the development of analytical, communication and pedagogical skills, mastering the skills necessary for scientific work and research, understanding the role of financial information in management decision-making, and the ability to interpret that information. During the training process, students learn to understand customer needs, to develop strategies and policies focusing on the achievement of the organisation’s goals and performance of the tasks of a modern-day company.

**Economics**

The aim of the **“Bachelor of Sciences in Economics” programme** is to prepare specialists able to carry out analytical and organisational activities in various fields of the economy by examining financial and information flows and production processes at production and commercial companies of any type of ownership, as well as at public administration institutions, and capable of making responsible decisions in accordance with the needs of the economy. The task of the bachelor programme is to raise awareness of social sciences and to provide theoretical and practical knowledge in the area of business economics, skills to independently master and make creative use of the accumulated and newly obtained knowledge, as well as to continue education at the next study level in line with the academic study programme.

The aim of the **“Master of Sciences in Economics” programme** is to prepare specialists able to undertake analytical, organisational (administrative), scientific research and educational (teaching) activities in various economic sectors and capable of making responsible decisions in accordance with the needs of the economy. The task of the academic master programme is to provide advanced theoretical knowledge, improve fundamental and professional knowledge and scientific and practical skills, as well as to provide higher academic education enabling to independently define and address scientific tasks related to the performance of professional functions, carry out scientific research in the field of economics, undertake pedagogical activities, and continue doctoral studies.

### 3.3.1.2. Development strategy of the study directions

In line with the strategic plan of the Transport and Telecommunications Institute, the aim of the academic bachelor and master programmes is to prepare specialists with the required academic and top level professional competences for work at Latvian and international companies, providing the possibility of obtaining bachelor and master degrees entitling them to continue education in doctoral programmes. The higher education study programmes fully comply with the TSI goals and tasks set by the TSI Constitution. The development of the study direction is harmonised with the TSI Development Strategy. To achieve the targets of the study direction, TSI management ensures continuous development of the study programmes and resources. The TSI Development Strategy includes activities in research and study areas and in the improvement of management and infrastructure.

**In accordance with the TSI Strategy, the development tasks of the “Management, Administration and Real Estate Management” and “Economics” study directions include:**

- further improvement of the study directions and programmes taking into account the labour market demand, the development trends of the Latvian economy and the development of new directions and programmes;
- the study of management and economics teaching experiences of European and world leading universities;
- the development of joint study programmes in cooperation with Latvian and foreign universities (e.g., in a ‘double diploma’ format), including in master and doctoral programmes;
- the active implementation of modern education programme formats in the study process (distance learning, development of e-learning, modular and interdisciplinary principle, networking, etc.);
enhanced methodological support and improved implementation methods of study programmes through more interactive techniques leading to improved quality of education services;

further development and delivery of methodological support for study courses in English;

inviting company managers and professionals, including from abroad, to participate in the development and implementation of study programmes;

attraction of foreign teachers to conduct joint training and master classes;

improvement of the quality of education management system (student and graduate surveys, development of a counter plagiarism system, participation in the work of TSI Graduate Association, etc.);

participation of students, graduates and employers in the quality management of the study programmes;

encouraging academic staff to participate in international, national and sectoral research programmes in the field of management science;

integration of scientific research into the study process;

activation of student participation in scientific work;

enhanced use of IT resources and laboratories for studies;

modernisation of the textbook collection offered to students of the study direction;

attraction of foreign students to constitute 35% of the total number of students in the future;

improvement of interinstitutional cooperation through agreements aimed at establishing an inter-university doctoral programme in Management Science.

Study programmes in the direction “Management, Administration and Real Estate Management”

Bachelor of Social Sciences in Management Science: future focus of graduate courses on the specialisation Marketing Communication (other options: “Internet Marketing and Social Media” or “Modern Marketing Communication”) and Risk Management.

Master of Social Sciences in Management Science: the main focus to be put on quality assurance issues of the study programmes. The main tasks also include the development of a programme for distance learning in English, designing the methodological base, especially in the Moodle environment, increasing the number of classes conducted by visiting professors, engagement of master students in scientific projects and delivery of lectures in bachelor programmes, lectures at companies, etc.

The professional master programme “Aviation Management”. is being prepared for licensing. The professional master programme “Aviation Management” will be a unique two-year professional master programme; alongside the Faculties of Transport and Logistics, Management Science, and Economics, internationally recognised experts and Latvian aviation sector representatives are participating in its design. The content of the programme will meet today’s academic and professional requirements and comply with international standards. The programme will provide for a possibility to:

- master the theory and practice of corporate governance at an advanced level;
- master and develop business management skills in the aviation industry;
- find solutions and make decisions on the basis of the knowledge acquired.

The trends of the modern aviation industry instil optimism also in the long term: both major aviation companies of the industry such as Airbus and Boeing, as well as international sector organisations such as IATA (International Air Transport Association), ICAO (International Civil Aviation Organization), and ACI (Airports Council International) foresee that for the next 20 years the growth in the industry will continue at the same rate.

The above globalisation and economic cooperation trends position the aviation industry and the related business lines among the most strategically and technologically important cornerstones of the world economic development of the 21st century. Therefore, taking into account the specific nature of the aviation industry, young and motivated specialists with advanced knowledge of aviation management are and will continue to be vitally necessary to ensure the development of the national economy.
The Transport and Telecommunications Institute, in cooperation with Vidzeme University and the Latvian University of Agriculture, are designing a new inter-university doctoral programme “Governance of Sustainable Development”. Each university will implement its profiling specialisation:

- Transport and Telecommunications Institute: Transport Economics and Management;
- Latvian University of Agriculture: Sustainable Management of Territorial Planning (Development);
- Vidzeme University: Service Management.

Scientific degree: Dr.oec. The programme will be implemented by combining the scientific potential of the three higher education institutions for delivering study courses and conducting doctoral workshops and promotion works, thus enhancing the scientific capacity of the three cooperation partners. This will serve as a positive example of cooperation in advancing scientific progress in Latvian universities. The aim of the doctoral programme is to ensure the highest level of academic studies providing for a possibility to acquire the advanced knowledge and skills necessary for independent research work, as well as to prepare international level management science specialists with scientific competences and advanced knowledge of territorial development, transport and service management.

Design and submission for licensing of the bachelor programme Business and Economic Development of Asian Countries is planned in 2018. The programme will prepare expert analysts or entrepreneurs with advanced knowledge of Asian businesses who would work for business or public entities and build cooperation with Asian countries. With a more active cooperation of Latvia and the EU in general with Asian countries both within the framework of international cooperation and at private business level, specialists with knowledge of the general social and economic and political situation in Asia and of how to organise business cooperation with those countries are needed in order to develop successful business relationships. Specialists having that knowledge will be in demand at the Ministry of Foreign Affairs, Ministry of Economics, Ministry of Agriculture and other public institutions and private business entities.

**Training programmes in the “Economics” study directions**

**Bachelor of Social Sciences in Economics:** development of the programme according to the applied economics model (financial analyst): Behavioural Economics or Business Economics; introduce in graduate courses specialisations in the following directions: International Finance, Behavioural Economics or Business Economics, Transport Economics; 20% of the classes to be organised at companies or by inviting their specialists.

**Master of Social Sciences in Economics:** development of the following directions of specialisation: Corporate Finance Management (micro level), Financial Investment and Risk Management (macro level). Special attention is to be paid to quality issues of the study programmes: improvement of the methodological base, especially in the Moodle environment; increasing the number of classes conducted by visiting professors, involvement of master students in scientific projects and delivery of lectures in bachelor programmes, lectures at companies, etc.
Table 3.9: Key target indicators

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Indicator value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of study directions (in line with university status)</td>
<td>2</td>
</tr>
<tr>
<td>Number of bachelor and master programmes</td>
<td>4</td>
</tr>
<tr>
<td>Number of doctoral programmes</td>
<td>0</td>
</tr>
<tr>
<td>Joint study programmes with Latvian and foreign universities</td>
<td>0</td>
</tr>
<tr>
<td>Number of working languages in distance learning programmes</td>
<td>1</td>
</tr>
<tr>
<td>Number of classes conducted by guest lecturers</td>
<td>7</td>
</tr>
<tr>
<td>Number of foreign guest teachers</td>
<td>3</td>
</tr>
<tr>
<td>Number of students (per year)</td>
<td></td>
</tr>
<tr>
<td>Study direction: Management, Administration and Real Estate Management</td>
<td></td>
</tr>
<tr>
<td>1. Bachelor programme &quot;Bachelor of Social Sciences in Management Science&quot;, 43345</td>
<td>351</td>
</tr>
<tr>
<td>2. Master programme &quot;Bachelor of Social Sciences in Management Science&quot;, 45345</td>
<td>68</td>
</tr>
<tr>
<td>3. Professional master programme “Aviation Management” (planned to be submitted for licensing by 1.09.2017)</td>
<td>--</td>
</tr>
<tr>
<td>4. Doctoral programme &quot;Governance of Sustainable Development&quot; (planned to be submitted for licensing by 1.09.2017)</td>
<td>--</td>
</tr>
<tr>
<td>5. Bachelor programme &quot;Business and Economic Development of Asian Countries&quot; (planned to be submitted for licensing in 2018)</td>
<td>--</td>
</tr>
<tr>
<td>Study direction: Economics</td>
<td></td>
</tr>
<tr>
<td>6. Bachelor programme &quot;Bachelor of Social Sciences in Economics&quot;, 43310</td>
<td>119</td>
</tr>
<tr>
<td>7. Master programme &quot;Master of Social Sciences in Economics&quot;, 45310</td>
<td>13</td>
</tr>
<tr>
<td>Number of persons with degrees or qualifications</td>
<td>68</td>
</tr>
<tr>
<td>Number of students studying in English</td>
<td>109</td>
</tr>
<tr>
<td>Improved quality system of studies and feedback</td>
<td></td>
</tr>
<tr>
<td>Questionnaires filled out by 35% of total students</td>
<td></td>
</tr>
<tr>
<td>Questionnaires filled out by at least 70%</td>
<td></td>
</tr>
<tr>
<td>Student and graduate database of the Faculty</td>
<td>no</td>
</tr>
<tr>
<td>Proportion of foreign students and attendees, %</td>
<td>38%</td>
</tr>
<tr>
<td>Share of foreign teachers, %</td>
<td>5%</td>
</tr>
</tbody>
</table>

Table 3.10: Development of the Faculty by direction

<table>
<thead>
<tr>
<th>Direction</th>
<th>Content</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modernisation of the education process</td>
<td>Development of competitive programmes at all levels of education Building of information and technological support for the study process</td>
<td>Bringing the education process closer to global standards; organising the TMC in accordance with the programmes implemented by the leading Latvian and European universities and faculties of economics; Achieve international comparability of key quality and quantity parameters; Extend the cooperation network with Latvian and EU universities.</td>
</tr>
<tr>
<td>Modernisation of scientific research and innovation activities</td>
<td>Development of the research infrastructure, materials and technical base in compliance with the TSI research programme (2015-2020); development of innovation activities</td>
<td>Strengthen the motivation to prepare publications and create a stable mechanism to support obtaining grants and participation in projects.</td>
</tr>
<tr>
<td>Development of the academic staff potential</td>
<td>Support staff career development and mobility, and attract talented young people to study at TSI and to carry out scientific research and innovation activities.</td>
<td>Organise work with the most prospective senior course students;</td>
</tr>
</tbody>
</table>
Priorities and principles of the Faculty:

- High demands for teachers (in terms of qualifications and competences) and students (in terms of academic performance and admission requirements);
- Continuous improvement and modernisation of the study process, which includes updating of the methodological teaching materials and their compulsory approval by the Faculty’s Methodological Commission or Council of Programme Directors. Taking forward active forms of studies and use of modern presentation techniques;
- Modernisation of scientific research activities (seeking access to international scientific projects and strengthening staff motivation to achieve high research results);
- Modernisation of innovation activities manifesting themselves in permanent contacts with leading European centres and universities implementing projects similar to those pursued by TSI;
- Development of staff potential (aimed at improving their professional skills by creating conditions for professional mobility, guest lectures, internships at European universities);
- Modernisation of the infrastructure, materials and technical base, increasing of the library collection;
- Improvement of the organisational structure aimed at simplification and acceleration of the decision-making process.

3.3.2. Students studying in the direction
3.3.2.1. Student dynamics of the study direction

In the academic year 2015/2016, 303 students studied in the “Management, Administration and Real Estate Management” programmes. 40 students, including 24 foreign students and 9 distance learners, studied in the “Master of Social Sciences in Management Science” programme. 263 students, including 44 distance learners, studied in the “Bachelor of Social Sciences in Management Science” programme. In the academic year 2015/2016, 124 students studied in programmes of the direction “Economics”. 11 students, including 1 foreign student and 2 distance learners, studied in the “Master of Social Sciences in Economics” programme. 113 students, including 22 distance learners, studied in the “Bachelor of Social Sciences in Economics” programme.
As of 1 October of the academic year 2016/2017, 419 students, including 156 foreign students and 85 distance learners studied in the direction “Management, Administration and Real Estate Management”. 132 students, including 26 foreign students and 31 distance learners studied in the direction “Economics”. Total number of students at the Faculty of MSE: 551.

As shown in Figures 3.11–3.13, starting from 2013 the number of students in the study directions of the Faculty increases each year, certifying to the attractiveness of the education programmes offered,
for example, in the direction “Management, Administration and Real Estate Management”. A special interest in the Faculty’s study programmes has been demonstrated by foreign students, constituting 35% of the total number of students in 2016. Interest in studies offered in English is on the rise.

In the academic year 2015/2016, 4 people studied in the Faculty’s programmes within the ERASMUS+ project, with 11 from Spanish and Polish universities in autumn 2016. TSI students studying for a semester or a whole year at foreign higher education institutions within ERASMUS+: 5 persons in the academic year 2014/2015, 6 in 2015/2016, and 6 in 2016/2017 (autumn semester).

If this positive dynamic continues, the Faculty expects an increase in the number of students by 2020, including in the direction “Management, Administration and Real Estate Management” where the number of students has grown by more than 218. Foreign students must constitute 45–50% of the total. If studies are organised in three languages — Latvian, Russian and English — an increase of up to 300 students is expected in distance learning programmes.

3.3.2.2. Student satisfaction

Summary of student satisfaction survey results and their use in quality monitoring of programmes. The aim of the survey was to seek students’ views on the quality of the studies at TSI in the period between 20 March and 31 May of the 2nd semester of the academic year 2015/2016. In the assessment of the courses taught, the main focus was on the evaluation of the academic staff. The students were asked to give answers to 13 questions and express their wishes as to the quality improvement of the study process. An average mark was given to each teacher and taken into account in the attestation process of the academic staff.

At the Faculty of MSE, 65 people or 25% of students participated in the survey. Most of the respondents (80% of the total) had a high attendance level (over 75%).

Responses in answer to the question ‘How would you evaluate the quality of education services offered by TSI’ were distributed as follows: 8% of respondents rated TSI education as excellent, with 55% considering the quality of education services offered by TSI as good. 32% evaluated the quality of education services as satisfactory, while 4% gave a negative evaluation, and 1% of respondents noted that it was ‘difficult to say’.

Overall, the survey results show a need for a wider range of teaching methods by introducing interactive forms of teaching, improving the quality of hand-outs and their availability, and inviting specialists with practical experience in the field to conduct classes.

In September 2016, a survey of TSI Faculty of MSE graduates (2012–2016) was conducted with participation of bachelor and master programme graduates, specialists and organisational unit managers from the following organisations: Cargomax, SIA Deliar, BLB Baltijas Termināls A/S, 4finance IT SIA, Wellness Travel Group, Diatom Enterprises, SGS Latvija Ltd., NORVIK BANKA AS, Dinotrans SIA, Health Centre Association Plavnieki, Media House, Eltel Networks SIA, Baltikums AAS, Latvijas pasta banka AS, LNK Centre, RBK Games, Secondary school No.29, SAF Tehnika AS, BKUS, a self-employed person, OEG, Casino, Binarium SIA, CSC Telekom SIA, TEZ TOUR, Aroma Floris, Cityfinances SIA, EHR Mediju Grupa, Rīgas Centrālcietums, Balticom AS, Pricewaterhouse, Coopers SIA, Pilots’ Club SIA, Airline Support Baltic, ExpressCredit SIA, Olympic Casino Latvia SIA, De Nova Agro SIA, Dinotrans, Sabi sushi, Drogas, etc.

The questionnaire was comprised of 26 questions. 27 master and 76 bachelor programme graduates participated in the survey. General conclusion: the overall attitude of graduates towards studies at TSI is positive.

According to the survey results, 93% of them are employed. Almost half of the graduates are not working in their speciality. To the question regarding the decisive reason why they do not work in their speciality, respondents mentioned lack of experience. They also said that employers more often pay attention to work experience rather than personal qualities, with university diploma being in the last place.
An active attraction of talented young people to studies in the Faculty programmes and their preparation for successful careers is planned in the future. Joint scientific projects and conferences and cooperation on topical issues will be organised with schools.

3.3.2.3. The MSE Faculty work plan with graduates and foreign students up to 2020

<table>
<thead>
<tr>
<th>The plan of action</th>
<th>Objectives and expected results</th>
<th>Time-line</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create a database of Faculty students and graduates to obtain comprehensive information about students, their employment after graduation and requirements for improving their professional qualifications.</td>
<td>Feedback from graduates; this information could be useful for organising a lifelong learning centre.</td>
<td>2020</td>
</tr>
<tr>
<td>Share of foreign students (in the framework of mobility) of the total number of students, %</td>
<td>At least 2% of the total number of students</td>
<td>2020</td>
</tr>
<tr>
<td>Share of foreign students studying towards a degree, of the total number of students, %</td>
<td>Increase the share of foreign students at the Faculty of MSE to at least 50%</td>
<td>2020</td>
</tr>
<tr>
<td>International learning and study practice (number of the Faculty of MSE students participating in mobility activities), %</td>
<td>At least 5% of the total number of students</td>
<td>2020</td>
</tr>
<tr>
<td>Possibilities to engage in the annual self-assessment process of a social sciences study programme in an internationally recognised higher education institution</td>
<td>Increase the international competitiveness and internationalisation of education; 1–3 study programmes</td>
<td>2020</td>
</tr>
<tr>
<td>Promoting the Latvian language and culture among foreign students; include in the study programmes a “Latvian Language and Culture” course</td>
<td>Promote knowledge about the economy and culture of the RoL abroad</td>
<td>2020</td>
</tr>
</tbody>
</table>

3.3.3. Management of study directions

Implementation of the study directions is basically ensured by the Faculty of Management Science and Economics, with its constituent Departments:

- The Department of Economics, Management and Finance,
- The Department of Humanities.

Other Faculties (Faculty of Computer Science and Telecommunications, Faculty of Transport and Logistics) and their reporting Departments, as well as other organisational units ensuring, within their sphere of competence, the achievement of the results envisaged by the programmes, are involved in the implementation of the study direction.

At the Faculty level, the management of study directions is ensured by the Dean of the Faculty in cooperation with programme directors and Heads of the Department of Economics, Management and Finance and the Department of Humanities. Taking into account expert evaluations and recommendations given during previous accreditations to improve cooperation with employers, 4 employer representatives have been included in the Faculty Council of MSE.

Development of study direction management

The following tasks have been set to improve the management of study directions:

- enhance the role of the programme director as the programme leader and innovator (programme director’s competences: management of the programme content, recommendations for staff recruitment, self-assessment of the programme);
- establish for each study programme a Council of professionals and business representatives from the area concerned;
- establish a Faculty level monitoring system (feedback from students) for determining the quality of programme implementation;
- resume continuous operation of the Knowledge Transfer Centre.
3.3.4. Faculty of Management Science and Economics, Human Resources development

3.3.4.1. Description of the existing situation

Study direction “Management, Administration and Real Estate Management”

15 teachers, of which 13 are elected in official TSI academic positions, participate in the implementation of the compulsory and limited optional part of the study programme. 10 among the elected teachers hold doctoral degrees, 4 are professors and there is 1 assistant professor. More than 90% of academic work is carried out by academic staff elected at the Transport and Telecommunications Institute.

The study direction “Economics”

Composition of the academic staff implementing the Bachelor of Social Sciences in Economics programme within the study direction:

- 24 teachers, including 22 (92%) holding elected positions at TSI of which 4 (17%) are professors or associate professors, 10 (42%) assistant professors and 10 (42%) lecturers, participate in the implementation of the programme. 14 (58%) of the teachers hold doctoral degrees.

Composition of academic staff implementing the Master of Social Sciences in Economics programme within the study direction:

- 15 teachers, including 13 (86.7%) holding elected positions at TSI of which 5 (33.3%) are professors or associate professors, 4 (26.7%) assistant professors and 3 (20%) lecturers, participate in the implementation of the programme. 12 (80%) of the teachers hold PhDs.

More than 90% of academic work is carried out by academic staff elected at the Transport and Telecommunications Institute.

3.3.4.2. Human resources development plan of the Faculty of MSE up to 2020

Table 3.12:

<table>
<thead>
<tr>
<th>The plan of action</th>
<th>Objectives and expected results</th>
<th>Time-line</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic staff involvement in research</td>
<td>Building of the scientific research capacities of the academic staff to ensure the development of the business environment and national economy</td>
<td>2020</td>
</tr>
<tr>
<td>Scientific publications in internationally peer-reviewed journals</td>
<td>According to the TSI plan</td>
<td>Annually</td>
</tr>
<tr>
<td>Speeches at international conferences</td>
<td>Professors and associate professors: 1–2 conferences per year; teachers and lecturers: 1 conference per year</td>
<td>Annually</td>
</tr>
<tr>
<td>Speeches at TSI educational and scientific conferences</td>
<td>According to the TSI plan</td>
<td>Annually</td>
</tr>
<tr>
<td>- TSI research and academic conference Science and Technology — Step into the Future;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- International scientific and educational conference Actual Problems of Education, MIP.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management of the Latvian Council of Science and other national research projects or participation in their implementation</td>
<td>2–3 projects</td>
<td>2020</td>
</tr>
<tr>
<td>Participation in implementation activities of international projects enhancing the internationalisation and international competitiveness of higher education</td>
<td>2–3 projects</td>
<td>2020</td>
</tr>
<tr>
<td>Management of scientific contract works or participation in their implementation; implementation of the first round of the “Practical Focus Research Projects”</td>
<td>2–3 projects</td>
<td>2020</td>
</tr>
<tr>
<td>Patents and licences received</td>
<td>3 patents</td>
<td>2020</td>
</tr>
<tr>
<td>Doctoral research plan</td>
<td>Teaching staff with doctoral degrees: 65% of the total number of MSE teachers</td>
<td>2020</td>
</tr>
<tr>
<td>Defence of promotion papers</td>
<td>Number of MSE teachers: 5</td>
<td>2016–2020</td>
</tr>
<tr>
<td>Activities to support international mobility and cross-border cooperation. Agreements signed on the implementation of</td>
<td>Encourage the taking up of good practices, exchange of information, cooperation</td>
<td>2020</td>
</tr>
</tbody>
</table>
international higher education activities under Erasmus+ (2015–2020) development and integration in the overall European education and employment processes in higher education.

Ensuring the scientific and professional development of academic staff and exchange of international experience within the EU Erasmus+ funding. Compilation of examples of good practices Number of academic staff participating in mobility activities: 3 persons annually. 2016–2020

Develop and implement international level quality criteria for academic staff development and election to academic positions (open international competitions for the professorships that have been introduced; the relevant regulatory framework has been prepared). Improvement of the quality of the university’s academic staff; enhancing international competitiveness of higher education. Ensuring coherence of pedagogical and research work. 2020

Special attention will be paid to support academic mobility and the professional development of the Faculty’s teachers. Cooperation with foreign partner universities will be improved through internship, scientific and innovation agreements and internationalisation of the study process.

Considering the fact that currently the average age of teachers is 52 and the largest age group is constituted by teaching staff over 64, with only one teacher in the age group under 35, active work at the Faculty is under way to specifically attract young trainers, including inviting Masters students to conduct practical training in bachelor programmes. Individual programmes are designed for young teachers for building successful careers at TSI. In the future, work will be enhanced to motivate teachers to undertake active research by modifying the remuneration system.

3.3.5. External cooperation between programmes of the study direction

3.4.5.1. Cooperation with foreign universities

Since the academic year 2005/2006, TSI has been active in the implementation of the Erasmus+ exchange programme under which students of the direction “Management, Administration and Real Estate Management” participate in “Student Mobility: Studies and Practice”. In 2015, 3 trainers from the Faculty of Management Science and Economics participated in the Erasmus Staff Mobility programme.

TSI has signed a range of cooperation agreements with universities and organisations from European Union countries, Russia and Kazakhstan on participation in joint research and innovation projects, provision of consultancy services, and exchange of teaching staff, etc. Such agreements have been signed with Vilnius Gediminas Technical University, the Kazakh Academy of Transport and Communications named after M. Tynyshpayeva, and St. Petersburg Polytechnic University, etc. Within the framework of international scientific projects, TSI students are offered a possibility to go to foreign universities or scientific institutions and obtain materials for their bachelor or master papers.

In the academic year 2015/2016, visiting professors were invited to teach certain subjects to master students: Massimo Merlino, Professor, University of Bergamo, Italy — International Marketing; Serkan Gursoy, Ass. Professor Beykoz Lojistik Meslek Yuksekokulu — Big Data as a Big Capital and Latest Strategies for Globalizing Business. Guest lectures by Assoc Prof. Eftihia Nathanail (University of Thessaly, Greece) are planned in the near future, as well as inviting professors from other cooperation universities: University of Zilina (Slovakia); University of Murcia (Spain); European Humanities University (Lithuania), etc.
3.3.5.2. External cooperation between programmes of the study direction

<table>
<thead>
<tr>
<th>The plan of action</th>
<th>Objectives and expected results</th>
<th>Time-line</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategic partnerships with Latvian universities, scientific institutions and the</td>
<td>With an increasing share of doctors (up to 67%) in the academic staff, its quality has improved</td>
<td>2016–2020</td>
</tr>
<tr>
<td>business sector to develop governance of the study process</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Development of an inter-university Management study programme and establishment</td>
<td>Development of inter-university doctoral programmes in Management Science</td>
<td>2020</td>
</tr>
<tr>
<td>of a joint Promotions Board</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Signing of cooperation agreements with Vidzeme University and approval of the</td>
<td>Signing of cooperation agreements, development of an action plan</td>
<td>2016</td>
</tr>
<tr>
<td>action plan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooperation with employers, entrepreneurs, company managers and sector specialists;</td>
<td>Development of staff and students’ professional competences</td>
<td>2016–2020</td>
</tr>
<tr>
<td>continuing of the Knowledge Transfer Centre activities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Development of lifelong learning in compliance with the market requirements and</td>
<td>Increasing the competitiveness of specialists and the development of their professional competences</td>
<td>2020</td>
</tr>
<tr>
<td>individual interests and needs in cooperation with employers and industry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>associations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recruit from the business environment 2–3 young trainers wishing to follow</td>
<td>Prepare competitive teachers; activate scientific research activities of the Department.</td>
<td>2020</td>
</tr>
<tr>
<td>pedagogical careers and undertake doctoral studies.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.3.6. Outlook assessment of the study direction and study programmes from the RoL interest point of view

The Sustainable Development Strategy of Latvia until 2030 approved by the Saeima of the RoL was used to assess the outlook of the study direction and study programmes from the point of view of the Republic of Latvia. Successful implementation of the TSI Development Strategy is the basis for building a knowledge-based society in Latvia, with TSI as a key partner in the achievement of the strategic goal set by the National Development Plan of Latvia 2014–2020: education and knowledge for the growth of the national economy and technological excellence. The programme provides: “boosting Latvian businesses supplying competitive products and services to foreign markets”.

