International Journal of Sustainable Development and Planning
Vol. 19, No. 4, April, 2024, pp. 1611-1619
Journal homepage: http://iieta.org/journals/ijsdp

Formation of Drivers of Sustainable Development: Administrative and Legal Support to Ensure Information Security

Myroslav Kryshtanovych[1*], Daria Kiblyk[2], Rostyslav Dzyanyy[3], Maksym Kovalskyi[4], Roman Primush[5], Tetiana Nazarenko[6]

[1] Institute of Law, Psychology and Innovative Education, Lviv Polytechnic National University, Lviv 79000, Ukraine
[2] Department of Administrative and Legal Disciplines, Donetsk State University of Internal Affairs, Kropyvnytskyi 25000, Ukraine
[3] Department of Administrative and Financial Management of Institute of Public Administration, Governance and Professional Development, Lviv Polytechnic National University, Lviv 79000, Ukraine
[4] Central-Western Interregional Department of the Ministry of Justice, Khmelnytskyi 29018, Ukraine
[5] The State Emergency Service of Ukraine in Charge of Digital Development, Digital Transformations, and Digitalization, National University of Civil Defence, Kharkiv 61000, Ukraine
[6] Department of Management Information System and Accounting, Zhytomyr Polytechnic State University, Zhytomyr 10001, Ukraine

Corresponding Author Email: myroslav.f.kryshtanovych@lpnu.ua

Copyright: ©2024 The authors. This article is published by IIETA and is licensed under the CC BY 4.0 license (http://creativecommons.org/licenses/by/4.0/).

https://doi.org/10.18280/ijsdp.190437

Received: 29 February 2024
Revised: 1 April 2024
Accepted: 11 April 2024
Available online: 28 April 2024

Keywords:
sustainable development, information security, economic growth, administrative support, regional development

ABSTRACT

The study is important because it reveals the connection between administrative and legal support for information security and the promotion of sustainable development using the example of the Lviv region, noting the need for an integrated approach in management and legislation. The main purpose of the article is to identify the key drivers of sustainable development through administrative and legal support of information security. The object of the study is the sustainable development of the Lviv region. The scientific task is to identify the key drivers of sustainable development through administrative and legal support for information security and ranking their importance in the context of the selected region. The research methodology includes a method of analyzing expert assessments, a method Euler's method and a structured ranking method. As a result of using the methods described above, we created a list of key drivers of sustainable development through administrative and legal support for information security and formed a ranking in accordance with the level of influence of each. The study has its limitations, as the study focuses on a specific region, the Lviv region, which may affect the generality of the findings and their application to other regions or contexts.

1. INTRODUCTION

The issue of ensuring information security through the use of modern administrative and legal mechanisms is a key element in supporting sustainable development. In the modern world, where digitalization has been integrated into almost all aspects of human life, the issue of forming effective protection of the information sphere becomes the basis for ensuring economic growth, social security and environmental balance. At the same time, the importance of using effective administrative measures and flexible legal frameworks is updated, which manifests itself in improving the protection of privacy and creating conditions for innovation and progress.

The introduction of an effective system for managing and protecting information through the introduction of modern policies and procedures, as well as detailed compliance with current legislation in the field of information security, raises the level of trust in digital systems in various spheres of society, including sustainable development and its technological component. In modern conditions, the increasing influence of cyber threats, the introduction of effective administrative and legal mechanisms is a key and determining element.

The field of sustainable development also inevitably faces the need to ensure information security, in particular in the context of planning and implementation of innovations. The development of any new technology must also take into account contemporary issues and trends in "conscious consumption." This requires an integrated approach that combines innovative technologies, strategic planning and effective resource management to achieve sustainable development goals.

The development of information technology plays a decisive role in shaping the modern world, influencing all aspects of human life and the sustainable development of society. These technologies are becoming catalysts for innovation in the economy, education, health and social

services, offering new opportunities to reduce poverty, and improve quality of life and environmental sustainability. However, along with undoubted advantages, the rapid development of information technology also creates new challenges, in particular those related to information security, data privacy and the digital divide, which can exacerbate inequality and threaten sustainable development. In this context, conducting research aimed at studying the impact of information technology on sustainable development becomes particularly relevant and important. It allows not only to better understand the connections and interactions between technological progress and established developments but also to develop effective strategies and policies to minimize potential risks and optimize the beneficial effects of these influences.

