RIGA TECHNICAL UNIVERSITY

Aija Pogule

INDICATORS SYSTEM FOR MONITORING HIGHER EDUCATION INSTITUTIONS' SUSTAINABLE PERFORMANCE

Summary of the Doctoral Thesis

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RIGA TECHNICAL UNIVERSITY
Faculty of Engineering Economics and Management
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Gratitude

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I would also like to extend my sincere appreciation to Mag. Dr. techn. Michael Hofer from the University of Vienna for the opportunity to undertake an internship in the field of quality assurance. This experience served as a significant turning point in shaping my interest in quality within higher education.

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DOCTORAL THESIS PROPOSED TO RIGA TECHNICAL UNIVERSITY FOR PROMOTION TO THE SCIENTIFIC DEGREE OF DOCTOR OF SCIENCE

To be granted the scientific degree of Doctor of Science (Ph.D.) in Social Sciences, the present Doctoral Thesis has been submitted for defence at the open meeting of RTU Promotion Council on August 26, 2025 at the Faculty of Engineering Economics and Management of Riga Technical University, 6 Kalnciema Street, Room 209.

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DECLARATION OF ACADEMIC INTEGRITY

I hereby declare that the Doctoral Thesis submitted for review to Riga Technical University for promotion to the scientific degree of Doctor of Science (Ph.D.) in Social Sciences is my own. I confirm that this Doctoral Thesis has not been submitted to any other university for promotion to a scientific degree.

The Doctoral Thesis has been written in Latvian. It consists of an Introduction, 4 chapters, Conclusions, 69 figures, 40 tables, and 14 appendices; the total number of pages is 211, including appendices. The Bibliography contains 230 titles.

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INTRODUCTION

An organisation's sustainable process management is considered a significant competitive advantage in today's fast-paced environment. Sustainable process management within the quality management framework ensures the integration of processes, systems and strategies, focusing on effective operations, continuous improvement and the involvement of key stakeholders in decision-making.

The term sustainability has been increasingly used in organisations' institutional strategies, operational reports and communication as one of the priorities. Various standards and guidelines are used to measure the sustainability of an organisation, such as Environmental, Social and Governance (ESG) Guiding Principles, Global Reporting Initiative (GRI), the United Nations Sustainable Development Goals (UN SDGs), etc. Existing standards and guidelines highlight many opportunities for organisations to report on their impact and sustainability. The previously mentioned assessment frameworks balance the environmental, social, and economic dimensions. Although there are currently a variety of frameworks available, they serve more as a guideline for organisations, as they are adaptable to any industry or organisation.

The Corporate Sustainability Reporting Directive (CSRD), issued in the European Union, requires large and medium-sized enterprises to publish an independently audited sustainability report in the coming years to promote the implementation of European Green Deal initiatives and the transparency of companies' activities. The Directive does not apply to higher education institutions (HEIs), as they differ from large companies in their governance, processes and purpose.

HEIs can use already existing standards and guidelines in an adapted version. For this reason, HEIs also choose to use already defined frameworks, such as international university rankings, which focus on evaluating and comparing HEIs in different areas of sustainability. In 2019, the first HEIs' sustainability ranking was published, the *Times Higher Education (THE) Impact Ranking 2019*, which assessed the contribution of HEIs to the implementation of specific UN SDGs goals. In 2022, the *QS World University Rankings: Sustainability Ranking* based on ESG fundamentals was released. The two rankings differ significantly, although on the topic of sustainability, creating confusion about the scope of sustainability assessment.

However, these and similar university rankings have limitations; they can be used to compare results within a single framework and with specific indicators. The indicators included in the rankings are standardised and often general to ensure that they can include and evaluate

different HEIs in one ranking framework. It is impossible to assess the organisation's sustainability only by analysing the results obtained in the rankings. It is necessary to consider indicators that reflect on the implementation of the processes and the sustainability of the system – the ability for it to exist for a long time. It is also necessary to understand how these indicators interact with each other and what their impact is.

Based on the scientific literature, the Doctoral Thesis reflects and identifies different levels of performance indicators, which are measured to understand the organisation's performance. In the mid-nineties, Kaplan and Norton (1996) stressed integrating the organisation's vision and strategy with concrete and measurable indicators to ensure sustainable governance. Today, in the field of sustainability, organisations mostly measure indicators that characterise and measure the impact of the central sustainability dimensions – environment, economy and society. From a quality management perspective and process point of view, other areas are emphasised, such as managing the organisation's resources, participation of stakeholders, leadership, monitoring, etc. These indicators are often measured and analysed individually in organisations, but from a systemic perspective, they must be integrated into one indicator system.

Research questions:

1. What elements ensure the organisation's sustainable performance?
2. What indicators are used in HEIs' strategies, performance evaluation and monitoring?
3. How do indicators interact within the HEIs' ranking systems?
4. How can an effective indicator system and process monitoring be established to ensure HEIs' sustainability?

The aim of the Doctoral Thesis is to develop an approach on how to form an indicator system for HEIs' process and performance monitoring while integrating the strategic direction and resource evaluation to ensure the HEIs' sustainable operations.

In order to reach the formulated aim, the following **tasks** have been set:

1. Explore the scientific research regarding the topic of indicator systems, different types of indicators, their importance in evaluating the organisation's performance, as well as to analyse trends in the areas of strategic development and sustainability.
2. Assess the priorities and indicators set in the Latvian HEIs' strategies, comparing them with the indicator groups identified from the scientific literature.

3. Analyse the HEIs' ranking methodologies, as well as the relationship and impact between indicators in the ranking systems.
4. Assess the performance of Latvian HEIs in ranking systems and analyse potential challenges.
5. Develop an approach for forming an indicator system and process monitoring, incorporating the resource-based view.
6. Develop a priority and benefit assessment matrix for evaluating the activities carried out by HEIs.

The research object: The indicators system for monitoring.

The research subject: Development of an indicators system for monitoring performance indicators of higher education institutions to ensure sustainable performance.

Limitations of the research:

- The relationship between HEIs' ranking indicators was analysed using data from the two ranking methodologies and the indicators included in them – THE WUR and QS WUR. The 2024 ranking data were used in the analysis.
- The analysis of Latvian HEI strategies was carried out in 2022, including those strategies from 13 HEIs (including universities, academies and higher education institutions) that were relevant in 2022.

The Doctoral Thesis is based on and uses several scientific theories, including value chain theory (Porter, M. E.), the concept of dynamic abilities (Teece, D. J.), stakeholder theory (Freeman, R. E.), systems theory (Ludwig von Bertalanffy), the concept of creating shared value (Porter, M. E.; Kramer, M. R.) and the resource-based approach (Barney, J. B.). The principles of indicator forming and indicator systems were based on the scientific contributions of R. S. Kaplan, D. P. Norton and D. Parmenter.

The main sources of information used in the research:

- Bibliographic databases of scientific literature, including Scopus, Web of Science, EBSCO, and ScienceDirect.
- The HEIs' results in QS WUR and THE WUR rankings. Three years (2022, 2023 and 2024).
- In 2022, publicly available Latvian HEI strategy documents.
- Data and indicator outputs for 2024 from the research analysis tool SciVal.

The Doctoral Thesis includes quantitative and qualitative research methods and scientific triangulation. Used methods: factor analysis, statistical data analysis, bibliometric analysis, literature review, analysis of thematic documents, focus group discussions, expert surveys, and qualitative content analysis with open coding.

Research design: The author developed the research design, incorporating the research phases, questions, and objectives (Fig. 1).

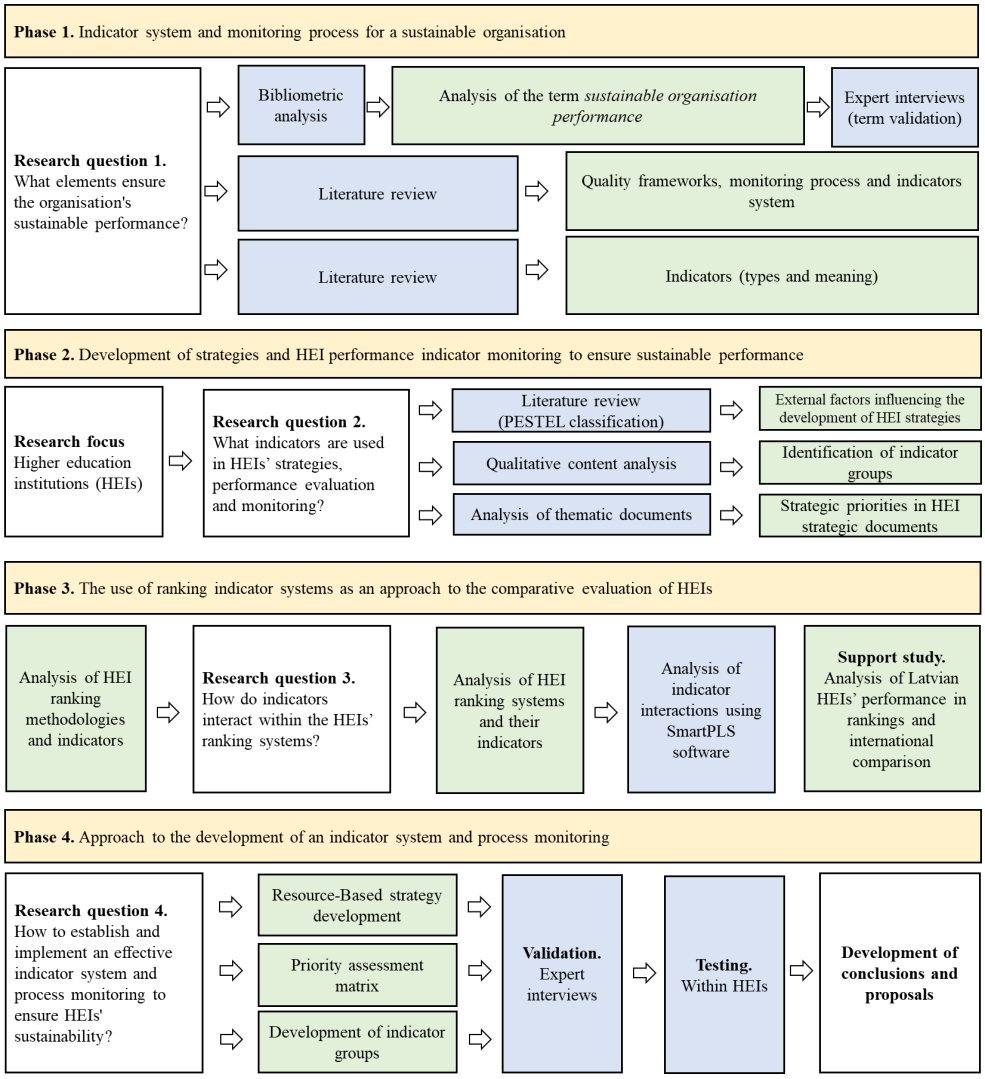

Fig. 1. Research design (created by the author).

Phase 1. Sustainable organisation indicator system and performance monitoring. Bibliometric analysis of the scientific literature was carried out to explore the concept of

sustainable organisation performance. The author also conducted a definition analysis to explain the term organisational performance in Latvia. The author defines sustainable organisation's performance as a result of the analysis, which was validated using the expert interview method.

In addition, the author researched well-known quality assessment frameworks and indicator systems, examining different types of indicators identified in the scientific literature. The research was conducted to understand the role of the monitoring process in developing the organisation's indicator system.

As part of Phase 1, the author answered the first research question by identifying what elements ensure the organisation's sustainable performance. The author developed the research hypothesis based on the results obtained in Chapter 1 of the Doctoral Thesis.

Phase 2. An indicator system and performance indicators are used to ensure HEIs' sustainable performance.

The research focus was narrowed to higher education institutions in the second phase. The author used the PESTEL framework to identify external influencing factors in HEIs' strategy development. A qualitative content analysis was carried out to identify indicator groups used to evaluate HEIs' sustainable performance. As a result of the analysis, seven theoretical indicator groups were identified. Additionally, the author analysed 12 Latvian HEIs' strategies and compared the results with the theoretical indicator groups.