Quantification of business development objectives is provided in the below table. (Source: [http://likumi.lv/doc.php?id=253919](http://likumi.lv/doc.php?id=253919))

<table>
<thead>
<tr>
<th>Base value</th>
<th>2014</th>
<th>2017</th>
<th>2020</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of economically active</td>
<td>65,629 (2011)</td>
<td>67,000</td>
<td>75,000</td>
<td>80,000</td>
</tr>
<tr>
<td>economic operators</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latvia’s ranking in the Doing</td>
<td>21 (2011)</td>
<td>20</td>
<td>17</td>
<td>13</td>
</tr>
<tr>
<td>Business Index</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latvia’s ranking in the Global</td>
<td>64 (2011)</td>
<td>60</td>
<td>53</td>
<td>45</td>
</tr>
<tr>
<td>Competitiveness Index</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The National Programme pays significant attention to research. The key issue is to achieve commercialisation of research results and satisfactory cooperation between the science and business sectors, including among the Baltic countries. The following tasks strengthening the role of the university in the preparation of specialists and in the commercialisation processes of science have been defined:

- Qualitative and quantitative reinvigoration of science, involving young scientists in research and scientific activities, and mobility of academic and research staff to promote the development of projects suitable for commercialisation in Latvia;
- Measures to support the export of higher education (teaming up for outstanding programmes and the creation of joint programmes in other EU languages in at least 10 study directions;
international publicity of the programmes and development of support centres for foreign students; recruitment of foreign teachers);

- Competitiveness and consolidation of higher education, development of material and technological base (facilities), improvement of the internal quality system, encouraging a higher rate of scientific publications by university staff, launching of international journals, increased effectiveness of the governance system.

Quantification of business development objectives is provided in the below table. (Source: [http://likumi.lv/doc.php?id=253919](http://likumi.lv/doc.php?id=253919))

<table>
<thead>
<tr>
<th></th>
<th>Base value</th>
<th>2014</th>
<th>2017</th>
<th>2020</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of scientists employed in the private sector (as a percentage of the total, full-time equivalent)</td>
<td>16.2 (2010)</td>
<td>18</td>
<td>21</td>
<td>23</td>
<td>27</td>
</tr>
<tr>
<td>Number of students at universities and colleges having obtained degrees or qualifications (thous.)</td>
<td>24.8 (2011)</td>
<td>23.9</td>
<td>24.1</td>
<td>24.6</td>
<td>28.6</td>
</tr>
<tr>
<td>Higher education (percentage of the population aged between 30 and 34 with higher education)</td>
<td>36 (2012)</td>
<td>37</td>
<td>38</td>
<td>40</td>
<td>&gt;40</td>
</tr>
</tbody>
</table>

As regards Doing Business 2017, it is already the 14th survey in a series measuring the regulations affecting the business activity of small and medium enterprises. The survey assesses the ease of doing business by taking into account factors characterising the business environment, such as starting a business, dealing with licences, labour legislation, registering property, getting credit, protecting investors, trading across borders, enforcing contracts and closing down a business. According to the latest report published by the World Bank (WB) and the International Finance Corporation (IFC) (Doing Business 2017) and measuring the business environment across 190 economies worldwide, Latvia is currently the 14th most favourable place in the world for doing business, which is higher than a year ago.

Latvia ranks 22nd in terms of starting a business, 23rd in terms of dealing with construction permits, 42nd in terms of getting electricity, 23rd in terms of registering property, 7th in terms of getting credit, 42nd in terms of protecting minority investors, 15th in terms of paying taxes, 25th in terms of trading across borders, 23rd in terms of enforcing contracts, and 44th in terms of resolving insolvency.

Preparation of specialists in the study direction “Management, Administration and Real Estate Management” is in line with the concepts for the preparation of specialists and development of science. TSI has all the resources necessary for the qualitative training of specialists and better engagement of students in scientific work. Education programmes for all age groups should refocus on promoting creativity related to teamwork and interdisciplinarity instead of merely acquiring specific competences (www.academia.edu).

By comparing the objectives and the set strategic priorities with the Sustainable Development Strategy of Latvia, it can be concluded that the study direction:

- ensures the development of skills, knowledge and talents of Latvia’s main capital — its people;
- promotes creativity and the ability to cooperate;
- educates young people so that they could integrate in the global labour market without leaving Latvia and offer their knowledge and skills in the virtual environment;
- provides the possibility for gifted and talented people to acquire world-class knowledge without leaving Latvia;
- realises all the key strategic development principles of Latvia: creative activity, tolerance, cooperation and participation;
- is able to increase the productivity of human capital and participation in the labour market;
ensures the efficiency of education services;
ensures qualitative and available lifelong education focused on creativity.

3.3.7. Social and democratic efficiency of the strategic development plan of the Faculty of MSE

As a result of performance of the set tasks, young managers and economic analysts emerge in Latvia who, with the support of new technologies, are able to create new directions of post-industrial economy, create a friendly social environment and a new quality of life.

By implementing the Development Strategy, MSE will become an education centre in the area of fundamental education in both economics and management sciences, and in transport and logistics. This will first of all manifest itself in the implementation of bachelor and master programmes: The Faculty of MSE will pour into the labour market over 300 competitive graduates each year. Internationalisation of the study process will promote the attraction of foreign students, teachers and researchers. The share of foreign students will reach 50% of their total number, while the number of foreign teachers invited by the Faculty will reach 20 people. MSE as part of TSI will become a leader in new economic research and development in a range of economic activities; 70% of its teachers will actively engage in scientific research activities, ensuring a wide use of the research results in the courses taught. A better concentration of academic staff in the common MSE structure will create the basis not only for the study process, but also for the development of scientific research potential, and will ensure much more favourable and transparent conditions for interaction with businesses where the intellectual resources of TSI are in demand. The university will become a resource centre disseminating advanced knowledge of economics, including in innovation management.

3.4. Management scheme of the university’s study directions and their quality of implementation

Management scheme of the study direction (extract from the TSI organisational structure):

![Management scheme of the university’s study directions](image)
Ensuring a high quality study process is a priority task of the university, and its performance ensures that TSI graduates are highly competitive in the labour market. Conceptually, the solution of this task is based on the principle of mutual and genuine involvement of all participants of the study process (administration, teaching staff and students) in the improvement of the process and achievement of high results.

Planning of the study process

At the draw-up stage of the curriculum, continuity of subjects to be taught is ensured in line with methodological plans. At this stage of designing the study process, the Dean of the Faculty controls the compliance of the methodological plans and other methodological training documentation with the approved study programmes. All methodological documents can be accessed by TSI students and staff on the TSI-Intra (intra.tsi.lv/root/) Intranet site.

Control

To control the study process and improve its efficiency, at the beginning of each semester students receive their independent work schedules, together with the curriculum and list of exams. Control over the quality of the study process and implementation of the study programme is exercised in the form of monitoring attendance, current academic achievements and liquidation of academic debts, as well as compliance of the class content with the approved methodological plans (based on entries in group attendance registers). Control over compliance with the curriculum, execution of the teaching plan and the study programme and over methodological support, as well as verification of academic achievements and organisation of open lessons is envisaged.

Decision-making and analysis

The quality of the study process and training outcomes is ensured through the methods defined in the TSI Internal Rules: Study Regulations, Study Rules of Procedure, Quality Manual. Systematic current, interim and final tests of the training results are carried out in accordance with the curricula and subject descriptions. The above documents define the quality assessment scale and the criteria. Improvement of the academic staff qualifications is organised through methodological workshops. The control, analysis and implementation procedures of corrective actions are defined by the university’s Quality Management System.

Based on the results of control visits at training sessions and analysis of work of the final examination commission, analysis of anonymous student surveys regarding the content and quality of training (in the form of questionnaires) and planning and organisation of the study process, the success, shortcomings and failings of the process are discovered and used to improve the training content and methodology and other areas of the university’s activities.

The management processes of training programmes are controlled by the Quality Management System of the university (approved by order of 08.01.2004 No. 01/4-V, certified in 2008 in compliance with ISO 9001 standard). The Education Service Development Manual describes the development and approval processes of study programmes, their periodic topicality tests and introduction of the required changes. The efficiency of the Quality Management System processes is verified during annual internal audits. The internal audit results are discussed at management, Faculty and Department meetings.

Student surveys are carried out each semester, with questionnaires containing questions pertaining to the university’s training methods and operational activities. This is followed by statistical processing of the survey results and finalisation of the report. The reports are used to improve all areas of activity at a Department, Faculty and general university level.

Democratic participation of parties to the process is ensured at all stages of planning and realisation of the study process:

- teaching staff, training support staff and students in cooperation with Academic Congregation
- teaching staff — with the participation of Departments, Faculty Council, Institute Senate;
- students—through questionnaires, with participation of the Student Self-Government study commissions and the Senate.

The efficiency of the quality improvement measures for the overall study process is analysed at the Training Methodological Commission Meeting of the Senate held at the end of the semester (academic year). Based on the analysis, a concrete action plan for the following academic year and a longer perspective is developed. The efficiency and topicality of the study programme is assessed during the course of the annual self-assessment exercise of the study programme. The results of the self-assessment are discussed at the TSI Training Methodological Commission Meeting and approved by the TSI Senate.

Transparency and reliability of the controls is ensured owing to collegial work of the teachers in Departments, at the Faculty Council, and at the Training Methodological Committee Meeting of the Senate. Those collegial bodies review both methodological and ethical aspects of academic staff. The university has a Code of Ethics which governs matters related to the quality assessment of the study process.

4. Research Programme

4.1. General profile

The Transport and Telecommunications Institute Research Programme for 2015–2020 was developed in 2015 within the ERDF project No. 2DP/2.1.1.3.3./15/IPIA/VIIA/006 “Institutional Capacity Building of the Transport and Telecommunications Institute”\(^{11}\). The Research Programme aims to create an education and science service environment ensuring continuous preparation of scientific staff and carrying out research and development along the TSI priority directions, requiring the following challenges to be met:

- ensure a sufficient number of qualified researchers;
- increase the students’ interest in research during the studies;
- mobilise EU support for the implementation of research projects;
- enhance international cooperation in the area of scientific research;
- develop innovative products in cooperation with local and international companies.

\[\text{Figure 4.1. Framework for development of the research programme of TTI}\]

\(^{11}\) Information about the project is available here: [http://www.tsi.lv/sites/default/files/editor/transport_and_telecommunication_institute_research_programme_final_website.pdf](http://www.tsi.lv/sites/default/files/editor/transport_and_telecommunication_institute_research_programme_final_website.pdf)
As already mentioned in Section 1 of the Strategy, the vision of TSI is to become a European level university offering education and scientific research in ICT and transport areas. In the context of this vision, we perceive our university’s research work as follows:

We will improve our position as a leading university through excellent training, engagement in qualitative international research and provision of education services of the highest standards, making a significant contribution to social, cultural, educational and economic development.

Our university will undoubtedly face various challenges in the global environment of education services. Although there will be pressure on the income flows from our higher education services and research, many opportunities exist to develop our strengths and diversify our activities. We have the possibility to increase the contribution to the development of society and the economy through engagement in research and business, and by extending our international profile. All these activities will help to ensure that we will continue to provide a high quality education and learning experience to our students.

Our ambitions will be mainly supported by three interlinked strategies: Research Strategy, Education Strategy and Knowledge Services Strategy (Figure 4.2). Each of them has its own targets, tasks and performance indicators.

The Knowledge Services Strategy is closely associated with the Research Strategy and is focused on the commercialization of research activities. The Education Strategy is based on the Research Strategy and is focused on the development of the academic component of the university and, at the same time, it serves as a basis for the development of human resources for research activities.

Our vision for Research recognizes that research excellence and innovation are integral to our overall strategy and to our strategies for Education and Knowledge Services. Our goal is to address fundamental and strategically important questions and to deliver economic, social and cultural impact at regional, national and international levels, through engagement in internationally-leading research activities and collaborations. This will be achieved through the following aims:

- We will support the highest quality research and develop collaborations that enhance the contribution of research to the broad portfolio of our activities.
- We will support and develop excellent researchers within a sustainable research culture.
- We will ensure that research informs our teaching and enhances the student experience.
- We will promote and publicize the contributions that our research makes to the advancement of knowledge and to wider economic and societal benefit.
• We will set very high standards to ensure that we maintain and advance our reputation for research. Our strategic investment in and support of research will be necessarily selective.

Our vision for Knowledge Services is to expand our provision of the quality-assured knowledge services commissioned by other organisations to improve their efficiency, effectiveness or profitability. These services are underpinned by our excellence in teaching and research, contributing to and making use of the high-level skills of our staff and our state-of-the-art facilities.

4.2. Development priorities of science and research

In a large number of directions, the provision of qualitative international research services is impossible; nevertheless we have demonstrated research excellence (at both national and international level) in several areas. We have identified research areas where we wish to develop ourselves and gain international recognition.

The following three overarching themes (pillars) will integrate the research capabilities and the programme strengths of TTI to enhance our capacity to respond to the academic and societal challenges (Figure 4.4.):

• Information and Communication Technologies (ICT) or Telematics.
• Smart Solutions in Transport and Logistics.
• Digital Society and Economy.
4.3. Preconditions for and challenges to the development of action plans under the research development programme

The following main sources of information are used for setting the strategic directions for development, key system performance indicators and development of action plans:

- Experts’ recommendations (Tehnopolis, 2013)
- Institute development strategy
- Priorities the development of Latvia (Sustainable Development Strategy of Latvia until 2030)
- Forecasts for the industry development (Industrial evaluation of RIS3 strategy)

For building realistic plans it is also important to take into account certain limitations (barriers) of the TTI as of a scientific organisation.

For one thing, 1st barrier is not enough due attention to improving all scientific fields (mentioned in 1st and 2nd chapters) to a higher level, which leads to an uneven development of these areas. But the reason lies in an insufficient number of the research staff not only in the TTI, but in the whole Latvian market.

TTI is a non-profit private state accredited by HEI with primary activities in the field of education and training that was established in 1999 on the base of the Riga Aviation University (RAU). Due to the stable university traditions of conducting scientific research, the authorities’ vision of the institute development has permanently involved active scientific activities as an obligatory condition of high quality education in the sphere of ICT, Transport and Logistics scientific direction became the second in priority sphere of the institute activities. The result is the “4” deserved mark from the international experts of the scientific activities of the TTI in 2014, but there has remained a major, above mentioned, problem – insufficiency of resources for the Institute to become more recognized in the European scientific arena.

Thus, we may state the problem of the dedicated (free from the education process) scientific researchers who would be engaged in the scientific research at full range. The Figure 9 presents the KPI values – the number of researchers who are included in the Register of the Academy of Sciences who, at the same time, are academic staff or PhD students. In 2014 26 researchers were registered in the official database, but recalculation to FTE is about 9 FTE (see Figure 9).
2nd barrier - the narrow field of the TTI research (and educational) activities in the modern highly technological and fast developing industry of the "ICT applications" is one of the most competitive ones in Europe and in the world. And in spite of the recognition of the Institute as of a major national player in this field, the starting positions of TTI in the European advancements are much weaker than those of the research entities of the "EU innovations leaders".

Therefore, the main efforts in the nearest five years should be aimed at the effective HR policy and sustainable cooperation strategy with the significant EU and Latvian research players. The TTI future research must be focused on strengthening its positions in the European market.

3rd barrier is lack of financial support for research initiatives. This barrier could be overcome by diversification of funding sources among EU funds, National funding programmes and TTI funds for development.

4.4. KPI framework for TTI sustainable development

The target model for research at TTI in 2020 foresees the diversification of R&D areas through the organization of interdisciplinary modes of research, building on core competencies of TTT but enriched the new subject-areas of ICT in transport and logistics.

The target model for research activity in 2020 will also be characterized by the following features:

- "TTI Fellowship" program recruits foreign academics and researchers to work at TTI based on an open international competition (for the positions of Postdoc, Researcher, Senior Researcher).
- "TTI Staff Portfolio" program financially incentivizes the staff and students at TTI to increase their personal publication rate; the amount of the compensation depends on the impact-factor of the journal, the involvement of a foreign co-author and the citation index.
- At least one of TTI's academic journal or international journal with TTI co-publishing is included in the Scopus and/or Web of Science database.
- A developed intellectual property policy is implemented in TTI, including patents, trademarks, other outputs or results of intellectual activity of the TTI.
- TTI holds at least two annual international researches and technology conference sponsored by TTI and international research associations and organizations.
- The graduate programs in TTI relies two pillars:
  - on the "science-education-business" model with active participation of business partners: organizing internships for graduate and post-graduate students; growing the number of programs, developed together with businesses
  - on the international base: to establish the international Master's and PhD programs (by 2020 – at least 2 double degree programs with foreign partners, including through distance learning) and to enrich the environment for active international academic mobility, including internships for
graduate and post graduate students as well as researchers in the EU research centres, and internships for foreign scientists and students at TTI.

The KPI framework presented on Figure 4.6. is used to follow the development tendency of TTI as research institution. The Table demonstrates current values of indicators (2014) and planned for 2020.

<table>
<thead>
<tr>
<th>Group</th>
<th>KPI</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2014</td>
</tr>
<tr>
<td>HR policy</td>
<td>Total number of researchers:</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>- amount</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>- FTE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Average age of researcher</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td>Scientific articles published in the SCOPUS, Web of Sciences (per 1 FTE)</td>
<td>0.8</td>
</tr>
<tr>
<td></td>
<td>Number of PhD student defended</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Number of Ms student graduated</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td>The number of new scientists supported for implementing Postdoc research</td>
<td>0</td>
</tr>
<tr>
<td>Funding</td>
<td>Funding from H2020 approved projects</td>
<td>87000</td>
</tr>
<tr>
<td></td>
<td>Patents/licenses</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Agreements on commercialisation of TTI research and Consulting projects</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Overall research income</td>
<td></td>
</tr>
<tr>
<td>Cooperation</td>
<td>Cooperation Agreements with EU RE and Universities</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Cooperation Agreements with business companies</td>
<td>7</td>
</tr>
</tbody>
</table>
4.5. Roadmaps of research activities and initiatives

Since the formulation of action plan appears to be of central importance for all aspects of this document the separate roadmaps were drafted for the development plan, highlighting also the impact expected. The roadmaps are drafted for five years and up and foresee the implementation of measures and eventual adjustments and/or corrective measures according to the changing economic or scientific demands.

The main avenues of transformation and development of TTI are formulated into six strategic initiatives:

**Strategic Initiative 1 (SI #1). Improving the positions in research in the number of areas of the sixth technological order**

The initiative is aimed at:

- the diversification of the TTI’s research and academic subject areas to expand beyond the narrow confines of its engineering profile;
- raising the standard of the TTI’s international research output: quantity of publications, citation index, number of patents and the like, in line with that of leading EU universities.

The context and concrete actions on the implementation of Initiative 1 divided in two stages according to the roadmap are shown in Annex 12.

**Strategic Initiative 2 (SI#2). Integration of TTI into the global research and educational system through leading research, information and learning technologies**

This Initiative is aimed at improving the graduate programs and the system of recruiting graduate foreign and domestic graduate students. It includes implementing postgraduate programs in cooperation with EU and LV universities and research organizations to include a system of dual degrees and forming a system for scientific internships during the Ms and PhD theses preparation period. This Initiative is aimed at taking the collaboration in research and education at TTI to a new level through:

- partnerships with EU and Latvian Universities, research establishments (RE) and high-tech companies around the world;
- creation of joint Masters and PhD programs;
- implementation of innovative learning technologies, including distance learning, research-based learning, project-based learning, problem-based learning;
- increase in quality and broadening of the audience of the TTI’s graduate programs;
- stricter quality control of education.

The implementation will be undertaken in two stages and shown in Annex 13.

**Strategic Initiative 3 (SI#3). Creating a novel HR system and forming a highly professional research staff**

Reorganization of working with personnel: a move away from the personnel accounting to an HR management system based on the global best practices of motivation, continuing education, etc.

This strategic initiative is aimed at the systemic modernization and an increase in the efficiency of HR work at the TTI. The basic principle of the HR strategy is recognizing faculty, staff and students as the key assets of the TTI that determine its development. There should be a change in the personnel policy program aimed at developing human research potential and includes the development of:

- assessing the quality of personnel;
- retention of the excellent researchers;
- system to attract talented young researchers;
- system to attract highly qualified personnel from other countries.
The implementation of the initiative will be undertaken in two stages and shown in Annex 14.

**Strategic Initiative 4 (SI#4). Development of strategic communications and achieving high recognition of TTI nationally and globally**

The initiative is aimed at raising the international competitive advantage of TTI by increasing brand awareness of the TTI internationally, recreating its image and developing a corporate culture, and significantly increasing the efficiency of its internal and external communications. The initiative is based on a comprehensive communications strategy, implemented across all areas of TTI development including, first of all, research development.

The implementation of the initiative will be undertaken in two stages and shown in Annex 15.

**Strategic Initiative 5 (SI#5). Development of the innovation ecosystem to support the growth potential of TTI in knowledge and technology transfer**

This SI is aimed at transforming the processes of organizing technology transfer, R&D commercialization placing the innovation ecosystem at TTI at a higher level in line with the TTI’s development objectives.

The activities are to be carried out in two stages, each of which focused on a separate development driver of the innovation ecosystem (see Annex 16).

**Strategic Initiative 6 (SI#6). Transformation and development of the TTI management system based on the principles of a research and business-oriented university**

New challenges and ambitious goals of the University demand a complete overhaul of the TTI’s management system. The implementation of this initiative involves moving the entire management system and the TTI in general towards the triangle principles of a research-community-innovation oriented university. This initiative is carried out in two stages and shown in Annex 17.

All activities of these strategic initiatives affect the following results in:

- Research Governance Development
- Human Resources Development
- Networking
- Infrastructure improvement
- Financial issues

### 4.6. Human resources for research

The existence of a Human Resources Development Strategy of scientific institutions is a European Commission (EC) initiative. TSI has adopted the European Charter for Researchers and the Code of Conduct for the recruitment of researchers, their employment contracts, career development and working conditions.

The practical implementation of HR strategy work at TTI was coordinated and planned by a working group authorized by the TTI Rector. The work was directed by the TTI’s quality steering group, which has representatives from both teaching and research personnel and is chaired by the Rector. The quality steering group examines quality management at the TTI as a whole and supports the Rector in the HR strategy implementation. HR strategy work is a part of the quality work and development of operations at TTI. The working group operated in cooperation with the personnel organisations and other stakeholder groups and research personnel participated in the work through the following channels: Research council and Quality Steering group.

The gap analysis started in September 2014. The working group compared the regulations, principles and operations models used at TTI with the goals set in the European Charter for Researchers. On the basis of its assessment, the working group concluded that the procedures that are based on
legislation, the Strategy of the TTI and its implementation programmes (internationalization, HR and communications strategies). For example, the terms of employment, recruitment, salaries, gender balance and participation in decision-making bodies are areas where the required regulations and instructions are already in place. The procedures that generally will correspond to the recommendations have been developed till 31 of December 2015.

The topics that were defined on the basis of the gap analysis as areas that became the base for actions plan. Issues related to the changing research distribution by age, stability of employment contracts, the meaning of supervisory work and communications were highlighted as the result of the working group activity and need actions that promote mobility, career advancement and equality.

The main actions can be combined in groups:

- **Mobility** (exchange visits, STSM, summer schools, etc)
- **Access to career advice** (self-assessments, career roadmap, training)
- **Stability and permanence of employment** (funding between projects, sharing good practices, HR planning, clearer career plans, highlighting the supervisory role, making use of development discussions)
- **Professional responsibility and attitude, ethical principles** (training on the legislation concerning document management, protection of research data, ethic aspects)
- **Dissemination of research results**
  - popularizing science, for example by organizing regular and open thematic events that present current research
  - support for scientific writing, publishing active support for popularizing research results; training, researcher interviews on YouTube, open events for stakeholder groups, communications plans of research projects, meetings with the funders after the research projects have been completed.

The human resource development is not only the issues of the number of the research personnel in the research entity, but also a point of the edge structure of the research staff. That is why the KPI framework takes into account not only increasing the number of researchers (by amount and by FTE), but also a significant change edge structure of the research staff. Figure 4.7. shows the current edge structure of the research staff and target until 2020.

Involvement of students in research. Doctoral studies and post-doctoral research

Qualified teaching staff are necessary for the development of promotion works, and this process is monitored by professors or associate professors. In view of the above, scientific research activities are
linked to the Faculty concerned, and the resources of that Faculty are used to carry out this work. This principle also applies to master level students whose works are supervised by assistant professors, professors or associate professors. The university has three master programmes and one doctoral programme aimed at preparing highly qualified EU class specialists in engineering sciences.

Regulations on the Preparation of Higher Scientific Qualifications Specialists (PhD holders) are available in Annex 3 to the Strategy. The Regulations establish the TSI’s regulatory framework and institutional structures determining and implementing the following processes for the preparation of higher scientific qualifications specialists (PhD holders): admission rules and requirements for mastering doctoral programmes; doctoral study arrangements; management of doctoral training processes; TSI promotion rules and criteria (defence of the promotion work and award of a doctoral degree).

Several problems, however, have been identified:

At the end of 2016, 4 applications for a post-doctoral programme (within the framework of the EU funded activity 1.1.1.2 “Post-doctoral research support” of the SO 1.1.1) were submitted. In accordance with the programme applied for, young scientists must engage in a research activity in the strategic research areas of TSI for 3 years. The plans are to also support programme applications from other young scientists over the next years.

Primary tasks for the replacement of scientific staff:

- To establish of a database and contacts to former TTI students successful as researchers abroad or in leading position in national and international companies. The purpose is to involve the alumni in the development of the scientific research at TTI, both as partners for international cooperation, mentors and supporters in general. Furthermore, positive contacts could particularly be useful for applications within the Horizon2020.
- Further establishment of partnerships with universities in Europe and other research institutions. Partnerships are formal cooperation agreements concerning both higher education and research cooperation.
- To establish a double mentoring system for PhD students: Depending on the field of study mentors can be found both in international universities/research institutions and/or in enterprises. Mentors in this case are understood as persons providing financial and scientific support for individual PhD students allowing them to carry out doctoral research work at the highest level.
- Introduction of a joint PhD program in Transport Management. To establish joint PhD programs with European and other international universities: such programs offer the advantage of a solid basic education at TTI combined with the realization of the doctoral thesis in internationally recognized and well equipped institutions. Students in this case should have supervisors at both universities in order to obtain a better identification with the research work and the cooperation itself.

