

Ukrainian State University of Railway Transport

Department of Management, Public Administration and HR Technologies

EXPLORING THE APPLICATION OF METAVERSE IN SUPPLY CHAIN MANAGEMENT EDUCATION

Explanatory Report and Analytical Calculations
to the Master's Qualification Thesis
under the educational program "Sustainable Logistics and Supply Chain Management"
specialty 073 "Management"

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Prepared by the Master's Degree Student
(second-cycle higher education)
(self-performed work in full compliance
with the principles of academic integrity)
Group 210-SL-D24
Ihor ROMANOVYCH

Supervisor: Senior Lecturer, Ph.D. in
Economics
Olena HULAY

Reviewer: Professor, Doctor of Economics
Myroslava KORIN

ABSTRACT

This qualification work includes 14 presentation slides, 80 pages of explanatory notes (A4 format) containing 3 figures, 14 tables, 5 appendixes, and 77 referenced literary sources. Keywords: SUPPLY CHAIN MANAGEMENT, METAVERSE, SUSTAINABLE LOGISTICS, DIGITAL TWINS, EXPERIENTIAL LEARNING, VIRTUAL REALITY, EDUCATION 4.0, GREEN COMPETENCIES.

The object of the study is the process of professional training of supply chain management specialists.

The aim of this qualification work is to theoretically substantiate and develop a conceptual model for integrating metaverse technologies into supply chain management education to improve the effectiveness of professional training and the formation of environmentally oriented competencies in the context of Industry 4.0.

The thesis systematises the theoretical and methodological foundations of using immersive technologies and digital twins in logistics education, based on the adaptation of D. Kolb's experiential learning theory.

Based on an empirical study of students and experts, an analysis of global trends, the state of digitalisation in education has been assessed, and critical gaps in practical skills regarding "green" logistics and digital tools have been identified.

An "Eco-Immersive Experiential Learning Model" has been developed, which integrates multisensory feedback and environmental impact visualisation, along with a typology of virtual scenarios for modelling sustainable supply chains.

The results of this research may be used by higher education institutions to modernise SCM curricula, create virtual laboratories, and develop VR simulation tools to ensure the training of specialists capable of working in digital and sustainable logistics systems.

АНОТАЦІЯ

Дана кваліфікаційна робота включає в себе 14 слайдів презентації, 80 аркушів пояснювальної записки формату A4, що містять 3 рисунки, 13 таблиць, 5 додатків та 77 використаних літературних джерел.

Ключові слова: УПРАВЛІННЯ ЛАНЦЮГАМИ ПОСТАЧАННЯ, МЕТАВСЕСВІТ, СТАЛА ЛОГІСТИКА, ЦИФРОВІ ДВІЙНИКИ, ЕКСПЕРИМЕНТАЛЬНЕ (ДОСВІДНЕ) НАВЧАННЯ, ВІРТУАЛЬНА РЕАЛЬНІСТЬ, ОСВІТА 4.0, ЗЕЛЕНІ КОМПЕТЕНТНОСТІ.

Об'єктом дослідження є процес професійної підготовки фахівців з управління ланцюгами поставок.

Метою кваліфікаційної роботи є теоретичне обґрунтування та розроблення концептуальної моделі інтеграції технологій метавсесвіту в освіту з управління ланцюгами поставок для підвищення ефективності професійної підготовки в умовах Індустрії 4.0.

У роботі систематизовано теоретико-методологічні засади використання імерсивних технологій та цифрових двійників у логістичній освіті на основі адаптації теорії емпіричного навчання Д. Колба.

На основі емпіричного дослідження студентів та експертів, аналізу глобальних трендів здійснено оцінювання стану цифровізації освіти та виявлено критичні розриви у практичних навичках щодо «зеленої» логістики та володіння цифровими інструментами.

Розроблено «Еко-імерсивну модель емпіричного навчання», що інтегрує мультисенсорний зворотний зв'язок та візуалізацію екологічного впливу, а також запропоновано типологію віртуальних сценаріїв для моделювання сталих ланцюгів поставок.

Результати дослідження можуть бути використані закладами вищої освіти для модернізації навчальних програм з SCM, створення віртуальних лабораторій та розроблення інструментів VR-симуляції задля забезпечення підготовки фахівців систем сталої логістики.

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Faculty of Economics

Department of Management, Public Administration and HR Technologies

Higher Education Level: Master

Educational Programme: Sustainable Logistics and Supply Chain Management

Specialty: 073 "Management"

APPROVED

Head of Department

Professor, Doctor of Economics

 Olena DYKAN

September 09, 2025.