As part of Phase 2, the author answered the Research Question 2 by identifying the indicators used in HEIs' strategies, performance evaluation and monitoring.

Phase 3. Exploring the use of ranking systems for benchmarking HEIs' performance. The author analysed the most well-known international HEI rankings, their methodologies and indicators to understand how different ranking indicator systems are constructed. An analysis of the relationship between QS WUR and the WUR ranking indicators and the identification of their impact pathways was performed to answer Research Question 2. To conduct the analysis, calculate correlations and visualise impact pathways, the author used the SmartPLS software. Additionally, an analysis of the Latvian HEIs' performance in comparison with the Top 500 HEIs in the world was carried out. The research was carried out to understand the performance and potential development directions of Latvian HEIs and to help the author put forward proposals for improving the Latvian HEI indicator systems.

Phase 4. Development of an indicator system and approach for process monitoring. In the final research phase, the author answers the Rsearch Question 4 – how to establish and implement an effective indicator system and process monitoring to ensure HEIs' sustainability.

The answer is constructed with three solutions, based on the analysis carried out in the previous phases of the research and the results obtained. The first solution is described as an approach for resource-based strategy development. The approach was validated with expert interviews and tested in one Latvian HEI. The second solution is a multi-dimensional benefit matrix that allows the HEI to simultaneously set priorities in several areas of interest that contribute to the HEI's sustainability. The developed matrix was tested in HEI with experts, and the obtained results were used to develop three areas of sustainability in one Latvian HEI. The third solution is customised indicator groups that consider the type and strategic priorities of HEIs, which were also validated and tested in expert interviews.

Development of conclusions and proposals. Based on the described stages of the research and their results, the author summarised the key conclusions of the research and developed proposals for different stakeholders.

The structure of the Doctoral Thesis is based on the set aim, tasks and research design. The Doctoral Thesis has four chapters.

In Chapter 1, the author analysed theoretical terms such as sustainability, sustainable development, sustainable organisation, performance and others. The author analysed elements of the indicator system and principles of resource-based strategy planning and explained the difference between key performance indicators, process indicators, and other types of indicators. At the end of the chapter the author developed a theoretical model describing sustainable organisation, which is based on value chain theory (Porter, 1985), the concept of shared value creation (Porter & Kramer, 2006), the concept of dynamic capabilities (Teece, Pisano, Shuen, 1997), the resource-based view and the identification of operational capacities (Barney, 1991; Wernerfelt, 1984) and resource management (Eisenhardt & Martin, 2000).

In Chapter 2, the author conducted a content analysis to identify indicator groups that can be used to evaluate HEIs' performance from a strategic perspective. The identified indicator groups were compared with indicators identified from Latvian HEIs' strategies. Additionally, a review of the scientific literature was carried out, identifying the factors, challenges and contributing factors affecting HEIs in the process of developing strategies. Changes in higher education in Latvia were analysed, taking into account the reforms related to the introduction of the Latvian HEIs' typology.

Within Chapter 3, an analysis of the international HEI rankings is carried out, identifying the focus areas of the rankings, such as research performance, academic reputation, internationalisation, sustainability, study and research outputs. The author carried out an analysis of ranking methodologies and their indicators. As a result of the analysis, the author

identified the main indicator correlations and their mutual impact pathways. Additionally, focusing directly on research outcome indicators, a comparison of the Latvian and foreign HEIs' performance was analysed.

Chapter 4 describes the approach for developing an indicator system and process monitoring that includes identifying strategic priorities and using a resource-based approach to ensure HEIs' sustainable performance. The author validated the developed approach by using expert interviews, and testing was carried out in one HEI. Expert interviews were also used to validate the theoretical indicator groups that are described in Chapter 1. Additionally, the author validated and tested a multidimensional benefit assessment matrix that was developed, including HEI ranking indicators and HEI priorities.

Scope of the Doctoral Thesis: The Doctoral Thesis includes an introduction, four chapters, conclusions and proposals, a list of the references and sources used, and 14 appendices. The volume of the Doctoral Thesis without appendices is 175 pages. In total, the Thesis includes 69 figures and 40 tables. The abbreviations and their transcripts are included in Appendix 1 of the Doctoral Thesis.

Novelties of the Doctoral Thesis

1. The author, for the first time in the context of Latvian higher education, describes the concept of *sustainable organisational performance*, determining that a sustainable organisation sets strategic priorities and implements a set of activities to achieve the strategic goals while considering resources and involved stakeholders and ensures monitoring of these activities.
2. An approach to creating and monitoring an indicator system has been developed, which includes the identification of strategic priorities and the use of a resource-based approach to ensure sustainable performance.
3. A priority assessment matrix has been established for the main indicators of the sustainability performance of a higher education institution, taking into account resources, the needs of stakeholders and the requirements of international HEI rankings.
4. Indicator groups have been established for the assessment and monitoring of the sustainable performance of higher education institutions.

The hypothesis for defence

The organisation's performance monitoring is supported by an indicator system that includes a systematic assessment of strategic priorities, considering the availability of resources and the needs of the stakeholders.

Theses for defence

1. The strategic priorities and the actions implemented to achieve the set strategic goals, taking into account the resources and stakeholders, determine the sustainable organisation's performance.
2. Continuous improvement and sustainable performance indicators should be integrated into the indicator and monitoring system.
3. An integrated approach can be used to assess an organisation's strategic priorities, which includes an analysis of resources and the needs of stakeholders to ensure the organisation's sustainable performance and data-based decision-making.
4. To justify the priorities and activities planned by HEIs, their impact and potential benefits should be assessed simultaneously.

The practical significance of the Thesis research

An analysis of the Latvian HEIs' strategies has been carried out, and opportunities for improvement in the strategic documents of HEIs have been identified, based on the priority areas identified in the scientific literature, which were validated within expert interviews.

Indicator groups were identified that should be included in HEIs' strategies in order to ensure the assessment and monitoring of the HEIs' sustainable performance. It is important to underline that the indicator groups also consider the HEI typology.

The author developed a systematic approach for evaluating and reviewing the priorities of the organisation's strategy, taking into account the organisation's resources and the needs of the stakeholders. The approach has been validated during interviews with foreign HEI experts and has been practically tested during one of the Latvian HEIs' strategy development stages.

An in-depth analysis of the relationship between international HEI ranking indicators has been carried out. Indicators have been identified that mutually contribute to higher ranking positions. Research output indicators and the performance of selected Top 500 HEIs in the rankings have been analysed in order to identify potentially achievable goals for one of the Latvian HEIs to achieve the Top 500 in the QS WUR or THE WUR ranking.

Participation in projects

- European University of Technology – EUt+ 2nd phase (01.11.2023–31.10.2027). Position: Senior Project Manager. Contribution to the Doctoral Thesis: Expert interviews for the validation of the novelties described in Section 4.1 of the Doctoral Thesis.

- Development of effective management of Riga Technical University (01.11.2018–30.04.2023). Position: Data Analyst. Contribution to the Doctoral Thesis: Testing of the novelty, described in Section 4.1, at Riga Technical University and analysis of strategies of Latvian HEIs.
- Development of management competencies for excellence-based stress prevention and work for the sustainable development of organisations in Europe (01.11.2017–31.10.2020) Position: Research Assistant. Contribution to the Doctoral Thesis: Strengthening the theoretical basis on the use of the EFQM model and other quality systems used in HEI.

In the academic year 2021/2022, the author was awarded a doctoral grant from Riga Technical University.

The results of the study are described in seven scientific publications

1. Medne, A., Zeps, A., Lapiņa, I. (2024). Data-based University Quality Assurance: Whether ranking results and performance indicators interrelate? *Proceedings Book of the 6th International Conference on Quality Engineering and Management*, Vol. 1 , pp. 557–575. (Indexed in Scopus)
2. Medne, A., Lapiņa, I., Zeps, A. (2022). Challenges of Uncertainty in Sustainable Strategy Development: Reconsidering the Key Performance Indicators. *Sustainability*, Vol. 14, No. 2, Article number 761. doi:10.3390/su14020761 (Indexed in Scopus and Web of Science)
3. Medne, A., Lapiņa, I., Zeps, A. (2020). Sustainability of a University's Quality System: Adaptation of the EFQM Excellence Model. *International Journal of Quality and Service Sciences*, Vol. 12, No. 1, pp. 29–43. doi:10.1108/IJQSS-09-2019-0108 (Indexed in Scopus and Web of Science)
4. Medne, A., Lapiņa, I., Zeps, A. (2020). Strategy Indicators and Performance Measurement as Part of University Knowledge Management System. In: *Knowledge in Digital Age: 15th International Forum on Knowledge Asset Dynamics (IFKAD 2020): Proceedings*, Italy, Matera, September 9–11, 2020, Matera: Institute of Knowledge Asset Management (IKAM), pp. 1239–1249. (Indexed in Web of Science)
5. Medne, A., Lapiņa, I. (2019). Sustainability and Continuous Improvement of Organization: Review of Process-Oriented Performance Indicators. *Journal of Open Innovation: Technology, Market, and Complexity*, Vol. 5, No. 3, pp. 1–14. doi:10.3390/joitmc5030049 (Indexed in Scopus)

6. Medne, A., Lapiņa, I., Zeps, A. (2019). University Quality System Development: KPIs for Strategy Evaluation. In: *22nd QMOD-ICQSS Conference "Leadership and Strategies for Quality, Sustainability and Innovation in the 4th Industrial Revolution": Proceedings*, Poland, Krakow, October 13–15, Lund: Lund University Library Press, pp. 1–13.
7. Medne, A., Lapiņa, I. (2018). EFQM Excellence Model towards Sustainability of University's Quality System. No: *21st QMOD-ICQSS Conference "The Quality Movement - where are we going? Past, Present, and Future": Proceedings*, Great Britain, Cardiff, 22–24 August, 2018. Lund: Lund University Library Press, pp. 433–441.

The results of the study were presented in 13 **conferences in Latvia and abroad** (Spain, Italy, Poland, Great Britain, Korea and Japan)

1. 6th International Conference on Quality Engineering and Management University of Girona, Spain June 13–14, 2024. Topic: Data-based University Quality Assurance: Whether ranking results and performance indicators interrelate?
2. 64th International Scientific Conference of Riga Technical University "Scientific Conference on Economics and Entrepreneurship SCEE'2023", 12.10.2023. Topic: *Measuring Excellence: Do Institutional Rankings Tie Up with Research-Based University Strategies* (Medne, A., Lapiņa, I., Zeps, A.).
3. SOI & DEMI of UNINA 2023 Conference, July 12–15, 2023, Online & Offline, University of Naples Federico II, Naples, Italy. Topic: *Systemic and Data-driven Decision Making in University: Indicators for Strategy Evaluation* (Medne, A., Lapiņa, I., Zeps, A.).
4. 63rd International Scientific Conference of Riga Technical University "Scientific Conference on Economics and Entrepreneurship SCEE'2022", 13.10.2022. Topic: *Indicators supporting strategy evaluation and quality system development in university* (Medne, A., Lapiņa, I., Zeps, A.).
5. 62nd International Scientific Conference of Riga Technical University "Scientific Conference on Economics and Entrepreneurship SCEE'2021", 14–15.10.2021. Topic: *strategy development process: integration of adapted decision-making model* (Medne, A., Lapiņa, I., Zeps, A.).
6. Society of Open Innovation: Technology, Market, and Complexity (SOI) & Riga Technical University, 12–15 July 2021, Online & Offline, DGIST R1, Daegu.

Korea. Topic: *Challenges of Uncertainty in Strategy Development: Reconsidering the Key Performance Indicators* (Medne, A., Lapiņa, I., Zeps, A.).