4.7. Participation in projects and the anticipated cooperation with other scientific institutions

During the international evaluation of TSI’s scientific institution, experts noted the high level of national research, therefore, the main task would be to significantly increase TSI’s participation in international projects by 2020. The main problem preventing changes in the existing situation is a shortage of scientific staff. A considerable increase in the number of researchers and trainers participating in projects and showing initiative is necessary for active participation in projects.

Based on the assessment by international experts, to become a significant EU level scientific institution TSI should focus more on international cooperation. One of the approaches could be increasing
TSI’s participation in international projects. The proposed holistic approach takes account of the TSI’s current problems which are basically related to a shortage of qualified staff. This is why three-pronged approaches have been proposed. The first two focus on increasing the number of researchers and their quality by involving them in EU level projects which are largely directed at cooperation, knowledge sharing, staff exchanges, staff training, etc. The last one is represented by Horizon 2020 projects and focusses on modern innovative research.

For the last 6 years TTI has participated in more than 29 different level projects (international, national and local), including 4 projects completed in the framework of the FP program of the EU. Most of the projects are related with the TTI main research area - ICT application in transport and logistics. The Annex 8 shows the funding amount of TTI from the research activity by their sources.

The analysis of the data shows the positive trends in funding research activities of the TTI and underlines that the institution does not receive any financial support from the state.

79% of the financing were received during execution of 2 ERAF projects and 2 ESF projects. ESF projects were targeted on the support of the master study programme (Support for implementation of TTI master degree programme „Master of Natural Sciences in Computer Science“) and the support of the doctoral study programme (Support for implementation of the Transport and Telecommunication Institute doctoral degree programme „Telematics and logistics“). In the observed period of time, also the following projects received ERAF funding: Optical fiber sensor applications for automatic measurement of the weight on the move: research and development; Information and communication technologies as a single academic resource in the Transport and Telecommunication institute.

Also, starting from 2014 TTI got opportunity to be financed in the framework of the State Research Programs, earlier participation in the program projects were financed by TTI (source of funding - Private funding) NextIT. Also, positive dynamics could be seen in completing the contract research. For the analyzed period of time TTI participated in two FP7 projects and provided more than 5 proposals (in cooperation with EU partners).

It should be noted that on 1 January 2016, Transport and Telecommunication Institute (TTI) together with two partners (University of Thessaly (Greece) and Fraunhofer Institute for Factory Operation and Automation IFF (Germany), started implementing the ALLIANCE project, financed by the European Union under the Horizon 2020 TWINNING Research and Innovation Programme. The Lead Partner of this project is Transport and Telecommunication Institute. The ALLIANCE project is the enabling of stimulating and strengthening the scientific and technological capacity of Latvia and the raising of the profile of the research staff and their institution, by providing knowledge in the field of smart interconnecting sustainable.

Currently TTI is running out of the research capacity. This makes clear that in order to actively participate in projects it is necessary to increase significantly the number of researchers and academic staffs involved in the research. Here, two main opportunities are foreseen: 1) active involvement of master and PhD students in the projects; 2) to increase quality and skills of the existing academic staff, who currently are not active in the projects; 3) active involvement of external researchers.

The approach is directed to the sustainable development of TTI at the national and international levels. But this could be reached only by having necessary resources. Here, under “resources” we primarily understand academic and research staff. According to the approach it is planned to intensively use the projects in the framework of the COST program in order to increase the quality level of the academic and research staff using at the same time the COST Actions as a platform for PhD and master students.

The next level is focused on participation in ERASMUS + program projects. This gives opportunity to make research and management staffs familiar with the projects (management and active research) and at the same time improve the education process and involve young researchers in the project.
Finally, the last level is orientated on participation in the Horizon2020 program. The projects in the framework of the program are orientated on research and innovation processes. From such projects TTI could benefit much from the scientific point of view: highly cited articles, participation in international level conferences, patents, etc. But participation in the Horizon2020 needs advanced research staff and intensive collaboration with international players. Both issues shall be reached by active participation in the previous level programs.

**COST Actions**

TTI has been participating in COST Action science 1999. From this time TTI has successfully participated in 10 COST Actions. The participation in COST Action gave possibility to obtain new knowledge and practical experience to successfully defend PhD theses. At the current time TTI is involved in a number of actions related with the field of the current research program. The list of running actions is presented in the table below. As most of the TTI research is orientated on application of ICT in the field of transport mainly, TTI participation is focused on the Transport and Urban Development domain of COST.

Taking into account the particularities of the COST program, it is not possible to create a specific list of the actions in which TTI staff will be able to participate in the future. Therefore, here are highlighted only the domains which are interesting for TTI participation. Under the list of interesting domains, the following ones could be enumerated (see table below). In order to involve the staff in COST Activities the research department of TTI, on a regular basis, will scan the initiated projects and share this information with all TTI staffs using the organisation internal communication tools (like e-mail, workshops, day of science in TTI etc). It is planned before 2020 to have the following involvement in COST Action:

- Information and Communication Technologies Domain - 4 actions;
- Materials, Physics and Nanosciences - 1 action;
- Transport and Urban Development - 4 actions;
- Trans-Domain Proposals - 1 action

**ERASMUS +**

The ERASMUS + program provides a number of opportunities to raise the quality of the education process and therefore prepare a new generation of academic and research staff. The projects in the framework of ERASMUS + are orientated on the innovation solutions in education, knowledge exchange, joint master program etc. Participation in ERASMUS+ projects gives a wide range of possibilities for the education and research staff and for PhD students.

Taking into account that ERASMUS + is a new program, TTI does not have much experience in participating in this program, but still a number of the proposals have been completed and are still pending for the evaluation, where TTI participates as a partner or as a lead partner. Now, 2 proposals have been accepted and are running:

<table>
<thead>
<tr>
<th>Project title</th>
<th>Period</th>
<th>Supervised</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning with ICT use (LEARN IT)</td>
<td>2015-2018</td>
<td>Prof. Y. Stukalina</td>
</tr>
</tbody>
</table>

At the same time TTI implements mobility of learners and staff actions. Currently TTI has 20 agreements with EU institutions. The list is updated continuously and includes the following EU institutions (selected list): University of Murcia (Spain), Madrid Technical University (Spain), University of Žilina (Slovakia), University of Economics and Innovation in Lublin (Poland), Vilnius Gediminas Technical University (Lithuania), Luleå University of Technology (Sweden), Otto-von-Guericke University Magdeburg
Most of the above mentioned partners are active in research and TTI has prepared a number of proposals in the framework of ERASMUS+ program.

**HORIZON2020**

HORIZON2020 program provides a range of opportunities for financing high-level research projects in different application fields. Most of Horizon2020 subprograms are orientated on establishment strong research cooperation between EU countries. Such cooperation will lead to innovative solutions and therefore able to raise the scientific level of participants and gives social and economic impact for all partner counties.

In the past, the TTI staff participated in number of FP6 and FP7 proposals as partners. The following projects could be mentioned as successfully completed in the framework of FP7 program: Enhancing the transfer of Intelligent Transportation System innovations to the market (TTRANS); Baltic–to–Balkan Network for Logistics Competence (B2B LOCO). Analysis of the proposals evaluation results shows, that one of the important factors in the proposal acceptance is the quality level of the consortia partners and involvement in the proposal of the representatives of industry and SME partners. That is why TTI decided to join ECTRI (European Conference of Transport Research Institutes) organization to become more visible in the European research area. By participation in the ECTRI thematic groups: TG Mobility; TG Freight and Logistics; TG Traffic Management, TTI participates in the activities related to the thematic groups: define research topics of interest for influencing EC policies and programs; participation in EU projects; networking and scientific exchanges. Participation in the ECTRI thematic groups gives ability to bring out the TTI interests to participate in the Horizon2020 projects and to be involved in the proposals initiated by the ECTRI members.

The planning of the activities in the framework of Horizon2020 will be linked with the ECTRI organization proposals. Currently, TTI has planned to support 5 proposals in the framework of Horizon2020 and is planning to have 2 projects in 2026, 2017.

Beside the activities in the framework of ECTRI TTI is planning to cooperate in the framework of the Horizon2020 with the partners from the previous projects and new ones. Having positive experience in cooperation and on the basis of the plans of future collaboration, the following list of potential international partners could be provided:

- Universidad Autònoma de Barcelona (UAB), Spain;
- Fraunhofer-Gesellschaft and Fraunhofer IFF, Germany;
- The University of Trieste (UNITS), Italy;
- The Institute of Logistics and Warehousing (ILiM), Poland;
- Poznan School of Logistics (WSL), Poland;
- Tallinn University of Technology (TUT), Estonia;
- Vilnius Gediminas Technical University (VGTU), Lithuania;
- Hellenic Institute of Transport (HIT)/Center of Research and Technology Hellas (CERTH), Greece;
- University of Tartu, (Estonia).

Also based on the results of the implemented TTRANS project (in the framework of FP7) the following network for research cooperation has been established in Latvia: Kemek Engineering Ltd; KOMIN SIA; Complete Payment Systems (CPS) Ltd. Mapon Ltd; Mappost Ltd; SWD Factory Ltd; X InfoTech Ltd; Rigas Karte Ltd; AVA Ltd etc.

**Other programs**
Among all the above topics, grants of the European Research Council are in the frame of the TTI interests. Taking into account the particularities (grant is given to a person, not an institution) of grants provided by the European Research Council the possibility to get the grant will be shared among the staff and the PhD students of TTI using internal standard communication tools. The following grant types will be promoted:

- ERC Starting Grant for the young, early-career top researchers (2-7 years after PhD) - up to 2 million euro for a period of 5 years;
- ERC Consolidator Grant for the already independent excellent researchers (7-12 years after PhD) - up to 2.75 million euro for a period of 5 years;
- ERC Proof of Concept Grants for ERC grant holders who want to check the market and/or innovation potential of the research results of the ERC-projects - up to 150,000 euro for a period of 12 months.

It is planned to have at least 2 proposals in 2017 years for the European Research Council grants. One proposal is planned in call ERC Proof of Concept as a logical continuation of the project SVARI, which was financed by ERDF, one is planned in ERC Starting Grant for young researchers.

The following programs will also be in the circle of the TTI attention:

- **International level**
  - Interreg Europe 2014-2020: having good cooperation in the Baltic Sea Region with Estonia, Lithuania and Finland allows taking part in the projects in the framework of Interreg Europe 2014-2020. But 15% co-financing must be taken into account. The two following topics are particularly interesting for TTI: 1) Research and Innovation; 2) Environment and resource efficiency;
  - Crossborder cooperation programs (Latvia-Lithuania, Estonia-Latvia-Russia, Estonia-Latvia): but particularities of the cooperation programs significantly decrease participation of the research institution;
  - Eea-Grants, Norway-Grants: A few point make this programme not so attractive for the TTI staff: small experience in writing proposals in the framework of this programme (only one not successful proposal with good evaluation); 2) high level of completion; 3) high salary rates in Norway, which makes misbalance in the work to be done by Latvian and Norway partners.
  - Baltic-German University Liaison Office projects: Low level of financing (up to 5000 EUR).

- **National level**
  - Contractual research. TSI will continue offering possibilities to industry companies to conduct research.
  - EU funded programmes. Within the operational programme Growth and Employment 2014–2020 (SO 1.1.1 activity 1.1.1.1 “Practical Research Aid”, the abovementioned activity 1.1.1.2 “Post-doctoral research support”, activity 1.1.1.3 “Innovation Grants for Students”, activity 1.1.1.5 “Support for Transnational Cooperation Projects in Research and Innovation” of the specific objective 1.2.1, Activity 1.2.1.2 “Support for Improving the Technology Transfer System”, Activity 1.2.1.1 “Support for the Development of New Products and Technologies within the Competence Centres”, activity 1.2.1.4 “Support for the Introduction of New Products into Production”) of the specific objective.
  - National Research Programme (NRP): TSI is planning to participate in NRP projects. In 2014, TSI started joint implementation of the NextIT project with Riga Technical University.
  - Latvian Council of Science grants: important cooperation partners are the Latvian University of Agriculture (LLU), Riga Technical University (RTU), and the University of Latvia (LU).
To sum up the plans of participation in EU level scientific programs, the following chart could show the development dynamics of participation in COST, ERASMUS+ and HORIZON2020 programs.

![Chart showing number of initiated projects in the framework of COST, ERASMUS+ and Horizon2020](image)

**Figure 4.8. Number of initiated projects in the framework of COST, ERASMUS+ and Horizon2020**

### 4.8. Knowledge Sharing Activities

Knowledge sharing and transfer is a core element of the TTI activities and Knowledge Services Strategy is one of the TTI main strategies. In spite of the fact that TTI was well evaluated by the international expert team as a research organization, the experts have pointed out a number of recommendations, which must be taken into account in the TTI development. It has been pointed out by the experts that TTI does not have enough of international collaboration and especially in the frame of the technology transfer. The aim of the knowledge and technology sharing and transfer is to significantly raise the level of knowledge of the TTI research and academic staff in order to be in accordance with modern knowledge in the selected area and to increase the visibility TTI at the international level. As mentioned in the presentation of Dr. A. Kiopa, Deputy State Secretary-Director of HE, Science and Innovation Department on WIRE 2015, 4 June 2015 Riga (Latvia) “...Role of Universities in Latvian R&D&I System to be Knowledge Hub, and Research Institutes - to develop relevant knowledge”. That’s why the spotlight in the research program is Knowledge development and sharing. The purpose of the knowledge services strategy will be the clear definition of the activities and tools which will be implemented in order to support effective knowledge sharing with TTI partners. This strategy will set a collaborative research roadmap development with reference to impact factors of the TTI development.

#### 4.8.1. Context of the Knowledge Transfer Strategy

In the Knowledge Services Strategy, business engagement is defined as all aspects of working with business. Business is understood as including the public sector, the private-for-profit sector, and the not-for-profit sector. Engagement encompasses:

- consultancy;
- knowledge transfer;
- applied research and development;
- workforce development;
- student and graduate placements;
- involvement in the development and delivery of University programmes and services.

TTI is planning to be known as the University of Applied Sciences. In achieving this aim, the TTI will use its relationships with business to deliver the lasting benefits to the economy through high-quality knowledge transfer and workforce development, while at the same time:
• helping to deliver an excellent student experience;
• promoting the development of business-aware and business-responsive academics;
• maintaining industrially-relevant provision;
• growing its international reputation for business creation and support;
• maximizing employability, enterprise and employment opportunities for its graduates.

The strategy reflects the strong alignment between research, business engagement, scholarship and teaching at the University, and consequently articulates closely with the research strategy and academic strategy. Key drivers for this approach include the responsibility of the University as a civic university to support the economy and welfare of society in the region, to ensure that its research has relevance and impact, to promote employability and entrepreneurship, and to enhance the workforce development for employers. All of this, and more, is linked directly to business engagement.

The main objectives of the business engagement strategy are to:

• become recognized as a sector leader in the delivery of client-focused knowledge-based business services;
• support regional and local regeneration, through the creation and growth of new businesses, applied research, high-level consultancy, knowledge transfer, and delivery of customized education and training programmes;
• ensure that all learning and teaching is informed by, and supportive of, innovation, employability and entrepreneurship, including the offer of direct real-world business experience for full-time students;
• ensure that the applied research strategy of the TTI is supportive of the business engagement strategy and academic strategy;
• facilitate career development opportunities in business for staff to:
  o provide staff with professional updating opportunities to inform their teaching, research and personal development;
  o assist with staff recruitment and retention;
• generate income for the TTI.

TTI will deliver its business engagement objectives, presented as the following two groups of activities:

**Growing the business engagement culture by:**

• creating a client-focused approach,
• creating the strategic framework for business engagement,
• implementing appropriate operating and management structures,
• embedding business engagement, and managing its performance,
• developing staff capacity and capability,
• providing guidelines for the staff involved in the business engagement activity,
• establishing high-quality facilities and infrastructure,
• delivering a high-profile marketing and communications strategy.

**Growing partnerships, products and services by:**

• developing partnership networks,
• developing products and services for the business market,
• promoting and supporting company formation,
• developing workforce development and employer-based students.

TSI’s plans include the establishment of at least 1 technologically oriented (spin-off) company by 2020, thus promoting knowledge transfer.
TSI is planning an active participation in the provision of research services under the innovation ‘voucher’ programme (Operational Programme Activity 1.2.1.2 “Support for the Improvement of the Technology Transfer System” of the specific objective 1.2.1 “Increase private sector investment in R&D”), providing at least 3 such technology transfer services by 2020.

4.8.2. Primary knowledge sharing tools

In order to service the needs of the industry with rapidly changing trends, scientific and academic institutions have to implement innovative learning systems and be able to match up to the expectations of the industry for knowledge support. The knowledge grows more with communication, sharing of ideas and transfer of knowledge through face-to-face communication, discussions, faculty and researchers training programs, conferences, and industry-institute interactions. The Table 17 shows the primary tools of knowledge sharing.

<table>
<thead>
<tr>
<th>Tools</th>
<th>Impact</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual International Conference “Reliability and Statistics in Transportation and Communication” organized by TTI</td>
<td>The conference provides excellent possibility for knowledge sharing. The international status of the conference gives possibility to invite advanced researchers from EU (for example in the framework of COST Actions)</td>
<td>The conference provides excellent possibility for knowledge sharing. The international status of the conference gives possibility to invite advanced researchers from EU (for example in the framework of COST Actions)</td>
</tr>
<tr>
<td>Publications in Transport and Telecommunication the Journal owned by TTI</td>
<td>The journal is indexed by more than 20 bibliography databases, including SCOPUS. The bibliography indexes for the past years have shown the growth of the journal quality and therefore could be a good tool to share research results among the auditorium of the journal.</td>
<td>The journal is indexed by more than 20 bibliography databases, including SCOPUS. The bibliography indexes for the past years have shown the growth of the journal quality and therefore could be a good tool to share research results among the auditorium of the journal.</td>
</tr>
<tr>
<td>STSM in the framework of COST Actions (PhD, master students and other researchers)</td>
<td>Participation in COST Action provides good possibility for knowledge sharing at the international level with key players in the research area of EU.</td>
<td>Participation in COST Action provides good possibility for knowledge sharing at the international level with key players in the research area of EU.</td>
</tr>
<tr>
<td>Knowledge Sharing centre</td>
<td>The existing knowledge-sharing centre of TTI provides capabilities for TTI students and industry partners to collaborate and share actual knowledge among the Knowledge Sharing participants.</td>
<td>The existing knowledge-sharing centre of TTI provides capabilities for TTI students and industry partners to collaborate and share actual knowledge among the Knowledge Sharing participants.</td>
</tr>
<tr>
<td>Participation in external International Conferences</td>
<td>Intensive participation of research and academic staff in international conferences could raise the knowledge level. The list of possible conferences is given in annex 6.</td>
<td>Intensive participation of research and academic staff in international conferences could raise the knowledge level. The list of possible conferences is given in annex 6.</td>
</tr>
</tbody>
</table>

4.8.3. Cooperation with the industry

R&D and knowledge and technology transfer, as well as business projects, necessarily involve cooperation and networking. TTI is a research and business oriented at the same time organization and its researchers are participating in activities of the Latvian public organizations:

- Latvian Telecommunication Association (LTA);
- Latvian Information and Communications Technology Association (LIKTA);
- Latvian Electrical Engineering and Electronics Industry Association (LErEa);
- Ministry of Transport of the Republic of Latvia (electronic communication sector council of the experts);
- Latvian branch of IEEE;
- Latvian Simulation Society;
- Latvian Operations Research Society;
- Latvian Logistic Cluster;
- Latvian Transport Development and Education Association;
- Aviation Research Centre Ltd.;
- LEO Competence Centre;
- Latvian Supply Chain Association;
Latvian Green Technology Cluster: e-mobility etc.

The main aims in collaboration with the above mentioned associations in the period (2016-2020) are:

- to define society, business and industry needs and requirements to R&D&I;
- support preparation of the project proposals for identification and promotion of new innovative opportunities for SMEs taking into account society, business and industry needs;
- search of additional funding opportunities, incl. business investment opportunities, etc.

TTI is one of the active promoters of the Aviation cluster establishment.

TTI has already built close contacts with entities coming from the stakeholders, from Latvia and the wider region, and from other EU states and will actively continue towards this direction. Indicatively, the following entities have already joined the TTI business network: Kemek Engineering Ltd; KOMIN SIA; Complete Payment Systems (CPS) Ltd., Mapon Ltd; SWD Factory Ltd; Rigas Karte Ltd; EcoTelematics Ltd., SMappost Ltd., Rīgas starptautiskā autoosta JSC, X Infotech Ltd etc.

TSI is planning to provide, in 2020, continued contract-based research services to at least 14 economic operators, including at least 3 operators established abroad (Lithuanian partners, for example). It is important for TSI to ensure its partners — economic operators and associations — access to research infrastructure, while participation in the UseScience system and innovation ‘voucher’ programme will promote the attraction of new partners (see Section 4.8.1).

4.8.4. Patents

As one of the weak points in the current scientific activity of TTI, the experts of Technopolis emphasize a low number of patents, which directly influences the capability of TTI to successfully commercialize its research results. Currently, according to the European Patent Office information, 4 patents are registered.

TTI plans to increase the number of patents by active participation in national and international level projects. It is planned to have 7 active patents in 2020.

4.8.5. Consulting capabilities

TTI has a positive experience in providing consulting service to the business and industry entities. For the last 6 years TTI has implemented more than 10 consulting projects for business and municipal organizations. In the future it is planned to increase the number of consulting projects. This will be done by signing cooperation agreement with the core field players in the area of ICT applications and involving more young researchers.

Laboratory of Applied Software Systems

The Laboratory of Applied Software Systems of the Transport and Telecommunication Institute carries on research and offers consulting in the following fields: traffic, logistics and business processes. The research and analysis are fulfilled using nowadays simulation software. The software of the laboratory allows doing the high-quality, representative and many-sided analysis of the research systems.

Centre of Telecommunications, electronics and robotics

The Centre of telecommunications, electronics and robotics has been founded in 2013. It includes nine laboratories equipped with the latest software and hardware widely used in the academic and research activities. Each laboratory is a collection of contemporary technical, software and methodological maintenance, which allows conducting classes with students, implementing research activities and providing consulting services at the highest level. The following laboratories have been formed and equipped as part of the Center: Laboratory of Physics and Electrical Machines; Laboratory of Modelling of Electronic Systems; Laboratory of Embedded Systems and Digital Signal Processing;
Laboratory of Industrial Automation; Laboratory of Subsurface Radiolocation; Laboratory of Robotics and Students’ Research Work; Laboratory of Designing And Prototyping; Laboratory of Telecommunications and Electro-Optical Systems Laboratory of Electronics. The center provides following consulting services:

- Non-destructive quality control of road surface;
- Assessing the quality of the laying road surfaces;
- Detection of hidden engineering communications;
- Detection of archaeological and natural artefacts (tree roots, stones etc);
- Electronic devices design and prototyping;
- Electronic component parameters measurement and testing;
- Automotive systems and drone’s communication and control systems analysis and design;
- Digital signal processing devices design and prototyping;
- Sensors parameters measurement and testing;
- Transport telematics systems devices analysis and design;
- Optical communications components parameters measurement and testing;
- Computer networks elements parameters measurement and testing;
- RFID programming and RFID base system design.

Multimedia laboratory

The laboratory is equipped with video-recording and editing equipment complex, which allows creating educational, informative and commercial videos.

Virtual Reality Laboratory

Virtual reality laboratory is the TTI joint project with the Aviation Research Centre Ltd. and Fraunhofer Institute for Factory Operation and Automation IFF, Magdeburg (Germany) (start – 2013). Virtual reality laboratory is dedicated to giving aviation maintenance staff practical skills for control, diagnostics and maintenance of equipment and units, which are placed on the latest generation helicopters and airplanes. Aviation companies have permanent need for technical personnel qualification adaptation and increase. This concerns monitoring, diagnostics and maintenance of the new types of helicopters and airplanes. The problem is aggravated by two factors:

- Practical skills of using the equipment and software have to be acquired before the airplanes and helicopters are supplied;
- Training procedures with real equipment are difficult due to high cost of modern airplanes and helicopters.

These problems can be solved by using virtual reality 3D models.

The main planned activities of the laboratory will be:

- Development of the integrated applications on the virtual models development platform;
- Development of the integrated concept of using virtual models as simulators for the improvement of practical maintenance skills;
- Simulation of the maintenance personnel behaviour in a real aviation environment;
- Development and practical implementation of the scenarios for demonstrating and evaluating practical maintenance skills obtained by aircraft technicians;
- Virtual simulators development for training specialists in order to maintain, operate and repair airplanes and helicopters.

The materials and technical basis of the TTI laboratories is detailed described in section 9.3.3 "Description of the existing infrastructure" of this Strategy.
The previous sections (4.8.1 and 4.8.3) describe possibilities of exploiting the potential of research and development infrastructure (including participation in the UseScience system) and the provision of research services within the framework of the innovation voucher program.

5. Human Resources Development Plan

The main task of the Human Resources Development Plan is to promote the development, growth and motivation of TSI teaching staff, and to involve young Latvian and foreign scientists in research activities.

5.1. Staff renewal and development

Description of the existing situation

In the academic year 2016/2017, the Transport and Telecommunications Institute employed 135 people, including 58 academic staff of which 41 have doctoral degrees and 8 are guest teachers. Distribution of academic staff in 2014–2016 by positions is reflected in the table below.

<table>
<thead>
<tr>
<th>Academic staff</th>
<th>2016</th>
<th>2015</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professors</td>
<td>10</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Associate professors</td>
<td>4</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Assistant professors</td>
<td>27</td>
<td>22</td>
<td>21</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>41</strong></td>
<td><strong>37</strong></td>
<td><strong>36</strong></td>
</tr>
<tr>
<td>Lecturers</td>
<td>16</td>
<td>22</td>
<td>24</td>
</tr>
<tr>
<td>Assistants</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Guest teachers</td>
<td>8</td>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>

Given that 41 academic staff members with doctoral degrees are employed by TSI, they constitute 71% of the total number of academic staff. To obtain a university status, the college needs to increase the share of doctoral degree holders to 75%.

In 2016, the university employed on a contract basis 8 teachers without elected status (the place of election is other than the Transport and Telecommunications Institute), as well as researchers, scientific assistants and specialists working within the framework of research and development projects. In view of the situation where project financing is the most important alternative source of financing, not only the attraction of elected staff, but also the involvement of specific professionals in the implementation of science projects is important for the further development of the university.

It must be noted that the country in general and each university are striving to attract young scientists (5 years following the award of a PhD). TSI is planning to implement, in 2017, post-doctoral support projects within the EU funds specific objective 1.1.1.2 “Post-doctoral research support”; the call for tenders was published in autumn 2016. It is vital that young scientists continue to work at Latvian institutions and do not leave for foreign scientific institutions.

A trend of aging academic staff has been observed in Latvia in recent years, affecting not only TSI, but also the majority of Latvian universities. Among the elected TSI staff aged over 55, 26 represent elected academic staff. The academic staff includes a relatively small number of young teachers, while for the future existence of the study programmes, the composition of teachers must definitely be renewed.

It must be mentioned, however, that in recent years the newly elected teachers have achieved good results: in the academic year 2014/2015, for example, four young teachers were awarded doctoral degrees. This can be considered a good indicator of the age renewal of academic staff. Most of the teachers carry out active scientific and research activities, participate in scientific projects, publish works in scientific journals and report at conferences.
69 general staff representatives from the administration, scientific and technical, and service staff are employed by TSI as their main job. The functions of these employees include the provision of administrative support (HR Department, Finance Department, IT Department, etc.) to all academic and scientific projects of the university.