In a globalizing world, the impact of information security breaches is not limited to the internal borders of countries. International coordination and harmonization of legal and administrative measures are critical to effectively respond to cyber threats. The global strategy not only helps combat the cross-border nature of cybercrime but also helps set global standards in data protection and cybersecurity. Such international cooperation meets the goals of sustainable development, which are global. The modern global context, determined by the expansion of digitalization through the COVID-19 pandemic and growing geopolitical tensions, emphasizes the relevance of the study and the strengthening of administrative and legal aspects of information security. The pandemic has accelerated the digital shift, increasing the risks of cyber threats, while geopolitical tensions have raised concerns about cyberattacks and state-sponsored espionage. In this context, ensuring information security becomes a critical element not only of economic and technical security but also of national and international stability.

Administrative and legal support for information security is a key element in achieving sustainable development in the current digital transformation. Its importance and necessity for modern research cannot be overstated, given the rapid changes in the technological landscape and the growing importance of digital infrastructure in the personal, economic and political aspects of our lives.

The main purpose of the article is to identify the key drivers of sustainable development through administrative and legal support of information security. The object of the study is the sustainable development of the Lviv region.

The structure of the article includes a literature review, a description of the methodology, a presentation of the results, their comparison and conclusions.

2. LITERATURE REVIEW AND MAIN GAPS

The literature on the administrative and legal basis of information security in the context of sustainable development offers a diverse and rich perspective on the subject, each contributing unique insights and methodologies.

The research by Hama [1] and Pylypenko et al. [2] delves into the legal security of land relations, highlighting the intricate relationship between legal frameworks and sustainable development. Their focus on land relations offers a valuable lens through which to understand the broader implications of legal structures in safeguarding various aspects of sustainable development, including information security. Addanki and Venkataraman's study [3] focuses on greening the economy through the implementation of urban sustainability measures for the development of new cities. The authors review existing policies and initiatives aimed at achieving sustainable development of urban agglomerations in developing countries. By analyzing various aspects of urban sustainability, from green building to energy efficiency and waste management, the study identifies key success factors and challenges to the green economy and the development of sustainable urban environments.

Kim [4] explored the impact of sustainable information technology on information security assimilation, with particular emphasis on the moderating effects of the balance between policy and technology. They find that IT resilience capabilities have a significant impact on the effectiveness of information security policy integration and use in organizations. The results suggest that an appropriate balance between policy and technology can enhance this impact, highlighting the importance of adaptive management in the context of increasing information security requirements in the sustainable development of organizations.

Saleh et al. [5] and Yemanov [6] discuss the legal management of cryptocurrency assets within national and cybersecurity systems. Their exploration into the intersection of emerging digital assets and legal frameworks provides critical insights into how legal systems adapt to new forms of digital information and assets, a key consideration for information security.

Khomyshyn et al. [7] and Añón Higón et al. [8] examine the impact of information and communication technologies on environmental sustainability from a global perspective. The authors analyze how ICT adoption can help or hinder the achievement of sustainable development goals, highlighting the complex relationships between technological progress and environmental challenges. This study contributes to a better understanding of the potential of ICT as a tool to promote environmental sustainability and also points to the need for a balanced approach to minimize the possible negative environmental impacts of technological development. Višinskis et al. [9] explored the legal environment within the EU, particularly the free movement of lawyers and legal services. This study provides a broader understanding of the legal landscape in the EU, contextualizing how information security is managed within a complex and interconnected legal framework. Aldrou et al. [10] investigated state management of environmental use in commercial development. This research is pertinent in understanding how administrative decisions impact sustainable practices, a concept that can be extended to include information security management. Krupa et al. [11] provide an evaluation of E-business performance in tourism, offering insights into the digital era's challenges and opportunities for information systems, a key area within information security. Finally, Kryshtanovych et al. [12] and Al Azzam et al. [13] examine the environmental and public aspects of sustainable regional development and the practice of law in the context of environmental safety during COVID-19, respectively. These studies highlight the multifaceted nature of sustainable development and the diverse roles that administrative and legal mechanisms play in different contexts, including information security.

