Abstract—The main problem is that there is a very low innovation performance in Latvia. Since Latvia is a Member State of European Union, it also shall have to fulfill the set targets and to improve innovative results.

Universities are one of the main performers to provide innovative capacity of country. University, industry and government need to cooperate for getting best results.

The intellectual property is one of the indicators to determine innovation level in the country or organization, and patents are one of the characteristics of intellectual property.

The objective of the article is to determine indicators characterizing innovative environment in Latvia and influence of the development of universities on them.

The methods that will be used in the article to achieve the objectives are quantitative and qualitative analysis of the literature, statistical data analysis and graphical analysis methods.

Keywords—HEI, innovations, Latvia, patents.

I. INTRODUCTION

The European Commission conducts on a regular basis the analysis of innovation performance of EU countries. The study “Innovation Union Scoreboard 2013” includes innovation development performance in eight spheres. Among 27 countries included in the analysis, Latvia takes the 25th place, just ahead Bulgaria and Romania. The innovation performance of these three countries, as well as of Poland is well below the EU average. In the previous study conducted in 2011, Latvia was the last – 27th. The immediate neighbors of Latvia in the Baltic countries took better positions: Lithuania – the 25th and Estonia – the 14th [13].

The European Union’s strategic plans include the target that the higher education institutions become more pronounced of the development of universities on them.

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II. MOVING OF HIGHER EDUCATION INSTITUTIONS TOWARDS MODERNIZATION

In order to evaluate interaction of higher education institutions and innovations, it is necessary first to consider types of higher education institutions. There are several

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classifications how the scientists group the higher education institutions.

One of the classifications is Carnegie breakdown of higher education institutions that classifies the higher schools mainly by types of school graduates. Carnegie Classification for higher education institutions is made by Carnegie Commission. The Carnegie Classification has been the leading framework for recognizing and describing institutional diversity in U.S. higher education for the past four decades. Starting in 1970, the Carnegie Commission on Higher Education developed a classification of colleges and universities to support its program of research and policy analysis. Derived from empirical data on colleges and universities, the Carnegie Classification was originally published in 1973, and subsequently updated in 1976, 1987, 1994, 2000, 2005 and 2010 to reflect changes among colleges and universities [29], [2].

There are researchers, which state that the higher education institutions can be divided in groups more accurately. Summarizing this method of classification, four main types of universities can be distinguished:

1) Research-Intensive universities;
2) Teaching-Intensive universities;
3) Communal-Intensive universities;
4) Professional-Intensive universities [3].

Recently, the higher educational institutions are classified in a different way, taking into account their impact on science, innovativeness and entrepreneurship. Such higher educational institutions as the Third Generation Universities and Business Universities have been distinguished as the most advanced universities. Wissema Classification shows the special features of Third Generation Universities.

At present, the universities should strive to business development, making researches between a numbers of existing sectors or creating new research areas more attention paying to creativity and practical manifestations, regardless of nationality.

In Latvia, Riga Technical University is one of the universities that have included the progress and development as the Third Generation University in its strategy [27].

Another popular model for the entrepreneurial university is the "triple helix model" [6], [7] which is based on academic-industry-government linkages forming a spiral pattern of cooperation [10]. This model suggests new understandings and metrics for traditional teaching and research missions, internal organizational changes that are more conductive to collaboration (both internal and external), new modes of governance and management and new institutional capacities. On a closer look, this view is also resonates with the knowledge transfer view with emphasis on advancing economic development through the strategy of technological innovation. Whereas managerial processes are processes mainly of control, normality, and standardization, the "entrepreneurial” approach is about play, anomaly, and movement [11], [16].

In a knowledge society, the universities must move to such category of higher institutions as business universities. One of the models that describe the business university is “Triple Helix” model, which determinates the university-industry-state relationships and has a number of possible variations [5], [7].

Classical “Triple Helix” model and relationships among university, industry and state you can see in Fig. 1.

![Tri-lateral networks and hybrid organizations](image)

Entrepreneurial universities are expected to play a leading role in regional innovation and to encourage start-ups. Similarly, industry is expected to reorganize itself in a network mode to be more receptive to external inputs. Government is expected to develop programs cooperatively with the other actors to support enhancement of the university, industry and the links between them. The three spheres are expected to act as a common subject and cooperatively implement an economic growth strategy [6].

Three selection environments are specified in the Triple Helix model:

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### TABLE II

<table>
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<th>Characteristics of the generations of universities [35]</th>
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<td><strong>1st generation</strong></td>
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<tr>
<td>Objective</td>
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<tr>
<td>Role</td>
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<td>Method</td>
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<td>Creating</td>
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<td>Orientation Language</td>
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<td>Organization Management</td>
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Fig. 1 Classical Triple-Helix model [7]
1) wealth generation (industry);
2) novelty production (academia);
3) public control (government) [21].

