

EDUCATION PARADIGM CHANGE AND IMPACT ON SUSTAINABLE ECONOMIC DEVELOPMENT: A CASE STUDY OF LATVIA

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Abstract. This research paper analyses the importance of a sustainable education-economy nexus in Latvia by analysing theoretical sources and expert opinions. The study reveals a paradigm shift in education towards an integrated, problem-oriented approach that promotes an eco-efficient economy. The focus is on synergies between education and industry, with particular emphasis on the role of knowledge-intensive business services in sustainable development. The article provides a new perspective of human capital on the interaction between education and the economy, pointing to the need for adaptive lifelong learning to promote sustainable economic development in Latvia. The results show that the Triple Helix integrated approach promotes knowledge sharing and positively recommends an innovation ecosystem, which is essential for sustainable economic development. However, the validity of the findings is limited by the country focus and data limitations. The study highlights the need for further research and improvements in policy making.

Keywords: Triple Helix, human capital, education transfer, innovation ecosystems, sustainable development, lifelong learning.

JEL Classification: J24.

1. Introduction

Innovation requires not only financial investment, but above all intellectual investment, ideas and wisdom. If a country's intellectual capital is not high enough or is directed towards other goals, one possible route to success is to use and learn from success stories (Ozols et al., 2012). Innovation is key to economic growth and sustainable development. The interaction between government, business and academia plays a key role in fostering innovation. Developing collaboration helps to understand how these sectors work together to promote the well-being of all involved.

In recent years, technological progress driven by pandemics has played a significant role in the world and in Latvia, as well as in the emergence of innovative processes in government, industry and academia. These events have clearly highlighted the need to work together and to change and adapt our strategies. Changing public and business attitudes towards consumption and wholesale trade could help to shift towards a sustainable economy. An economy that is able to make trade-offs between

economic, social and environmental aspects. Innovation systems are not only a neat element in the internal environment of each sector, but also serve as a common evolutionary perspective. It is the public institutions that are the main drivers of compromise (Leydesdorff, 2005).

The Green Deal sets targets for European Member States to achieve climate neutrality by 2050, focusing on a number of key sectors such as clean energy, sustainable industry, construction and renovation, biodiversity and others. To achieve these goals, new educational methods and programmes need to be developed with an engineering focus. Attention must be paid to human capital, which must be able to navigate these concepts (Kalnbalkite, 2023).

Research on cooperation between government, industry and universities can improve the competitiveness of countries and regions by helping to build effective innovation systems and fostering cooperation between different stakeholders. It is important to keep the focus on employment, which is closely linked to higher or further education. Education is an important factor in

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the development of today's economy, as it contributes to increasing productivity and enables people to adapt quickly to technological change. Human capital refers to people's knowledge, skills, education, experience and competences that are used in the labour market and in productive activities. It includes people's potential and contribution to economic development. Human capital should be seen as a long-term investment (Giziene & Simanaviciene, 2015).

Today, as technological development and globalisation shape an increasingly changing and demanding labour market, the ability of education systems to adapt to these changes has become a critical factor in a country's economic competitiveness and sustainability. Latvia, like many other countries, faces the need to reform its education system to better meet the needs of today's and tomorrow's labour market.

Latvia's labour market has undergone major changes, driven by demographic shifts, the structural transformation of the economy and the introduction of new technologies. These changes are placing new demands on the skills and competences of the workforce, underlining the need for lifelong learning and skills renewal.

By highlighting the importance of the Triple Helix model for the development of human capital and innovation ecosystems in Latvia, this study makes an important contribution to our understanding of building a sustainable economy, opening up new perspectives and opportunities for both academic researchers and policy makers.

2. Research question and methods

The choice of methodology for this study is based on the need to provide an in-depth and objective understanding of the impact of the Triple Helix model in Latvia through a systematic literature review. This approach allows for a methodical selection and analysis of scientific sources, ensuring the reliability and replicability of the study. The analytical method used in the study allows for a structured assessment of both theoretical and empirical data sources, facilitating the drawing of accurate and valid conclusions. This provides a reliable basis for further understanding of human capital development and innovation ecosystems.

The aim of this study is to analyse and evaluate the impact of the Triple Helix model on human capital in innovation ecosystems, specifically identifying how this model facilitates knowledge sharing and collaboration between universities, industry and government in Latvia. Object of research: the Triple Helix model and human capital. Subject of the research: Impact of the Triple Helix model on human capital in Latvia. Research questions: what socio-economic and scientific factors contributed to the development of the Triple Helix model, and what is its relevance for the development of modern innovation ecosystems? What are the main differences in findings and opinions between different studies on the

effectiveness and impact of the Triple Helix model? How will human capital in the innovation system change in Latvia?