In a study by Rushchyshyn et al. [14], The management of innovative development of enterprises is studied, taking into account their financial and resource capabilities in the context of security. The authors focus on the importance of integrating security approaches into enterprise development strategies,

arguing that such integration is a key element of sustainable development. This source is very valuable for my topic, as it emphasizes the need for administrative and legal support for information security in the context of innovative development, which is one of the key drivers of sustainable development. Their findings can serve as the basis for identifying specific administrative and legal support mechanisms aimed at supporting the innovative development of enterprises in a safe environment.

Collectively, these works offer a comprehensive view of the intricate relationship between administrative and legal mechanisms and sustainable development, with a specific focus on information security. They underscore the necessity of robust legal and administrative frameworks to navigate the complex challenges posed by the digital era and highlight the pivotal role these frameworks play in ensuring sustainable development. Let's see the main gaps (Table 1).

Table 1. The main gaps in literature

Gap	Essence of the Gap
Data limitations and availability	Often, research on this topic faces the problem of a lack of open and accessible data related to the administrative and legal aspects of information security and their impact on sustainable development. This may be due to a lack of systematic data collection, confidentiality restrictions, or insufficient attention to this area in national and international research initiatives.
Subjectivity in assessment and interpretation	Methodological approaches used in research (for example, expert assessments or opinion analysis) often contain an element of subjectivity that affects the objectivity of the results. While peer reviews are a valuable tool for understanding complex issues, they can also reflect the personal preferences, experiences, or interests of experts, which can lead to biased selection of drivers or misinterpretation of their influence.
Challenges of universalization of results	Research in the field of administrative and legal support of information security often faces the problem of universalizing its findings. The diversity of legal systems, cultural contexts and levels of information technology development in different countries makes it difficult to apply the same conclusions or recommendations on a broad scale. This limits the ability to extrapolate research results to the global level, requiring an individual approach when developing strategies and policies in the field of information security.

An analysis of selected literary sources demonstrated that, despite significant scientific developments, there are still scientific gaps and inaccuracies in this area, mainly related to limitations in practical testing, failure to take into account the complexity of the problem and ignoring strategic planning. All of these gaps impair understanding of the relationships between legal and administrative initiatives and sustainable development in the context of information security.

The scientific task is to identify the key drivers of sustainable development through administrative and legal support for information security and ranking their importance in the context of the selected region.

3. MAIN METHODS

The study applies an integrated approach, including the method of analyzing expert assessments, the Euler method and the structured ranking method to identify and assess the main drivers influencing sustainable development in the context of administrative and legal support for information security.

The first stage of the study, the method of analyzing expert assessments, is used to collect and analyze the opinions of recognized experts in information security and sustainable development. This method allows you to integrate the professional experience and knowledge of experts, identifying key aspects and challenges associated with the research topic. However, it should be noted that although the method of analyzing expert assessments provides an in-depth understanding of the problem, it can also involve subjective assessments that require critical reflection and verification of the data obtained.

In implementing the method of analyzing expert assessments, we identified and involved leading experts in the field of information security and sustainable development, based on their professional experience and achievements. Following this, a series of surveys or interviews were conducted with experts using structured or semi-structured questions to gather their assessments and opinions on key aspects of the topic under study. The data obtained is analyzed to identify consensus, disagreement, and important insights that can contribute to a deeper understanding of the problem and identify directions for further research.

The second stage, the method of graph theory using Euler's method, is used to model the relationships between the identified drivers. Thanks to this method, it is possible to visualize the complex structure of interactions, identifying both direct and indirect connections between elements of the system. This helps to identify key drivers that are of strategic importance for strengthening information security in the context of sustainable development. Despite the obvious advantages, the Euler method requires large amounts of data and complex analytical tools for processing this data.