7. 61st International Scientific Conference of Riga Technical University "Scientific Conference on Economics and Entrepreneurship SCEE'2020", 14–16.10.2020. Topic: *Using knowledge management for the university's strategic decision-making process* (Medne, A., Lapiņa, I., Zeps, A.).
8. IFKAD 2020, International Forum on Knowledge Asset Dynamics, 9–11 September, University of Basilicata, Matera, Italy. Topic: *Strategy Indicators and Performance Measurement as Part of University Knowledge Management System* (Medne, A., Lapiņa, I., Zeps, A.).
9. 22nd QMOD-ICQSS Conference "Leadership and Strategies for Quality, Sustainability and Innovation in the 4th Industrial Revolution", 13–15 October 2019, Krakow, Poland. Topic: U*niversity Quality System Development: KPIs for Strategy Evaluation* (Medne, A., Lapiņa, I., Zeps, A.).
10. 60th International Scientific Conference of Riga Technical University "Scientific Conference on Economics and Entrepreneurship SCEE'2019", 11–12.10.2019. Topic: *University quality system development: aligning key performance indicators* (Medne, A., Lapiņa, I., Zeps, A.).
11. SOItmC 2019, SOItmC & Meijo University 2019 conference, 28.06–01.07.2019. Meijo University, Nagoya, Japan. Topic: *Sustainability and Continuous Improvement of Organization: Review of Process-Oriented Performance Indicators* (Medne, A., Lapiņa, I., Zeps, A.).
12. 59th International Scientific Conference of Riga Technical University "Scientific Conference on Economics and Entrepreneurship SCEE'2018", 18–19.10.2018. Topic: *Analysis of university quality system development approaches* (Medne, A., Lapiņa).
13. 21st QMOD conference on quality and service sciences ICQSS 2018, 22–24 August, Cardiff University, Wales, UK. Topic: *Sustainability of a University's Quality System: Adaptation of the EFQM Excellence Model* (Medne, A., Lapiņa, I.)

1. INDICATOR SYSTEM AND CURRENT TRENDS IN SUSTAINABILITY

In the Doctoral Thesis, the author explores how an indicator system can be used to monitor sustainable organisational performance. This chapter is dedicated to examining the concepts related to the organisation's sustainability. As a result of the bibliometric analysis and definition analysis, the author explained the concept of *sustainable organisational performance* in the context of Latvian higher education. Expert interviews were used to validate the developed concept. Understanding the concept was used as the foundation for the research in the next chapters of the Doctoral Thesis.

1.1. Strategic development directions and sustainability in organisational governance

The concept of *sustainable organisational performance* is not clearly defined in the scientific literature. The concept was first mentioned in the Scopus database in 2013 and has been identified in 93 scientific publications during the period from 1985 to 2023. From the analysis of the scientific literature, the author concludes that the sustainable activity of the organisation is studied at three levels:

- sustainable governance (including leadership, strategic leadership and fostering a culture of innovation);
- process performance (including efficient management of resources, including human resources, knowledge, information and technologies);
- performance (performance evaluation, monitoring and key performance indicators);

Based on the bibliometric analysis, literature review and definition analysis, the author offers a description of the concept of *sustainable organisation performance*. **A sustainable organisation sets strategic priorities and implements a set of activities to achieve the strategic goals** (Çiftçi, 2023), **while considering resources** (Alnamrouti *et al.*, 2022; Al Aina & Atan, 2020), **involved stakeholders** (Banker *et al.,* 2014), **and ensures monitoring of these activities** (Al Aina & Atan, 2020; Schaltegger *et al.,* 2016; Mulder *et al.,* 2012).

The author used the expert interview method to validate the concept. Experts were asked to evaluate both the overall concept and the individual elements of the concept. Additionally, taking into account the topic of the Doctoral Thesis, the author asked experts to evaluate the need for an indicator system and how the system could support the organisation. The author

summarised the results in Fig. 1.1. In the graph, a sustainable organisation is marked with the abbreviation "SO".

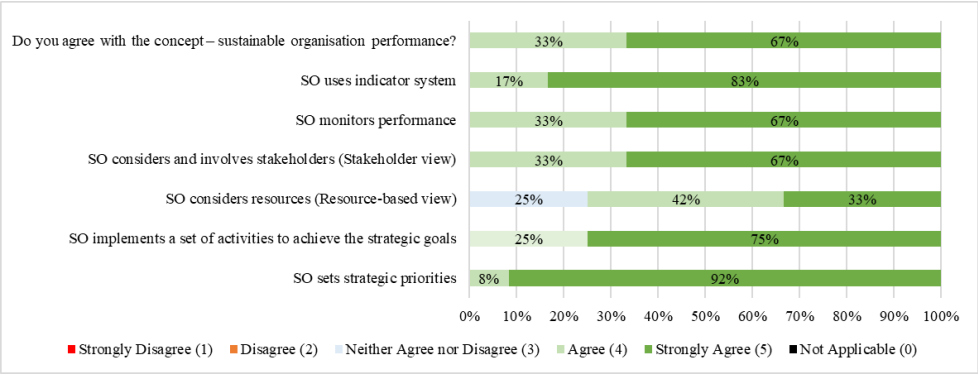

Fig. 1.1. Expert interview results (created by the author).

Based on the results, 67 % (8 experts) fully agree and 33 % (4 experts) agree with the concept of s*ustainable organisation performance* proposed by the author. A majority of 83 % (10 experts) fully agree and 17 % (2 experts) agree with the statement that a sustainable organisation needs and uses an indicator system. Experts also assessed the significance of each of the elements included in the concept. Almost unanimously, experts emphasised that a sustainable organisation sets strategic priorities and implements a set of activities to achieve the strategic goals. Identifying the needs of stakeholders (stakeholder view) and monitoring the organisation's performance were equally valued. The wider distribution of the votes and the differences in expert opinion were assessed concerning the *use of a resource-based view*. Nine experts agreed or fully agreed with the statement, while three experts provided a neutral response. A neutral vote from the experts was based on the recommendation to complement the resource-based view with the *dynamic capabilities* concept. One expert's reasoning is that strategic planning already includes resource planning. During the discussion, experts emphasised that resource management varies across different stages of strategy implementation. For example, at the planning stage, resources should be the foundation for the strategic goal setting, while at the stage of strategy review, resources must be flexible and adjustable. The experts linked the resource-based view, the need for an indicator system and performance monitoring to ensure evidence-based decision-making.

The author concludes that the indicator system and reliable data play a critical role in the strategic management, process management and decision-making of the organisation. The indicator system is also an important support for the effective management and planning of an

organisation's resources to ensure the ability to adapt to changing conditions. Experts also highlighted the role of stakeholders in the creation of shared value.

Based on the interview results and expert insights, a theoretical concept was developed that incorporates the author's concept of sustainable organisational performance, the principle of Porter's value chain model, the concept of shared value creation, and operational and dynamic capabilities (Fig. 1.2).

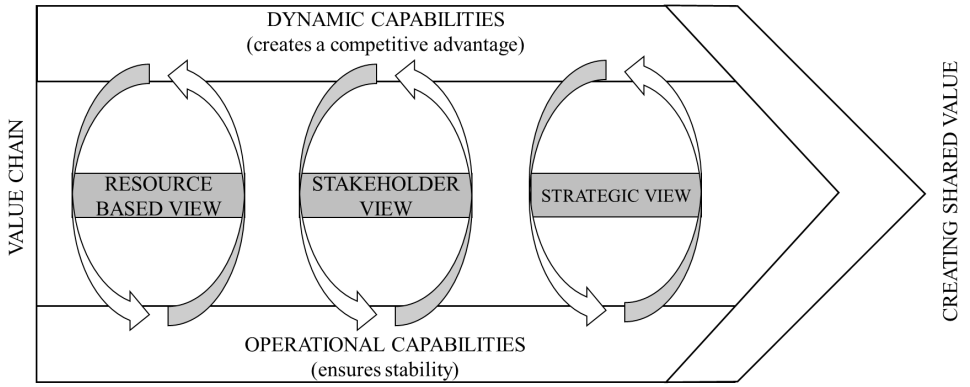

Fig. 1.2. The theoretical concept of a sustainable organisation (based on studies by *Porter, M. E., Kramer, M. R., Teece, D. J., Pisano, G., Shuen, A., Eisenhardt, K. M., Martin, J. A., Barney, J. B., and Wernerfelt, B.).*

Based on Porter's theory of the value chain (Porter, 1985), the organisation's core operational capabilities ensure the implementation of primary and support activities with the aim of creating added value for customers. Extending this theoretical approach with the concept of creating shared value that promotes greater cooperation and positive impact on society and other stakeholders (Menghwar & Daood, 2021; Porter & Kramer, 2006), as the overarching goal of the organisation, it is possible to characterise a sustainable organisation. This statement is consistent with the views of authors of a number of scientific papers that study the various aspects of the activities of a sustainable organisation (Çiftci, 2023; Al Aina & Atan, 2020; Andreassen *et al.,* 2018; Carayannis, Sindakis, & Walter, 2015).

Dynamic capabilities (Teece, Pisano, & Shuen, 1997) ensure the organisation's ability to adapt to the external changing environment and create a competitive advantage, while operational capabilities ensure the functioning of main processes and support processes. These capabilities are based on processes and an organisation's quality management system (Garvin, 1988; Teece, Pisano, & Shuen, 1997).

A resource-based view and awareness of operational capabilities are also seen as an organisation's competitive advantage (Barney, 1991; Wernerfelt, 1984). The efficient use of

resources, identification (Eisenhardt & Martin, 2000), and the ability to dynamically adapt processes are the basis for sustaining long-term operation (Teece, 2007), which creates opportunities for the organisation to become sustainable.

In the theoretical concept created by the author, three dimensions are integrated into the value chain:

- resource-based view – a theoretical concept that involves identifying, managing and linking the various resources to the capabilities of the organisation (Grant, 1991);
- stakeholder view – includes identifying the organisation's key stakeholders, identifying needs, and engaging them in decision-making (Freeman, 1984);
- strategic view – planning, development and implementation of the organisation's strategies.

Within the Doctoral Thesis, the author focuses on the creation of an indicator system that reflects the sustainability of the organisation's activities – the ability to exist and develop for a long time in changing conditions. In response to the first research question raised in the Doctoral Thesis, the author concludes that strategic management, involvement of stakeholders, a resource-based view and the creation of an appropriate indicator system contribute to the sustainable organisational performance.

The author concludes that the first thesis proposed has been confirmed. As the first novelty of the doctoral thesis, the author offers the concept of *sustainable organisation performance*. A sustainable organisation sets strategic priorities and implements a set of activities to achieve the strategic goals, while considering resources involved, stakeholders, and ensuring monitoring of these activities.

The analysis carried out in Chapter 1 of the Doctoral Thesis has made a significant contribution to highlighting the characteristics of a sustainable organisation and the concepts closely related to it. In order to be able to assess the organisation's performance, it is necessary to introduce an appropriate indicator system for monitoring. A well-developed indicator system, which ensures systematic and data-based decision-making, is one of the basic elements of the organisation's quality management system. In order to understand the importance of quality management in the creation of an indicator system and the monitoring process, the author in the next chapter analyses well-known quality management frameworks and quality assurance approaches.

1.2. Quality evaluation and indicator system

By conducting a literature review on various quality management frameworks, the author focused on elements that were identified in the previous chapter as contributing elements to the sustainable organisation performance: a resource-based approach, stakeholder involvement and strategic management.

In addition, the author identified which of the quality frameworks already have integrated indicator systems, monitoring processes or elements of them. The author emphasises that the organisation's systems integration level plays a key role in how effective and useful an indicator system can be implemented. The indicator system is part of a larger organisational system that is influenced by internal and external factors and the functioning of other systems. The basic principle of systems theory states that a system can be defined as a set of elements that are in mutual interaction with one and the environment (Bertalanffy, 1972). This principle also applies to the interaction and integration of several systems.

The author proposes to align the basic elements of the EFQM model with the level of the organisation's indicator system, integrating them with Deming's continuous improvement cycle (plan–do–check–act), and create an approach to creating a sustainable organisational indicator system (Fig. 1.3).