The study uses a structured approach with well-defined procedures and criteria. This approach ensures that information is collected and analysed according to defined principles, rather than random or subjective choices about inclusion or exclusion. A systematic literature review, for example, involves well-defined steps for selecting and evaluating literature relevant to a particular research question or topic, in order to provide an objective and complete overview of existing research on the topic (Kokins & Straujuma, 2020; Siddaway, 2014).

The authors wanted to gain a deeper understanding of the emergence of Triple Helix and the models of cooperation between government, business and universities that preceded it. It was also important to gain insight into the role of universities and science in the past and to compare it with the Triple Helix model. The authors Leydesdorff, Etzkowitz, Gibbons (Etzkowitz & Leydesdorff, 1995; Siegel et al., 2016).

The literature review of this study reveals important knowledge gaps and the need for a deeper understanding of the impact of the education paradigm shift on the economy, highlighting the need for integrated approaches that combine theory and practice.

A detailed search of databases including Scopus, Science Direct and Web of Science, among others, was carried out to provide a comprehensive literature review on the impact of the Triple Helix model on human capital. The searches were conducted using phrases such as "Triple Helix" AND "Innovation", "Entrepreneurial university" AND "Knowledge-based economy". The search period was limited to 1995–2023 and English and Latvian articles, abstracts, etc. were considered. Sources were included if they explicitly discussed the Triple Helix model and its implications for human capital, the university and innovation.

This study analyses the importance of the educational paradigm shift and its impact on sustainable economic development in Latvia. We found that the Triple Helix model, fostering cooperation between universities, businesses and public institutions, is a key driver of innovation and human capital development. However, given the limited amount of data up to 2023, the geographical focus on Latvia and the specificity of the methodological approach, the generalisability of the findings is limited. These factors point to the need for further research to better understand the nuances of the dynamic interaction between education and the economy. The study focuses on the views of education and innovation experts, which limits the generalisability of the results across sectors. It is recommended that experts from different industries and government be involved in the future to deepen the analysis.

For the case study on Latvia, relevant studies and data from public institutions in recent years were selected. As well as studies from international institutions

on knowledge transfer to industry. The search keywords identified for the literature search were: “Triple Helix model”, “Entrepreneurial university”, “Innovations”, “Interdisciplinarity”, “Mode-1”, “Mode-2”, “Knowledge-based economy”, “Globalization”, “Innovation systems”, “Higher education institutions”, “Human capital”.

3. The situation in Latvia

Latvia is facing significant changes in the labour market and human capital development, which are closely linked to demographic trends, economic changes and technological developments. Latvia has experienced significant economic growth over the last decade, which has, however, also created new challenges in the labour market. Changing labour requirements, rapid technological evolution and globalisation of the labour market have placed new demands on the education system to effectively prepare human capital to meet changing needs. One of the most important trends is the ageing workforce, which, combined with low fertility rates, is putting pressure on the labour market. This calls attention to the importance of lifelong learning and the need for continuous updating of skills to enable workers to adapt to new labour market demands. The education system, in its current phase, must focus not only on providing knowledge but also on developing skills, critical thinking and creativity. The aim is to foster the capacity for lifelong learning and adaptation to a changing working environment. The Triple Helix model, which promotes cooperation between higher education institutions, business and government, has proven to be an effective way to foster innovation and respond to the needs of the economy and the labour market.

The Latvian government has introduced a number of policies and initiatives to address these challenges, including education reforms and programmes that support lifelong learning and skills development. However, it is important to continue to develop and improve these initiatives to ensure that the education system and the labour market can respond effectively to rapid changes in the economy and technology.

In 2023, Latvia's startup ecosystem thrived despite global challenges. According to the report, Latvian startups paid a total of €57.2 million in taxes, a significant contribution to the national budget. The average salary in the startup ecosystem was €2,500, significantly higher than the national average. Moreover, the number of startups continues to grow, with 449 registered by the end of 2023, which is a reflection of the entrepreneurial activity and innovation potential in the country (Latvian Startup Association, 2023).