In applying the Euler method, in the second stage of the study, a graph is first created where the nodes represent the identified factors, and the edges represent the connections between them, including both direct and indirect effects. This graph allows us to visualize the structure of interactions between factors, making it easier to identify key drivers with a high degree of impact on information security and sustainable development.

At the third stage, we applied a structured ranking method, which in the context of our study was used to conduct a comprehensive assessment and ranking of key drivers of influence on sustainable development. Due to the use of this method, we are able to comprehensively assess the weight of each driver, taking into account the system of weighting coefficients determined through the method of expert assessments.

Using this method comes down to giving each driver a quantitative score, formed based on determining its importance. This approach allows us to form an idea of the importance of each factor for a specific system.

This method is often used in regional sustainable development planning systems. For example, a large number of municipal governments in the developed world actively use planning and development systems that are shaped by this method, particularly in relation to environmental initiatives

such as waste recycling, water storage or green building programs. Through such an analysis, it is possible to quantify the impact of each initiative on the sustainable development of society, taking into account weighting factors reflecting environmental, economic and social aspects.

Integration of these methods into a single comprehensive research methodology allows not only to identify and evaluate the key drivers of sustainable development within the framework of administrative and legal support for information security, but also to form a rating of these drivers according to their level of significance.

4. RESULTS OF RESEARCH

The first step of our research is the application of the expert assessment method, which plays a key role in determining the fundamental drivers of sustainable development in the context of administrative and legal support for information security. This approach allows us to collect and analyze the opinions and assessments of highly qualified experts in the field, combining their experience and knowledge to identify seven key drivers. These drivers, identified based on expert assessments, will play a decisive role in further analysis and development of strategies aimed at improving the level of information security in accordance with the principles of sustainable development. The expert research method provides not only scientific validity for the selection of drivers but also opens up opportunities for an in-depth understanding of the complex interaction between various aspects of information security and sustainable development in the Lviv region.

Thus, we have identified the following drivers and marked them with mnemonic names (Table 2).

Table 2. Drivers and marked them with mnemonic names

Mnemonic Name	Driver Name	Driver Essence
D_1	Regional legislation and policies	Development and adaptation of legislative and policy initiatives at the level of the Lviv region aimed at strengthening information security in accordance with national standards.
D_2	Local technological innovation	Support and development of local technology startups and initiatives that offer solutions to improve the level of information security, including the use of encryption, blockchain technologies and other innovative approaches.
D_3	Educational programs and initiatives	Development and implementation of education and awareness programs in the field of information security for residents of the Lviv region, in cooperation with local educational institutions.
D_4	Collaboration with the public sector	Engage with non-governmental organizations, public initiatives and the local community to create a culture of responsible handling of information and ensure its protection.
D_5	Effective management and transparency of actions	Strengthening management mechanisms in the field of information security at the level of the Lviv region, including ensuring transparency of the actions of organizations and authorities to the public.
D_6	Standardization and certification at the regional level	Implementation of information security standards specific to the needs of the Lviv region, and certification mechanisms for local organizations.
D_7	Interregional and international partnership	Expanding cooperation with other regions of Ukraine and international partners to exchange experience, technologies and best practices in the field of information security.

The Lviv region, as an important regional center with developed industry, a high level of education and active civic participation, faces unique challenges and opportunities in the context of ensuring information security and promoting sustainable development. The region's industrial sector, which includes the production of high-tech equipment, IT services, as well as traditional industries such as light and food industries, requires special attention to issues of cybersecurity and information protection. The development of local technological innovations, supported by the active startup ecosystem of Lviv, opens up new opportunities for the use of advanced solutions in the field of information security, in particular, the use of blockchain technologies for data protection and information encryption.

Educational initiatives in the Lviv region, given the presence of numerous universities and research institutes, can become the foundation for the formation of a strong knowledge base in the field of cybersecurity among the population. The development of specialized programs and courses aimed at raising awareness among residents about the importance of information security and how to ensure it is key to creating a culture of responsible data management.