5.2. Cooperation with the industry and other universities

It must be emphasised that TSI cooperates with national and foreign institutions to ensure that the education to be acquired meets the industry demand, thus promoting a stronger link between education and research as well as the development of the education offered. This increases competitiveness at both the national and international levels. TSI’s cooperation with other higher education institutions here in Latvia and abroad, building long-term relationships and ensuring the exchange of experience and visibility, ought definitely to be mentioned.

In order to ensure joint scientific research, methodological and operational teaching activities aimed at development, and the implementation of joint projects, TSI has signed cooperation agreements with several Latvian universities, individual faculties and scientific institutes. Those include the University of Latvia, Riga Technical University, Vidzeme University, Ventspils University College, etc. Among other things, such agreements also provide for the following twinning forms and actions:

a) knowledge partnerships:
   - cooperation in knowledge and technology transfer;
   - drafting the legal framework for partnerships in clusters, consortiums, innovation clusters, EU research and innovation support programmes;
   - other activities to ensure the achievement of the targets defined by the university’s Development Strategies for 2015–2020;

b) partnership for the attainment of a common goal:
   - cooperation through participation in the creation of clusters, consortiums, innovation clusters;
   - cooperation in the provision of innovation support activities;
   - cooperation in the implementation of research projects, incl. within the framework of the EU’s research and innovation support programme Horizon 2020;
   - cooperation through medium or long-term agreements on contractual research and other activities towards a common goal;

c) resource partnership:
   - ensuring reciprocal access to research infrastructure;
   - potential building of a shared research infrastructure.

5.3. Selection of academic staff

Academic staff of the Transport and Telecommunications institute is recruited in accordance with the RoL Law on Universities and with the TSI Constitution, and is based on the number of students and training workload at the Faculty Departments. The academic staff are stable and qualified, they participate in various conferences, seminars and other activities related to the improvement of qualifications, and continue to raise their education level through doctoral studies and research activities.

Teachers are recruited in open competitions governed by TSI Regulations On the Election of Academic Staff by Competition. When applying for teacher vacancies, applicants must submit a document package reflecting their curriculum vitae, their level of competence and scientific activities. If the academic job applicant has not worked as a teacher at TSI before the elections, the head of the organisational unit organises a hearing of an open lecture or practical training conducted by the applicant.
When selecting applicants for work at TSI, the principles of impartiality and fair assessment are respected, and applicants have equal opportunities to demonstrate their competences.

Guest teachers and external trainers are also invited to conduct individual, contract-based university courses; their competences and references are assessed in the same way as for elected academic staff.

Scientific staff are elected in accordance with the TSI Regulations on the Election to Academic Positions of Scientific Staff involved in Scientific Research (approved by the Senate meeting on 23.04.2013). The greatest attention in the selection of these employees is paid to their scientific activities, publications, and participation in local and international level projects.

There is a practice of inviting highly qualified guest teachers to deliver individual lecture courses and conduct practical training within several programmes. A good cooperation has been long established with certain foreign universities contributing to the internationalisation process in general.

5.4. Staff career planning and improvement of competences and qualifications

In 2014, TSI developed a “Programme for the Organisation of Professional Development Planning for Academic Staff”. The Programme includes targets, content and forms of professional development planning for TSI academic staff. On the basis of conditions included in the document, a strategic development plan for TSI staff is established and then specified by special action plans for each academic year.

The following targets for the professional development of academic staff have been set:

1. Mastering of new knowledge, skills and teaching methods, and the ability to use them in practical work;
2. Development of professional skills and overall personal development.

The regular audit and assessment process of academic staff competences includes:

- Preparation of annual action plans for the professional teaching and methodological development of academic staff and their implementation in accordance with the Programme and TSI management decisions;
- Planning of the financial resources required for upgrading the skills of academic staff;
- Assessment of the professional growth potential of the academic staff of the Faculties and the preparation of proposals and nominating of the most promising teachers;
- Compiling individual plans for teachers and proposals from Department heads on the implementation of the required professional development measures during the academic year;
- Organisation of annual academic staff attestations.

The following forms of the professional development of academic staff are used:

- Defence of promotion papers and publications in internationally quoted journals;
- Training/internships at international training centres or foreign universities;
- Speeches by TSI academic staff at international or inter-university conferences, seminars, participation in national or international projects and experience exchange programmes;
- Promotion of academic staff mobility by organising cooperation with other universities of a similar profile in Latvia and other countries (incl. within the ERASMUS+ programme);
- Participation of teachers in TSI organised conferences (MIP, RelStat, R&T-SiF), and publication of their articles in international journals and those issued by TSI;
- Participation of young teachers in methodological workshops to master new teaching methodologies and pedagogical skills;
- Lectures by the most experienced professors at workshops for the improvement of pedagogical skills of young teachers;
• Mastering of programmes on innovations in the higher education system, university didactics or the management of education work by teachers without higher pedagogical education;
• Internships of academic staff with leading employers of the industry and work in research laboratories outside the Institute;
• Development of foreign language skills necessary for teachers’ work.

Active participation in the above and similar activities acts as an active motivator for TSI teachers for proactive improvement of their professional and language skills.

To strengthen academic staff capacities, TSI is planning to increase the involvement of students in academic work and research in line with the university’s study directions and material and technical support. A more active work of students in practical training sessions will stimulate interest in scientific activities and concentration on more serious research and further academic studies. The most promising teachers who have recently been awarded doctoral degrees are planned to be involved in programmes supporting scientific activities, such as “Post-doctoral research support”. At the end of 2016, TSI submitted 4 applications for post-doctoral programmes. In accordance with the programme applied for, young scientists must engage in a research activity in the strategic research areas of TSI for 3 years. The plans are to also support programme applications from other young scientists over the next years.

The Transport and Telecommunications Institute is planning to make project applications not only with the Erasmus+ programme countries, but also with partner countries. Several projects within Erasmus+ are planned with partner countries, mainly aimed at attracting highly qualified foreign teachers who would teach study courses or a part of them. The Institute is also planning the development of Erasmus+ KA2 Strategic Partnerships and capacity building projects with a potential cooperation partner. In addition to the Programme, TSI will make use of the possibility to apply for support for the attraction of foreign teachers within the EU funds specific objective 8.2.2 “To strengthen the capacities of the academic staff of higher education institutions in the areas of strategic specialisation”.

Information about strengthening the capacities of each Faculty’s academic staff is included in Sections 3.1.2.7 and 3.2.2.8 of the Strategy “Scientific and academic activity development plan for the academic staff of the study direction” and Section 3.3.4.2 “Human resources development plan of the Faculty of MSE up to 2020”. Information about human resources for research and strengthening of the capacities of scientific staff is available in Section 4.6 of the Strategy “Human Resources for Research”.

5.5. Staff motivation system and remuneration policy

To incentivise staff and determine remuneration, TSI has set the following targets: motivation to take initiative and responsibility and a remuneration system of fair and transparent compensation for the amount of work performed and qualifications, as well as financial incentives for the quality of work and academic and professional excellence.

To evaluate the performance of academic staff, annual attestations are organised in accordance with the “Academic Staff Attestation Procedure” where the main criteria for assessment are achievements in science, academic work, scientific and organisational activities, and administrative activities. The evaluation results obtained are used for determining remuneration, which acts as an incentive for employees to achieve continuous improvement.

The evaluation criteria are reviewed and adjusted annually to ensure their compliance with the priority axes for the academic and scientific activities set by the university. As a result of the attestation, junior teachers are included in the TSI staff reserve list, applying a special motivation system to them, different from the common system.

In 2017/2018, TSI is planning to increase the efficiency of the remuneration system by making use of the opportunities offered by the EU specific objective 8.2.3 “To ensure better governance in higher education institutions”.
5.6. International staff mobility plan

A crucial task for reaching the future vision of the Transport and Telecommunications Institute of ensuring international competitiveness is to strengthen and develop TSI’s international dimension. In the context of the Strategy, TSI interprets the international dimension as cooperation with foreign higher education and scientific institutes, participation in international organisations, implementation of joint scientific projects, attraction of foreign students and various other international projects in which the university can participate, thus contributing to academic fields. TSI’s international visibility depends on its own activities and efforts to prove itself at an international level.

Within the framework of the ERASMUS+ project, TSI has signed 26 cooperation agreements with higher education institutions of 14 countries. TSI students and teaching and administrative staff make use of the opportunities offered by ERASMUS+ to go to foreign higher education institutions for learning, exchanging experiences or giving lectures at partner universities. Within the framework of the ERASMUS+ project, such opportunities are also exploited by collaborating with higher education institutions visiting TSI.

By 2020, TSI is planning to double the number of cooperation agreements signed and use them as a basis for building sustainable academic and scientific collaboration with foreign universities and organisations in each area of its specialisation. A special attention will be paid to countries where TSI does not have a sufficient number of cooperation partners (Northern Europe).

Mobility of teaching staff and personnel is a means of popularising TSI abroad, which is one of the ways to attract various cooperation partners and upgrade the qualifications of the teaching staff, personnel and students.

Within the framework of international mobility, TSI sets as priorities for the coming years participation in international education institutions, development of joint study programmes with foreign universities, and involvement of TSI academic staff in the international movement of teaching staff.
5.7. Action Plan

<table>
<thead>
<tr>
<th>Activity</th>
<th>Challenge</th>
<th>Target indicators, results</th>
<th>Time-line</th>
<th>Origin of resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Promotion of staff replacement and development</td>
<td>1. Develop and implement a plan to ensure academic staff succession at Faculties</td>
<td>1. Knowledge continuity in study directions ensured 2. Increased number of academic staff with PhDs</td>
<td>2017 and thereafter on an ongoing basis</td>
<td>Internal TSI resources</td>
</tr>
<tr>
<td>Staff career planning, activities for improving competences and qualifications</td>
<td>Complement and develop teaching staff competences (language and technical skills)</td>
<td>Higher competitiveness and level of competences of teaching staff</td>
<td>2017 and thereafter on an ongoing basis</td>
<td>Internal TSI resources, external cooperation partners</td>
</tr>
<tr>
<td>Improvement of the staff motivation system and remuneration policy</td>
<td>Improve the academic staff motivation and remuneration system by linking it to the results of academic and research work and to social activities</td>
<td>A tool to support staff incentives comprising result-oriented activities by academic staff</td>
<td>2018 and thereafter on an ongoing basis</td>
<td>EU funds</td>
</tr>
<tr>
<td>Implementation of mobility activities</td>
<td>Develop the existing inputs, seek new possibilities and types of cooperation for increasing TSI’s competitiveness and ensuring its international competitiveness</td>
<td>Increased number of students and teachers acquiring new knowledge and valuable experience through internships abroad, ensuring future contribution</td>
<td>2016 and thereafter on an ongoing basis</td>
<td>ERASMUS+</td>
</tr>
</tbody>
</table>

Additional information about TSI’s international cooperation is included in the Strategy section “Internationalisation Plan”.

6. Management Development Plan

6.1. Purpose and key challenges of the management system

The aims of the Transport and Telecommunications Institute (TSI) in the field of management focus on ensuring satisfaction of its clients — students, employers, cooperation partners, NGOs — at the world level of market requirements by making effective use of the university’s resources for ensuring high quality studies and research focusing on the continuous improvement of operations, aiming to meet the needs of all stakeholders, and systematic and successful management of the Institute at all management levels to increase its efficiency. Key challenges:

1. Fragmentation of certain functions increasing the total amount of resources and reducing effectiveness of expenditure;
2. Inaccurate distribution of functions leading to their duplication;
3. Limited possibilities of the existing staff to upgrade their qualifications, knowledge, or exchange experience with other EU universities;
4. Insufficient awareness of the university’s goals and plans at all staff levels;
5. Targeted and gradual implementation of the quality management system by involving employees of all management levels and organisational units is underestimated, leading to loss of continuity and transparency of functions, and understanding of the overall management processes.
6.2. Management structure and processes, decision-making and strategic management

6.2.1. Representative bodies, decision-making bodies and management

The overall administrative structure of the Transport and Telecommunications Institute is shown in the Figure below:

Figure 6.1: Overall administrative structure of TSI

* In this organisational chart, subordination of Faculties to the Vice-Rector for Academic Affairs is shown for ease of graphical reference only. In their activities, Faculties are linked to all management levels and all organisational units of the university.

In accordance with the above structure, TSI has the following representation, decision-making and management bodies:

- Constitutional Assembly
- Senate
- Management Board
- Rector
6.2.2. Institutional governance

The highest management and decision-making body of TSI on strategic and financial matters is the Management Board of the joint stock company appointed by founders.

The highest representation and management body and decision-making body on academic and scientific matters is the Constitutional Assembly (29.07.2008 version of the Constitution in accordance with the Cabinet of Ministers Order No. 444 of 29.07.2008). The Constitutional Assembly adopts and amends the TSI Constitution, elects and dismisses the Rector, Audit Committee, Academic Arbitration Court and the Senate (in accordance with the Constitutional Regulations).

The TSI Senate is a collegial management and decision-making body which approves the procedures and regulations governing all areas of TSI's activities. The Senate approves Vice-Rectors and internal regulatory documents in compliance with the TSI Constitution (approved on 29.07.2008). The Senate is composed of the Senate’s standing committees: Constitutional Committee, Competition Committee, Training Methodological Committee and student Committee (in accordance with the amendments to the Constitution of 15.10.2013).

Distribution of the Senate: 75% elected academic staff, with the share of students no less than 20%, and representatives from scientific and administrative units.

The Rector carries out general administrative activities in the academic and scientific areas of TSI. In the area of finance, the Rector represents the Institute, coordinating his/her activities with the TSI Board. The Rector is responsible for the quality of education and science and promotes staff development and academic freedom.

The TSI Senate elects the Audit Committee from among all the permanent staff and student self-government, with the exception of administrative staff. The Audit Committee is entitled to inspect TSI's financial and operational documents and assess their compliance with the legislation of the RoL, and report the inspection results to the Board.

In accordance with the TSI Constitution, the Academic Arbitration Court is composed of members of student self-government and academic staff. The Academic Arbitration Court reviews the administrative acts issued by the Institute, submissions by academic staff or their actual conduct.
concerning restrictions to the academic freedom and rights defined by the Constitution, and makes decisions which are binding on TSI staff.

6.2.3. Structural governance

The TSI organisational units are Faculties, Departments, Chairs, scientific and training laboratories, carrying out their activities in accordance with the regulations approved by the Senate.

A Faculty is composed of organisational units of a scientific or professional study direction, or units of several directions, and is headed by a Dean. The Dean is elected by the Faculty Council. The Faculty Council is a collegial management body of the Faculty consisting of the Head of the Faculty, Heads of Chairs, external experts and student self-government representatives. The Council is elected by the general meeting of the Faculty. The Dean recommends and prepares external experts for election to the Faculty Council. The Council is headed by its Chairperson and deals with the election of the Dean, methodological support to study programmes offered, external cooperation (within the scope of the Faculty’s operations), and development planning of study programmes (in accordance with the amendments to the Faculty Regulations approved on 21.06.2016).

The Dean is responsible for and manages the planning and coordination of study work, distribution of study workload, consolidation of the budget of faculties and chairs, as well as the analysing of study plans and loads, and budget execution. The Dean organises the management of study programmes and coordinates work in the event of accreditation and self-accreditation of study programmes (in accordance with the Faculty Regulations of 23.04.2013).

Organisational units participate in TSI decision-making and budgeting in accordance with the financial management plan, and organisational unit managers control and analyse its short and long-term (up to 5 years) performance.

Budgeting based on the needs of responsibility centres and budget allocation are carried out in accordance with the approved plan. The financing plan provides for a separate development fund to support scientific activities. Annual work planning and budget drafting across organisational units takes place based on the performance results of the current year.

An organisational unit’s budget is drafted by its manager, evaluating the efficiency of the use of resources from both the technical and human resources perspectives; moreover, it is done in cooperation with employees of the relevant organisational unit, involving and consulting other organisational units. The organisational unit manager coordinates these plans with his/her immediate supervisor in accordance with the reporting lines (subordination scheme) specified in the organisational chart.

Annual activity plans in which the organisational unit manager collects information about ongoing work processes (more attributable to the core functions) and strategically justified projects contributing to the development of the organisational unit and increasing its efficiency, are drafted in a similar way. Whereas faculty activity planning and budgeting, as well as control activities are carried out by Deans in accordance with the above-mentioned Faculty Regulations, (as amended on 21.06.2016).

6.2.3.1. Student self-government

TSI students have their own Student Self-government (SSG) — an elected independent body representing the rights and interests of students. It operates in accordance with its Regulations prepared by the SSG Board and approved by the TSI Senate.

Main objectives of the SSG:

- To represent the interests of TSI students at the university and other public institutions;
- To represent the interests of students in matters concerning the study process and organisation of social life;
- To represent the university’s students in Latvia and abroad;
- To determine the procedure for the election of students to higher collegial bodies of the university.
Main tasks of the SSG:
- To cooperate with the administration in addressing training, research and social issues;
- To preserve, defend and develop TSI traditions;
- To organise and support students’ leisure, training and sports activities;
- To strengthen cooperation with other universities in Latvia and abroad;
- To identify and develop the creative and managerial potential of students by involving them in the activities of SSG;
- To ensure a dialogue between students and the university’s management in the resolution of educational, social and cultural issues of common interest;
- To participate in internal and external projects of the university;
- To pursue any other activities which are not prohibited by laws of the RoL and TSI Constitution;
- To participate in the involvemnt of foreign students in TSI’s social life

Organisation of the SSG: The TSI Student Self-government consists of the Board and members. The TSI SSG Board is the managing authority of the TSI SSG, which coordinates and is responsible for the activities of the SSG.

The SSG’s lines of action:
- Dissemination of extra-curriculum information about events organised by the TSI SSG;
- Organisation of and support of scientific research activities and cultural events;
- Organisation of sports activities and events for TSI students;
- Adaptation activities and consultations for foreign students;
- Building and maintaining external contacts with SSGs of other universities and sponsors.

6.2.4. Performance improvement

TSI strives to develop and implement a Quality Management System encompassing the entire staff of the university and its activities, and to keep it functional. A systematic management and governance of the university and attainment of its strategic goals is possible by introducing, and keeping in working order, a Quality Management System driving TSI towards continuous improvement of its performance and efficiency.

Justification of the TSI Quality Management System (QMS):
- Focus on consumers of education services;
- The role of top management in ensuring the consistency of the QMS development goals and interaction between the internal environment and the effects of the changing external environment;
- Staff involvement in management processes;
- Accessibility and continuous improvement of the QMS;
- Fact-based decision-making;
- Mutually beneficial relationships with clients.

While the performance indicators of permanent academic staff are annually evaluated and measured in accordance with the TSI Academic Staff Attestation Procedure and the attestation results are directly reflected in the learning quality indicators and have repercussions on the workload and remuneration of academic staff (Remuneration Arrangements for Academic Staff of the Transport and Telecommunications Institute, approved by Order No. 01-12.1/61 of 10.11.2015), the performance of management staff is recorded, planned and controlled based on the annual activity plan, but not analysed or otherwise measured, since those indicators are not directly related to remuneration or motivation tools or mechanisms.

In 2017–2018, the university is planning to improve its governance by using the opportunities offered by the EU funds under the special objective 8.2.3 “To ensure better governance in higher education institutions”. It is essential for TSI to increase the efficiency of the internal quality assurance system, incl. the staff remuneration system, through more efficient management of the performance
results. Within the framework of this EU funds programme, TSI will examine the possibilities to develop e-solutions for a better governance system.

When implementing the Strategy, it would be necessary to support the work of study direction councils, including through updating the content of study programmes.

6.3. Improvement of the university’s internal regulations

The Transport and Telecommunications Institute relies on its management processes for the following internal regulations:

1. TSI Constitution *(24.02.2009).*
2. Regulations on the Constitutional Assembly *(24.02.2009).*
3. Regulations on the Senate *(24.02.2009).*
4. Regulations on the Standing Committees of the Senate *(18.12.2009).*
5. Regulations on the Academic Arbitration Court *(24.04.2003).*
6. Regulations on the Audit Committee *(24.02.2003).*
7. Regulations on Student Self-Government *(27.06.2011).*
8. Regulations on Studies *(22.02.2011).*
9. Regulations on the Faculty *(21.07.2016).*
10. Regulations on the Department *(29.04.2014).*

TSI has issued a number of other regulations, procedures and instructions governing the work of organisational units and/or establishing the framework for internal rules, ethics and study processes. These regulations have been prepared in accordance with the laws and regulations of the RoL binding on TSI. The internal regulatory documents of TSI are kept in the electronic regulatory database and can be accessed by all staff.

6.4. Action plan for the improvement of the Institute’s internal rules

<table>
<thead>
<tr>
<th>Activity</th>
<th>Challenge</th>
<th>Target indicator/result</th>
<th>Time-line</th>
<th>Management results</th>
<th>Origin of resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clarify the division of responsibilities between various organisational units</td>
<td>Internal rules and regulations are not actively used in practice; lack of understanding about their applicability and succession and their updated versions</td>
<td>Analysis and updating of all organisational unit regulations</td>
<td>Q4, 2017</td>
<td>More efficient succession and efficiency of processes ensured</td>
<td>Human resources: SCS; OUms; CTD; AD. Financial resources: 100% internal (TSI profit) and external (borrowed funds) financial resources.</td>
</tr>
<tr>
<td>Introduce an integrated QMS e-system compatible with other accounting and information databases and systems of the university</td>
<td>No clear justification for the feasibility of introducing the QMS</td>
<td>Reports from regular meetings are easy to summarise and transparent in all areas and from various perspectives, and are reflected in the minutes of the meetings</td>
<td>Q3, 2019</td>
<td>The introduction of an integrated system will produce quickly and efficiently measurable results without involving additional staff</td>
<td>Human resources: CTD; AD; VA; ReL. Financial resources: 100% internal (TSI profit) and external (borrowed funds) financial resources. Also EU funds if granted.</td>
</tr>
<tr>
<td>Develop and introduce a motivation system for management staff</td>
<td>Lack of initiatives and participation, unclear interaction between the personal development of employees and the university</td>
<td>Annual assessment of employees’ knowledge and skills; improved business trip reports submitted by employees within the ERASMUS+ project, describing clearly and in detail the benefits from the exchange programme for each employee</td>
<td>Q4, 2017</td>
<td>By specifying concrete process owners and reviewing the schematically shown achieved results, it is possible to effectively motivate employees</td>
<td>Human resources: HR; FD. Financial resources: 100% internal (TSI profit) and external (borrowed funds) financial resources. Also EU funds if granted, and European Commission’s ERASMUS+ programme.</td>
</tr>
</tbody>
</table>
Improve the university’s internal rules and policies by revising the quality management system of TSI education services in compliance with the requirements of the new LVS EN ISO 9001:2015 standard. Due to the complicated transparency of the current system, justification for its applicability has collapsed. Updating of the existing system: review and e-integration with other systems. 2017–2018. A simple and transparent quality system more visibly demonstrating the progress of processes and the required checkpoints. Human resources: QML; SCS. Financial resources: 100% internal (TSI profit) and external (borrowed funds) financial resources. Also EU funds if granted.

Development and implementation, and preparation for certification of the TSI energy management system in compliance with the requirements of the LVS EN ISO 50001:2012 standard. Lack of a common energy management system. The main purpose of the energy management system is to optimise energy consumption and introduce a systematic approach to energy planning. This includes world’s best practices, by including both a logical and well-thought-out method and instructions to ensure the effective functioning of the company in the long term, and guidance for its integration with other systems of the organisation, giving tangible financial savings. 2017–2018. The results improve the effectiveness of the infrastructure and enable analysis of the renewal potential of the resources used. Human resources: QML and external consultants. Financial resources: 100% internal (TSI profit) and external (borrowed funds) financial resources. Also EU funds if granted.

Development and implementation, and preparation for certification of a TSI environmental management system in compliance with the requirements of the LVS EN ISO 14001:2015 standard. Such a system is a novelty in the country and is also being actively introduced in other companies focusing on an ecological and clean environment with environmentally friendly use of resources. Environmental audit, environmental indicators and declarations, and their interoperability with other governance systems. 2018–2019. Use of environmentally friendly resources ensured. Human resources: QML and external consultants. Financial resources: 100% internal (TSI profit) and external (borrowed funds) financial resources. Also EU funds if granted.

Key:
SCS — Standing Committees of the Senate; OUMs — organisational unit managers; HR — Human Resources Department; FD — Finance Department; CTD — Computer Technology Department; AD — Administration; SRD — Scientific Research Department; SE — Senate and its standing committees; QML — Quality Management Laboratory.

6.5. Financial Management Plan

Financial management at TSI is implemented by the Finance Department directly reporting to the TSI Management Board, thus ensuring independence of financial management.

Core functions of the Finance Department:
- formulation, organisation and coordination of the financial policy;
- planning and management of the financial resources;
- preparation of the budget (and amending budget) and control over its execution;
- ensuring methodological guidance for a uniform system in the areas of remuneration, financial management and accounting.

As a university with private capital, TSI also supports its operations from its own revenues. Own revenues constitute up to 90–95% of the total financing, with the other 5–10% coming from the implementation of various Latvian and EU funding projects.

Permanent sources of own revenue:

- revenue from tuition fees (80%);
- revenue from training courses (13%);
- revenue from contractual research (3%);
- revenue from other scientific activities (1%);
- revenue from the lease of premises, utility and other services (3%).

TSI funding for the operating costs is reallocated to the following cost items:

- salaries and other staff costs — up to 56% of the total costs;
- costs of utility services and infrastructure maintenance — up to 14% of the total costs;
- costs of marketing and advertising — up to 10% of the total costs;
- costs of ensuring the training process — up to 7% of the total costs;
- costs of scientific activities — up to 4% of the total costs;
- other costs constitute up to 9% of the total costs.

In addition to financing from its own revenues, TSI raises financing from various projects, incl. implementation of Latvian and EU project financing for both improving the learning process and ensuring scientific activities. During the period between 2011 and 2015, project financing totalling EUR 2.94 million was obtained, of which EUR 2.51 million were envisaged for infrastructure projects. Infrastructure projects offer TSI greater opportunities to improve its operations and increase efficiency by means of EU funding.

<table>
<thead>
<tr>
<th>Source of funding</th>
<th>Total from 2011–2015 (EUR mil.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latvian Council of Science grants</td>
<td>0.07</td>
</tr>
<tr>
<td>National research programmes</td>
<td>0.02</td>
</tr>
<tr>
<td>ESF, ERDF funding</td>
<td>2.41</td>
</tr>
<tr>
<td>Framework programme projects</td>
<td>0.30</td>
</tr>
<tr>
<td>Funding from other international projects</td>
<td>0.14</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>2.94</strong></td>
</tr>
</tbody>
</table>

Due to the fact that the largest share of the total funding is constituted by revenue from tuition fees while the majority of total costs are staff costs, a decrease in the number of students and downgrading of staff professionalism and loyalty may have destabilising effects on the TSI’s financial situation. Therefore, as a university with private capital, TSI steadily and ambitiously takes various result-oriented actions and measures, primarily towards increasing the number of students and effectiveness of staff costs and other costs.