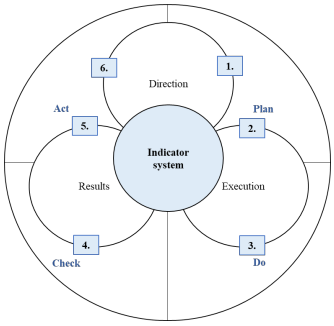

Fig. 1.3. Sustainable organisation indicator system *(*basis of the principles of EFQM and Deming's improvement cycle PDCA).

By applying the key elements of the EFQM model (Direction, Execution, and Results) to the indicator system level and integrating Deming's improvement cycle, the development of a sustainable indicator system is ensured. Figure 1.3 includes six stages of operation:

1. Direction – plan: The objective of the indicator system is established, indicator groups are defined, and specific indicators, targets, and responsible parties are identified based on the organisation's planning documents, processes, and the requirements of other integrated systems.

2. Execution – plan: The strategy for implementing and maintaining the indicator system is put into practice. Data sources are identified, and the methods for obtaining the necessary data or measurements are determined. At this stage, new solutions are introduced through automated processes within information systems or via manual recording, particularly in cases where the relevant data or measurements have not previously been collected.
3. Performance – do: Process of data and information collection.
4. Results – check: The accuracy of measurements and indicators is verified to ensure reliable results and alignment with the overall objective of the indicator system.
5. Results – act: Indicator success monitoring.
6. Direction – act: the indicator system, groups or individual indicators are adjusted based on the results of Stage 5 or other influencing factors.

During the expert interviews described in Section 1.1 of the Doctoral Thesis, the author presented the stages outlined in Fig. 1.3 to the experts in order to gather their opinions on the proposed approach to the creation, maintenance, and improvement of the indicator system. Experts emphasised that the indicator system plays a critical role in evaluating the organisation's performance. The scoreboard must reflect the performance of the organisation’s critical processes – those that are essential to its existence – and this information must be expressed through measurable indicators. The experts also stressed that the indicator system should be adaptable to the changing environment, and they agreed with the author's proposal to introduce elements of continuous improvement in the process of creating and maintaining the indicator system. The author concludes that, for an organisation to adapt to a changing environment, it is essential to develop an indicator system that enables fact and data-based decision-making. In order to understand what elements are included in the indicator system, the author in the next section conducted an in-depth analysis of the types of indicators and their role in monitoring the organisation's performance.

1.3. Types of indicators and their role in evaluating performance

To understand the classification of various indicators, the author conducted a systematic literature review. The purpose of the research was to identify the types of indicators used in organisational management, as well as their classification and hierarchical structure. During the literature review, conceptual differences were identified and compared by the author with the aim of understanding their significance in evaluating organisational management and processes.

The author proposes to categorise the identified types of indicators into four levels – strategy, system, process and data (see Fig. 1.4).

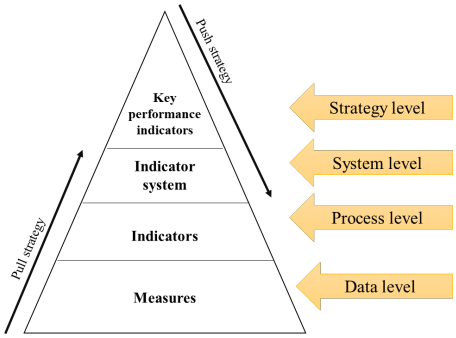

Fig. 1.4. Types of indicators and their levels in an organisation (created by the author).

The researchers emphasise that different indicators provide different functions in an organisation, so it is important to integrate the *push approach* in key performance indicators (KPI) and the *pull approach* in measures and indicators (Kaplan & Norton, 1996). The *push approach* allows the organisation to provide a strategic direction, while the *pull approach* provides insight into operational activity. Data measures can be considered the most basic parameter of processes. Given that measurements occur as a result of the process operation, they can be considered quantitative parameters. Indicators are a commonly used term when it comes to measuring process performance. Unlike individual indicators, a defined set of indicators can provide comprehensive and detailed information about system performance. Additionally, KPIs are closely related to the organisation's strategic management.

The author concludes that it is important to incorporate several types of indicators into the indicator system, enabling the organisation to analyse its activities at the strategic, system, and process levels. At each of the levels of the indicator system, it is necessary to identify and document the objectives and to ensure appropriate and reliable measurements. The indicator system must ensure maintenance and constant improvement, like any other system of the organisation.

Based on the literature review done in Chapter 1 of the Doctoral Thesis, the hypothesis was developed: the organisation's performance monitoring is supported by an indicator system that includes a systematic assessment of strategic priorities, considering the availability of resources and the needs of the stakeholders.

In Chapter 2, the scope of the research will be narrowed, focusing on the higher education sector and the assessment and comparison frameworks used in it.

2. HEI PERFORMANCE EVALUATION FRAMEWORKS AND THEIR INDICATORS

To identify suitable solutions for monitoring the sustainable HEIs' (Higher Education Institutions) performance, in this chapter of the Thesis, the author analyses activities of HEIs at both the strategic level and the level of the indicator system. In Section 2.1 , based on an analysis of the scientific literature, the factors influencing the planning of the HEIs' strategic direction and the indicator groups supporting the sustainable performance of HEIs were identified. In addition, an analysis of the Latvian HEIs' strategies was carried out in order to determine at what level the indicator groups identified in the scientific literature are used in HEIs' strategies.

2.1. Key performance indicators and strategies for HEIs

The selection of appropriate KPIs and indicator groups is an important stage of the strategic process, which ensures the linking of the organisation's processes to the set strategic objectives (Pohludka *et al.,* 2018; Milichovský, 2015). To identify what indicators are used in higher education, the author conducted qualitative content analysis with open coding. As a result of the analysis, the author created seven indicator groups that are used to assess the performance of HEIs in the context of sustainable performance (Fig. 2.1).

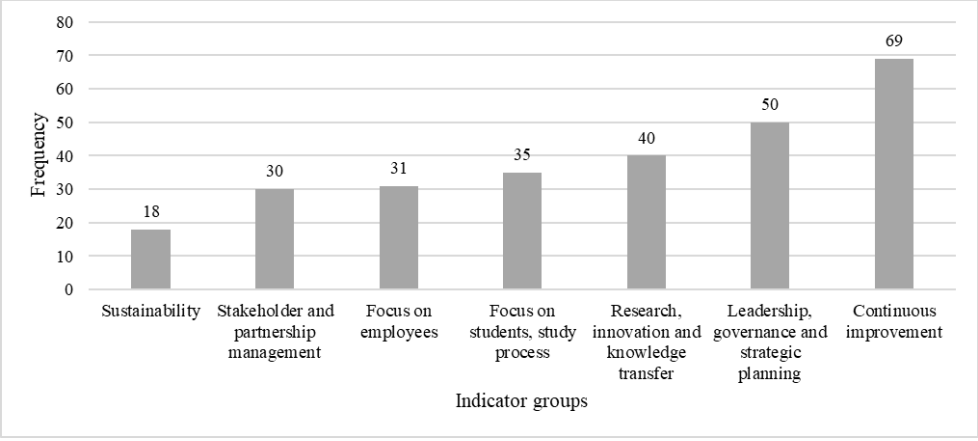

Fig. 2.1. Frequency of identified indicator groups, based on qualitative content analysis (created by the author).

Each identified indicator group consists of indicators that are mentioned in the scientific literature as possible measurements for evaluating the HEIs' performance. In the Doctoral Thesis, the author conducted a literature review, describing each of the groups created. The author concludes that continuous improvement indicators can be identified at all levels of

processes and systems in the organisation. These indicators are applicable across all previously identified groups, as they are primarily focused on system or process improvement. For example, the level of integration, measures of process efficiency, and indicators reflecting employees' or other stakeholders' perceptions of process complexity. Therefore, the author has integrated the identified continuous improvement indicators into groups of all the above indicator groups to ensure that each of them includes an element of improvement (Fig. 2.2).

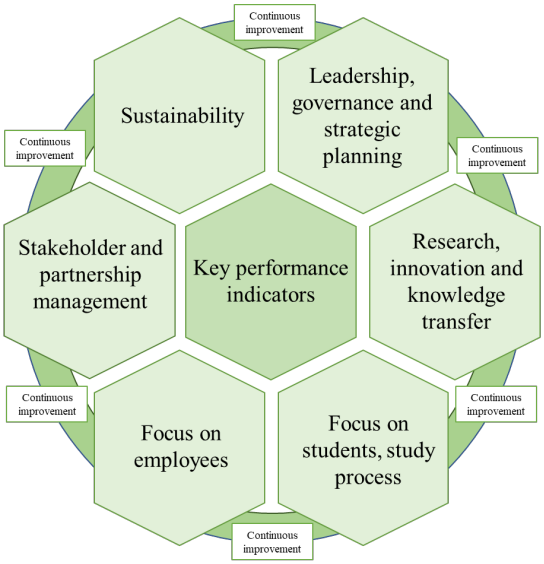

Fig. 2.2. Model of theoretical indicator system's interaction (created by the author).

The author concludes that continuous improvement indicators serve as a support mechanism for processes that are monitored by previously identified indicator groups. From the systems theory point of view, in order to create a system, there must be an interaction between these indicator groups and the indicators (Bertalanffy, 1972). Based on the results of the research, the second thesis has been proven: continuous improvement and sustainable performance indicators should be integrated into the indicator and monitoring system.

To examine whether the identified indicator groups align with the key process or performance indicators defined by HEIs, the author analyses the strategic planning documents of Latvian HEIs. From an indicator perspective, an organisation's strategy includes the main priorities, the objectives and performance indicators.

2.2. Latvian HEIs' strategies and key performance indicators

Before analysing the HEIs' strategies, the author summarised the most significant changes that have affected Latvian higher education in recent years. In 2021, the Law on Higher Education Institutions in Latvia was amended, which included the typology of HEIs. The law stipulates that four types of HEIs are distinguished in Latvia – the university of science, the university of arts and culture, the university of applied sciences and the higher education institution of applied sciences. As a result of these changes, HEIs must adjust their strategies to fulfil legal obligations and preserve their status. The main differences between the types of HEIs are their focus areas, the proportion of staff with a Ph.D. and the levels at which the study programs are offered. The government's requirements do not restrict HEIs from pursuing directions in other areas of strategic importance to the HEIs. The specialisation and fundamental operating principles of each HEI are established in its Constitution, which guides the development of the institution's operational strategy for a defined period. The HEIs' strategy includes the mission, vision, development directions and objectives, which are monitored in the form of indicators. In order to identify whether the indicator groups in the HEIs' strategies are similar to the indicator groups identified in scientific literature, the author carried out an analysis of the publicly available Latvian HEIs' strategies. The research question: Which of the indicator groups identified in the theory are included in the Latvian HEIs' strategies? The following process steps were identified for the research (Fig. 2.3).

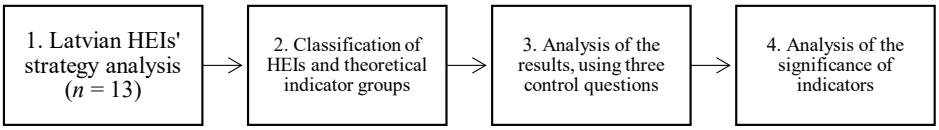

Fig. 2.3. Steps of the research process (created by the author).

A total of 13 HEIs' strategies were reviewed, while 3 Latvian HEIs' strategies were not publicly available. The strategy analysis was carried out in March 2022, and the author used the most relevant HEIs' strategies at that time. The information contained in the selected documents was analysed according to three control questions:

1. Is the theoretical indicator group identified in the strategy as a priority?
2. Do the priorities have objectives?
3. Are any measurable performance indicators defined for the objectives?

The aggregated results show that the most identified priorities in strategies are about students and staff. In the student context, priorities such as improving student satisfaction and

student experience and attracting talented students are mentioned, while in the context of employees, priorities such as upskilling academic and scientific staff, career development initiatives, and employee well-being indicators are mentioned. In the area of sustainability, the author identified priorities that were related to infrastructure, environment and social aspects, such as an inclusive environment. The lowest priorities the author identified were related to leadership, governance, and strategic management. Furthermore, the author analysed the results based on the types of HEIs (Table 2.1).