At the regional level, strengthening cooperation between the public sector, private companies, educational institutions and public organizations can contribute to the effective implementation of legislative and policy initiatives in the field of information security. The introduction of local standards and certification adapted to the specifics of the Lviv region, along with the expansion of interregional and international partnerships, will not only increase the level of information security, but also ensure the sustainable development of the region in the context of globalization and technological progress.

Euler method has found its application in various scientific disciplines, including chemistry, computer science, logistics, and especially in economics, where there is a particular focus on networked systems. A network in this context is an extended concept of a Euler method, where each connection (edge) is assigned a weight, which can represent price, profit, revenue, or other values.

Let us assume that all identified drivers of sustainable development form a certain set $D=\{D_1, D_2, \ldots, D_n\}$. From this set we will select a group of the most important drivers of sustainable development: $D_1 \in D_2$. For better clarity, a mnemonic name has been added to each driver's mathematical symbol.

As an initial step, we will represent the subset of sustainability drivers D_1 and their potential relationships in the form of a directed graph, where the vertices of the graph represent elements of the subset D_1, and directed edges connect pairs of vertices (d_i, d_j) between which there is a relationship. This relationship symbolizes the dependence of one driver (the starting point of the arrow) on another (the ending point of the arrow) (Figure 1).

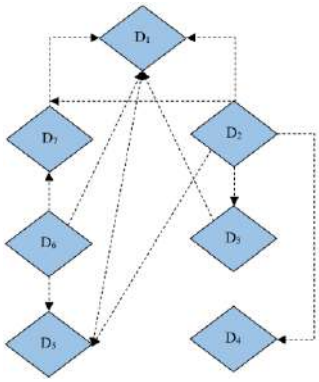


Figure 1. The connections between drivers of sustainable development through administrative and legal support of information security

Based on the developed Figure 1, we form a binary dependency matrix A (Table 3) for a set of vertices D_1 according to the following principle (1):

$$a_{ij} = \begin{cases} 1 \; if \; criterion \; (vertex) \; I \; depends \; on \; criterion \; (vertex) \; J \\ 0 \; if \; criterion \; (vertex) I \; does \; depends \; on \; criterion \; (vertex) \; J \end{cases} \quad (1)$$

Using the binary dependency matrix A as a starting point, we create a reach matrix. This is achieved by creating a binary matrix (I+A), where I represents the identity matrix. As a result, the resulting reach matrix should correspond to Eq. (2):

$$(I + A)^{k-1} \leq (I + A)^k = (I + A)^{k+1} \quad (2)$$

Creating a binary matrix consists of filling out a table similar to the one above, where the binary values of the elements are set in accordance with the following principle (3):

$$b_{ij} = \begin{cases} 1 if \; it \; is \; possible \; to \; get \; from \; I \; to \; J \\ 0 \; in \; the \; other \; case \end{cases} \quad (3)$$

Based on the above principle, we build a reachability Matrix (Table 4).

Table 3. Binary dependency matrix

		1 D_1	2 D_2	3 D_3	4 D_4	5 D_5	6 D_6	7 D_7
1	**D_1**	The vertex is independent:0	The vertex is independent:0	The vertex is independent:0	The vertex is independent:0	The vertex depends:1	The vertex is independent:0	The vertex is independent:0
2	**D_2**	The vertex depends:1	The vertex is independent:0	The vertex depends:1	The vertex is independent:0	The vertex depends:1	The vertex is independent:0	The vertex is independent:0
3	**D_3**	The vertex is independent:0	The vertex is independent:0	The vertex is independent:0	The vertex is independent:0	The vertex is independent:0	The vertex is independent:0	The vertex is independent:0
4	**D_4**	The vertex is independent:0	The vertex is independent:0	The vertex is independent:0	The vertex is independent:0	The vertex depends:1	The vertex is independent:0	The vertex is independent:0
5	**D_5**	The vertex is independent:0	The vertex is independent:0	The vertex is independent:0	The vertex is independent:0	The vertex is independent:0	The vertex is independent:0	The vertex is independent:0
6	**D_6**	The vertex depends:1	The vertex depends:1	The vertex depends:1	The vertex is independent:0	The vertex is independent:0	The vertex is independent:0	The vertex is independent:0
7	**D_7**	The vertex is independent:0	The vertex is independent:0	The vertex depends:1	The vertex is independent:0	The vertex is independent:0	The vertex is independent:0	The vertex is independent:0