The operational costs of the TSI Latgalian Branch are fully covered by its own revenues, constituted of revenues from tuition fees and lease of premises, leading to positive performance results despite the difficult overall demographical situation in the region.

For control and analysis of the financial situation, incl. mitigation of financial risks, TSI has developed a financial policy and financial management plan with concrete targets, lines of action and tasks. Changes are underway in TSI’s accounting policy concerning the separation of economic and non-economic
activities, reservation of intellectual property rights, and separation of access mechanisms, industrial research and experimental development, and setting of cost prices and market prices.

TSI’s Financial Management Plan contributes to:
- the enforcement of TSI’s strategy and mission;
- the overall growth and development of TSI;
- the development of TSI’s priority areas and increasing their efficiency;
- the development, updating and improvement of TSI’s resources and infrastructure;
- TSI cost optimisation by increasing their effectiveness.

In accordance with the approved strategic plans, for the development of TSI’s economic system and financial policy, it is necessary to promote economic growth by improving and reinforcing the management of education and modernising of higher education, thus opening up financial possibilities on the account of cost-effectiveness.

TSI has set a strategic plan in the area of financial management, which is an essential precondition for its sustainable functioning and development: **Ensuring Financial Stability and Increasing Cost-Effectiveness.**

---

### Table 6.3: Action plan in the area of financial management

<table>
<thead>
<tr>
<th>Aim of the activity</th>
<th>Ensuring financial stability and increasing cost-effectiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main tasks of the activity</strong></td>
<td></td>
</tr>
<tr>
<td>Improvement of the budgeting process</td>
<td>From 01.09.2017</td>
</tr>
<tr>
<td>Improvement of the control mechanisms and of the monitoring process</td>
<td>From 01.12.2017</td>
</tr>
<tr>
<td>Financial and operational risk monitoring</td>
<td>From 01.01.2018</td>
</tr>
<tr>
<td>Improvement of financial stability indicators</td>
<td>From 01.09.2016</td>
</tr>
<tr>
<td>Improvement of the cost price system</td>
<td>From 01.09.2016</td>
</tr>
<tr>
<td>Reinforced analysis of and control over receivables and factoring operations</td>
<td>From 01.09.2016</td>
</tr>
<tr>
<td>Improvement of all the management programme integration processes</td>
<td>From 01.10.2016</td>
</tr>
</tbody>
</table>

**Description of the existing situation**

TSI plans its operations and controls and analyses its performance of the plan. TSI conducts both short-term (for an academic year) and long-term (up to 5 years) budgeting by allocating separate budgets for financial responsibility centres. A bottom-up approach to budgeting is used; the budget is organised based on the needs of the financial responsibility centres, and funding is distributed in accordance with the approved Action Plan. Since the TSI management does not define work performance indicators, the financing provides for a separate development fund earmarked for supporting scientific activities, which is not used for other areas or lines of action.

**Additional tasks**

**Change in the budgeting process and approach**

Two approaches to the budgeting process are used: top-down and bottom-up, primarily using the top-down approach to identify priority areas and lines of action, as well as to allocate funding in accordance with TSI’s strategic vision of development and to set performance indicators for each line of action.

The general TSI budget is allocated along 3 budget lines, determining sources of funding for each budget line:

- Core budget;
- Support budget;
- Development budget.

The core budget ensures the functionality of financial responsibility centres at a basic level.

The support budget is allocated to areas and types of activity which have achieved and exceeded the set result (performance) indicators within the fiscal year.

The development budget is only allocated to the TSI’s strategic activities and/or areas.

**Budget programming, definition and approval of objectives**

Defining high, medium and basic priority action lines and their distribution into separate centres of financial responsibility or budget programmes (hereinafter budget programmes)
Development and approval of funding plans for budget programmes

Monitoring of budget programme implementation

Monitoring of the use of budget programme funding

Analysis of the achievement results of the budget programme objectives

Remedial action plan and monitoring of its implementation

**Improvement of the control mechanisms and of the monitoring process**

**Description of the existing situation**

Financial control as a core function covering academic, scientific and administrative areas, focuses on the aim of increasing the efficiency of the use of the resources, minimising the impact of financial risks on the overall operations of TSI, and elimination of deficiencies in the processes in order to avoid inefficient use of the budgetary resources allocated. Financial controls can give an objective assessment of the operations of each responsibility centre and the economic efficiency of economic operations to prevent potential losses and irregularities. Since TSI has and will continue to introduce various structural and process changes, the monitoring process and control mechanisms developed are not able to perform their functions in full, which reduces the effect of financial controls on TSI operations.

**Additional tasks**

Analysis of the existing control mechanisms and detection of deficiencies

Updating, development and introduction of control mechanisms

Improvement of internal monitoring processes

**Monitoring of strategic, financial and operational risks**

**Description of the existing situation**

The risk management system is used with the main objective of increasing the business value. One of the tools available and at the same time effective for qualitative risk assessment is risk mapping. A risk map includes not only a list of potential problems to be monitored and controlled, but is also an implementation tool of the Strategy. TSI makes an inventory and analysis of risks, but does not create risk maps.

**Additional tasks**

Creating a strategic, financial and operational risk map

Analysing the strategic, financial and operational risk map

Drawing up a strategic, financial and operational risk impact mitigation plan and development of risk management methods

Performance control and analysis of the strategic, financial and operational risk impact mitigation plan

Improvement of financial stability indicators

**Description of the existing situation**

In 2014, with the change of TSI management, substantial changes were undertaken and introduced in both the study process and financial management, including the introduction of a new revenue accounting and debt administration system, resulting in improved financial stability and liquidity ratios.
Despite the demographic situation in the Republic of Latvia, due to changes in the demand for services, net turnover is increasing. Due to various structural and functional changes, TSI profits are growing.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net turnover, mil. EUR</td>
<td>4.19</td>
<td>5.03</td>
<td>6.01</td>
<td>7.20</td>
<td>8.61</td>
</tr>
<tr>
<td>EBIT, mil. EUR</td>
<td>0.33</td>
<td>0.58</td>
<td>0.77</td>
<td>1.03</td>
<td>1.28</td>
</tr>
<tr>
<td>EBITDA, mil. EUR</td>
<td>0.46</td>
<td>0.71</td>
<td>0.97</td>
<td>1.28</td>
<td>1.61</td>
</tr>
<tr>
<td>Average gross remuneration (excl. compulsory social security contributions) per employee per year, thous. EUR</td>
<td>10.25</td>
<td>11.77</td>
<td>13.55</td>
<td>14.86</td>
<td>17.79</td>
</tr>
<tr>
<td>Balance sheet total, mil. EUR</td>
<td>6.93</td>
<td>7.82</td>
<td>8.08</td>
<td>7.67</td>
<td>7.91</td>
</tr>
<tr>
<td>Gross profitability</td>
<td>5.35%</td>
<td>9.59%</td>
<td>11.39%</td>
<td>13.28%</td>
<td>14.23%</td>
</tr>
<tr>
<td>Return on equity (ROE), %</td>
<td>11%</td>
<td>21%</td>
<td>27%</td>
<td>34%</td>
<td>40%</td>
</tr>
<tr>
<td>Return on assets (ROA), %</td>
<td>4%</td>
<td>7%</td>
<td>10%</td>
<td>13%</td>
<td>16%</td>
</tr>
<tr>
<td>Overall liquidity ratio</td>
<td>0.51</td>
<td>0.65</td>
<td>0.82</td>
<td>1.00</td>
<td>1.12</td>
</tr>
</tbody>
</table>

### Development of STEM programmes

<table>
<thead>
<tr>
<th>Programme*</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor programme “Aviation Transport”</td>
<td>0.21</td>
<td>0.33</td>
<td>0.44</td>
<td>0.66</td>
<td>0.85</td>
</tr>
<tr>
<td>1st level professional study programme “Technical Maintenance of Aircraft Transport”</td>
<td>0.01</td>
<td>0.01</td>
<td>0.02</td>
<td>0.04</td>
<td>0.06</td>
</tr>
<tr>
<td>Bachelor programme “Bachelor of Natural Sciences in Computer Science”</td>
<td>1.02</td>
<td>1.27</td>
<td>1.56</td>
<td>2.11</td>
<td>2.74</td>
</tr>
<tr>
<td>Bachelor programme “Bachelor of Engineering Sciences in Electronics”</td>
<td>0.08</td>
<td>0.10</td>
<td>0.12</td>
<td>0.17</td>
<td>0.23</td>
</tr>
<tr>
<td>Professional study programme “Electronics”</td>
<td>0.05</td>
<td>0.06</td>
<td>0.07</td>
<td>0.10</td>
<td>0.13</td>
</tr>
<tr>
<td>Bachelor programme “Transport Commercial Operation”</td>
<td>0.01</td>
<td>0.01</td>
<td>0.02</td>
<td>0.03</td>
<td>0.04</td>
</tr>
<tr>
<td>Bachelor programme “Telecommunications systems and computer networks”</td>
<td>0.11</td>
<td>0.13</td>
<td>0.16</td>
<td>0.20</td>
<td>0.27</td>
</tr>
<tr>
<td>Master programme “Master of Natural Sciences in Computer Science”</td>
<td>0.06</td>
<td>0.07</td>
<td>0.09</td>
<td>0.11</td>
<td>0.15</td>
</tr>
<tr>
<td>Master programme “Master of Engineering Sciences in Electronics”</td>
<td>0.01</td>
<td>0.01</td>
<td>0.02</td>
<td>0.03</td>
<td>0.04</td>
</tr>
<tr>
<td>Master programme “Information System Management”</td>
<td>0.10</td>
<td>0.12</td>
<td>0.14</td>
<td>0.18</td>
<td>0.24</td>
</tr>
<tr>
<td>Doctoral programme “Telematics and logistics”</td>
<td>0.02</td>
<td>0.03</td>
<td>0.03</td>
<td>0.04</td>
<td>0.05</td>
</tr>
</tbody>
</table>

*The calculations do not include the newly planned STEM professional bachelor programme “Robotics”, as it is still in the development process and documents for its licensing have not been submitted.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross profitability of programmes</td>
<td>65%</td>
<td>68%</td>
<td>70%</td>
<td>72%</td>
<td>80%</td>
</tr>
</tbody>
</table>

**Implementation of projects funded by the Republic of Latvia and the EU**

Based on the assessment by international experts, to become a significant EU level scientific institution TSI should focus more on international cooperation. One of the approaches could be increasing TSI’s participation in international projects. The proposed holistic approach takes account of the TSI’s current problems which are basically related to the insufficient number of qualified staff. This is why three-pronged approaches have been proposed. The first two tiers focus on increasing the number of researchers and improving their quality by involving them in EU level projects which are largely directed at cooperation, knowledge sharing, staff exchanges, staff training, etc. The last one is represented by Horizon 2020 projects and focuses on modern innovative research.
To characterise the total planned participation in projects, the data have been arranged in a diagram describing participation dynamics in projects within the framework of the COST, ERASMUS+ and Horizon 2020 programmes.

### Number of projects implemented

<table>
<thead>
<tr>
<th>Year</th>
<th>Horizon 2020</th>
<th>Cost, Erasmus+ u.c.</th>
<th>Citi projekti (ERAF, ESF, VVP u.c.)</th>
<th>Ligumpētjumi</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2019</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>2020</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2021</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Funding received, EUR mil.

<table>
<thead>
<tr>
<th>Year</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>0.86</td>
<td>0.90</td>
<td>1.14</td>
<td>1.19</td>
<td>1.84</td>
</tr>
</tbody>
</table>

### Increased efficiency of own funds

- Analysis of building own funds and detection of deficiencies. Determining the required total of own funds. Ensuring attraction of the maximum own funds from internal sources of finance. Ensuring attraction of the required funds from external sources of finance. Optimisation of the proportion of internal and external sources of finance.

### Improvement of the cost price system
Cost price is one of the management tools of an organisation which can be used for the analysis of its operations and decision-making. Activity-based costing (ABC) is used to calculate cost prices, which assigns the cost to each activity (service or process) and enables to precisely determine the cost price of the activity. However, due to the changes made and envisaged in both internal processes and the structure, the cost price system needs improvements.

<table>
<thead>
<tr>
<th>Description of the existing situation</th>
<th>Additional tasks</th>
<th>Explanations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Updating the internal processes, description and gathering of information required to calculate the cost price</td>
<td><strong>Additional tasks</strong></td>
<td></td>
</tr>
<tr>
<td>Gathering of information required to calculate the cost price</td>
<td><strong>Explanations</strong></td>
<td></td>
</tr>
<tr>
<td>Updating and approval of the price cost calculation system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reinforced analysis of and control over receivables and factoring operations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Description of the existing situation</td>
<td>In 2014, with the change of TSI management, substantial changes were undertaken and introduced in both the study process and financial management, including the introduction of a new revenue accounting and debt administration system. All receivables are inventoried in the debt administration system, and doubtful and bad debts are recognised automatically. Bad receivables are forwarded to a debt collection company. An analysis and development of a plan for reducing the amount of doubtful debts is required in addition to the existing debt administration system.</td>
<td></td>
</tr>
<tr>
<td>Additional tasks</td>
<td><strong>Analysis of amounts receivable and of their causes and maturities. Updating the evaluation process of amounts receivable in accordance with the current situation and risk map projections. Improvement of the provisioning process</strong></td>
<td></td>
</tr>
<tr>
<td>Analysis of the control process</td>
<td>Analysis of the control process of amounts receivable, detection of deficiencies and preparation of their elimination plan and performance control of the above</td>
<td></td>
</tr>
<tr>
<td>Factoring operations</td>
<td>Analysis of options for factoring operations and actions based on the results</td>
<td></td>
</tr>
<tr>
<td>Improvement of all the management programme integration processes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Description of the existing situation</td>
<td>TSI accounts are kept electronically, with the help of a licenced “1C” financial management software. In addition, TSI project management and cost pricing is performed by separate applications. Regardless of several improvements to the accounting software, its integration with project management software is still necessary. Several improvements are needed in the cost price calculation software in line with the changes already introduced in the internal processes and the planned improvements in the cost price calculation process.</td>
<td></td>
</tr>
<tr>
<td>Additional tasks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improvements to the accounting software</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linking the project management software to the accounting software</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improvements to the cost price calculation software</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 7. Cooperation Development Plan

#### 7.1. Lifelong Learning Centre of the Transport and Telecommunications Institute

#### 7.1.1 Description of the existing situation

The Lifelong Learning Centre of the Transport and Telecommunications Institute (TSI LLC) was established on 15 January 2015, and its operations are governed by the Regulations on the Lifelong Learning Centre of the Transport and Telecommunications Institute. TSI LLC is an organisational unit ensuring the implementation of adult learning programmes for updating qualifications and retraining, counselling, and non-formal and informal education. Its task is to cooperate with the best industry specialists and develop course programmes involving the most outstanding specialists of the industry. TSI LLC is actually focused on people’s career progression and ability to work in the fast-changing world by promoting lifelong acquiring of knowledge, including formal and non-formal education. The action lines
and measures envisaged by the plan for attainment of the set targets are consistent with the main tasks set by the guidelines and contribute to the achievement of their results.

The Centre organises non-formal, informal, optional and professional development training courses and workshops for the population of the city, province and the country for their personal and professional development based on the needs of companies and private individuals. Currently the Lifelong Learning Centre offers 44 unique courses on the most demanded subjects:

- IT (Information Technologies);
- Foreign languages;
- Robotics;
- Logistics;
- Management and personal development.

In 2016, the TSI Lifelong learning Centre developed and now offers several professional development and qualifications update courses in the IT area:

- Basic Java programming (Java 1 – Introduction to Java), in Java programming language;
- Basic C++ programming (several levels);
- Professional WEB design courses (several levels);
- Cisco Certified Network Associate (CCNA) Routing and Switching, module 1: Introduction to Networks;
- Cisco Certified Network Associate (CCNA) Routing and Switching, module 2: Routing & Switching Essentials;
- Cisco Certified Network Associate (CCNA) Routing and Switching, module 3: Scaling Networks;
- Cisco Certified Network Associate (CCNA) Routing and Switching, module 4: Connecting Networks.

In 2016, TSI LLC, in collaboration with ATLANT-TEC, delivered industrial KUKA robot programming courses which are unique in Latvia and during which practical training on the installation and operation of industrial KUKA robots is envisaged not only for updating qualifications of individuals, but also for company staff training.

Continuing with the implementation of training and professional development or qualification update courses in the field of logistics, in 2016 the TSI Lifelong Learning Centre developed and now offers several professional logistics courses in line with industry developments: Methods for improvement of the stock-building process and technologies, Efficient management of stocks and control systems, Efficient management of warehouses, etc.

In 2016, the TSI LLC also prepared an offer of courses and workshops in the areas of management and personal development:

- Project Management and MS Project courses;
- Advanced Microsoft Word and Excel workshops;
- “Behavioural typology in colours” training programme;
- “Effective presentation and public speaking skills” workshop.

Taking into account the past involvement of the Transport and Telecommunications Institute in Chinese language training and building of in-depth understanding of the Chinese culture, it is important to continue cooperation with the University of Latvia Confucius Institute. In the academic year 2015/2016, 9 TSI LLC course attendees, or one fourth of the total of 32 throughout Latvia, mastered Chinese with good or excellent results. The plans are to increase this number to 60 by 2020.

On 28 June 2016, a cooperation agreement was signed between the Transport and Telecommunications Institute and the Arabic Culture Centre. The agreement aims to extend cooperation
between representatives of various nationalities, familiarise with the Arabic culture and traditions, and develop cultural and business relationships. One of the first steps of the cooperation will be the organising of Arabic language courses at the Transport and Telecommunications Institute by TSI LLC. The planned number of people having mastered Arabic is 65 by 2020.

Continuing the cooperation policy with NBS (Latvian National Armed Forces) started in 2015, TSI LLC will ensure the training of NBS IT specialists in accordance with the generally accepted computer network administration standards also in 2016. End result: NBS staff trained in a standardised manner. Provision of training is planned until 2020 or until funding (EUR 81,000) is obtained.

An agreement was signed with the NDA (National Defence Academy) in 2016 on the implementation of a 3-year Air Force Military Command programme (5 semesters) for the training of future air force officers.

7.1.2. Tasks and the Action Plan in the area of lifelong learning

- Implementation of non-formal, informal, optional and professional development training and workshops for the population of the city, province and the country for their personal and professional development, based on the needs of and demand by companies and private individuals.
- Development of a training and attendee registration system, recording of credits and alignment of courses with lifelong learning higher education programmes.
- Development of an implementation and administration system for courses in the form of distance learning.
- Recognition of previously obtained education and experience, skills and competences in compliance with local and European Union legislation.
- Extending the international language training offer.
- Implementation and improvement of the existing projects, and extension of national and international cooperation.
- Diversification of the offer of courses and workshops by attracting international level guest lecturers.
- Implementation of a training quality assessment system aimed at providing courses for top and medium-level managers and specialists.
- Cooperation with companies in the career development of students and graduates.

<table>
<thead>
<tr>
<th>Measures foreseen in the Action Plan and objectives set by the Action Plan of the Lifelong Learning Centre of the Transport and Telecommunications Institute (TSI LLC)</th>
<th>Implementation of non-formal, informal, optional and professional development training and workshops for the population of the city, province and the country for their personal and professional development, based on the needs of companies and private individuals.</th>
<th>Time-line</th>
<th>Target indicators/results</th>
<th>Key target indicators for 2016</th>
<th>Key target indicators for 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Enlarge the scope of TSI LLC activities by diversifying the range of courses</td>
<td>Continuously</td>
<td>Unique professional and personal development courses and workshops relevant for the labour market developed</td>
<td>8–10 various courses, workshops conducted</td>
<td>30–40 unique courses and workshops developed and conducted</td>
<td></td>
</tr>
<tr>
<td>2. Intensify cooperation with partners in language training matters (Arabic, Chinese and other languages)</td>
<td>31.12.2020</td>
<td>An extensive offer of foreign (especially exotic) languages</td>
<td>20 course attendees mastering foreign languages</td>
<td>120 course attendees mastering foreign languages</td>
<td></td>
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<tr>
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<td></td>
</tr>
<tr>
<td>3. Intensify cooperation in the training of public service employees (for example, NBS, NDA, etc.)</td>
<td>31.12.2020</td>
<td>Public service employees trained to a high standard</td>
<td>1–2 groups of specialists undergoing training</td>
<td>At least 10 groups of public service employees undergoing training</td>
<td></td>
</tr>
<tr>
<td>4. Development of a training and attendee registration system, recording of credits and alignment of courses with lifelong learning higher education programmes through the following activities:</td>
<td>31.12.2020</td>
<td>Development of a training and attendee registration system, recording of credits and alignment of courses with lifelong learning higher education programmes will be ensured.</td>
<td>System layout designed</td>
<td>System put into operation</td>
<td></td>
</tr>
<tr>
<td>- a single registration system of TSI LLC course and workshop attendees on the TSI website;</td>
<td></td>
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<td></td>
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<tr>
<td>- a single TSI LLC course attendee database;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- a single recording system of credits and alignment of courses;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- introduction of a single administration system</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Development and implementation of TSI LLC lifelong learning system through the following activities:</td>
<td>31.12.2020</td>
<td>1) Implementation of courses in the form of lifelong learning and an administration system meeting the quality standards will be ensured</td>
<td>System layout designed</td>
<td>System put into operation</td>
<td></td>
</tr>
<tr>
<td>- development and implementation of a single form of distance learning and a registration system of TSI LLC course attendees;</td>
<td></td>
<td>2) Lifelong learning courses provided</td>
<td>Development, placement and dissemination of information about courses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- a single recording system of credits for TSI LLC lifelong learning and alignment of courses</td>
<td></td>
<td></td>
<td>At least 30 lifelong learning courses offered, with 40 attendees having mastered the courses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Cooperation with companies in the career development of students and graduates through the following activities:</td>
<td>31.12.2020</td>
<td>1) Development of courses for corporate customers and other training offers upon request.</td>
<td>Implemented in full</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- active involvement in TSI Career Days, offering courses and other forms of training to students and external cooperation partners;</td>
<td></td>
<td>2) Cooperation with companies and updating of employee qualifications.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- development of a course offer for TSI students and</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Continuously</td>
<td>Graduates are informed about opportunities</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
members of the TSI Graduate Association; development of an assortment of professional further education opportunities to be offered to members of the TSI Graduate Association.

<table>
<thead>
<tr>
<th></th>
<th>Annually</th>
<th>and special discounts, and are involved in the lifelong learning process</th>
<th>At least 5% of course attendees are graduates</th>
<th>At least 10% of course attendees are graduates</th>
</tr>
</thead>
</table>

### 7.2. TSI Academic and Professional Aviation Centre

#### 7.2.1. Description of the existing situation

The Academic and Professional Aviation Centre (TSI/APAC) was established in 2008 as an organisational unit of the Transport and Telecommunications Institute to provide various types of education services in the area of aviation. In 2009, TSI/APAC was awarded the European Aviation Safety Agency (EASA) **Part-147 certificate** (Ref/.LV.147.0002). TSI/APAC provides category B1 “Technician Mechanics” and category B2 “Technician Avionics” basic training programmes in compliance with the EASA requirements for organisations providing **aircraft maintenance type training**. TSI/APAC also provides training and conducts specialised aviation course examinations.

In October 2014, TSI/APAC was awarded an EASA Part-147 certificate which allows the provision of training for the following types of aircraft: A318/A319/A320/A321 with CFM56, V2500 engine. In May 2016, permission was received to provide training also for CRJ 100/200 series CL600 2B19 type aircraft (GE CF 34 engine) — both theoretical and practical courses.

TSI/APAC employs around 20 Institute professors, lecturers and trainers. The qualifications of the Centre’s trainers to teach certain modules or courses have been recognised by the Latvian Civil Aviation Agency. TSI/APAC classrooms are equipped with simulators and machine tools with modern installations and instruments required for the training of aviation specialists. The Institute’s Laboratory of Radio Electronics and the Laboratory of Electronics are available to TSI/APAC. Modern teaching aids, multimedia presentations and the latest journals are available for training needs. The TSI/APAC quality system complies with the requirements of EASA. 500 certificates for the successful passing of examinations on completion of various aviation training courses were issued in 2016, of which 121 certificates were issued to TSI students of the aviation speciality.

TSI/APAC aims to become the leading provider of aviation training in the Baltic and Eastern European region, and therefore has undertaken the implementation of the following study directions:

- “Flight Dispatch / Flight Operations” training course. The course is based on ICAO DOC 71 92-AN/857 Part D-3 recommendations and intended for training Flight Operations Officers / Flight Dispatchers. It has been approved by the Latvian Civil Aviation Agency;

- Professional and basic training for Remotely Piloted Aircraft System (RPAS — drones) operators has been provided since 2016. The programme ensures a common basis for the recognition of pilot and crew competences in relation to the operation of remotely piloted aircraft systems with a maximum take-off mass of less than 25 kg that are used under Visual Line of Sight or Extended Visual Line of Sight.

TSI/APAC signed two partnership agreements in 2016:

- A partnership agreement with Flight Path International (Canada), joining resources and expertise for training solutions for Airbus, Boeing, Bombardier and Embraer commercial airplanes;
• A partnership agreement with Jeppesen (a Boeing company), joining resources and expertise for the implementation of an EASA-supported flight operations / flight dispatch training programme, which has been fully accredited by the Latvian Civil Aviation Agency.

7.2.2. TSI/APAC operational tasks and Action Plan

• Expand TSI/APAC premises by accommodating a Cessna-150 airplane and a turbojet engine for training purposes;
• Create new training laboratories;
• Renovate the Cessna-150 airplane engine for conducting field training;
• Increase the number of field training sessions on the A-320 simulator and in the laboratories of the Telecommunications, Electronics and Robotics Centre;
• Start the “Flight Dispatch / Flight Operations” training course in cooperation with the AirBaltic company;
• Extend the professional and basic training course for Remotely Piloted Aircraft System operators.

Figure 7.2: Action Plan

<table>
<thead>
<tr>
<th>Measures to attain the objective pursued</th>
<th>Time-line</th>
<th>Target indicators/results</th>
<th>Key target indicators for 2016</th>
<th>Key target indicators for 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Enlarge the scope of TSI/APAC activities by diversifying the range of courses offered</td>
<td>Continuously</td>
<td>New training programmes launched</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>2. Intensify cooperation with external partners: professional training providers, airlines, industry representatives and providers of related services and technical maintenance organisations</td>
<td>31.12.2020</td>
<td>Cooperation agreements signed with local and foreign partners — professional training providers, airlines and aviation industry representatives</td>
<td>11</td>
<td>16</td>
</tr>
<tr>
<td>3. Increase the number of EASA/CAA certificates received for the implementation of various aviation training programmes</td>
<td>31.12.2020</td>
<td>Professional certificates received allowing to conduct various aviation training programmes</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>4. Invest in TSI/APAC infrastructure by expanding the premises, increasing the number of laboratories and the equipment contained</td>
<td>31.12.2020</td>
<td>TSI/APAC training premises expanded The number of TSI/APAC laboratories (practical training rooms) increased</td>
<td>467 m²</td>
<td>867 m²</td>
</tr>
<tr>
<td>5. Increase the number of professional aviation certificates issued by an average of 7% each year</td>
<td>31.12.2020</td>
<td>An increased number of students and cadets having received certificates of successfully passed examinations on the completion of various aviation training courses</td>
<td>500</td>
<td>655</td>
</tr>
</tbody>
</table>
7.3.  Cooperation with graduates

7.3.1.  Description of the existing situation

The world leading universities with centuries-old history nurture their deep traditions of uniting students by establishing effective and multilateral relationships. First existing as private clubs, graduate associations have now turned into an important public power capable of supporting their universities and affecting social, economic and political processes.