Table 2.1

Comparison of Results Based on the HEI's Type

Typology of HEIs / Indicator group	University of science	University of arts and culture	University of applied sciences	Higher education institution of applied sciences	Average (n = 13)
Sustainability	75 %	56 %	67 %	75 %	68 %
Stakeholder and partnership management	75 %	78 %	83 %	83 %	80 %
Focus on employees	92 %	67 %	100 %	92 %	88 %
Focus on students and study process	100 %	78 %	100 %	83 %	90 %
Research, innovation and knowledge transfer	75 %	67 %	83 %	33 %	65 %
Leadership, governance and strategic planning	67 %	44 %	17 %	42 %	42 %
Average	**81 %**	**65 %**	**75 %**	**68 %**	**72 %**

The results indicate differences between the distribution of strategic priorities for different types of HEIs. All indicator groups considered in the theory were identified in the Latvian HEIs' strategies. Universities of science strategies cover the most indicator groups – 81 %, but the least of them are included in the universities of arts and culture – 65 %. Leadership, governance and strategic planning was the least identified indicator group, accounting for only 17 % for universities of applied sciences, 42 % for higher education institutions of applied sciences, and 44 % for universities of arts and culture. Of all types of HEIs, the universities of science show the highest priorities in this field. The author identified strategic priorities in the field, but the strategies did not include specific objectives and measurable indicators for leadership, governance and strategic planning. The author concludes that indicator groups linked to strategies that identify and describe priorities, set goals, and define expected outcomes can be regarded as important indicators for HEIs. By comparing the obtained results with the theoretical model of the indicator system, it becomes evident which indicator groups are prioritised in the strategic planning documents of Latvian HEIs (Fig. 2.4).

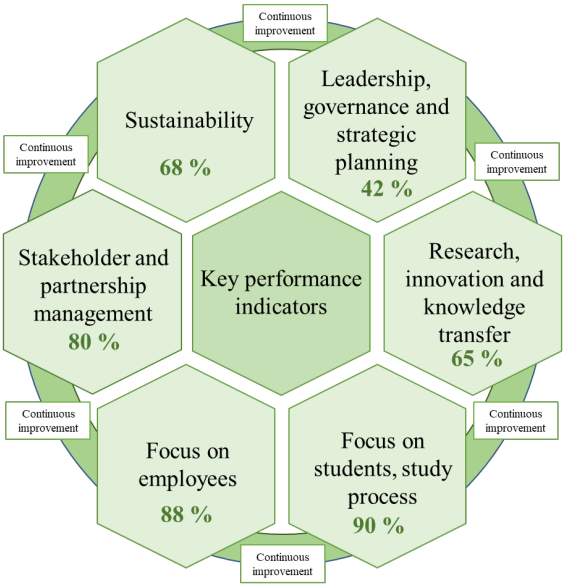

Fig. 2.4. Comparison of the priorities of Latvian HEIs in the theoretical model.

The indicators most frequently identified in the Latvian HEIs' strategies are related to the study process, human resources, stakeholders, and partnership management. Comparatively less emphasis is placed on areas such as sustainability, research, innovation, knowledge transfer, leadership, and strategic management. The author observes that indicators linked to leadership, governance, and strategic management are less commonly included in HEIs' strategic planning documents. The findings suggest that, within the context of HEI governance, there is a lack of clearly defined strategic priorities and measurable indicators to support the monitoring of change management and the successful achievement of strategic objectives.

Based on the obtained results, the author concludes that the second task set in the Doctoral Thesis has been fulfilled. The priorities set in the Latvian HEIs' strategies and their indicators are compared with the priority areas identified in the scientific literature. The results provide an answer to the second research question: What indicators are used in HEIs' strategies, performance evaluation and monitoring?

The author concludes that at this stage of the research, it is impossible to determine how the established indicator groups interact with each other and what the impact is, since data on performance is not available in the HEIs' strategies. This information is not published at a detailed level to allow qualitative comparison at this stage of research. Non-disclosure of this information is also a matter of competitiveness for HEIs. However, there is also publicly available information on the performance of HEIs on various indicators and internationally

recognised ranking systems. Therefore, in the next chapter of the Thesis, an in-depth analysis of ranking systems and their indicators will be carried out.

3. RANKINGS AS A BENCHMARKING APPROACH FOR HEI

Chapter 3 of the Doctoral Thesis is focused on the analysis of internationally recognised ranking systems for HEIs and their indicators. Nowadays, ranking systems are widely used around the world as a way to compare the performance of HEIs in the region and internationally. In this chapter, the author analysed the ranking focus areas, the most significant differences, the indicators included in the methodologies, their impact and interaction.

3.1. Analysis of ranking indicators and their interactions

In this section, the indicators included in the QS WUR (QS World University Rankings) and THE WUR (Times Higher Education World University Rankings) rankings are analysed with the aim of understanding whether there are correlations between the indicators. The author raised the following research question for the research: What indicates that the indicators included in the rankings interact with each other and form an indicator system? The research was done in four steps (Fig. 3.1).

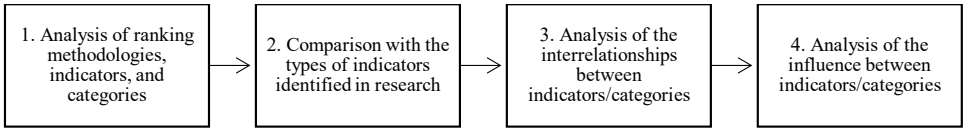

Fig. 3.1. Steps of the research process (created by the author).

The analysis was based on the methodologies of two rankings and publicly available data, which included nine indicators in the QS WUR ranking and 13 indicators in the THE WUR ranking (which was divided into 5 categories). The author used SmartPLS software (Ringle *et al*., 2024) to analyse and visualise the results of both rankings. In order to determine whether the indicators included in the rankings form a system or are independent indicators, the author used the structural equation modelling (PLS-SEM) algorithm (Wold, 1982; Lohmöller, 1989) to determine correlations. Within the research, very high, high and medium correlations were analysed further. In Section 3.2 of the Doctoral Thesis, the author described the steps of the analysis process, which included data retrieval, data quality check, development of indicator codes, correlation calculations, testing, visualisation of correlations, reliability of results and analysis of results.

In the context of the QS WUR, data on the performance of 1498 HEIs were used. For the analysis of the nine categories and indicators in the THE WUR, data from the 2024 ranking covering 1500 HEIs were used. Those HEIs included in the ranking beyond the top 1500 were excluded from the analysis, since the author identified that complete data in each category is not available for these HEIs. Furthermore, if data is unavailable, it is impossible to assess the position of specific HEIs in the ranking. In the publicly available results of the THE WUR ranking, the performance of HEIs is evaluated at the level of categories, not specific indicators, as is the case in the QS WUR ranking. Assuming that the nominated categories characterise a specific group of indicators, a similar data analysis was performed using SmartPLS software and the structural equation modelling (PLS-SEM) algorithm (Wold, 1982; Lohmöller, 1989). The author performed a sample size analysis by calculating the critical t-value, determining the error probability at 5 %. The calculated minimum correlation factor was $r = 0.0506$ at the sample size for both data sets. The coefficient indicates a statistically significant correlation to the minimum value obtained, since the sample size is relatively high. Complete calculations are included in Section 3.1 of the Doctoral Thesis.

Analysis of QS WUR ranking indicators. Each of the indicators was assigned codes by entering them into the SmartPLS software: QS 1 – academic reputation; QS 2 – employer reputation; QS 3 – faculty student ratio; QS 4 – citation; QS 5 – Iiternational faculty ratio; QS 6 – international student ratio; QS 7 – international research network; QS 8 – employment outcomes; QS 9 – sustainability.

As a result, the correlation of nine indicators was tested using the developed algorithm. Each of the indicators was analysed against its impact on the other eight indicators. Using SmartPLS software, the correlation between each indicator was calculated. The cells coloured in grey in Table 3.1 indicate a correlation between the same indicator, resulting in a value of 1,000, and in further analysis, the author did not take these values into account (Table 3.1).

Table 3.1

Correlations Between QS WUR Ranking Indicators

	QS 1	**QS 2**	**QS 3**	**QS 4**	**QS 5**	**QS 6**	**QS 7**	**QS 8**	**QS 9**
QS 1	1.000	0.835	0.355	0.535	0.397	0.390	0.688	0.713	0.719
QS 2	0.835	1.000	0.325	0.394	0.326	0.341	0.472	0.658	0.558
QS 3	0.355	0.325	1.000	0.123	0.174	0.233	0.187	0.275	0.193
QS 4	0.535	0.394	0.123	1.000	0.416	0.337	0.520	0.397	0.547
QS 5	0.397	0.326	0.174	0.416	1.000	0.704	0.428	0.351	0.469
QS 6	0.390	0.341	0.233	0.337	0.704	1.000	0.381	0.329	0.405
QS 7	0.688	0.472	0.187	0.520	0.428	0.381	1.000	0.493	0.764
QS 8	0.713	0.658	0.275	0.397	0.351	0.329	0.493	1.000	0.589
QS 9	0.719	0.558	0.193	0.547	0.469	0.405	0.764	0.589	1.000

The calculated results show that one correlation is rated as very high and six are rated as high. The average correlation is observed 11 times.

In the next step of analysis, the author analyses the impact of indicators. In the first direction, 18 individual correlations were tested between the selected indicators, and the results were evaluated as very high, high, or moderate correlations. The ratio of indicators with weak and very weak results was not included in the model. In the model, the direction of influence between indicators is illustrated by the direction of the arrows.

The results show that in 15 cases a positive impact on the selected indicators is calculated, while in two cases a negative effect is observed, which is characterised by the coefficient of the individual path. The intensity of the arrow's marking reflects the significance of the calculated individual path coefficient (Fig. 3.2).

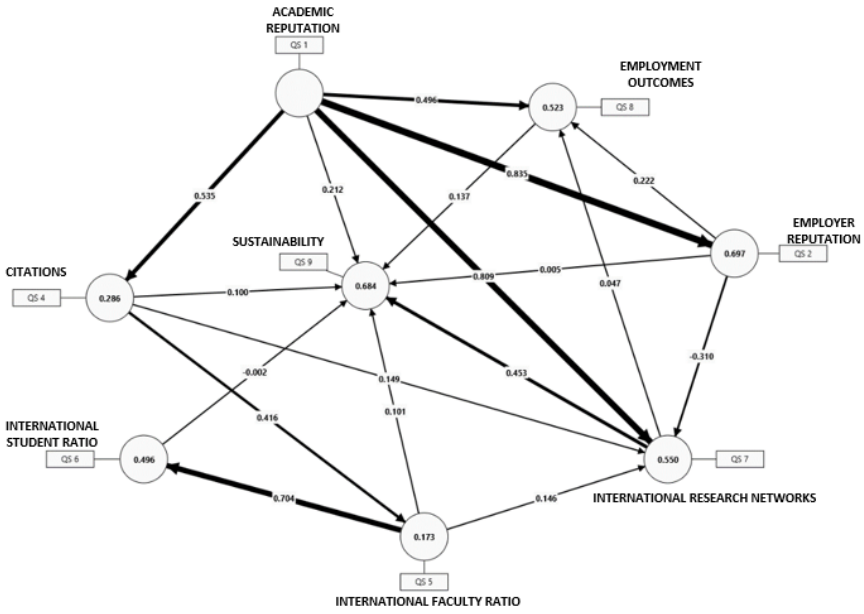

Fig. 3.2. Analysis of the interaction of indicators, Direction 1 (created by the author).

The International Student Ratio (QS 6) has a minimal impact on sustainability (QS 9), while a higher employer reputation (QS 2) is associated with lower scores in the international research network (QS 7) indicator. The average impact of the international research network (QS 7) and sustainability (QS 9) indicators has been identified. The results show that the international faculty ratio (QS 5) has a positive impact on the international student ratio (QS 6).