Technology adoption, wider digital accessibility and the integration of Environmental, Social and Governance (ESG) standards into organisations will be key drivers of transformation. Macro-economic factors such as the rising cost of living and slow economic growth will also influence change, as will investments in green transition

and localisation of supply chains (World Economic Forum, 2023). Latvian labour market projections to 2040 foresee significant changes in the sectoral structure, with an increasing share of higher value-added sectors. IT and industry will increase their share in the economy, while agriculture, transport, financial services and public services will decline. The agricultural sector will grow at a slower pace, with a greater role for large companies, whose growth will be driven by productivity growth. Growth is also expected to be stronger in high- and medium-high technology sectors. The information and communication services sector will experience some of the fastest growth, driven by the demand for digitalisation and global trends in the IT industry. The construction sector is expected to grow strongly in the medium term, driven by the implementation of major investment projects. Transport and storage will be supported by growth in air and road transport, while trade and commercial services will be closely linked to private consumption dynamics (LR Ekonomikas ministrija, 2022). The objectives, priorities, lines of action and tasks of Latvia's science and technology development policy are set, promoting the sustainable development of research and development human capital, knowledge, skills, competences and technologies.

The main policy focuses are:

- Excellent research: Promote high quality and internationally recognised research that fosters the development of innovative organisations and entrepreneurship in Latvia.
- Innovative and technologically advanced entrepreneurship: To develop high added value technologies, products and services that are competitive and in demand in global markets.
- Smart, skilled and innovative societies: To foster society's capacity to create, develop and innovate, valuing the social and economic value of knowledge and research (LR Izglītības un zinātnes ministrija, 2022).

Students' desire to gain experience abroad is also important. Higher education institutions and policy makers need to focus on understanding students' needs and barriers in order to develop more relevant and inclusive education offers. This includes both improving the structure and accessibility of study programmes and strengthening support systems to encourage students' active involvement in international mobility and placements. This approach will contribute to a paradigm shift in the education system, making it more open, flexible and relevant to the demands of modern society and the labour market. There are a number of important aspects to take into account in changing educational paradigms. More active involvement of women: There is a gender gap in international mobility. This aspect can lead to discussions on gender equality in educational opportunities and the need to develop support mechanisms that encourage women's participation in science and technology. Differences between levels of study programmes: Bachelor

students are more active in international mobility. This reflects the need for mobility programmes that are accessible and tailored to students at different levels of study. Barriers to mobility:

- Lack of personal motivation and insufficient foreign language skills are the main barriers to student mobility. This points to the need to strengthen language training and motivational measures.
- Health impairments as a barrier: Health impairments limit students' opportunities to participate in international mobility. This highlights the need for more accessible and inclusive education and mobility opportunities (Latvijas Universitātes Filozofijas un socioloģijas institūts, 2022).

The paradigm shift in Latvia's education system must be geared towards adaptation to changing labour market requirements, promoting skills development, lifelong learning and international mobility. This requires an integrated approach involving cooperation between government, educational institutions and business to develop a flexible, open and relevant education offer to meet the needs of today's and tomorrow's society.

4. Innovations

While the Triple Helix model promotes knowledge exchange between universities, business and government, it is not always effective in different socio-economic contexts and may be less appropriate for mid-level universities and regions. The emphasis is on the need for tailoring the model to specific needs and for a more inclusive approach that takes into account social factors and societal influences on science. The paper calls for further research to understand the limitations of the model and possible adaptations to foster the development of broader innovation ecosystems.

The Triple Helix involves policy changes in science and technology strategies. These changes are taking place for a variety of reasons, including criticism of the linear model of innovation, which has not been sufficiently reliable as a framework for measuring and forecasting innovation. These policy changes affect different actors and sectors, mainly companies, universities and public authorities. This is contributing to the emergence of a new paradigm of cooperation. Under this model, innovation rarely takes place in isolation and often involves complex relationships between different actors in the system, including companies, universities and research institutes. These actors are an important part of the knowledge creation and commercialisation system, and innovation develops on the basis of these collaborative and non-linear paradigms (Etzkowitz & Leydesdorff, 1995; Siegel et al., 2016). While several studies point to the positive effects of Triple Helix, there are also criticisms and uncertainties about its effectiveness in different socio-economic contexts. The Triple Helix model assumes that universities play an important role in offering knowledge transfer to industry and society. However,

this approach does not work equally well everywhere and may be ineffective for mid-level universities and regions. Moreover, it does not take sufficiently into account social factors and how society influences science and vice versa. It is stressed that the Triple Helix model is not sufficiently tailored to specific contexts and does not address all factors of innovation (Cooke, 2005). Today, universities are just one of many actors involved in knowledge creation, with implications for future relations. Education has to adapt as more and more knowledge is not in traditional textbooks. Universities have a key role to play in training new knowledge workers. This requires new forms of collaboration and the use of technology, and is both a challenge and an opportunity (Gibbons, 1998).