The TSI Graduate Association was established on 30 January 2016. It is a non-governmental organisation accepting TSI graduates.

7.3.2.  Tasks in the area of activity of the TSI Graduate Association

Tasks of the Association:
- Strengthen the link between graduates and the Institute;
- Support the career development of graduates;
- Create a favourable environment for the sharing of experience and exchanging business contacts;
- Encourage work with trainees and offer opportunities to update their qualifications;
- Organise graduate meetings and other events, including faculty and course anniversary reunions;
- Develop friendly and business contacts between graduates;
- Inform Association members about TSI projects.

7.3.3.  Activities envisaged by the plan

<table>
<thead>
<tr>
<th>Objectives set by the Transport and Telecommunications Institute Graduate Association (TSI GA) plan</th>
<th>Time-line</th>
<th>Target indicators/results</th>
<th>Key target indicators for 2016</th>
<th>Key target indicators for 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Promoting cooperation between Association members through the following activities:</td>
<td>31.12.2016</td>
<td>Website with the domain name <a href="http://www.tsiaa.lv">www.tsiaa.lv</a> created</td>
<td>At least 10 activities implemented</td>
<td></td>
</tr>
<tr>
<td>- Creation of a TSI GA website</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Career advice</td>
<td>Annually</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Workshops</td>
<td>Annually</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Graduates as both members of the Association and company representatives offer career development possibilities to TSI students/graduates.</td>
<td>Annually</td>
<td>Relations between graduates and Alma Mater</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2. Ensuring further education opportunities for TSI graduates through the following activities:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Implementation Date</th>
<th>Description</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development of a course offer for TSI Graduate Association members</td>
<td>31.12.2016</td>
<td>Implemented in full</td>
<td>10–15 unique courses with special discounts for TSI Graduate Association members</td>
</tr>
<tr>
<td>Cooperating with national and local authorities, companies and social partners through the following activities:</td>
<td></td>
<td></td>
<td>30–40 unique courses with special discounts for TSI Graduate Association members</td>
</tr>
<tr>
<td>Organising TSI Career Days</td>
<td>Annually</td>
<td>40 company representatives from various industries with their own stands and professional guest lectures invited.</td>
<td>Extension of Career Days by inviting students from other universities (EKA, ISMA, etc.)</td>
</tr>
</tbody>
</table>

3. Cooperation with industry representatives, national and local authorities and non-governmental organisations

7.4. Description of the existing situation

Continuous and well thought-over cooperation with industry representatives, national and local authorities and non-governmental organisations is needed for successful operation of the university. Close cooperation ensures an increased quality of education, opens up more possibilities for TSI students and promotes the students’ competitiveness in the domestic and international labour market.

TSI annually increases the number of its cooperation partners by concluding and implementing more and more new cooperation agreements. Currently TSI has cooperation agreements signed with over 200 partners. The main areas where the number of cooperation partners is being increased are information technologies, aviation, electronics, robotics and logistics. In the selection of cooperation partners, special attention is paid to the innovation level of their production and/or service provision.

Social partners and industry associations constitute an integral part of the partnerships. Cooperation with LDDK and LCCI is important for establishing a dialogue about the compliance of higher education with employers’ requirements and for monitoring the quality of education. LDDK and LCCI also serve as a communication channel with employers capable of ensuring training posts and jobs for students and graduates. The plans are to involve LDDK and LCCI in the establishment of a mentoring programme for students’ business incubators.

An intensive cooperation is ongoing with industry associations covering TSI scientific and academic directions, e.g., LIKTA, LETERA, Latvian Logistics Association, and others. As a member of a range of professional associations, TSI engages in their everyday work, continuously following up industry developments and participating in the social dialogue with partners.

7.4.2. Tasks in the area of corporate customer services

Tasks and forms of cooperation:

- Extend the existing cooperation through new cooperation agreements;
- Develop new forms of cooperation, such as addressing business problems using TSI student resources, etc.;
- Integrate knowledge transfer form professionals of the business environment into the academic process;
- Involve partners in the improvement of the quality of studies: reviewing of programmes, development of subjects for graduation papers, etc.;
- Implementation of joint scientific and practical projects;
- Ensuring an increasing range of employment and traineeship opportunities for students and graduates;
- Use of TSI resources for the needs of companies.

### 7.4.3. Activities envisaged by the plan

<table>
<thead>
<tr>
<th>Objectives set by the cooperation plan of the TSI Corporate Services Department</th>
<th>Diversify and extend the cooperation with external partners by increasing the range of cooperation partners and their involvement in TSI operations and their improvement, offering additional opportunities for students and graduates</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Measures to attain the objective pursued</strong></td>
<td><strong>Time-line</strong></td>
</tr>
<tr>
<td>Extend the existing cooperation through new cooperation agreements</td>
<td></td>
</tr>
<tr>
<td>- Drafting and signing of new agreements</td>
<td>Annually</td>
</tr>
<tr>
<td>Develop new forms of cooperation, such as addressing business problems using TSI student resources, etc.</td>
<td></td>
</tr>
<tr>
<td>- TSI addressing the challenges faced by companies</td>
<td>Annually</td>
</tr>
<tr>
<td>- Involvement in the creation of a business incubator</td>
<td>31.12.2017</td>
</tr>
<tr>
<td>Integrate knowledge transfer from professionals of the business environment into the academic process, involve partners in the improvement of the quality of studies: reviewing of programmes, development of subjects for graduation papers, etc.</td>
<td>Annually</td>
</tr>
<tr>
<td>Implementation of joint scientific and practical projects</td>
<td>Annually</td>
</tr>
<tr>
<td>Ensuring increased employment and traineeship opportunities for students and graduates</td>
<td>Annually</td>
</tr>
<tr>
<td>Training of company employees upon request</td>
<td>Annually</td>
</tr>
</tbody>
</table>
Cooperation with schools  | Annually | Pupils, teachers and parents informed about the possibilities to study and career development opportunities for young people | At least 20 groups of pupils have visited TSI | At least 100 groups of pupils have visited TSI

8. Internationalisation Plan

8.1. Types of international cooperation and their development possibilities

TSI pays continuous attention to its international pedagogical and scientific research cooperation with foreign partners. This cooperation focuses on the following results:

- Development and implementation of new joint programmes;
- Development of academic mobility through student exchanges and lectures by TSI teaching staff at foreign universities, inviting teaching staff from cooperating universities to deliver lectures at TSI;
- Participation in annual scientific conferences and workshops organised by cooperation partner universities;
- Preparation of joint scientific publications with foreign universities;
- Preparation and implementation of joint scientific research and innovative contractual research projects.

Participation in joint scientific projects within the framework of EU funded programmes provides for a possibility to acquire new knowledge and skills, create and develop new, innovative scientific ideas and find their potential application, as well as promoting the transfer of knowledge and experience from foreign partners for developing TSI’s scientific ideas in Latvia.

Good examples of cooperation are the B2BLOCO and TTRANS projects which were implemented under the Seventh EU Framework Programme (FP7). The outcomes of those projects pay an important role in promoting cooperation between various types of institutions in the area of building and developing transport networks. Cooperation networks built within the framework of the projects will enable a more intense cooperation between scientific research institutions and small and medium-sized enterprises, ensuring the practical introduction of new technologies and enabling the attainment of the required results by both parties involved.

To gain a greater European visibility, TSI has joined the European Conference of Transport Research Institutes (ECTRI), where it participates in several thematic groups: Mobility, Freight and Logistics, and Traffic Management. Within the relevant thematic groups, TSI wishes to participate in the process of defining proposals for the European Union Research Policy and certain programmes under that policy. Participation in ECTRI thematic groups will enable TSI to push its research interests at a larger scale, will serve as a precondition for potential participation in EU funded projects, and will ensure the exchange of scientific information and establishing of contacts for participation in new cooperation projects.
<table>
<thead>
<tr>
<th>Name</th>
<th>Type of cooperation</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Universities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vilnius Gediminas Technical University</td>
<td>Joint research projects “Safer Heavy Goods Traffic”, “The Impact of the Market Structure on Safety and Security in BSR”; scientist exchanges</td>
<td>Lithuania</td>
</tr>
<tr>
<td>Kaunas University of Technology</td>
<td>Joint projects</td>
<td>Lithuania</td>
</tr>
<tr>
<td>Hamburg University of Technology (Institute of Business Logistics and General Management)</td>
<td>Joint research Project in the area of simulation application in logistics sphere (joint workshops, publications, project proposals)</td>
<td>Germany</td>
</tr>
<tr>
<td>Otto-von-Guericke University Magdeburg</td>
<td>Joint workshops</td>
<td>Germany</td>
</tr>
<tr>
<td>Centre for Maritime Studies, University of Turku</td>
<td>Joint workshops, joint project</td>
<td>Finland</td>
</tr>
<tr>
<td>Universidad Politécnica de Madrid</td>
<td>Scientist exchanges in the framework of joint research activities on the modelling of public transport passenger flows in the era of intelligent transport systems</td>
<td>Spain</td>
</tr>
<tr>
<td>University of Murcia</td>
<td>Joint project</td>
<td>Spain</td>
</tr>
<tr>
<td>University Autònoma de Barcelona</td>
<td>Joint project</td>
<td>Spain</td>
</tr>
<tr>
<td>University of Liege</td>
<td>Joint research in the area of 3D urban models (chapter in the book, project proposals)</td>
<td>Belgium</td>
</tr>
<tr>
<td>Ben Gurion University</td>
<td>Joint research, papers, seminars for master and PhD students and papers in the Data Mining field.</td>
<td>Israel</td>
</tr>
<tr>
<td>Universidad Autònoma de Barcelona</td>
<td>Joint project</td>
<td>Spain</td>
</tr>
<tr>
<td>Universita degli Studi di Trieste</td>
<td>Joint project</td>
<td>Italy</td>
</tr>
<tr>
<td>Immanuel Kant Baltic Federal University (IKBFU)</td>
<td>Academic and scientific cooperation</td>
<td>Russian Federation</td>
</tr>
<tr>
<td>University of Thessaly</td>
<td>Joint project</td>
<td>Greece</td>
</tr>
<tr>
<td>University of Economy in Bydgoszcz</td>
<td>Joint project</td>
<td>Poland</td>
</tr>
<tr>
<td>Technological Educational Institute of Epirus</td>
<td>Joint project</td>
<td>Greece</td>
</tr>
<tr>
<td>Plovdiv University</td>
<td>Joint project</td>
<td>Bulgaria</td>
</tr>
<tr>
<td>University of Economics and Innovation in Lublin</td>
<td>Joint project</td>
<td>Poland</td>
</tr>
<tr>
<td>Klaipeda State College</td>
<td>Joint project</td>
<td>Poland</td>
</tr>
<tr>
<td>Häme University of Applied Sciences</td>
<td>Joint project</td>
<td>Finland</td>
</tr>
<tr>
<td>TTK University of Applied Sciences</td>
<td>Joint project</td>
<td>Estonia</td>
</tr>
<tr>
<td><strong>Scientific institutes</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fraunhofer Institute for Factory Operation and Automation</td>
<td>Joint research in the area of applying the mesoscopic approach to the simulation of logistics systems, 2008–2010 Knowledge exchange in the area of applying 3D virtual reality technologies for training, education and research</td>
<td>Germany</td>
</tr>
<tr>
<td>Institute of Logistics and Warehousing</td>
<td>Joint FP7 project “B2BLOCO”</td>
<td>Poland</td>
</tr>
<tr>
<td>LAGRANGE SARL</td>
<td>Joint project</td>
<td>France</td>
</tr>
<tr>
<td>INRETS Laboratoire d’Ingénierie Circulation Transports</td>
<td>Joint projects: COST Actions TU0804, TU0903</td>
<td>France</td>
</tr>
<tr>
<td>KEMA Nederland BV</td>
<td>Joint project</td>
<td>The Netherlands</td>
</tr>
<tr>
<td>Kouvolan rautatie ja aikuiskoulutus OY</td>
<td>Joint project</td>
<td>Finland</td>
</tr>
</tbody>
</table>

TSI as a university as a whole, and its teaching staff and scientists individually, take an active part in the work of many European level specialised organisations and associations:

- OECD (Organisation for Economic Co-operation and Development),
- ECTRI (European Conference of Transport Research Institutes),
- Joint Transport Research Centre,
8.2. Developing cooperation with foreign universities

Staff mobility is a key tool to attract various cooperation partners. A very positive fact is that the number of foreign students studying for one semester or a full academic year within the framework of TSI ERASMUS+ projects is increasing each year.

### Table 8.2: Number of visiting ERASMUS+ students

<table>
<thead>
<tr>
<th>Academic year</th>
<th>Number of visiting ERASMUS+ students</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014/2015</td>
<td>5</td>
<td>Turkey</td>
</tr>
<tr>
<td>2015/2016</td>
<td>15</td>
<td>Turkey, Poland, Bulgaria, Spain</td>
</tr>
<tr>
<td>2016/2017 (planned)</td>
<td>17</td>
<td>Bulgaria, Poland, Turkey, Spain</td>
</tr>
</tbody>
</table>

At the same time, the number of TSI students and academic staff visiting a foreign university within the ERASMUS+ programmes has not seen a significant increase over recent years. Although student interest in such training seems to be great enough, student mobility in the academic year 2015/2016 was used by only 15 TSI students and 3 teachers. This number needs to be significantly increased in the coming years.

### Table 8.3: Number of TSI ERASMUS + students

<table>
<thead>
<tr>
<th>Academic year</th>
<th>Number of TSI students who went abroad with the ERASMUS+</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014/2015</td>
<td>11</td>
</tr>
<tr>
<td>2015/2016</td>
<td>15</td>
</tr>
<tr>
<td>2016/2017 (planned)</td>
<td>7 (1st semester only)</td>
</tr>
</tbody>
</table>

Likewise, a more active cooperation and submission of applications for participation in the ERASMUS+ programme is planned for cooperation with non-EU countries, extending the range of cooperation partners and improving the mobility of teaching staff and students.

In September 2016, TSI submitted a grant application for the ERASMUS+ programme activity together with the Israeli Shamoon College of Engineering: “Higher education student and staff mobility between Programme and Partner Countries”. Aims of the project: science cooperation, attraction of teachers who are specialists in a given area, development of cooperation between higher education institutions, attraction of qualified teachers to conduct and develop individual study courses in partner countries.

In 2016, a cooperation agreement was signed with the SolBridge International School of Business in South Korea. Based on this agreement, an exchange programme will be implemented and the best management science programme students of TSI and the SolBridge International School of Business will be able to study for one semester at the partner university (two students per semester).

In addition to the ERASMUS+ cooperation agreement, a separate agreement with the Beykоз Vocational School of Logistics (Istanbul, Turkey) was signed in 2015, according to which students from this Turkish university (3rd and 4th year students) will come to Riga to complete the last year of their studies.

In 2015, an agreement was signed with Sathyabama University (India) on the exchange of technical field students (electronics, computer science, telecommunications).
Currently negotiations are ongoing for cooperation with Egyptian universities included in the list of the highest ranking Arab universities. Negotiations are also under way with several universities in China on the implementation of mobility programmes in the academic year 2017/2018.

8.3. Attraction of foreign students

Regardless of the recent complicated international situation, due to active external marketing activities, the number of foreign students at TSI is increasing each year (see Table 8.4).

![Table 8.4: Number of foreign students at TSI](image)

It is safe to say that in terms of the share of foreign students TSI takes one of the first places among Latvian universities, since in the academic year 2015/2016 the average share of foreign students at Latvian universities was 8%. Thus, the TSI indicator was almost twice the average.

The following table shows the distribution of TSI foreign students by country of origin in the academic year 2015/2016.

![Table 8.5: Distribution of TSI foreign students by country of origin](image)

TSI makes active use of services provided by agencies (with official cooperation agreements signed) to attract more foreign students, notably in the strategic directions such as information and communications technologies, and transport, including aviation transport. TSI has also opened two representation offices abroad:

- in Central Asia (and Caucasus), and in
- South Asia (started work in 2016).

Already today students from India, Sri Lanka and other Asian countries show active interest in and wish to master technical specialities and receive qualitative higher education in Europe so that they could return home and apply the knowledge gained for the development of their own countries. An increasingly active cooperation is built not only with agents, but also foreign universities and cooperation partners. Already today TSI has partners in Mongolia, Egypt, China, Slovakia, Czech Republic, Bulgaria, Turkey and other countries. Since December 2012, TSI has also had a Central Asian (and Caucasus) representation office in Almaty (Kazakhstan). By increasing the number of cooperation partners and, through marketing activities, acquainting new regions with our operations, we actively cooperate with countries such as Georgia, Armenia, Azerbaijan, Kazakhstan and others. Already today TSI has students from 32 countries (including Latvia): Belarus, Turkey, Peru, Mongolia, Finland and Germany, to name a few.
Taking into account the increasing interest to study in Latvia in English, we can predict that in 2020 the majority of foreign students will give preference to studies in English. This is why we are developing the existing and creating new programmes aimed at offering studies in line with the leading worldwide trends and demand. In 2016, 195 students were studying in English, with almost 1/3 of them in the bachelor programme Aviation, and therefore, we can expect a rapid growth in the number of people wishing to study in English in aviation programmes also in the future. Moreover, the plans by 1.09.2017 include licencing the Aviation Management programme, covering syllabuses of engineering and social sciences and to offer them in English. An increase is also expected in the number of distance learning students studying in English. To date, the Ministry of Education and Science has accredited 9 of our distance learning study programmes to be taught in Russian; 25 % of the 440 distance learning students are constituted by foreign students. Currently three of our distance learning programmes are in preparation for teaching in English, and we expect a rapid growth in the number of distance learning students mastering courses in English.

This is why TSI is planning to open several more foreign representation offices in other regions and increase the number of foreign students to 1,500 by 2020.

Currently TSI ensures attraction of international students at its own expense and from funds allocated within the ERASMUS+ project. We pay great attention to the selection and admission of foreign students. Several measures are taken to admit the most promising students (entrance exams are organised for foreign students) and prevent the risk of illegal immigration.

### 8.4. Attraction of foreign academic staff

A variety of international projects, international programmes and other types of cooperation ensure closer cooperation with the existing partner universities and promote interest about TSI among new universities, serving as a tool to attract qualified foreign teaching staff to the Transport and Telecommunications Institute.

A positive fact is that the number of foreign teachers temporarily arriving at TSI to deliver certain study courses has been increasing over recent years.

<table>
<thead>
<tr>
<th>Academic year</th>
<th>Financed by the ERASMUS+ programme</th>
<th>On the basis of a cooperation or other agreement</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014/2015</td>
<td>5</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>2015/2016</td>
<td>7</td>
<td>8</td>
<td>15</td>
</tr>
<tr>
<td>2016/2017 (planned in the 1st semester)</td>
<td>3</td>
<td>3</td>
<td>6</td>
</tr>
</tbody>
</table>

In view of the strategic plan of the Transport and Telecommunications Institute to obtain a university status, it aims to achieve that, within two years, 10% of TSI teachers are visiting professors from abroad.

To increase the number of foreign teachers, the Transport and Telecommunications Institute is planning to enter into new agreements within the Erasmus+ project KA1 with universities in various Erasmus+ programme countries. These agreements provide for the exchange of students, teachers and academic staff between universities. Within the framework of the ERASMUS+ programme, the Transport and Telecommunications Institute is planning to sign 3–5 new agreements with various higher education institutions each year to increase the mobility of teaching staff, and with that the number or foreign trainers. The Transport and Telecommunications Institute aims to increase not only the total number of agreements with higher education institutions, but mainly the range of countries where the Institute has agreements with higher education institutions to promote wider experience possibilities for both students and teaching staff. In addition, TSI will make use of the possibility to apply for support for the attraction of foreign teachers within the EU funds specific objective 8.2.2 “To strengthen the capacities of academic staff of higher education institutions in the areas of strategic specialisation”.

Table 8.6: Foreign guest lecturers arriving at TSI to deliver study courses
8.5. Implementation of study programmes or their modules in foreign languages

All the 18 programmes implemented by the Transport and Telecommunications Institute have been accredited for teaching not only in Latvian, but also in English. In the academic year 2016/2017, TSI offered the following full-time study programmes in English:

<table>
<thead>
<tr>
<th>No.</th>
<th>Name of the programme</th>
<th>Type of programme</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bachelor of Natural Sciences in Computer Science</td>
<td>Bachelor</td>
</tr>
<tr>
<td>2</td>
<td>Bachelor of Social Sciences in Management</td>
<td>Bachelor</td>
</tr>
<tr>
<td>3</td>
<td>Transport and Business Logistics</td>
<td>Bachelor</td>
</tr>
<tr>
<td>4</td>
<td>Aviation Transport</td>
<td>Bachelor</td>
</tr>
<tr>
<td>5</td>
<td>Master of Transport and Logistics</td>
<td>Master</td>
</tr>
<tr>
<td>6</td>
<td>Master of Social Sciences in Management</td>
<td>Master</td>
</tr>
<tr>
<td>7</td>
<td>Management of Information Systems</td>
<td>Master</td>
</tr>
</tbody>
</table>

Programmes where full-time training in English is planned in the near future:

<table>
<thead>
<tr>
<th>No.</th>
<th>Name of the programme</th>
<th>Type of programme</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Master of Natural Sciences in Computer Science</td>
<td>Master</td>
</tr>
</tbody>
</table>

To attract additional foreign students, in the near future TSI is planning to also provide training in English for distance learners:

<table>
<thead>
<tr>
<th>No.</th>
<th>Name of the programme</th>
<th>Type of programme</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Master of Social Sciences in Management</td>
<td>Master</td>
</tr>
<tr>
<td>2</td>
<td>Management of Information Systems</td>
<td>Master</td>
</tr>
<tr>
<td>3</td>
<td>Several programmes</td>
<td>Bachelor</td>
</tr>
</tbody>
</table>

All of the 18 study programmes include professional English courses, and the plan is to teach at least 10% of the syllabus of each study programme in English by 2020.

Launching another 5 new programmes and their licencing for studies in English is planned by 2020. Some of them, such as “Aviation Management” and “Business and Economic Development of Asian Countries”, are to be delivered in English only. The professional STEM bachelor programme “Robotics” is also planned in Latvian and English.

8.6. Motivating teachers to develop their foreign language skills

The professional improvement system of TSI academic staff is based on the principle whereby teachers themselves are responsible for updating their qualifications, while shareholders, the Management Board and the Rectorate encourage and support this process. In the same way, this principle applies to the mastering of foreign languages and the development of the foreign language skills necessary for work.

To improve foreign language skills, TSI uses the professional improvement forms of academic staff described in Section 5.4 of the Strategy: *Staff career planning, improvement of competences and qualifications.*
8.7. Measures to be taken

<table>
<thead>
<tr>
<th>Activity</th>
<th>Challenge (problem addressed)</th>
<th>Target indicator (including the numerical result)</th>
<th>Time-line</th>
<th>Origin of resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developing cooperation with foreign universities</td>
<td>New cooperation agreements to be signed, joint study programmes and projects to be developed</td>
<td>Sign 15 new cooperation agreements with foreign universities; develop 3 joint study programmes</td>
<td>2019</td>
<td>EU funds; TSI funds; funds from partner universities; fund raising through academic cooperation agreements</td>
</tr>
<tr>
<td>Attraction of foreign students</td>
<td>The number of foreign students must be increased</td>
<td>No less than 1,500 foreign students at TSI</td>
<td>2020</td>
<td>TSI funds; External marketing support programmes of LIAA and other institutions</td>
</tr>
<tr>
<td>Attraction of foreign academic staff</td>
<td>The number of foreign academic staff must be increased and their qualifications improved</td>
<td>No less than 10% of TSI teachers are visiting professors from abroad</td>
<td>2018</td>
<td>EU funds; TSI funds; fund raising through academic cooperation agreements</td>
</tr>
<tr>
<td>Implementation of study programmes or their modules in foreign languages</td>
<td>The number of study programmes implemented in a foreign language must be increased</td>
<td>10% of the syllabus in each programme is taught in English</td>
<td>2018</td>
<td>EU funds; TSI funds; fund raising through academic cooperation agreements</td>
</tr>
</tbody>
</table>

9. Resources development plan

9.1. Real estate development plan

9.1.1. Buildings and premises used by TSI

TSI owns 12 properties, including 2 academic buildings. The below table provides information about real estate property owned.

<table>
<thead>
<tr>
<th>Real estate category</th>
<th>Description</th>
<th>Area, m²</th>
<th>Acquisition date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building</td>
<td>Building at Lomonosova St. 1, bldg.-12, in Riga, cad. No. 0100046203028</td>
<td>620.30</td>
<td>2015</td>
</tr>
<tr>
<td>Building</td>
<td>Building at Lomonosova St. 1, bldg.-10, in Riga, cad. No. 01000462035</td>
<td>690.50</td>
<td>2015</td>
</tr>
<tr>
<td>Building</td>
<td>Building — academic building at Lomonosova St. 1, bldg. 3, in Riga, cad. No. 01000462003005</td>
<td>13,567.10</td>
<td>2015</td>
</tr>
<tr>
<td>Building</td>
<td>Building at Varsavas St. 43B in Daugavpils, cad. No. 0500-004-8704</td>
<td>879</td>
<td>2004</td>
</tr>
<tr>
<td>Apartment</td>
<td>Apartment at Ilukstes St. 103 b-1-143 in Riga, cad. No. 0100 917 4792</td>
<td>32.2</td>
<td>2009</td>
</tr>
<tr>
<td>Building</td>
<td>Building at Varsavas St. 43 in Daugavpils, cad. No. 0500-004-8701</td>
<td>3,055.40</td>
<td>2004</td>
</tr>
<tr>
<td>Land</td>
<td>Plot at Varsavas St. 43 in Daugavpils, cad. No. 0500-004-8701</td>
<td>5717</td>
<td>2004</td>
</tr>
<tr>
<td>Land</td>
<td>Plot at Varsavas St. 43B in Daugavpils, cad. No. 0500-004-8704</td>
<td>2,059</td>
<td>2004</td>
</tr>
<tr>
<td>Land</td>
<td>Plot at Varsavas St. 41 in Daugavpils, cad. No. 0500-004-8707</td>
<td>8,061</td>
<td>2005</td>
</tr>
<tr>
<td>Land</td>
<td>Plot at Lomonosova St. 1, bldg. 12, in Riga, cad. No. 01000460040</td>
<td>3,142</td>
<td>2015</td>
</tr>
<tr>
<td>Land</td>
<td>Plot at Lomonosova St. 1, bldg. 3, in Riga, cad. No. 01000460035</td>
<td>9,527</td>
<td>2015</td>
</tr>
<tr>
<td>Land</td>
<td>Plot at Lomonosova St. 1, bldg. 10, in Riga, cad. No. 010000460061</td>
<td>3,823</td>
<td>2015</td>
</tr>
</tbody>
</table>
As is known, the legislation of the Republic of Latvia does not provide for a detailed regulation on the premises necessary for universities and their area. The only document containing such a direct reference is the Law on Higher Education Institutions, namely its Section 8: *Foundation of a Higher Education Institution and Opening of a Branch of a Higher Education Institution*. In accordance with that Section, the design of the premises must ensure the implementation of study programmes taking place simultaneously during the study process in an area of no less than 7 square meters per student, including premises provided for the individual work of academic staff.