In Direction 2, the same 18 connections with opposite directions were tested. As a result, no negative direction of influence was identified. The sustainability indicator (QS 9) has a significant impact on two indicators – international research network (QS 7) and employment outcomes (QS 8) (Fig. 3.3).

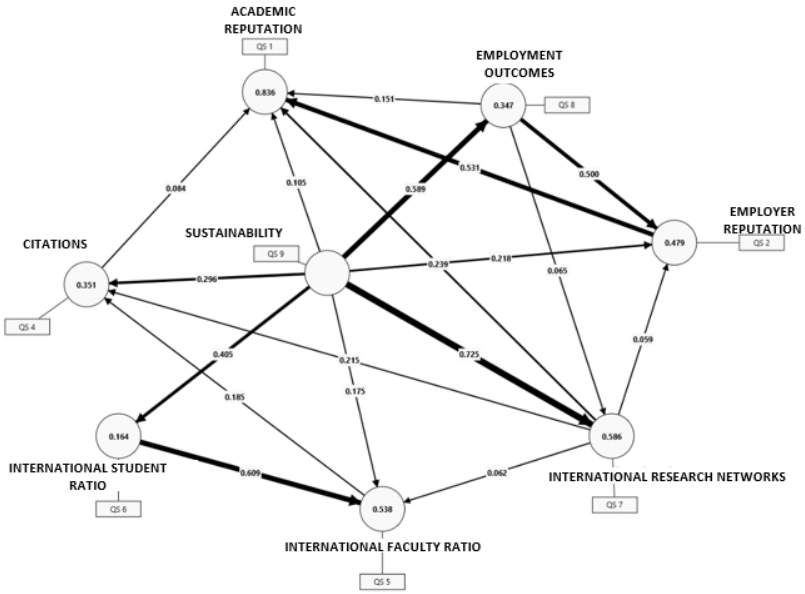

Fig. 3.3. Analysis of the interaction of indicators, Direction 2 (created by the author).

On the other hand, the employment outcomes (QS 8) have a significant impact on the employer reputation (QS 2). When comparing the two directions, the 10 most important paths of influence were identified – six from the analysis of Direction 1 and four from Direction 2 (Table 3.2).

Table 3.2

Summary of the Main Pathways of Influence

Direction	Influencing indicator	Indicator affected	Coeficient
1.	Academic reputation (QS 1)	Employer reputation (QS 2)	0.835
1.	Academic reputation (QS 1)	International research network (QS 7)	0.809
2.	Sustainability (QS 9)	International research network (QS 7)	0.725
1.	International faculty ratio (QS 5)	International student ratio (QS 6)	0.704
2.	Sustainability (QS 9)	Employment outcomes (QS 8)	0.589
1.	Academic reputation (QS 1)	Citation (QS 4)	0.535
2.	Employment outcomes (QS 8)	Employer reputation (QS 2)	0.500
1.	Academic reputation (QS 1)	Employment outcomes (QS 8)	0.496
1.	Citation (QS 4)	International faculty ratio (QS 5)	0.416
2.	Sustainability (QS 9)	International student ratio (QS 6)	0.405

The greatest positive impact is observed on the academic reputation (QS 1), on the employer reputation (QS 2), and on the international research network (QS 7) indicators, but the average impact is on the employment outcomes (QS 8) and citation (QS 4) indicators. The impact of sustainability (QS 9) can be attributed to international research network (QS 7), employment outcomes (QS 8) and the international student ratio (QS 6) indicators.

Analysis of the categories of the WUR ranking. Before conducting the analysis, the author created category codes: THE 1 – teaching (study environment); THE 2 – research environment; THE 3 – industry; THE 4 – research quality; THE 5 – international outlook. Initially, an analysis of the interrelationships of the five categories was carried out, calculating correlation coefficients and assessing their significance (Table 3.3).

Table 3.3

Calculation of Correlations Between THE WUR Ranking Categories

	THE 1	**THE 2**	**THE 3**	**THE 4**	**THE 5**
THE 1	1.000	0.864	0.636	0.431	0.337
THE 2	0.864	1.000	0.754	0.587	0.499
THE 3	0.636	0.754	1.000	0.454	0.390
THE 4	0.431	0.587	0.454	1.000	0.540
THE 5	0.337	0.499	0.390	0.540	1.000

The results show that one correlation is rated as very high and two are rated as high. An average correlation is observed five times. In order to answer the research question, also in the context of the THE WUR ranking, as part of the fourth step of the process, the author conducted an analysis of the interaction of the identified five categories, repeatedly using the structural equation modelling (PLS-SEM) algorithm. Also, at this stage, two-way testing was carried out, which helped to identify the level of impact of each category.

In Direction 1, eight individual correlations were tested, which indicated very high, high and medium correlations. Categories with low correlation coefficients were not included in the analysis. A total of five category interactions were tested (Fig. 3.4).

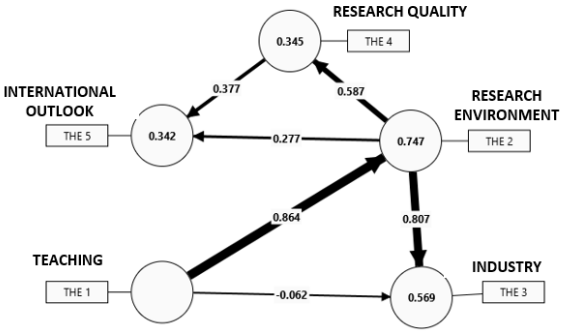

Fig. 3.4. Analysis of category interactions, Direction 1 (created by the author).

As part of testing Direction 1, three significant directions of impact were identified. The research environment (THE 2) has a positive impact on the industry (THE 3) and the research quality (THE 4) categories. Teaching (study environment) (THE 1) positively affects the research environment (THE 2). However, as part of the testing of Direction 2, the author concluded that even more significant is the impact of the research environment (THE 2) on teaching (study environment) (THE 1). These two categories mutually positively affect their performance in the ranking (Fig. 3.5).

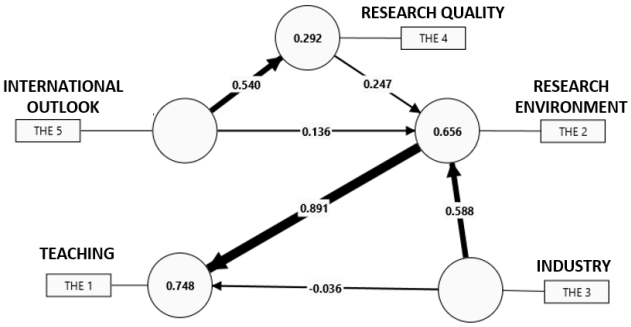

Fig. 3.5. Analysis of category interactions, Direction 2 (created by the author).

Comparing the results obtained after testing Direction 2, the author concludes that it is possible to identify another significant correlation of indicators – the impact of international outlook (THE 5) on research quality (THE 4). The most significant results are summarised in Table 3.4.

Table 3.4

Summary of the Main Pathways of Influence

Direction	Affecting category	Category affected	Factor
2.	Research environment (THE 2)	Teaching (study environment) (THE 1)	0.891
1.	Teaching (study environment) (THE 1)	Research environment (THE 2)	0.864
1.	Research environment (THE 2)	Industry (THE 3)	0.807
1.	Research environment (THE 2)	Research quality(THE 4)	0.587
2.	International outlook (THE 5)	Research quality(THE 4)	0.504

The results show that almost equally high cross-effects are observed between the research environment (THE 2) and the teaching (study environment) (THE 1) categories. The research environment (THE 2) has a positive impact, which includes indicators of the volume of scientific publications and the amount of research income, on the industry (THE 3) category.

Based on the methodologies and analysis of the indicators of both rankings and the correlations, the author concludes that it is possible to answer the third research question: How do indicators interact within the HEI ranking systems? The results obtained show that there are indicator groups that impact not only one or several indicators at the individual level but also within the framework of the system, where there is an observable interaction.

The author concludes that, based on the results, the third research question was answered: How do indicators interact in international HEI ranking indicator systems? From the two ranking indicator systems, the correlations between the indicators and their mutual influence were identified. Based on the analysis, the author identified that internationally recognised ranking systems can be used to assess and monitor the performance of HEIs.

4. INDICATOR SYSTEM AND PERFORMANCE EVALUATION FOR SUSTAINABILITY IN HEI

In Chapter 4 of the Doctoral Thesis, the author answers the raised research question: How to establish and implement an effective indicator system and process monitoring to ensure HEIs' sustainability? The author developed a structured approach to forming an indicator system for HEIs and monitoring performance indicators, which is outlined in three distinct stages. Each of these stages is presented as the novelty of the Doctoral Thesis. Chapter 4 includes the validation and testing of these developed novelties. Validation was conducted through expert interviews, while the testing phase was implemented at Riga Technical University (RTU).

4.1. Development and monitoring of the indicator system

Development and review of HEIs' strategy and KPI identification. To identify indicators that reflect the progress of HEIs towards achieving their core activities and strategic objectives, the author proposes an approach for selecting, analysing, and reviewing strategic directions. The approach integrates an assessment of HEIs' strategic directions through the resource-based view and the participation of stakeholders in decision-making. The approach is based on the theoretical principles of sustainable organisation performance described in Fig. 1.8, which was validated during expert interviews, as well as tested during the development of the HEI's strategy.

The theoretical framework for organisation's sustainable performance described in Section 1.1. is used as a basis for the approach. The approach for assessing the HEI's strategic directions includes four stages (Fig. 4.1).

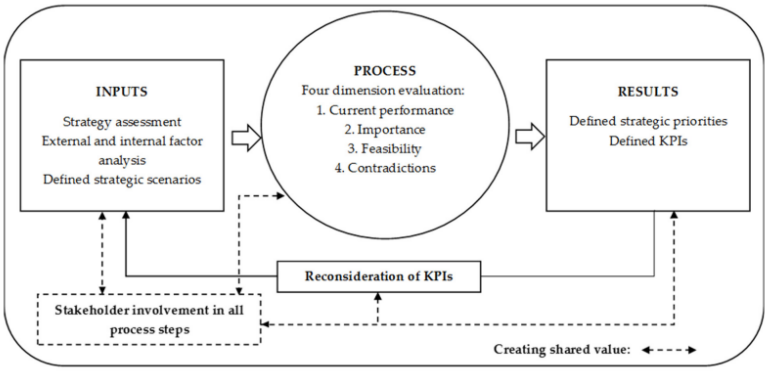

Fig. 4.1. Approach to evaluating strategy directions and creating shared value.

The stages defined in the approach are (1) input, (2) evaluation process, (3) results, and (4) KPI review. The first stage includes an assessment of the current strategy and the results of an analysis of HEIs' internal and external factors. As part of the evaluation of the current strategy, the involvement of key stakeholders is ensured by incorporating their feedback through surveys and organised discussions. The feedback results are used to define scenarios for several HEIs ' strategic directions, which are presented to the key stakeholders. Scenarios of strategic directions include a description of specific activities in HEIs' main processes.

The second stage involves the evaluation of scenarios related to the established strategic directions. Each scenario is assessed across four dimensions, incorporating the perspectives of key stakeholders. These stakeholders evaluate the activities within each strategic direction according to the following four dimensions:

- Current performance – attributed to activities that HEI has implemented in the past, allowing for the assessment of their performance so far.
- The importance of activities is assessed in the context of the objectives set by the next strategic period.
- Feasibility of implementation – the analysis of existing resources and availability of resources in the planned strategy period.
- Contradiction analysis – activities are reviewed to identify potential contradictions for the simultaneous implementation of activities.

In the third step, based on the assessment of the four dimensions, a list of priority activities is established, and the KPIs, along with other relevant indicators, are defined within the HEI's indicator system. The indicator system is based on the basic principles of EFQM and the PDCA (Deming improvement cycle), as proposed by the author in Section 1.2 (Fig. 1.3). The definition of KPI refers to the first four steps of a sustainable HEI indicator system, including the clear definition of indicators and responsibilities, the monitoring of the indicators, and the quality of data and measurements.