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<tr>
<th>Sub-dynamics</th>
<th>Wealth generation</th>
<th>Novelty production</th>
<th>Public control</th>
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<tr>
<td>Carriers</td>
<td>Industry—University—Government</td>
<td>Industry—University—Government</td>
<td>Industry—University—Government</td>
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In the analytical model, the different perspectives of government, industry, and academia can first be spanned along orthogonal axes, and the observables can then be appreciated as interaction effects among the functions (Fig. 2). For example, since the second half of the 19th century, corporations have operated R&D laboratories, which contribute systematically to novelty production alongside academia. However, universities can also be considered as state apparatuses. Administrative innovations like patent legislation have reshaped the three environments by providing a nexus among them [30].

Performing literature review and analyzing different definitions and explanations of the concept “patent” from several research papers and official offices of patents by the use of “Tag Cloud” (Fig. 3) method that “patent is an invention protected by grant” [1], [4], [9], [12], [19], [20], [23], [24], [31]-[34]. Patents reflect a country's inventive activity. Patents also show the country's capacity to exploit knowledge and translate it into potential economic gains. In this context, indicators based on patent statistics are widely used to assess the inventive performance of countries [8].

On the other side, there are scientists that believe that patent counts are very imperfect measures of innovative output [17]. In order to determinate the innovative potential of Latvia, at first, it is necessary to view the application share at European Patent Office (EPO) per population of the country.
Considering the total number of patent application share in European Patent Office (EPO) per million residents (Fig. 4), Latvia takes one of the last places in Europe, far below the European Union average (almost 13 times). Latvia is behind the leading European country even 33 times in terms of applied patents. The increase in this indicator is affected by several factors, including the scientific infrastructure, research staff creativity, financial security, etc.

R&D funding is one of the main factors that influence the creation of new patents. In order to determine Latvian patent application creation potential, it is necessary to view application share at European Patent Office (EPO) per national R&D funding.

Funding towards research and development can be correlated with an increase in the number of patents as you can see in Fig. 6, but it takes a certain time lag, as, in order to prepare a patent application, time is required for innovative research. In other words, increasing R&D funding, the returns from it will be after a certain time period, until the equipment will be renewed, more knowledgeable and more creative staff will be involved, the research will be performed in respective field and the innovation will be developed.

Higher education and research institutions are the base, where most of the research processes take place and new patents are created.

As it can be seen from the diagram (Fig. 7), the major applicant of patents and licenses is Riga Technical University,
which is the leading university of engineering sciences in Latvia. Besides, this university is the only higher education institution in Latvia that has included the movement and development as a Third Generation University in its strategy, as mentioned above. So it can be seen that the university is on the right way forward.

As it can be seen from the increase in the patent share of Riga Technical University in the total number of the Latvian patents shown in the diagram (Fig. 8), the trend is rapidly progressive. The increase in the number of patents is facilitated by financing from European Union structural funds leveraged for research and development growth. The decrease in the year 2010 is a consequence of financial crisis in Latvia in 2008 – 2009, that was followed by the decrease also in funding for research and development.

IV. CONCLUSION

There is a very low innovation performance in Latvia; according to the studies it takes 25th place among all EU countries. As an EU Member country, it shall have to achieve targets set in EU, including those that can help develop innovative environment – the funding from total GDP shall be increased and an environment of universities shall be improved, as it is a base for innovative activities. The movement of the higher educational institutions towards the Third Generation University type is one of the elements for improving of innovation potential.

At present, the universities should strive to business development, making researches between a numbers of existing sectors or creating new research areas more attention paying to creativity and practical manifestations, regardless of nationality.

The intellectual property is one of the indicators to determine innovation level in the country or organization, and patents are one of the characteristics of intellectual property. They can be considered both at public level and at the level of individual universities. Patents are one of the indicators, by which the innovation level of the country, as well as university-industry-state interaction can be described.

There exist contradictory opinions about the patent as an innovative element. The major part of scientists believes that patents reflect a country’s inventive activity. Patents also show the country’s capacity to exploit knowledge and translate it into potential economic gains. But there are scientists that believe that patent counts are very imperfect measures of innovative output.

Latvia lags behind the average European Union innovation development performance also by factors affecting the innovation environment: both by the number of patent applications and by research and development funding.

At the level of higher education institutions, the greatest contributions in the development of Latvian innovations are made by Riga Technical University with the largest number of applied patents. This university is the only higher education institution in Latvia that has included the movement and development as a Third Generation University in its strategy, in that way clearly defining its movement to research excellence.

REFERENCES


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