ASSIGNMENT FOR THE MASTER'S QUALIFICATION WORK Ihor ROMANOVYCH

1 Topic «Exploring The Application Of Metaverse In Supply Chain Management Education»

supervisor Olena Hulay, Candidate of Economic Sciences, Associate Professor.

approved by the Order of the Faculty of Economics dated February 07, 2025 No. 58/25

2 The deadline for submission of completed work by a higher education applicant is December 12, 2025

3 Initial data Scientific and methodological sources on supply chain management, immersive technologies (VR/AR) and the metaverse; regulatory documents and strategies for the digital transformation of education; results of an empirical survey of students and teachers of logistics specialities conducted by the author in 2024–2025; technical documentation and analytical reports on the functionality of modern digital twin platforms and virtual simulation environments.

4 Content of the calculation and explanatory note (list of issues to be developed)

The Essence and Evolution of the Metaverse Concept: Technological and Educational Aspects. Theoretical Approaches to Learning in the Metaverse: Adaptation of D. Kolb's Experiential Learning Model. The Role of Digital Transformation and Immersive Technologies in Supply Chain Management (SCM). Analysis of Current SCM Teaching Practices: Global Trends and Sustainability Challenges. Research Methodology and Results of the Stakeholder Survey Regarding Readiness for Digitalisation. Assessment of the Gap Between Traditional Teaching Methods and Industry 4.0 Requirements for Green Skills. Methodological Approach to Integrating Metaverse Tools into SCM Training. Structure and Dynamics of Virtual Learning Environments for Supply Chain Modelling (Use Cases). Psychological and Organisational Factors Influencing the

Implementation of the Metaverse. Development of a Conceptual Model for Improving Learning Effectiveness and Shaping Environmental Awareness (Revised Framework).

5 List of graphic material

1 Theoretical and Methodological Foundations for Using the Metaverse in Logistics Education – two slides (Theoretical Framework; Input-Process-Outcome Model). 2 Empirical Study of the State of Education and the Need for Digitalisation in SCM – four slides (Empirical Study Results; Competency Gaps; Integral Index of Education Alignment; Platform Analysis). 3 Development of a Conceptual Model for the Application of the Metaverse in Supply Chain Management and Sustainable Logistics Education – three slides (Methodological Approach; Use Cases and Metaverse Reaction; Eco-Immersive Experiential Learning Model and Economic Efficiency).

6 Individual Section Consultants

Section	Surname, initials, title and academic degree Consultant	Signature, date	
		The task was issued by	task Took

7 Assignment Date September 09, 2025

CALENDAR PLAN

Stage name	Deadline for the implementation of the stages of work	Note
1 Theoretical and methodological foundations for the use of the metaverse in logistics education	10.10.2025	
2 Empirical study of the state of education and the need for digitalization in SCM	05.11.2025	
3 Development of a conceptual model for the application of the metaverse in supply chain management and sustainable logistics education	09.12.2025	
Graphic part	10.12.2025	

Higher education applicant


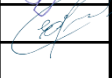


Ihor ROMANOVYCH

Supervisor

Olena HULAY

Contents

Introduction	7
1 Theoretical and methodological foundations for using the metaverse in logistics education	10
1.1 The essence and evolution of the metaverse concept: technological and educational aspects	10
1.2 Theoretical approaches to learning in the metaverse: adaptation of D. Kolb's experiential learning model for logistics education	13
1.3 Digital transformation, immersive technologies and a conceptual model of the impact of the metaverse on learning outcomes in supply chain management	16
Conclusions to Chapter 1	22
2 Empirical study of the state of education and the need for digitalisation in SCM	24
2.1 Analysis of current SCM teaching practices: global trends and sustainability challenges	24
2.2 Research methodology and data collection: stakeholder survey	27
2.3 Stakeholder survey results and their interpretation	30
2.4 Assessment of the gap between traditional methods and Industry 4.0 requirements for green skills: analytical, competency and technological dimensions	33
Conclusions to Chapter 2	38
3 Development of a conceptual model for the application of the metaverse in supply chain management and sustainable logistics education	41
3.1 Methodological approach to integrating metaverse tools into SCM training	41
3.2 Structure and dynamics of virtual learning environments for supply chain modelling (use cases)	44

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Rev.	Sheet	Document No.	Signature	Date	<i>Exploring The Application Of Metaverse In Supply Chain Management Education</i>	Ref..	Sheet	Sheets
Prepared by		Romanovych I.Y.					5	80
Reviewed by		Hulay O.S.						
Standards Control		Krykhtina Y.O.				UkrSURT		
Approved by		Dykan O.V.						

3.3 Psychological and organisational factors influencing the implementation of the metaverse in SCM training	47
3.4 Conceptual model for improving learning effectiveness and shaping environmental awareness through the metaverse (Revised Framework)	51
Conclusions to Chapter 3	62
Conclusion	65
List of sources	68
Appendix A	74
Appendix B	77
Appendix C	78
Appendix D	79
Appendix E	80

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