Furthermore, the fourth stage of evaluation consists of the process of reviewing the KPI, which is also extended to the concept of the sustainable HEI indicator system proposed by the author. This process is described in the final stages of the indicator system and involves analysis, review, and adjustment of the KPIs, if needed.

Validation: Expert interview method and the justification for the chosen experts. In order to carry out the approach validation developed in the Doctoral Thesis for the assessment of strategic directions, the author used the expert interview method. The purpose of using the

method was to obtain the assessment and validation of foreign experts for the novelties put forward in the Doctoral Thesis. The suitability of experts to participate in the interview was assessed on the basis of their professional experience as experts in higher education and their management positions in HEIs. Furthermore, the expert's professional or academic experience in the field of quality management or quality assurance was also taken into account. A total of 14 experts from five different types of HEIs were selected. The experts represented nine HEIs in Europe and two outside Europe (Table 4.1).

Table 4.1

Comparison of Represented HEIs in Expert Interviews

Type of HEI	Name of the HEI	Country	Number of experts
University of science	University of Vienna	Austria	1
	Vytautas Magnus University	Lithuania	1
	Truïve University of Technology	France	1
University of applied sciences	Darmstadt School of Applied Sciences	Germany	1
	Utrecht University of Applied Sciences	Netherlands	1
Polytechnic university	Gdańsk University of Technology	Poland	2
	Technical University of Cluj-Napoca	Romania	2
	Sofia Technical University	Bulgaria	2
Comprehensive (broad-spectrum) university	Transylvanian University in Brașov	Romania	1
	Afyon Kocatepe University	Türkiye	1
Specialised higher education institution (private)	Al Maktoum College of Higher Education	United Kingdom	1

Individual expert interviews were organised between 16 December 2024 and 17 January 2025. The results of the interviews regarding the author's approach to evaluating strategic directions and creating shared value are summarised in Fig. 4.2).

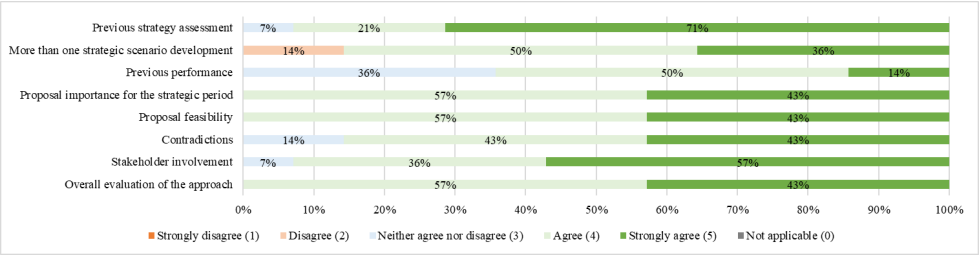

Fig. 4.2. Expert assessment results of evaluating the approach.

Overall, the expert assessment of the approach is positive; 43 % of experts fully agree with the characteristics of the approach, and 57 % agree. The experts evaluate the author's approach as an essential part of the strategy development process. During the concluding discussions, the experts advised highlighting the interdependence between the four main stages – input, process, results, and review of the GDR. Given that each of these stages is time-

consuming, the experts highlighted the practical need to develop procedures for each of the evaluation steps and to ensure that they are accessible to all key stakeholders. Based on the results, the author concluded the validation phase of the developed approach.

Approach testing: Developing RTU strategy. In addition to the expert interviews, testing of the developed approach was carried out. The RTU Strategy development process was used as a basis for testing. The testing phase is described in detail in Section 4.1 of the Doctoral Thesis, and it was divided into three stages:

1. **Development scenarios.** Based on the RTU's development vision, two potential development scenarios were identified.
2. **Expert working groups.** Two working groups were organised with RTU study and research process experts. The experts involved in the working groups were senior and mid-level university staff who represented the interests of RTU faculties and administration in the areas of studies, research, and innovation.
3. **Result analysis and selection of the strategic development scenario.** The author analysed the results, and they were used as the basis for the development of RTU's strategy.

The author concludes that, based on the validation and testing phase, the third thesis was confirmed – strategic priorities should be assessed on the basis of a resource-based approach and analysis of the needs of the parties involved in order to ensure the sustainable operation of the organisation and data-based decision-making. In the Doctoral Thesis, as a second novelty, the author proposes an approach to creating and monitoring an indicator system that has been developed, which includes the identification of strategic priorities and the use of a resource-based approach to ensure sustainable performance.

4.2. Setting priorities for the sustainable operation of HEIs

Prioritising the sustainable performance of HEIs using a multi-dimensional benefit matrix. Given that international ranking systems provide a systematic basis for comparing HEI performance, the author proposes an approach for multidimensional benefits analysis that combines the evaluation of the planned HEI activities in consideration of their impact on the ranking indicators. As an example, HEIs' sustainability priorities and sustainability ranking indicators were used to set priorities. The developed approach was tested with HEI experts who are working in different dimensions of sustainability at the HEI. The author, as the third novelty of the Doctoral Thesis, proposes a priority assessment matrix that has been established for the

main indicators of the sustainability performance of a HEI, taking into account resources, the needs of stakeholders and the requirements of international HEI rankings.

The use of the priority assessment matrix enables the evaluation of how HEIs' priorities in areas such as resource management and social responsibility contribute to their performance in external assessments, including international HEI rankings. The multidimensional benefit matrix consists of:

- resource management dimension, which includes an analysis of the availability of HEIs' resources, including available funding or potential cost, and an assessment of the environment, including the infrastructure;
- dimension of social responsibility, which includes an assessment of the implementation of the functions of HEIs as a socially responsible organisation;
- the external assessment (rankings) dimension, which includes indicators of HEIs' priority ranking systems.

The multidimensional benefit matrix is based on the quality function deployment matrix (QFD). The use of the matrix aims to identify the priorities that deliver the greatest benefit in the selected dimensions and helps to define appropriate indicators in the HEIs' priority areas, taking into account the indicators included in the ranking systems. In order to visualise the multidimensional benefit matrix proposed by the author, the Venn diagram was used, indicating the common elements of the defined dimensions – the priorities set by HEIs and the indicators that characterise them (Fig. 4.3).

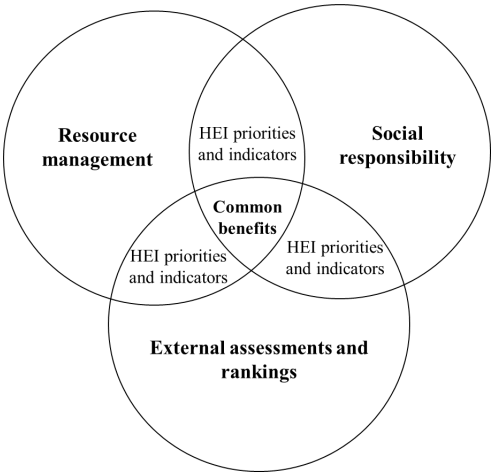

Fig. 4.3. Multidimensional benefit assessment (created by the author).

Once the key areas of influence for HEIs have been identified, particularly from the perspectives of resource management, social responsibility, and performance in rankings,

correlations can be established with the support of selected internal experts from the HEI. A detailed evaluation process is outlined in Section 4.2 of the Doctoral Thesis. The core steps of this process include identifying impact areas, conducting expert assessments, implementing relevant activities, and analysing the overall benefits (Figure 4.4).

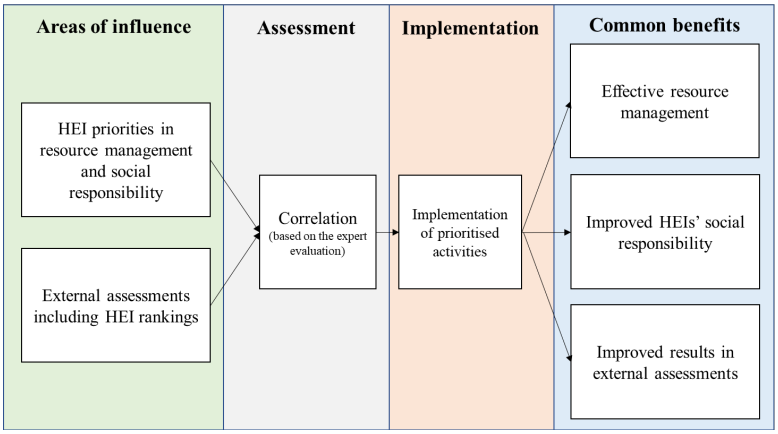

Fig. 4.4. Evaluation of the benefits of HEIs' activities (created by the author).

The multidimensional evaluation matrix was validated and tested at RTU when RTU sustainability-related activities were planned for the next planning period. RTU's goal was to identify activities that would contribute not only to RTU's key stakeholders and cost savings, but also to positively impact international sustainability rankings. The assessment was based on the indicators included in the THE Impact rankings and UI GreenMetric ranking systems. Based on the results of the expert assessment, priority activities were identified that promote the efficient use of resources, enhance HEIs' social responsibility, and contribute to potentially higher performance in external sustainability-related evaluations, thereby generating multidimensional benefits. The evaluation identifies areas of activity whose development simultaneously has a positive impact on HEIs' external evaluations and rankings. The experts highlighted that one of the most significant advantages of the matrix is its ability to provide a comprehensive view across multiple dimensions, particularly given that each expert primarily represents their own field of expertise. The experts recommended that such an assessment should be carried out periodically in order to take into account changes in HEIs' internal processes and also externally from the perspective of changes in the ranking methodologies.

Based on the research, the expert comments involved in the validation phase of the approach and the testing of the developed approach, the author concludes that the fourth thesis is proven – to justify the priorities and activities planned by HEIs, their impact and potential benefits should be assessed simultaneously.

4.3. Identification of indicator groups for HEIs

Development of an indicator system and identification of indicator groups. The author proposes indicator groups and determines their importance, considering the type of HEI. The proposed indicator groups are based on the groups identified in theory in Section 2.1 (Fig. 2.1) and the results of the analysis of the Latvian HEIs' strategies (Fig. 2.4). The author conducted expert interviews to validate the proposed indicator groups. Additionally, compliance with these indicator groups was done, considering the types of HEIs represented by the experts. Information on experts is available in Table 4.2 of the summary, while the course of the interview is described in Chapter 4 of the Doctoral Thesis. The main results of the expert interviews are summarised in Fig. 4.5, including a comparison of theoretical indicator groups with the priorities of Latvian and foreign HEIs.

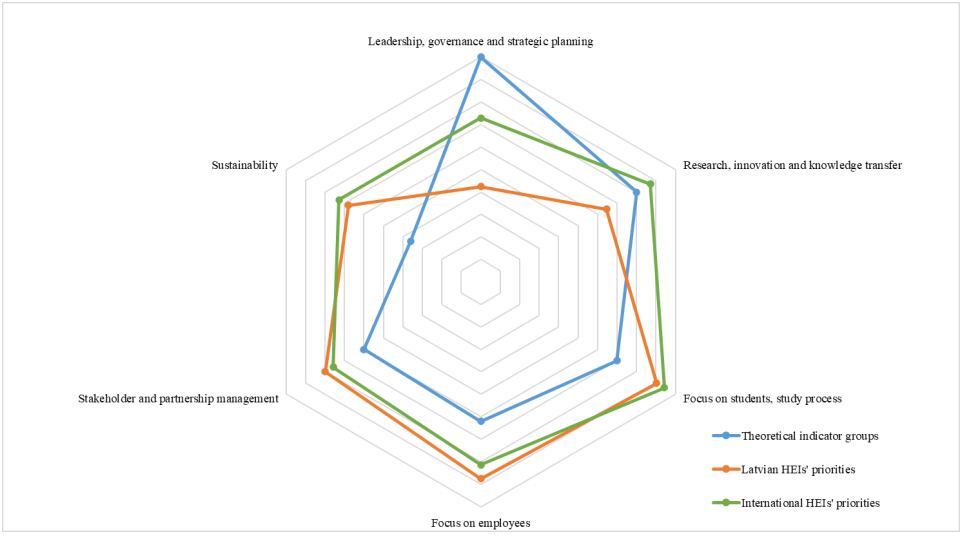

Fig. 4.5. Comparison of theoretical indicator groups with the priorities of Latvian and foreign HEIs.