Table 4. Reachability matrix

		1 D_1	2 D_2	3 D_3	4 D_4	5 D_5	6 D_6	7 D_7
1	**D_1**	The vertex depends:1	The vertex is independent:0	The vertex is independent:0	The vertex is independent:0	The vertex depends:1	The vertex is independent:0	The vertex is independent:0
2	**D_2**	The vertex depends:1	The vertex depends:1	The vertex depends:1	The vertex depends:1	The vertex depends:1	The vertex is independent:0	The vertex depends:1
3	**D_3**	The vertex depends:1	The vertex is independent:0	The vertex depends:1	The vertex is independent:0	The vertex is independent:0	The vertex is independent:0	The vertex is independent:0
4	**D_4**	The vertex is independent:0	The vertex is independent:0	The vertex is independent:0	The vertex is independent:0	The vertex depends:1	The vertex is independent:0	The vertex is independent:0
5	**D_5**	The vertex is independent:0	The vertex is independent:0	The vertex is independent:0	The vertex is independent:0	The vertex depends:1	The vertex is independent:0	The vertex is independent:0
6	**D_6**	The vertex depends:1	The vertex is independent:0	The vertex is independent:0	The vertex is independent:0	The vertex depends:1	The vertex depends:1	The vertex depends:1
7	**D_7**	The vertex depends:1	The vertex is independent:0	The vertex is independent:0	The vertex is independent:0	The vertex is independent:0	The vertex is independent:0	The vertex depends:1

Vertex d_j is considered accessible from vertex d_i when a route connecting d_i to d_j is found in the graph. Such a peak is called achievable. We denote the group of such vertices as $Y(d_i)$. At the same time, vertex di is a priority for vertex d_j if it is directly connected to it in the Figure 1. We denote the collection of predecessor vertices as $V(d_i)$.

The formation of the intersection of subsets of reachable vertices and predecessor vertices occurs according to the following principle (4):

$$M(d_i) = Y(d_i) \cap V(d_i) \quad (4)$$

The implementation of the set of drivers mentioned above forms the initial level of the hierarchy of sustainable development of drivers of sustainable development through administrative and legal support for information security, which is the least significant in terms of their influence on the analyzed process. Based on the results obtained from the previous matrix, we create Table 5 to define it.

Table 5. Calculation table for building a model of the hierarchy of influence of drivers of sustainable development through administrative and legal support for information security

I	Y	V	$Y(d_i) \cap V(d_i)$
1	Determinants: 1, 5	Determinants: 1, 2, 3, 6, 7	1
2	Determinants: 1, 2, 3, 4, 5, 7	Determinants: 2	2
3	Determinants: 1, 3	Determinants: 2, 3	3
4	Determinant: 4	Determinants: 2, 4	4
5	Determinant: 5	Determinants: 1, 2, 5, 6	5
6	Determinants: 1, 5, 6, 7	Determinant: 6	6
7	Determinants: 1, 7	Determinants: 2, 6, 7	7

The second column of this table presents the indices of units of the corresponding rows of the reach matrix, and the third column presents the indices of units in its columns. The analysis shows that this equality applies to the D_2 (Local technological innovation) and D_6 (Standardization and certification at the regional level). According to the hierarchy analysis methodology, these drivers belong to a lower level of priority in the context of their impact on the sustainable development of the Lviv region. Next, from Table 4 we remove rows with indices 2 and 6, and in columns we cross out numbers 2 and 6. This gives us Table 6, which serves as the basis for a second iteration of analysis to determine the driver indices that form the next level of the hierarchy.

In the second iteration of the analysis, it was found that some threats satisfy certain criteria for the D_3 (Educational programs and initiatives), D_4 (Collaboration with the public sector) and the D_7 (Interregional and international partnership). These elements form the next level of the structured ranking. Accordingly, in Table 5 we remove entries for the third, fourth and seventh threats, as well as the corresponding numbers in the second and third columns. Without additional calculations, we can conclude that at the top of the hierarchy will be the D_1 (Regional legislation and policies), and the D_5 (Effective management and transparency of actions).