Several studies have looked at similar cooperation models alongside the Triple Helix analysis. "The Living Lab" approach offers the opportunity to tackle complex problems and develop new solutions by providing real experiences and feedback from different stakeholder groups. These are experiential environments for research and innovation, where real-life experiments and innovation processes are carried out, contributing to social, economic and environmental sustainability. Overall, the concept of "The Living Labs" is an innovative approach to innovation development in which different stakeholder groups collaborate to tackle complex problems and develop sustainable solutions (Burbridge & Morrison, 2021). Open innovation practices are an approach in which an organisation involves external actors such as other business units, public authorities, universities or even individual innovators to jointly design and develop new ideas, products or technologies. This approach differs from traditional innovation methods, where all processes take place internally within a company or organisation. Open innovation practices can involve a number of activities and strategies, such as: Working with external partners to jointly develop new products or technologies. Sharing knowledge and information with other companies or research institutions. Co-designing and funding research and development projects with other companies or partners. Opening a product to the public or licensing it to other companies. This approach allows companies and organisations to benefit from a broader base of ideas and resources, offering new opportunities for innovation and product development. At the same time, it facilitates the flow of knowledge and technology between different sectors and actors.

Given the political, economic and cultural differences between countries, universities around the world are implementing open innovation practices to different extents. However, the role of open innovation in technology transfer activities is not yet fully understood. Some universities have shown that open innovation improves research and development processes, which increases the innovation efficiency of the university (Bejarano et al., 2023).

The Triple Helix model and other innovation models can vary significantly depending on region, country,

sector and other factors. Such different circumstances and contexts can influence how innovation and collaboration between universities, businesses and public authorities are implemented and adapted. It is important to take into account local conditions and specificities when designing and implementing innovation and entrepreneurship strategies. Different regions and sectors may have different resources, knowledge bases and opportunities for collaboration, and models need to be adapted to reflect specific circumstances. In addition, national or regional policies and programmes can play an important role in fostering innovation and entrepreneurship. Each region or sector may therefore have its own approach and priorities to stimulate innovation and entrepreneurship (Ozols et al., 2012). The importance of knowledge exploitation and capitalisation for the development of society has become increasingly important in a globalised competitive environment. In the past, government policies and public efforts focused mainly on the creation and production of knowledge. However, merely increasing the quantity of knowledge is not necessarily accompanied by qualitative and practical growth. It is more important to produce useful knowledge and to have a deep understanding of how to apply and use it to contribute to the development of society (Lee & Ngo, 2012).

Over the last decade, researchers have come to three main conclusions about innovation. First, innovation refers to new developments or improvements and is multi-dimensional. Second, innovation develops through interactions between firms and a multi-stakeholder network that enables knowledge sharing. Thirdly, creating innovative solutions requires knowledge transfer between different fields and interdisciplinary cooperation (Suija-Markova, 2023). More and more universities are showing that supporting the innovation ecosystem, including start-ups and external partnerships, if properly managed, can be fully consistent with cherished academic values while strengthening the university's resource base. This is particularly true for public universities, which are experiencing reduced public financial support and are therefore forced to be more innovative and entrepreneurial (Heaton et al., 2019).

Innovation is multi-dimensional and requires collaboration and knowledge transfer between different fields and stakeholders. Universities and innovation ecosystems can be effective if they are well managed and promote knowledge sharing and collaboration in line with academic values. These approaches can improve innovation performance and contribute to societal development.

5. Human capital

Human capital refers to the knowledge, skills and experience that are essential to the innovation process. Human capital is a resource for innovation development because it enables innovation capacity, creativity and the application of technical knowledge. Universities play an important role in preparing the entrepreneurs and innovators

of the future (Kalnbalkite, 2023; Reinsone et al., 2022). Human capital development has evolved in historical contexts to include different components, not only education, but also health, culture and the economy. Approaches to measuring the value of human capital have expanded beyond financial aspects to include intangibles and value added. However, there is still a diversity of views in this area and a lack of a common definition of human capital. The important conclusion is that human capital is an essential economic resource, comprising knowledge and skills, and that it depends on people's ability to use other factors of production efficiently to achieve the desired result (Znotiņa, 2013). Both higher education institutions and the business sector should encourage more open communication. This enables higher education institutions to offer graduates a high quality education and increases the practical applicability of scientific results (Idrees et al., 2023; Mačerinskienė et al., 2014).