The results show that the indicator group *focus on students and the study process* is an equally priority area for Latvian and foreign HEIs. Similar priorities can be observed for indicator groups *sustainability, focus on employees, stakeholder and partnership management*. On the other hand, foreign HEIs, compared to Latvian HEIs, place more emphasis on two indicator groups – *leadership, governance and strategic planning,* and *research, innovation and knowledge transfer,* which is also the higher prioritised group than that identified in theory.

The author concludes that all of the indicator groups identified in theory are included in the strategies of foreign HEIs, which indicates the relevance and usability of theoretical

indicator groups to monitor the activities of international HEIs. Based on the analysis, the author proposes the identified indicator groups for assessing and monitoring the sustainable performance of HEIs as the fourth and final novelty of the Doctoral Thesis.

The proposed indicator groups were analysed using Latvian HEIs' strategies and foreign HEIs' perspectives, based on the results of expert interviews. The experts were asked to identify whether other indicator groups were also used in the HEIs they represented, but such groups were not identified. While all indicator groups were identified in all HEIs, the most significant differences in priorities for indicator groups are visible regarding the types of HEIs. Some experts noted differences between priorities; for example, universities of applied sciences have a greater emphasis on indicators in the field of study. However, a lower priority is given in the context of indicators related to research and innovation. On the other hand, research, innovation and studies are equally important priorities for universities of science (Fig. 4.6).

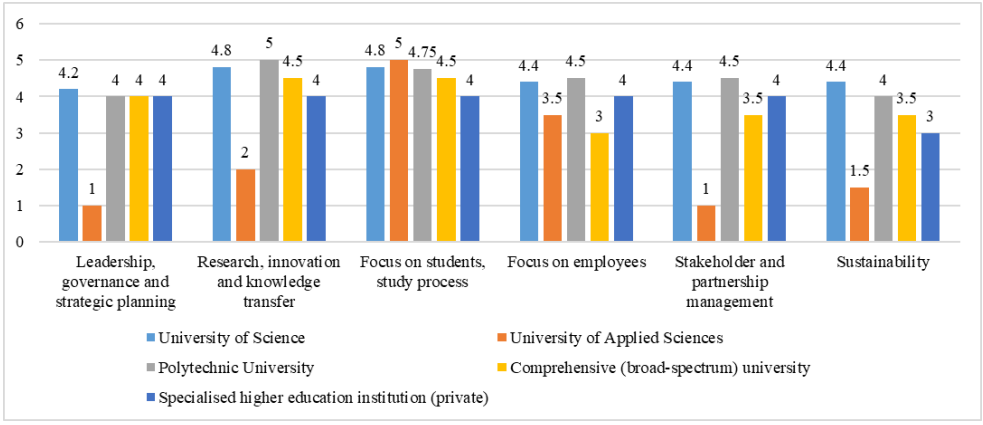

Fig. 4.6. Comparison of indicator groups by type of HEIs.

For comprehensive universities, equal emphasis is placed on study and research processes. However, indicators related to staff, particularly academic and research staff, are assigned the lowest priority. Experts representing this type of university noted that existing HEI strategic documents do not prioritise staff and other stakeholders, excluding students, as key focus areas.

CONCLUSIONS AND PROPOSALS

Within the Doctoral Thesis, the hypothesis was proven: The organisation's performance monitoring is supported by an indicator system that includes a systematic assessment of strategic priorities, considering the availability of resources and the needs of the stakeholders.

Based on the research findings within the Doctoral Thesis, the author formulated conclusions and proposals:

1. The concept of *organisational performance* is used with different meanings in Latvian depending on the context. For example, organisational performance is meant in the context of system and process efficiency, efficiency in terms of used resources, organisational process performance, and the activities undertaken to reach objectives. However, the common feature of these concepts is the focus on results.
2. Based on the research, the elements characterising sustainable organisations were identified, which were used as the basis for the concept of sustainable organisational performance developed by the author. The identified elements include a systemic approach, strategic management, resource management, including human resource management, identification and meeting of the needs of stakeholders, the development of an indicator system, and the implementation of a monitoring process.
3. The indicator system is part of a broader organisational system influenced by internal and external factors, the functioning of other systems and the level of integration between systems. The integration of systems is an important precondition for the development of an effective indicator system.
4. A sustainable system of organisational indicators can be created by integrating Deming's continuous improvement cycle and the basic elements of the EFQM model – direction, execution and results. A sustainable scoreboard that includes clearly defined indicators, reliable data, and regular monitoring of indicator performance is critical to an organisation's strategic leadership, process management, and resource management to enable an organisation to make data-driven and performance-based decisions.
5. The performance of an organisation is characterised by various indicators, such as key performance indicators, key result indicators, performance indicators, individual indicators, process measurements, which can be divided into four levels: strategy, system, process and data levels. Each level of indicators serves a specific function, integrating the view on both the organisation's operational activities and the performance of its strategic management.

6. Internationally recognised ranking indicator systems can be used to compare the performance of higher education institutions. Taking into account limiting factors: the specifics of ranking methodologies and different definitions of indicators, the data periods, as well as the ranking data normalisation approaches, which consider from which region HEIs are.
7. Based on the literature review, seven indicator groups were identified: 1) leadership, governance and strategic planning; 2) research, innovation and knowledge transfer; 3) focus on students, study process; 4) focus on employees; 5) stakeholder and partnership management; and 6) sustainability and 7) continuous improvement. Continuous improvement indicators were identified in all of the previously mentioned groups as support indicators. All of the indicator groups were identified both in the Latvian and foreign HEIs' strategies, which indicates the conformity of the indicator groups with the monitoring of the activities of modern HEIs.
8. When comparing the Latvian HEIs' strategies, in 90 % of cases, focus on students and the study process is set as a priority with achievable goals and measurable indicators, but focus on employees was identified in 88 % of cases. The least identified indicator group was leadership, governance and strategic planning, which shows that the HEIs' governance lacks strategic priorities and measurable indicators to monitor HEIs' change management and ability to achieve their objectives.
9. The most widely represented indicator group in international HEIs rankings is related to research performance indicators, covering 23 %, while study performance indicators account for only 12 %, and these indicators are not included in all analysed rankings. This difference shows a strong predominance in rankings to prioritise the research outputs of HEIs.
10. For the improvement of positions in the international HEI rankings, priority investments should be made in human resources, in particular in the development of the talents of academic and scientific staff and in the international cooperation of HEIs. This will encourage growth in most of the ranking indicators related to the broadest group of indicators represented in the rankings – research performance indicators.
11. Based on the QS WUR ranking impact analysis author concluded that academic reputation has a positive impact on employer reputation, as well as on the employment outcomes. Academic reputation and the sustainability indicators have a positive impact on HEIs' success in establishing international research networks. The international staff ratio has a positive effect on the international student ratio in HEIs.

12. Based on the THE WUR ranking impact analysis, the author concluded that almost equally high cross-effects are observed between the category of the research environment and the teaching (study environment) category, as well as the positive impact of the research environment category on industry and research quality categories.
13. HEI ranking indicators should be interpreted within the context of the overall ranking system, with an understanding of how they interact with one another. A similar approach should be adopted in developing a scoreboard that incorporates indicator groups based on the type of HEI and its strategic priorities, identifies interactions between indicators, and enables ongoing performance monitoring.
14. Performance in international rankings should not be a strategic objective for HEIs. However, participation in such assessments offers valuable insights into the HEIs' performance. The results can be analysed in comparison with the performance of other HEIs over multiple years. These indicators may serve as a valuable benchmark for the HEI's internal scoreboard and competitiveness analysis. Moreover, high results in the rankings can enhance an HEI's visibility, reputation, and opportunities for collaboration with other institutions.
15. The indicator groups identified in the scientific literature were also found in the strategic documents of both Latvian and international HEIs. However, variations in institutional priorities across different types of HEIs influence the emphasis of these indicator groups. The author concludes that the indicators could have different weights in the indicator system for different types of HEIs.

On the basis of the conducted research and its results, the author presents the following proposals to higher education institutions, the Ministry of Education and Science in Latvia, other stakeholders of HEIs and researchers.

<u>For higher education institutions</u>

- Include in the strategic planning process an analysis of HEIs' existing and potential resources to enable data-driven decision-making. To ensure the participation of stakeholders in the process of developing and reviewing the HEIs' strategy, which would raise awareness of the role, functions and activities of modern HEIs in society.
- Implement clear stakeholder participation mechanisms during the planning and evaluation phases of HEIs' strategies. Use external feedback from stakeholders to promote the competitiveness of HEIs.

- Include in HEIs' strategies and indicator systems a set of indicators describing elements of leadership, governance, and strategic planning. Monitoring of these indicators would contribute to the achievement of the strategic objectives and HEIs' change management processes.
- Consider the type of higher education institution and its strategic focus areas when developing or improving an indicator system and selecting indicator groups that are tailored to the specific needs of the HEI.
- Use the HEI rankings to compare and benchmark the HEIs' performance at the regional and global levels. Use the author's analysis of the interaction between ranking indicators to support HEIs' activities in the positive impact directions to improve the Latvian HEIs' global reputation and positions in the rankings.
- In the process of planning activities, use the multidimensional matrix proposed by the author, which allows for the simultaneous assessment of the impact of activities, the necessary resources and potential benefits in several areas by implementing the activities.

For the Ministry of Education and Science in Latvia

- Ranking systems should be used to compare the performance of HEIs at the regional and global levels, but should not be set as a strategic objective for the acquisition of specific places in international rankings. In this context, also consider the typology of HEIs, recognising that different types of HEIs may have varying priorities that do not always align with the focus areas emphasised in international rankings, such as the strong emphasis on research output.
- Select performance indicators from international rankings that are relevant to the Latvian higher education system and national economic priorities and establish long-term, achievable targets for these indicators, ensuring alignment with the funding allocated to HEIs.
- Set HEI objectives based on an analysis of resource availability and capacity, ensuring that the goals established are realistic and attainable within the planning period.

For other main stakeholders of HEIs

- Be actively involved in the process of developing and reviewing HEIs' strategies to ensure that the needs and expectations of key stakeholders are reflected in HEIs' strategic priorities.

For researchers

- It is recommended to analyse other HEI ranking systems and identify indicator groups that interact with each other, for example, the latest ranking systems aimed at assessing the sustainability of HEIs.
- Analyse other assessments related to HEI governance, which would make it possible to identify additional indicator groups relevant to higher education.
- Conduct a comprehensive analysis of HEIs' strategies, including their priorities, objectives, and indicators, and perform a comparative assessment of the performance indicators across these strategies.
- Conduct an in-depth analysis of the differences between HEI types and examine how these differences influence the performance of HEIs in international rankings.

Based on the research conducted in the Doctoral Thesis and its results, the author concludes that the aim set in the Thesis – to develop an approach on how to form an indicator system for HEIs' process and performance monitoring while integrating the strategic direction and resource evaluation to ensure the HEIs' sustainable operations – has been achieved.

The four theses were proven, and the hypothesis – the organisation's performance monitoring is supported by an indicator system that includes a systematic assessment of strategic priorities, considering the availability of resources and the needs of the stakeholders – was proven.

The Latvian HEIs' strategies were examined, and opportunities for improvement were identified, taking into account the type of HEIs. Based on the literature review and the expert interviews, indicator groups were identified that should be included and monitored in the HEIs' indicator system in order to ensure sustainable organisational performance. An in-depth analysis of international HEI ranking methodologies and an analysis of the interaction between indicators have been carried out. The author identified indicators that mutually contribute to higher performance in rankings.

Additionally, in the context of Latvian higher education, the concept of sustainable organisational performance was developed, identifying the most important elements of a sustainable organisation. The systematic approach developed by the author for evaluating and reviewing organisational strategic priorities, taking into account the organisation's resources and the needs of its stakeholders, is a significant contribution to both scientific research and the practical application of the approach.

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