Table 6. Second calculation table for building a model of the hierarchy of influence of drivers of sustainable development through administrative and legal support for information security

I	$S(d_i)$	$P(d_i)$	$S(d_i) \cap P(d_i)$
1	Determinants: 1, 5	Determinants: 1, 2, 3, 6, 7	1
3	Determinants: 1, 3	Determinants: 2, 3	3
4	Determinant: 4	Determinants: 2, 4	4
5	Determinant: 5	Determinants: 1, 2, 5, 6	5
7	Determinants: 1, 7	Determinants: 2, 6, 7	7

Having ordered the drivers according to their levels, we form a structure-organized scheme (Table 7), which reproduces the ranking of the influence of these drivers of sustainable development through administrative and legal support for information security.

Table 7. Scheme of the ranking of the influence of drivers of sustainable development through administrative and legal support for information security

Level	Drivers of Sustainable Development Through Administrative and Legal Support for Information Security		
Level 1	D_1 Regional legislation and policies		D_5 Effective management and transparency of actions
Level 2	D_3 Educational programs and initiatives	D_4 Collaboration with the public sector	D_7 Interregional and international partnership
Level 3	D_2 Local technological innovation		D_6 Standardization and certification at the regional level

In the process of studying the drivers of sustainable development through administrative and legal support of information security in Lviv region, it was revealed that drivers, such as regional legislation and policy, as well as effective management and transparency of actions, are of particularly high importance. These components play a critical role in shaping the conditions for sustainable development of the region, indicating the need to concentrate efforts on these aspects. Thus, focusing on these drivers will not only help ensure information security but will also improve the overall level of sustainable development in the in Lviv region, creating a safe and stable environment for economic growth, social well-being and environmental balance.

5. DISCUSSIONS OF THE MAIN RESULTS

The study focused on sustainable development through the lens of the administrative and legal framework of information security in the context of the Lviv region, uses the method of analyzing expert assessments, the Euler method and the structured ranking method to assess and improve information security as a key element of sustainable development of the region. This approach allows us to examine in detail the

relationships and hierarchies in the administrative and legal structure, providing a deeper understanding of the mechanisms for maintaining sustainability in the digital space.

Our study is influenced by the work of Shafique et al. [15] by using the method of analyzing expert assessments, the Euler method, and the structured ranking method to gain a deeper understanding of the administrative and legal aspects of information security as a key to sustainable development of the Lviv region. Our approach allows us to not only identify but also evaluate the impact of external and internal factors on information security, providing a comprehensive view of the problem, while Shafik et al. focus on the narrower aspect of green supply chain management.

In the context of the work of Alazzam et al. [16], our research expands the concept of legal frameworks in the digital sphere, using the structured ranking method and Euler method to detail the structure and relationships, allowing administrative and legal mechanisms to adapt to the rapidly changing conditions of digitalization. This allows us to identify specific information security challenges and needs, while Alazzam et al. [16] focus on general principles of compliance in e-commerce.

The study by Kronivets et al. [17] focuses on the legal framework for the use of artificial intelligence in educational processes, identifying important aspects of integrating AI into the system of sustainable development using the example of education. This research is important for understanding the mechanisms of legal regulation and the application of artificial intelligence in various mechanisms of sustainable development. In contrast, our study dives into an analysis of the relationship between administrative and legal support for information security and the promotion of sustainable development using the example of the Lviv region, emphasizing the role of information security as a key factor in sustainable development. Thus, our study expands the scope of analysis, including not only legal aspects, but also integrating administrative and technological dimensions, which distinguishes it by the depth of analysis and complexity of the approach.

The study of Bazilyuk et al. [18] comparing the institutional dynamics of regional development resonates with our approach through the application of similar methodologies to analyze complex systems. However, our study adds value by extending the application of these methods to the study of information security as a fundamental element of sustainable development, allowing for a deeper understanding of the interaction between administrative and legal initiatives and their impact on regional development.