In view of the fact that the total area of the main building used by TSI is 13,567.10 square metres, while the total number of students in the academic year 2015/2016 was around 2,600 (specifically, 2,564 students according to the list of 28.06.2016), the average area per student registered is 5.29 square meters. If the currently partially unused premises of building 10 (690.50 square meters) and the premises of the Latgalian Branch (879 square meters) are added, the average area per student increases to 5.88 square meters.

Accordingly, it is important to forecast the expected changes in the number of students when planning the future development of TSI. If, in the medium term, the number of students remains approximately the same, the area of the existing premises will be sufficient, while if the expected increase in the number of students takes place (mainly on the account of foreign students), the existing premises will be insufficient and expansion of the university will have to be considered.

### General information about the building at Lomonosova St. 1, bldg. 3, in Riga used by TSI

<table>
<thead>
<tr>
<th>Type of building</th>
<th>Buildings designed for schools, universities and scientific research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building area</td>
<td>4,361.40 m²</td>
</tr>
<tr>
<td>Building capacity</td>
<td>55,734.00 m³</td>
</tr>
<tr>
<td>Total area</td>
<td>13,567.10 m²</td>
</tr>
<tr>
<td>Number of floors</td>
<td>9 overground, 1 underground</td>
</tr>
<tr>
<td>Current owner of the building</td>
<td>Transport and Telecommunications Institute AS</td>
</tr>
<tr>
<td>Author of the construction plan</td>
<td>no data</td>
</tr>
<tr>
<td>Name of the construction plan, date and year of acceptance</td>
<td>no data</td>
</tr>
<tr>
<td>Year of construction</td>
<td>1983</td>
</tr>
</tbody>
</table>

### Technical condition of the building

The overall indicative wear and tear of the Transport and Telecommunications Institute building is 25–30%. The building design, accommodation and engineering systems basically comply with the requirements of the existing construction standards. The main structural elements of the building (foundation, load-bearing walls, intermediate floors) are generally in a satisfactory technical condition and meet the requirements of Section 9, Clause 2(1) (mechanical strength and stability) of the Construction Law, the assigned functions and intended use. The energy efficiency of the building is unsatisfactory. Most of the windows have been replaced. The heat resistance of the building envelope (external walls, base and roofing frameworks) does not meet the requirements of the LBN 002-15 standard “Thermotechnics of Building Envelopes”. Measures intended for increasing the energy efficiency of the building are justified and welcome, while at the same time renovation of certain damaged building elements is desirable. With introducing a complex of energy efficiency measures, heat loss and energy consumption of the heating system will be reduced. Renovation and insulation of the building envelope will extend its useful life and improve comfort in the building.
Conclusions and recommendations

In accordance with the energy performance certificate of the building issued on 25 October 2016, energy consumption is estimated at 114.46 kWh/m² per year (100.84 kWh/m² for heating). The building does not meet ‘net zero energy building’ requirements.

In line with the actual technical condition of the building and the requirements of energy efficiency standards for buildings, the Transport and Telecommunications Institute building needs renovation, with the main emphasis to be put on measures to improve energy efficiency (Opinion of the technical building inspection on 21.10.2015). Measures to increase the heat resistance of the building envelope must be implemented in compliance with the requirements of the LBN 002-15 standard “Thermotechnics of Building Envelopes”. The following main construction works are recommended during the energy efficiency improvement measures and renovation:

- heat insulation of all the exterior walls of the building (including foundation) combined with façade finishing works,
- selective renovation of damaged wall elements must be done simultaneously with the wall insulation,
- replacement of the old metal doors and windows with insulated wood or PVC doors and windows, with sealing and insulation of window apertures,
- building of protective foundation walls,
- repair of porches and external stairs,
- insulation of roof lining,
- replacement of roofs and tinplate connections,
- creation of a ventilation system with an efficient heat-recovery (recuperation) mechanism in compliance with the LBN 231-15 construction standard “Regulation on Heat Supply and Ventilation of Residential and Public Buildings”

General information about the building at Lomonosova St. 1, bldg. 10, in Riga used by TSI
(incl. Library building, currently no training activities)

<table>
<thead>
<tr>
<th>Type of building</th>
<th>Buildings designed for schools, universities and scientific research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building area</td>
<td>435.2 m²</td>
</tr>
<tr>
<td>Building capacity</td>
<td>2,713 m³</td>
</tr>
<tr>
<td>Total area</td>
<td>690.50 m²</td>
</tr>
<tr>
<td>Number of floors</td>
<td>2 overground floors</td>
</tr>
<tr>
<td>Current owner of the building</td>
<td>Transport and Telecommunications Institute AS</td>
</tr>
<tr>
<td>Author of the construction plan</td>
<td>no data</td>
</tr>
<tr>
<td>Name of the construction plan, date and year of acceptance</td>
<td>no data</td>
</tr>
<tr>
<td>Year of construction</td>
<td>no data</td>
</tr>
</tbody>
</table>

General information about the building at Varsavas St. 43 b in Daugavpils used by TSI
(TSI Latgalian Branch)

<table>
<thead>
<tr>
<th>Type of building</th>
<th>Buildings designed for schools, universities and scientific research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building area</td>
<td>744.7 m²</td>
</tr>
<tr>
<td>Building capacity</td>
<td>4,688 m³</td>
</tr>
</tbody>
</table>
9.1.2. Future development prospects of real estate

To define the future development prospects of TSI’s real estate, the potential risks arising from its topical problems, the existing real estate and the adjacent infrastructure were analysed. Actually the risks are associated with infrastructure development in Riga, since the building in Daugavpils and its technical condition and capacity are consistent with the current and expected number of students.

<table>
<thead>
<tr>
<th>Risk</th>
<th>Potential impact</th>
<th>Probability and type of prevention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insufficient energy efficiency of the main TSI academic building</td>
<td>Potential impact: decrease in the number of students;</td>
<td>The risk can be averted by renovating and insulating the building, including modernisation of the engineering networks.</td>
</tr>
<tr>
<td>(in Riga) and a technical condition which does not meet the</td>
<td>Deterioration of the technical condition of the building, nonconformity with the requirements of the regulatory framework.</td>
<td></td>
</tr>
<tr>
<td>requirements of a modern building</td>
<td>Impact: high</td>
<td></td>
</tr>
<tr>
<td>Absence of a TSI campus (Riga) and shortage of space required for</td>
<td>Potential impact: too high of a load on the existing training facilities;</td>
<td>The risk can be averted by acquiring (renting) the real estate property (building, land) adjacent to the TSI academic building and adapting it to training needs, and arranging a TSI dormitory.</td>
</tr>
<tr>
<td>development</td>
<td>Student dissatisfaction and reduced student flow (non-Riga students);</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Difficulties in planning the student training process.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Impact: medium</td>
<td></td>
</tr>
<tr>
<td>Inefficient use of TSI training facilities (Riga)</td>
<td>Potential impact: non-compliance of the existing training facilities with the</td>
<td>The risk can be averted by optimising the use of the TSI academic building through the change of the usage type of certain premises and the creation, expansion and modernisation of auditoriums.</td>
</tr>
<tr>
<td></td>
<td>requirements of a modern university (including ergonomic requirements);</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The fragmented placement of TSI’s organisational units in a 9-storey building;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Insufficient premises to ensure the training process at APAC.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Impact: high</td>
<td></td>
</tr>
<tr>
<td>Insufficient space for housing laboratories</td>
<td>Potential impact: limited possibilities for practical training and laboratory works; limited collaboration possibilities within international projects; limited possibilities to involve students in the research process in cooperation with the industry. Impact: medium high.</td>
<td>The risk can be averted by reconstructing the building (bldg. 10) owned by TSI for the needs of laboratories.</td>
</tr>
</tbody>
</table>

A conceptual future vision exists to divide, for optimisation purposes, the main building of TSI (bldg. 3) by floors into the following areas:
Floors 7–8: administrative area
Floors 3–6: area designed for ensuring/servicing the study process
Floors 0–2: training room area

**Proposals for the placement of organisational units in TSI’s academic building**

1. Floor 8: vacated from the regular student training process and adapted for administrative purposes of the TSI Lifelong Learning Centre;
2. Floor 7: the function remains unchanged, used for the needs of the Rectorate and Management Board office;
3. Floor 6: used for the needs of the Faculty of Transport and Logistics;
4. Floor 5: used for the needs of the Faculty of Computer Science and Telecommunications;
5. Floor 4: used for the needs of the Faculty of Management Science and Economics;
6. Floor 3: used for the training process and administrative purposes;
7. Floor 2: the function remains unchanged, computer classrooms located here;
8. Floor 1: the function remains unchanged, sliding walls could be installed in the large auditoriums No. 221 and No. 230 increasing their area;
9. Floor 0: priority task – to arrange 3 new auditoriums next to the main entrance to compensate the insufficient training areas on the top floors;
10. Basement level: 1 new room for the practical training of aviation students.

With the forecast **increase in the number of students** by 2020 (of local and foreign students), the existing premises will be insufficient, therefore TSI will need to consider extending the university. A map view of the infrastructure adjacent to the TSI academic building at Lomonosova St. 1, bldg. 3, in Riga is shown in Figure 9.1. Extension of the infrastructure can be ensured due to the fact that several buildings of the University of Latvia and Riga Technical University are located next to the Institute’s territory, which, according to the information available, those universities are planning to sell in the next 5 years, as they are going to develop student campuses in Tornakalns and Kipsala in Riga.

Thus the University of Latvia training facilities of the Faculty of Social Sciences bordering the main academic building of TSI will be vacated in the medium term. The area of the LU building is 8,000 m², including 4,500 m² of auditoriums and laboratories. Should an increasing trend in the number of students manifest itself during the next years, TSI will probably buy the building vacated by LU, since both facilities / academic buildings are connected by common engineering networks.

Whereas the land owned by TSI and hosting the academic building and library borders a 3,000 m² plot owned by the Ministry of Education and Science (designated on the plan as the ‘Planned sports field’). In recent years, the plot housed tennis courts, and the issue of registration of title to that land with the Land-book Register on behalf of the state is being addressed. Following the registration, this plot will be leased or disposed of, and TSI focuses on the potential acquisition or rental of the plot for its own sports field.

After the above steps, the creation of a fully fledged TSI student campus could be considered completed.
9.1.3. Action Plan

<table>
<thead>
<tr>
<th>Activity</th>
<th>Challenge</th>
<th>Target indicator</th>
<th>Time-line</th>
<th>Origin of resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renovation of the TSI academic building and energy efficiency improvements (Lomonosova St. 1, bldg. 3, Riga)</td>
<td>Non-compliance of the building with ‘net zero energy building’ requirements. Degraded building infrastructure. Large payments for energy consumed. High CO₂ emissions.</td>
<td>Improved energy efficiency in line with energy audit recommendations. Building modernised and networks repaired. Greenhouse gas reductions achieved. Training facilities renovated.</td>
<td>2019</td>
<td>ERDF; External and internal sources of finance (borrowed funds, shareholder loans, own revenue)</td>
</tr>
<tr>
<td>Renovation and insulation of the Scientific Centre building (Riga, Lomonosova st. 1, bldg. 10)</td>
<td>The building is not functional due to the inadequate technical condition: renovation and insulation works are required.</td>
<td>Improved energy efficiency. Building modernised and networks repaired. Adaptation of the premises to create laboratories.</td>
<td>2019</td>
<td>External and internal sources of finance (borrowed funds, shareholder loans, own revenue)</td>
</tr>
<tr>
<td>Establishment of a TSI dormitory (Lomonosova St. 1, bldg. 12, Riga)</td>
<td>No dormitory available to TSI students, which has a negative impact on the increase in their number. Absence of a student campus.</td>
<td>TSI dormitory established.</td>
<td>2020</td>
<td>External and internal sources of finance (borrowed funds, shareholder loans, own revenue)</td>
</tr>
<tr>
<td>Acquisition of real estate (Riga, Lomonosova St. 1, adjacent building: LU Faculty of Social Sciences)</td>
<td>Insufficiently developed TSI infrastructure. Absence of a student campus.</td>
<td>A building for TSI training and research needs to be obtained.</td>
<td>2020</td>
<td>External and internal sources of finance (borrowed funds, shareholder loans, own revenue)</td>
</tr>
</tbody>
</table>
9.2. Investment plan

9.2.1. Investment over the last five years and valuation of return on investment

As a university with private capital, TSI supports its operations with its own revenues. Over the period between 2004 and 2016 TSI invested more than EUR 7.18 million, of which EUR 2.46 million or 34% were constituted by the Republic of Latvia and EU project funding.

<table>
<thead>
<tr>
<th>Investments, mil. EUR</th>
<th>Total</th>
<th>incl. TSI funding</th>
<th>incl. project funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land, buildings, land for construction</td>
<td>3.57</td>
<td>3.57</td>
<td></td>
</tr>
<tr>
<td>Investment in fixed assets</td>
<td>0.28</td>
<td>0.07</td>
<td>0.22</td>
</tr>
<tr>
<td>Equipment</td>
<td>0.85</td>
<td>0.03</td>
<td>0.82</td>
</tr>
<tr>
<td>Computer software</td>
<td>0.46</td>
<td>0.13</td>
<td>0.33</td>
</tr>
<tr>
<td>Computer hardware, etc.</td>
<td>1.55</td>
<td>0.45</td>
<td>1.09</td>
</tr>
<tr>
<td>Furniture and other equipment</td>
<td>0.46</td>
<td>0.46</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>7.18</strong></td>
<td><strong>4.72</strong></td>
<td><strong>2.46</strong></td>
</tr>
</tbody>
</table>

During the period between 2011 and 2016 TSI implemented only one infrastructure development project co-financed by ERDF. Between 2010 and 2013, the “Information and Communications Technologies as a Single Academic Resource of the Transport and Telecommunications Institute” (hereinafter IKAR) project was implemented, agreement No. 2010/0180/3DP/3.1.2.1.1/09/PIIA/VIAA/023, with ERDF funding of EUR 2.08 mil. (85% of eligible costs) and TSI investment of EUR 0.37 mil. (15% of the costs). The following activities were implemented within the project:

- delivery of telecommunications equipment and software;
- delivery of an automatic computer simulator;
- technical drawing, design and data analysis software;
- delivery of microelectronic and robotic equipment;
- delivery of stands for thematic physics training;
- computer network hardware and software;
- multimedia hardware and software;
- delivery of optometric equipment and software;
- delivery of hardware and software for remote sensing of the natural environment and ecological monitoring;
- delivery of distance learning hardware and software;
- purchase and installation of lifts;
- external reconstruction and renovation works of the building and customisation of internal and external stairs for people with disabilities;
- renovation and customisation of hygiene facilities for people with disabilities.

The IKAR infrastructure project offers TSI greater opportunities to improve its operations and increase efficiency by means of EU funding. The below table analyses the return on investment in the project.
<table>
<thead>
<tr>
<th>Project</th>
<th>Activities</th>
<th>Analysis of returns</th>
</tr>
</thead>
<tbody>
<tr>
<td>IKAR</td>
<td>The Telecommunications Laboratory and Computer Network Laboratory have been modernised within the project. The purchased equipment corresponding to the latest technologies ensures improvement of the quality of the training process of various study programmes, increases the number of courses dedicated to network technologies, and enhances network security.</td>
<td>The purchased equipment corresponding to the latest technologies ensures improvement of the quality of the training process of various study programmes, increases the number of courses dedicated to network technologies, enhances network security, and offers greater opportunities for the development of science and research. Various studies have been carried out and training courses improved over the last 5 years, enabling the increase of the number of students in the computer science, electronics and telecommunications programmes.</td>
</tr>
<tr>
<td>IKAR</td>
<td>The Multimedia System Laboratory was equipped with hardware in the framework of the project, ensuring the remote broadcasting of lectures, interactive IP TV broadcasting, photo and video recording, and high performance IT virtual infrastructure. During the project, data transmission networks were modified for multimedia broadcasting needs.</td>
<td>Owing to the innovations, the students have the possibility to access multimedia educational content, watch lecture broadcasts and laboratory works at the Latgalian Branch and on the internet. The equipment provided possibilities to considerably improve the quality of the study process at the Latgalian Branch, whilst at the same time reducing TSI costs.</td>
</tr>
<tr>
<td>IKAR</td>
<td>An Aerosim training simulator for servicing Airbus A320 airplanes was installed in the framework of the project. The procedure simulator is a 3D copy of an Airbus A320 cockpit, which looks like it and enables you to perform the same functions. The simulator enables one to perform aero-plane technical maintenance in close to real conditions. Reality of the sensations is ensured by the location of all the control elements on 12 touch-screen monitors, in the same way as in the A320 cockpit. The simulator also has an ‘iron’ embodiment of separate dashboard components — multipurpose control &amp; display unit (MCDU), aeroplane control lever, and flight control unit (FCU).</td>
<td>The simulator enables mastering all the skills necessary to perform Airbus A320 technical maintenance procedures, provides documentation, and guides through the device panel and unit compartment. The simulator is an absolutely precise virtual copy of the airliner allowing on and off control of any switch, replacement of devices, and mastering of any technical performance nuances, diagnostics and repair features. Moreover, this is done with no risk for passengers. The number of students in aviation programmes has rapidly increased over the last 3 years.</td>
</tr>
<tr>
<td>IKAR</td>
<td>Various software have been bought within the project: Mathematica versions — a powerful tool for analytical calculations, AnyLogic — a universal tool to imitate modelling, PTV VISSIM &amp; VISUM — a tool to model transport flows, SPSS Modeller — data analysis (datamining); OrCAD and Proteus VSM systems for automated design of electronic equipment and functional modelling of electronic systems; ArGIS geographical information system; IDS Sheer Aris system for Business Process Modelling; SPSS and STATISTICA software sets for statistical data processing.</td>
<td>The purchased software not only increases the efficiency of training, but is also able to ensure a scientific process with wider research opportunities. Various studies have been carried out and training courses improved over the last 5 years, enabling the increase of the number of students in the computer science, electronics and telecommunications programmes. Through the possibilities to carry out various types of research and experiments offered by the new software, several dozens of students got involved in the scientific process.</td>
</tr>
<tr>
<td>IKAR</td>
<td>Construction works on the building and customisation of its infrastructure for disabled persons were carried out within the project: - purchase and installation of lifts; - external reconstruction and renovation works of the building and customisation of internal and external stairs for people with disabilities; - renovation and customisation of hygiene facilities for people with disabilities.</td>
<td>Since persons with disabilities study and work at the university and the premises had not been accommodating for their needs, repair works were needed in the premises of the academic building. Now the TSI premises are fully customised for persons with disabilities and ensure availability of the environment.</td>
</tr>
</tbody>
</table>
Annex 1 provides a list of the investments in IT infrastructure, equipment and installations made within the IKAR project.

In addition to infrastructure projects, TSI made various investments from its own resources, enabling the attainment of TSI objectives and leading to benefits in the future. Major investments were made in the purchase of land and buildings: land and buildings for the Latgalian Branch purchased in 2004 and land and buildings in Riga purchased in 2015.

### Table 9.6: TSI investments between 2004 and 2016 Analysis of the return on investment

<table>
<thead>
<tr>
<th>TSI investments</th>
<th>Activities</th>
<th>Analysis of returns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land, buildings</td>
<td>Acquisition of land and buildings by TSI</td>
<td>Acquisition of buildings (incl. the belonging land) has several benefits:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- reduced TSI cost of renting premises (by an annual average of EUR 120 thous.);</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- increased revenue from leasing premises (by an annual average of EUR 40 thous.);</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- ensures that all training processes, scientific and administrative activities take</td>
</tr>
<tr>
<td></td>
<td></td>
<td>place on one property;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- more efficient use of premises.</td>
</tr>
<tr>
<td>Investment in fixed assets</td>
<td>Reconstruction and renovation of buildings</td>
<td>Reconstruction and renovation of buildings increased their efficiency and partially</td>
</tr>
<tr>
<td></td>
<td></td>
<td>reduced their management costs (up to an average of EUR 2 thous. per year).</td>
</tr>
<tr>
<td>Equipment</td>
<td>Updating and purchasing laboratory equipment</td>
<td>Laboratory equipment enables TSI to provide additional training in various courses,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>generating additional TSI revenues (up to an average of EUR 45 thous. per year).</td>
</tr>
<tr>
<td>Computer software</td>
<td>Updating and purchasing new computer software</td>
<td>Updating and purchasing new computer software and hardware increases the efficiency</td>
</tr>
<tr>
<td></td>
<td></td>
<td>of the work of both academic and management staff, which in turn has a positive</td>
</tr>
<tr>
<td></td>
<td></td>
<td>impact on TSI’s overall activity.</td>
</tr>
<tr>
<td>Computer hardware, etc.</td>
<td>Purchase of computer hardware</td>
<td>Purchasing furniture and other equipment increases the efficiency of the work of</td>
</tr>
<tr>
<td></td>
<td></td>
<td>both academic and management staff, which in turn has a positive impact on TSI’s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>overall activity.</td>
</tr>
<tr>
<td>Furniture and other equipment</td>
<td>Purchase of furniture and other equipment</td>
<td>Purchasing furniture and other equipment increases the efficiency of the work of</td>
</tr>
<tr>
<td></td>
<td></td>
<td>both academic and management staff, which in turn has a positive impact on TSI’s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>overall activity.</td>
</tr>
</tbody>
</table>

Taking into account that TSI’s core business is training within higher education study programmes (transport and logistics, computer science, electronics and telecommunications, aviation transport) where the training process is mainly based on field training, regular updating of the training computer hardware and laboratory equipment is required. Since TSI invested EUR 2.59 mil. in the purchase of land and buildings and renovated the sports hall in 2015, although insufficiently, computer hardware and laboratory equipment are now being updated. Consequently, TSI needs to attract external funding to update and develop infrastructure.

9.2.2. Investment attraction plan

The investment attraction plan was developed in view of the investments made over the last years described in Section 9.2.1 of the Strategy, the current state of infrastructure and logistical support, and the development prospects of the university over the next years. The table below shows the total investments and items, while their breakdown, especially regarding the development of STEM programmes, is provided in Section 9.3.4 “Investments planned in the development of STEM programmes”, and in Annex 3 “Modernisation of equipment, installations and IT infrastructure for the
needs of STEM study programmes”. Amounts indicated in the Investment Plan are VAT inclusive. Since normally a 5-year period is used for financial programming, investments are planned until 2021.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Renovation of the academic building for the needs of STEM programme implementation. Lomonosova St. 1, bldg. 3, Riga</td>
<td>350,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ERDF</td>
</tr>
<tr>
<td>Insulation of the academic building, increasing energy efficiency and renovation of networks. Lomonosova St. 1, bldg. 3, Riga</td>
<td>1,000,000</td>
<td>1,000,000</td>
<td></td>
<td></td>
<td></td>
<td>External and internal sources of finance (borrowed funds, shareholder loans, own revenue)</td>
</tr>
<tr>
<td>Renovation and repair of the academic building. Lomonosova St. 1, bldg. 3, Riga</td>
<td>16,800</td>
<td></td>
<td>1,000,000</td>
<td></td>
<td></td>
<td>External and internal sources of finance (borrowed funds, shareholder loans, own revenue)</td>
</tr>
<tr>
<td>Development of the academic building, incl. the purchase of furniture for the needs of STEM programme implementation. Lomonosova St. 1, bldg. 3, Riga</td>
<td>48,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>External and internal sources of finance (borrowed funds, shareholder loans, own revenue)</td>
</tr>
<tr>
<td>Renovation and insulation of the Scientific Centre building. Lomonosova St. 1, bldg. 10, Riga</td>
<td>300,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>External and internal sources of finance (borrowed funds, shareholder loans, own revenue)</td>
</tr>
<tr>
<td>Establishment of a TSI dormitory. Lomonosova St. 1, bldg. 12, Riga</td>
<td>500,000</td>
<td>500,000</td>
<td>200,000</td>
<td></td>
<td></td>
<td>External and internal sources of finance (borrowed funds, shareholder loans, own revenue)</td>
</tr>
<tr>
<td>Acquisition of real estate (buildings). Lomonosova St. 1, Riga (LU Faculty of Social Sciences)</td>
<td></td>
<td></td>
<td></td>
<td>1,000,000</td>
<td></td>
<td>External and internal sources of finance (borrowed funds, shareholder loans, own revenue)</td>
</tr>
<tr>
<td>Acquisition of real estate (land), ca 3,000 m². Riga, next to Lomonosova St. 1, bldg. 3</td>
<td>300,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>External and internal sources of finance (borrowed funds, shareholder loans, own revenue)</td>
</tr>
<tr>
<td>Repairs of Library premises</td>
<td>50,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>External and internal sources of finance (borrowed funds, shareholder loans, own revenue)</td>
</tr>
<tr>
<td>Purchase of electronic textbooks</td>
<td>200,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ERDF</td>
</tr>
<tr>
<td>Purchase of computer hardware and laboratory equipment</td>
<td>200,000</td>
<td>422,220</td>
<td>147,700</td>
<td>500,000</td>
<td></td>
<td>ERDF</td>
</tr>
<tr>
<td></td>
<td>866,800</td>
<td>1,720,220</td>
<td>1,947,700</td>
<td>1,500,000</td>
<td>1,700,000</td>
<td></td>
</tr>
<tr>
<td>Total by 2021</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7,734,720</td>
</tr>
</tbody>
</table>

*All amounts are VAT inclusive.*
9.3. Development plan of the infrastructure and material and technical base

9.3.1. Management system of the material supply and infrastructure at TSI

The TSI management system of the material supply and infrastructure comprises several elements (subsystems):

- Planning and organisation of material supply at the Institute;
- Organisation of rational and economical use of material resources, identifying reserves for resource savings;
- Preservation and maintaining in working condition of the building infrastructure and engineering networks used by TSI;
- Calculation of the consumption and stocks of material resources at the Institute;
- Recordkeeping of material supply: procurement, attraction, accounting, movements, preservation control, write-offs;
- Legal aspects: corporate regulations in the area of material supply and financial resources;
- Usage conditions of material resources to ensure their preservation and efficient use, environmental aesthetics, security and protection at work, and environmental protection.

The material resources needed for TSI operations are planned within the current annual budget based on justified requests from the organisational units concerned and taking into account the existing possibilities of the Institute and the previously prepared medium-term (3–5 years) plans for prospective acquisition of new equipment and installations.

The following resources are planned for use in pedagogical and scientific work:

- Material resources owned and held by TSI;
- Material resources to be bought in the following programming period or which are supplied under deferred delivery contracts;
- Material resources which TSI is going to attract from other entities based on rental, lease, lending or cooperation agreements.