Research 20 years ago highlighted the need for innovation to foster new forms of cooperation and partnerships between businesses and knowledge producers. The focus was on how to improve the capacity of individuals, companies, regions and countries to learn and adapt to a changing environment. Research has highlighted the difference between a skills-based economy and a knowledge-based economy and how human capital is changing. It is important to point out that developing sustainable human resource policies in companies, regions or countries has the potential to build knowledge-intensive human capital, where all components – skills, knowledge, attitudes – are important. The emphasis is on integrating formal and informal knowledge, including practical aspects. This integration covers commercial services, technology, social, organisational aspects and self-management, promoting a holistic approach and greater efficiency (Descy et al., 2001; Znotiņa, 2013).

In the light of the above, the authors point out that research in the field of human capital highlights the importance of human capital for the development and well-being of the country and the firm. The studies analyse human capital in different economies and time periods. Importantly, there is an evolutionary process. Not only interdisciplinary, but also through the development of different competences that help to achieve not only individual progress but also global growth.

6. Conclusions

The sources mention different innovation and collaboration paradigms, highlighting Triple Helix, the living lab approach and open innovation practices. These paradigms point to the need to rethink traditional innovation models and foster collaboration between different actors in order to promote innovation and the sustainable development of society. Open innovation practices are highlighted as an approach in which organisations involve external actors in the innovation process. This

allows companies and organisations to benefit from a broad base of ideas and resources and to contribute to the development of innovation. Research highlights the role of universities in the creation and transfer of innovation to industry and society. However, this approach does not work equally well everywhere, and universities need to adapt to changing circumstances and stakeholders need to develop new forms of cooperation. Future research needs to address the impact of social factors on science and innovation, and how innovation affects the development, quality and use of human capital. Sustainable human resources policies can contribute to the development of knowledge-intensive human capital by integrating different aspects. Businesses and organisations can promote formal education and non-formal learning, as well as practical experience and knowledge, to improve human capital. Social and organisational aspects, such as social factors, work environment and organisational culture, influence human capital development and motivation. Self-management and a holistic approach to how people can manage their own learning, career and personal development and how organisations can facilitate this self-management. Based on the research, the Triple Helix model is a potentially powerful tool for strengthening human capital in innovation ecosystems. Analysing the sources, the authors highlight several possible directions for studying human capital development in innovation ecosystems: human capital quality measurement, human capital development trends, local and global impact of innovation on higher education institutions. In addition, there is a need to explore how to integrate Triple Helix into social entrepreneurship, fostering community engagement and the development of sustainable innovations that support economic upliftment without harming the environment. This in-depth research could help policy makers, academia and industry to better integrate the model into their work. Linking the analysis of human capital in Latvia to the Triple Helix model, the following conclusions can be drawn:

- A more active role of universities in the economy: the Latvian situation shows that closer cooperation between higher education institutions and research centres and businesses is essential to foster innovation and skills development in line with labour market needs. The Triple Helix model underlines the importance of this cooperation, which in the Latvian context could help to address the shortage of high-skilled jobs.
- The role of the state as a mediator and stimulator: Latvian public policies and support programmes are important to foster cooperation between the academic sector and industry. In the Triple Helix model, the role of the state is to facilitate and support the integration of these two spheres, which in Latvia could help to build more effective support for innovation and human capital development.

The development of innovation ecosystems, where universities, businesses, and public authorities collaborate

closely, is intrinsically linked with the integration of life-long learning into these processes. This partnership not only facilitates high value-added job creation and combats brain drain but also ensures that the workforce remains adaptable and skilled for the rapidly evolving demands of the innovation economy. By fostering a culture of continuous learning and skill development, the Triple Helix model significantly contributes to sustainable economic growth and resilience in Latvia.

The study provides insights into how changing the education system can build closer cooperation between universities, businesses and the state. These changes can foster innovation, human capital development and competitiveness in Latvia by addressing both global and local trends and challenges.

Author contributions

Both authors were equally and actively involved in all phases of the study, including study design and planning, data collection, provision of analytical tools, writing and proofreading, and overall supervision.

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