According to external expert evaluation, one of the weaknesses of TSI’s operations is the low investment level and limited funding for priority research directions. Following the reconstruction of the Institute’s laboratories, the above problem concerns, first of all, the common infrastructure, buildings and networks used by TSI. It is therefore planned to program and use resources for the maintenance and repairs of buildings, maintenance of an appropriate working environment, and purchase of new equipment, hardware and literature.

9.3.2. Main objectives and tasks of the plan

To develop the material and financial resources for TSI’s pedagogical, scientific and innovation areas, the plan includes:

- ongoing monitoring of the technical condition of TSI’s auditoriums, laboratories, scientific equipment, installations, library and auxiliary rooms, and recording any needs for renewal, renovation or purchase of new resources;
- identification of the future needs of organisational units concerning the attraction of new material and technical resources;
- budgetary planning by including funds necessary for infrastructure development;
• works necessary to preserve and maintain in working condition the premises, infrastructure and engineering networks used by TSI, as well as the efficient, rational and economical use of devices and appliances and their components, and their technical maintenance;
• ensuring record-keeping of material supply: purchase, accounting, movements, preservation control, write-offs;

To determine the funds available for infrastructure development, TSI shareholders and the Management Board undertake medium-term budget forecasting (for 3–5 years) and annual budget planning, based on the evaluation of the condition of the material resources and procurement plans of scientific equipment and installations. All activities concerning the procurement, repairs and renewal of material supplies are carried out in accordance with the approved budget of the Transport and Telecommunications Institute.

9.3.3. Description of the existing infrastructure

9.3.3.1. Availability and workload of training facilities

A total of 40 rooms are used for training needs in the TSI owned building at Lomonosova St. 1, bldg. 3 in Riga; their description and workload are provided in the below table.

<table>
<thead>
<tr>
<th>No.</th>
<th>Auditorium No.</th>
<th>Number of places per auditorium</th>
<th>Auditorium type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>01</td>
<td>21</td>
<td>Practical training room</td>
</tr>
<tr>
<td>2</td>
<td>02</td>
<td>25</td>
<td>Computer classroom</td>
</tr>
<tr>
<td>3</td>
<td>03</td>
<td>24</td>
<td>Laboratory</td>
</tr>
<tr>
<td>4</td>
<td>101</td>
<td>25</td>
<td>Laboratory</td>
</tr>
<tr>
<td>5</td>
<td>105</td>
<td>24</td>
<td>Practical training room</td>
</tr>
<tr>
<td>6</td>
<td>126</td>
<td>36</td>
<td>Practical training room</td>
</tr>
<tr>
<td>7</td>
<td>130</td>
<td>250</td>
<td>Auditorium</td>
</tr>
<tr>
<td>8</td>
<td>220</td>
<td>52</td>
<td>Auditorium</td>
</tr>
<tr>
<td>9</td>
<td>221</td>
<td>92</td>
<td>Auditorium</td>
</tr>
<tr>
<td>10</td>
<td>222</td>
<td>70</td>
<td>Auditorium</td>
</tr>
<tr>
<td>11</td>
<td>223</td>
<td>100</td>
<td>Auditorium</td>
</tr>
<tr>
<td>12</td>
<td>224</td>
<td>24</td>
<td>Practical training room</td>
</tr>
<tr>
<td>13</td>
<td>225</td>
<td>60</td>
<td>Auditorium</td>
</tr>
<tr>
<td>14</td>
<td>226</td>
<td>15</td>
<td>Computer classroom</td>
</tr>
<tr>
<td>15</td>
<td>227</td>
<td>30</td>
<td>Computer classroom</td>
</tr>
<tr>
<td>16</td>
<td>230</td>
<td>68</td>
<td>Auditorium</td>
</tr>
<tr>
<td>17</td>
<td>303</td>
<td>21</td>
<td>Computer classroom</td>
</tr>
<tr>
<td>18</td>
<td>304</td>
<td>24</td>
<td>Computer classroom</td>
</tr>
<tr>
<td>19</td>
<td>305</td>
<td>22</td>
<td>Computer classroom</td>
</tr>
<tr>
<td>20</td>
<td>306</td>
<td>24</td>
<td>Computer classroom</td>
</tr>
<tr>
<td>21</td>
<td>503</td>
<td>25</td>
<td>Computer classroom</td>
</tr>
<tr>
<td>22</td>
<td>505</td>
<td>23</td>
<td>Computer classroom</td>
</tr>
<tr>
<td>23</td>
<td>703</td>
<td>60</td>
<td>Auditorium</td>
</tr>
<tr>
<td>24</td>
<td>710</td>
<td>30</td>
<td>Practical training room</td>
</tr>
<tr>
<td>25</td>
<td>903</td>
<td>60</td>
<td>Auditorium</td>
</tr>
<tr>
<td>26</td>
<td>904</td>
<td>15</td>
<td>Practical training room</td>
</tr>
<tr>
<td>27</td>
<td>905</td>
<td>24</td>
<td>Practical training room</td>
</tr>
<tr>
<td>28</td>
<td>906</td>
<td>40</td>
<td>Practical training room</td>
</tr>
<tr>
<td>29</td>
<td>I</td>
<td>170</td>
<td>Auditorium</td>
</tr>
<tr>
<td>30</td>
<td>II</td>
<td>210</td>
<td>Auditorium</td>
</tr>
</tbody>
</table>
The workload analysis of the TSI Riga academic building in the academic year 2015/2016 shows regular difficulties in the planning of training sessions due to the uneven number of groups studying various subjects and other factors regarding the number of students or course content which cannot always be predicted. Practically all of the above-mentioned premises can be, to a greater or lesser extent, used for the implementation of training programmes in STEM directions, since the auditoriums are not strictly divided by Faculties, study directions or programmes. As already mentioned in the Real Estate Development Plan, due to the planned increase in the number of students, (an active student attraction policy is being implemented) additional auditoriums need to be placed in the TSI academic building by optimising their use and redesigning some areas according to the type of use.

The following rooms are used for training needs in the TSI owned building on Varsavas St. 43 b in Daugavpils:

<table>
<thead>
<tr>
<th>No.</th>
<th>Auditorium No.</th>
<th>Number of places per auditorium</th>
<th>Auditorium type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>102</td>
<td>30</td>
<td>Auditorium</td>
</tr>
<tr>
<td>2</td>
<td>104</td>
<td>28</td>
<td>Auditorium</td>
</tr>
<tr>
<td>3</td>
<td>105</td>
<td>34</td>
<td>Auditorium</td>
</tr>
<tr>
<td>4</td>
<td>106</td>
<td>24</td>
<td>Auditorium</td>
</tr>
<tr>
<td>5</td>
<td>201</td>
<td>24</td>
<td>Auditorium</td>
</tr>
<tr>
<td>6</td>
<td>203</td>
<td>24</td>
<td>Computer classroom</td>
</tr>
<tr>
<td>7</td>
<td>302</td>
<td>24</td>
<td>Computer classroom</td>
</tr>
<tr>
<td>8</td>
<td>305</td>
<td>8</td>
<td>Computer classroom / Library</td>
</tr>
</tbody>
</table>

Due to the fact that training sessions at the TSI Latgalian Branch only take place on Fridays, Saturdays and Sundays, no data about the workload of auditoriums in the branch building are recorded.

9.3.3.2. TSI’s existing fixed assets and their sources

The total value of TSI’s fixed assets is EUR 7.18 mil., constituted by the land and buildings owned by the university, as well as by the equipment and computer software.

<table>
<thead>
<tr>
<th>Item</th>
<th>TSI investment</th>
<th>IKAR project</th>
<th>Learn IT project</th>
<th>LZP project</th>
<th>Next IT project</th>
<th>TSI IKA project</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment</td>
<td>34,723</td>
<td>808,461</td>
<td>11,541</td>
<td></td>
<td></td>
<td></td>
<td>854,725</td>
</tr>
<tr>
<td>Computer software</td>
<td>128,806</td>
<td>289,378</td>
<td></td>
<td></td>
<td></td>
<td>41,019</td>
<td>459,203</td>
</tr>
<tr>
<td>Computer hardware, etc.</td>
<td>453,343</td>
<td>1,088,343</td>
<td>606</td>
<td>4,178</td>
<td></td>
<td>1,546,470</td>
<td></td>
</tr>
<tr>
<td>Land, buildings, land for construction</td>
<td>3,574,680</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3,574,680</td>
<td></td>
</tr>
</tbody>
</table>
### 9.3.3.3. Current condition of the IT infrastructure and the main challenges

Today, the TSI IT infrastructure includes 42 auditoriums equipped with personal computers, projectors and TVs. 11 of those are computer classrooms with over 20 workstations equipped with computers. The IT infrastructure includes its own data centre providing the learning process with the necessary servers and connecting internal networks and optical telecommunications channels. The equipment is actually outdated, and the underlying problems are associated with insufficient capacity, limited technical possibilities, and insufficient data storage space, etc. To resolve these problems, investments are required in capacity increase, additional power supply units, increase of RAM, improvement of data storage facilities, and purchase of new servers.

As regards local networks, the Institute has a 1 Gb/s CAT trunk network, and although wireless network covers almost all the premises (802.11/b/g/n standards), in many places there are difficulties to distribute channels between the TSI staff, voice network and data transmission of the student subnetwork. To resolve the local network problems, data transmission channels from trunk switching units to subscribers need to be installed, which would distribute network signals and increase the overall stability of the computer network.

The number of access points to the Wi-Fi network needs to be increased in the academic building, and the controller must be updated.

As regards the computer classrooms, the predominant concern is the outdated computers: in six computer classrooms in Riga (AK-305, AK-306, AK-503, AK-503, AK-01, AK-02), the computers were purchased more than 8 years ago. The computers in the Library are also outdated, their number is insufficient, and they do not provide for a possibility to efficiently work with electronic literature. The TSI staff computers are also outdated: 56% of monitors and 58% of computers are more than 6 years old. Investment in the purchasing of new computers is necessary to address the problem.

The software required for the learning process (Moodle 3, 972 courses, Intranet, conference system, final examination system) does not ensure sufficient links with the learning process, system functionality is poorly integrated in the management process, performance of the distance learning system and Intranet is poor, many other technical deficiencies exist requiring updates, and an “Electronic Dean’s Office”, server replacement, introduction of a conference system, etc., are necessary. A detailed description (list) of the existing IT infrastructure including justification for modernisation is available in Annex 2.

### 9.3.3.4. The existing teaching equipment and installations

#### Telecommunications, Electronics and Robotics Centre laboratories

The Telecommunications, Electronics and Robotics Centre was established in 2013 within the framework of the IKAR project, with financial support from the ERDF. The Centre features 9 laboratories with modern software and technical equipment actively used in both academic and research work. Each laboratory is a complex of modern technical, software and methodological support, enabling courses to be conducted at the highest level. A detailed description of the existing laboratory equipment is available in Annex 1.
Laboratory of Telecommunications and Electro-Optical Systems

The Laboratory is intended to enable students to explore the construction principles of telecommunications equipment. The Laboratory is equipped with stands demonstrating the principles of operation of the following systems:

- mobile communications systems (GSM);
- global navigation systems (GPS);
- radio-frequency identification systems (RFID);
- optoelectronic systems;
- digital telecommunications networks;
- radio transmission and reception devices;
- antenna-feeder devices.

Modernisation is needed that is unrelated to the maintenance of the existing infrastructure, but that will enhance the functional properties of the equipment.

Laboratory of Industrial Automation

The Laboratory is equipped with Siemens control systems and production line models. The Laboratory is designed for mastering the principles of industrial networks and engineering of automation systems based on industrial logic controllers. The Kawasaki RS03N industrial manipulator allows learning the principles of programming industrial robots and exploring the features of integrating robotic devices into automated production lines. Modernisation is needed that is unrelated to the maintenance of the existing infrastructure, but that will enhance the functional properties of the equipment.

Laboratory of Electronics

This laboratory is equipped with typesetting fields for creating analogue and digital electrical circuits. Experimental research is carried out on both separate components of electrical systems (semiconductor diodes, transistors, integrated micro-assemblies) and functional units of electrical systems (amplifiers, automatic generators, etc.). A universal specialised stand enables the exploration of the automotive electronic system. All experimental research is conducted using modern digital measuring equipment. Modernisation is needed that is unrelated to the maintenance of the existing infrastructure, but that will enhance the functional properties of the equipment.

Laboratory of Subsurface Radiolocation

The laboratory is equipped with a GSSI SIR-30 double-channel ground penetrating radar and a set of options for roadbed research. A set of replacement antennae enables sensing at a depth of 0.1–4.0 m and assessing the condition not only of the asphalt road surface layer, but also the internal structure of load-bearing base layers. RADAN 7 software has been installed in the laboratory for the processing of the ground penetrating radar data, which enables exploring not only methods for non-destructive control of road surfaces, but also detection and mapping of hidden engineering communications. Modernisation is needed that is unrelated to the maintenance of the existing infrastructure, but that will enhance the functional properties of the equipment.

Laboratory of Physics and Electrical Machines

The laboratory is equipped with PHYWE training equipment, which allows students to explore the effect of the fundamental laws of physics by their separate domains: mechanics and molecular physics, electricity and magnetism, wave processes and optics.

Work with the equipment helps to develop modern physical experimenting skills using computer processing methods of measurement results. The universal K&H MFG laboratory stand of electrical machines helps to explore the principles and work of modern electric motors. No modernisation is required.
Laboratory of Robotics and Student Research Work

The Laboratory is equipped with a variety of modern measuring equipment made by HAMEG and a set of debug modules for microcontrollers, PLIC and signal processors. The NI ELVIS II software and hardware platform allows carrying out research on the operation of electronic devices through physical, semi-natural and mathematical simulation. The Laboratory features a set of functional units of robots from LEGO, Lynxmotion, Pololu and Parallax, which enables the creation of autonomous mobile robots and exploring in the Laboratory the principles of the control system architecture of robotic facilities.

Modernisation is needed, since the robots at the disposal of the Laboratory do not contain the required electronic, power and processor components, preventing their use at training courses dedicated to studying mechatronics, robotics, artificial intelligence and embedded robotics. The Laboratory equipment should be modernised by supplying mobile robots with a finished construction and functionality containing processors and network devices that are reprogrammable to address a wide range of tasks.

Laboratory of Designing and Prototyping

The Laboratory is equipped with software and hardware for the production of prototypes of electronic devices, including the CNC LPKF Protomat S63 machine tool for the production of double-sided printing plate circuit boards. The soldering equipment of the Laboratory enables assembly using PTH (Pin Through Hole) and SMT (Surface Mount Technology) technologies. No modernisation is required.

Laboratory of Modelling of Electronic Systems

A computer classroom with modern software, enabling the simulation of electric circuits and designing of printing plate circuit boards. The list of software includes:

- OrCAD Electronic Design Automation package;
- Proteus VSM Functional Modelling (Simulation) System;
- Modelling (Simulation) System of NI Multisim Industrial Standard;
- NI LabVIEW Graphical Programming System;
- AVR Studio Designing System for Microcontrollers;
- Xilinux ISE WebPACK Designing System for PLIC (programmable logic integrated circuits), and others.

Modernisation is needed that is unrelated to the maintenance of the existing infrastructure, but that will enhance the functional properties of the equipment. Software updates are necessary to enable modelling of electronic systems, power electronics, super high frequency devices, complicated embedded systems, intelligent devices, and telecommunications systems.

Laboratory of Embedded Systems and Digital Signal Processing

The laboratory is equipped with special debug kits with modern AVR, Freescale, STMicroelectronics microcontrollers, as well as XILINX programmable logic circuits. The laboratory equipment allows designing and exploring digital signal processing systems and intelligent control systems.

Modernisation is needed that is unrelated to the maintenance of the existing infrastructure, but that will enhance the functional properties of the equipment (including computers) and software.

In view of the rapid technological development and the range of STEM programmes, the plans are to establish three new laboratories: Laboratory of Training and Manufacturing Practice; Laboratory of Mobile Robots, and Automatic Control Laboratory of System Elements. In view of the planned purchase of equipment for studying embedded electronic systems, SMART and INTERNET of things technologies, it would be useful to:
- Transform the Laboratory of Embedded Systems and Digital Signal Processing into the Laboratory of Digital Signal Processing and place it in the laboratory premises already in use, using in the learning process all the acquired equipment and devices in the same study programmes for the purpose for which they were purchased;
- Establish a new Laboratory of Embedded Systems and SMART Technologies.

Other laboratories

Laboratory of Applied Software Systems

The Laboratory ensures training and research in the areas of transport, logistics and business processes, using IT solutions for simulation modelling. Modernisation is needed that is unrelated to the maintenance of the existing infrastructure, but that will enhance the functional properties of the software and hardware.

Multimedia Laboratory

The laboratory is equipped with video-recording and editing equipment and software, which enables creating educational, informative and commercial videos. The filming process of video lectures for distance learning purposes, sound recording of video materials and their preparation for placing into e-studying environment take place at the filming studio. The Laboratory also ensures live broadcasts of lectures and conference reports by the Institute’s instructors and invited guest lecturers on the internet. The Laboratory software and hardware need to be updated.

The Computer Network Technology Laboratory “Cisco Networking Academy” prepares computer network design and operation professionals in accordance with international standards. Training takes place in a special laboratory equipped with modern professional Cisco equipment. No modernisation is required.

Microsoft IT Academy: the Microsoft IT Academy Programme is a global solution of the Microsoft Corporation in the area of education, enabling the unification of students, lecturers and professional communities of IT specialists. No modernisation is required.

The Academic and Professional Aviation Centre (APAC) as a TSI organisational unit is located in the Institute’s academic building, occupying the basement floor premises and featuring 2 classrooms and 2 laboratories. The main problem is the insufficient space for practical training. The premises need renovation and better adaptation to the training process (additional 400 m²). To ensure the training process, the purchase of a high level two-contour aviation gas turbine engine and establishment of Non-destructive Aircraft Control Methods and Composite Material Laboratories is necessary.

9.3.4. Planned investment in the development of STEM programmes by 2020

The table 9.10 below details all the planned TSI investments in the development of STEM programmes over the next years. The measures include both the renovation and insulation works, and the purchase and modernisation of equipment and installations.
<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Description, notes</th>
<th>Planned investment, EUR</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Building 3 new auditoriums on the ground floor of the academic building Lomonosova St. 1, bldg. 3, Riga</td>
<td>Planned area: 195 m$^2$; 100 new training places will be arranged for students</td>
<td>Construction: 70,000  Development: 13,000</td>
<td>ERDF; External and internal sources of finance (borrowed funds, shareholder loans, own revenue)</td>
</tr>
<tr>
<td>2</td>
<td>Library renovation and extension Lomonosova St. 1, bldg. 3, Riga</td>
<td>Actual area: 190 m$^2$, planned area: 262 m$^2$</td>
<td>Construction: 50,000</td>
<td>External and internal sources of finance (borrowed funds, shareholder loans, own revenue)</td>
</tr>
<tr>
<td>3</td>
<td>1 new room for the practical training of students of aviation and other STEM directions on the basement level of the academic building Lomonosova St. 1, bldg. 3, Riga</td>
<td>Planned area: 400 m$^2$; 24 new training places will be arranged for students, as well as premises for other functions, including technical facilities</td>
<td>Construction: 100,000  Development and technical facilities: 35,000</td>
<td>ERDF; External and internal sources of finance (borrowed funds, shareholder loans, own revenue)</td>
</tr>
<tr>
<td>4</td>
<td>Renovation and insulation of auditoriums No. I, II and III on the 1st floor of the academic building Lomonosova St. 1, bldg. 3, Riga</td>
<td>Total area: 656 m$^2$</td>
<td>Construction: 196,800</td>
<td>ERDF</td>
</tr>
<tr>
<td>5</td>
<td>Building insulation to improve energy efficiency (including engineering systems) Lomonosova St. 1, bldg. 3, Riga</td>
<td>Total area: 13,567.10 m$^2$</td>
<td>Construction: 2,000,000</td>
<td>External and internal sources of finance (borrowed funds, shareholder loans, own revenue)</td>
</tr>
<tr>
<td>6</td>
<td>Renovation of the Scientific Centre building to establish new laboratories Lomonosova St. 1, bldg. 10, Riga</td>
<td>Total area: 690.5 m$^2$, including: Laboratory of Electrical Machines — 55 m$^2$  Laboratory of Embedded Systems and Smart Technologies — 45 m$^2$  Advanced Prototyping Laboratory — 60 m$^2$  Laboratory of Mobile Robots — 60 m$^2$</td>
<td>Construction: 300,000</td>
<td>External and internal sources of finance (borrowed funds, shareholder loans, own revenue)</td>
</tr>
<tr>
<td>7</td>
<td>Building and development of a dormitory Location: plot adjacent to the TSI academic building</td>
<td>Approximate area: 600 m$^2$</td>
<td>Construction: 1,200,000</td>
<td>External and internal sources of finance (borrowed funds, shareholder loans, own revenue)</td>
</tr>
<tr>
<td>8</td>
<td>Modernisation of the equipment and facilities at the existing 7 laboratories; Establishment of 4 new laboratories</td>
<td>7 existing laboratories; Establishment of 4 new laboratories. Detailed breakdown provided in Annex 3.</td>
<td>535,000</td>
<td>ERDF; External and internal sources of finance (borrowed funds, shareholder loans, own revenue)</td>
</tr>
<tr>
<td>9</td>
<td>Purchase of electronic textbooks</td>
<td>Renewal of the Library collection in TSI educational and research directions. Acquisition of textbooks for distance learning purposes, as well as remote access to the Library collection for students, teachers and scientific staff.</td>
<td>200,000</td>
<td>ERDF</td>
</tr>
<tr>
<td>10</td>
<td>Modernisation of the IT infrastructure</td>
<td>Computers, servers, software.</td>
<td>204,920</td>
<td>ERDF</td>
</tr>
<tr>
<td>11</td>
<td>Modernisation of APAC equipment and facilities</td>
<td>Establishment of 2 new laboratories, Detailed breakdown provided in Annex 3.</td>
<td>300,000</td>
<td>ERDF: External and internal sources of finance (borrowed funds, shareholder loans, own revenue)</td>
</tr>
<tr>
<td>----</td>
<td>-----------------------------------------------</td>
<td>-------------------------------------------------------------------</td>
<td>-------</td>
<td>------------------------------------------------------------------</td>
</tr>
</tbody>
</table>

The plans within the specific objective 8.1.1 “To increase the number of study programmes of the modernised STEM, including medicine and creative industries” of the EU Operational Programme 2014–2020 “Growth and Employment”, for the use of ERDF funds, include the performance of construction works in the volume not exceeding 30% of the funding available to TSI (EUR 1,174,189), at the same time investing in laboratory equipment and purchasing computer hardware and software and electronic textbooks. Annex 6 of the Strategy “Investments within the ERDF project “Modernisation of the STEM Programmes of the Transport and Telecommunications Institute” (MODERN_STEM) in 2017–2019” provides a list of the investments planned within the EU funds SO 8.1.1, while Annex 7 “Actions Complementary to Investment within the ERDF project “Modernisation of the STEM Programmes of the Transport and Telecommunications Institute” (MODERN_STEM) in 2019” includes investments that will be covered from the SO 8.1.1 grant reserve funds of EUR 76,272.

 Planned workload of the infrastructure and its sharing with other higher education institutions
Within the SO 8.1.1, investments will be made to establish new auditoriums (on the ground floor), renovate the existing 3 auditoriums (on the 1st floor) and in the new premises for practical training of aviation and STEM programme students (on the basement floor). At the moment, there is an acute problem with the uneven workload of auditoriums depending on the time of the day, day of the week, month and semester. Many students study part-time, and the auditoriums are filled to the maximum on Saturdays and during the evenings. An acute shortage of auditoriums is experienced during those periods and difficulties with course scheduling arise for teachers, including foreign instructors. It is problematic to find auditoriums during the daytime on Tuesdays, Wednesdays, Thursdays and Saturdays, especially during the autumn semester. This problem is less felt during the spring semester, when senior students undergo traineeships or write diploma papers. The planned workload of STEM direction students for auditorium No. I (1st floor) is an average of 560 hours per year, with 950 hours per year for auditorium No. II (1st floor), and 706 hours per year for auditorium No. III (1st floor). It is difficult to estimate the planned workload of the 3 new auditoriums on the ground floor, which may reach an average of 700 hours per year. The planned workload of the basement floor premises (400 m²) for the practical training of aviation and other STEM direction students may reach 525 hours per year. The planned workload of the Laboratory of Designing and Prototyping is 352 hours per year. The planned workload of the Laboratory of Mobile Robots is 464 hours per year. The planned workload of the Automatic Control Laboratory of System Elements is 416 hours per year.

Sharing of the built infrastructure with other higher education and scientific institutions will be ensured on the basis of the existing and future cooperation agreements. Strategy Section 8.1 “Types of international cooperation and their development possibilities” provides a list of TSI’s foreign partners — universities and scientific institutions. TSI has a lasting cooperation with the University of Latvia, Vidzeme University, Ventspils University College and Latvian Maritime Academy, and has signed cooperation agreements with local scientific institutions — the Institute of Physical Energetics and Institute of Electronics and Computer Science. The TSI research infrastructure has been registered with the UseScience system, which enables industry stakeholders, research organisations, and education and academic institutions to access the required facilities and infrastructure.
Links and synergies of the development of the infrastructure and material and technical base with other investments

In addition to the planned ERDF project investments under SO 8.1.1 of the “Growth and Employment” Operational Programme 2014–2020, TSI is planning infrastructure modernisation works worth EUR 4.03 million. As a private university, TSI has no access to other EU programme funding, including within the SO 1.1.1 activity 1.1.1.4 “Development of R&D infrastructure in the areas of smart specialisation and strengthening the institutional capacity of scientific institutions”. Private universities may also not apply for funding from the European Commission’s Cross-Border Cooperation programmes.

TSI will consider possibilities to attract external funding for insulation of the academic building and infrastructure modernisation, including by analysing borrowing options and opportunities offered by ESKO energy service companies. TSI takes an active part in the European Commission’s Horizon 2020 programme; it is likely that the university will have a possibility to purchase laboratory equipment for joint research within the projects. In view of the amount of investment, it can be concluded that major financial investment is not possible from own revenue. Given the nonexistence of budget grants and the limited possibilities to receive EU funding for infrastructure modernisation, participation in the EU funded SO 8.1.1 project is actually the only possibility to receive aid for infrastructure modernisation.

As regards previous investments in the STEM study programmes planned for modernisation and non-duplication with the EU structural funds investments to date, Annex 4 of the Strategy provides a detailed list of the investments in IT infrastructure, purchase and modernisation of training equipment and facilities in 2010–2013 within the ERDF project “Information and Communications Technologies as a Single Academic Resource of the Transport and Telecommunications Institute”; information is also available about the needed modernisation and its justification. The infrastructure investments referred to in Annex 4 are the only ones with EU structural funds investments as the source. Various scenarios were analysed in 2016 concerning investment in laboratories and IT infrastructure within SO 8.1.1. With regard to laboratories, a decision was made to invest EU funds in two new laboratories and to purchase additional equipment for the existing Laboratory of Designing and Prototyping which today has no such equipment or its analogues. This excludes the potential occurrence of investment duplication.