Rushchyshyn et al. [19] study of the regulatory framework for ensuring the financial security of the state complements our understanding of the role of legal frameworks, but our study offers an innovative perspective on the integration of information security in the context of sustainable development, pointing to the need for more flexible and adaptive legal instruments. We focus on establishing a strong foundation for developing policies that take into account the dynamic nature of digital threats and opportunities, in contrast to the more static approach of Rushchyshyn et al. [19].

Alazzam et al. [20] focus on the analysis of electronic contracts using blockchain technology, which is an innovative approach in the context of digitalization. This aspect of the study contrasts with our focus on administrative and legal methods of supporting sustainable development through information security in the Lviv region. However, both studies highlight the importance of regulation and innovation in information security protection, which is key to sustainability and development.

Study of Pyliavskyi et al. [21], focusing on modeling ways to improve green growth and environmental protection, demonstrates the importance of good governance in promoting sustainable practices. This emphasis on governance and legal frameworks is reflected in our study, where we also recognize the importance of administrative and legal instruments in promoting sustainable development through information security.

Yesimov and Borovikova [22] provide a framework for a methodological approach to information security that reflects the diversity and development of research methods. Our research is distinguished by the use of specific methods such as expert analysis, Euler method and structured ranking method, which allows us to analyze in more depth the administrative and legal aspects of information security, with an emphasis on their importance for sustainable development.

Sylkin et al. [23] and Kryshtanovych et al. [24] emphasize the need for crisis management to assess and control the financial security of the engineering industry. This approach to risk management has parallels in our study, where we also recognize the importance of administrative and legal information security strategies as an element of sustainable development. Our research expands this dialogue by highlighting how both information security and environmental sustainability can be integrated into a sustainable development framework through effective governance.

To summarize, we have identified the key differences and advantages of our research (Table 8).

Table 8. The key differences and advantages of our research

Results	Differences and Advantages
An Integrated Approach to Sustainability and Information Security	Our research is unique in that it integrates the concept of sustainable development with information security through administrative and legal mechanisms. This allows information security to be viewed not just as a technical exercise or requirement, but as a fundamental element that contributes to the sustainability and responsibility of organizations and society as a whole.
Development and Application of Innovative Methods	The use of a set of methods such as method of analyzing expert assessments, the Euler method, structured ranking method to identify and rank key drivers of sustainable development distinguishes your research. These methods allow for more in-depth analysis and assessment of the impact of administrative and legal initiatives on information security, providing valuable insights for practitioners and policymakers.

Our study significantly extends the theoretical contributions of existing work by integrating and simultaneously expanding the analysis of technological innovation, legal regulation, and regional cooperation in the context of information security for sustainable development. Differences in approaches to information security, documented in the work of other authors, serve as the basis for our unique analysis, which demonstrates the interaction between administrative, legal and technological elements as fundamental drivers of sustainable development in a regional context. This study not only highlights the importance of a comprehensive approach to information

security, but points to the need for flexibility and adaptability in legal regulation and governance to effectively respond to the rapidly changing environment of digitalization. The rating of sustainable development drivers we developed opens up new perspectives for decision-making in the field of information security, providing targeted directions for further research and practical activities. Thus, our study not only highlights the importance of an integrated approach to sustainability and information security, but opens new horizons for the development of effective strategies and policies aimed at ensuring a sustainable future.

6. CONCLUSIONS

At the regional level, as in the case of the Lviv region, this requires special attention to the development and implementation of administrative and legal frameworks that would not only counter existing threats, but also adapt to the rapid development of technology and changing socio-economic context. This approach requires a deep understanding of the relationships between technological progress, legal standards and established developments, as well as recognition that information security is the fundamental element on which all pillars of sustainable development rest.

Based on the research conducted in the field of identifying key drivers of sustainable development through administrative and legal support of information security using the example of the Lviv region, we have reached important conclusions. Using a set of methods, including the method of analyzing expert assessments, Euler method and structured ranking method, allowed us to delve deeply into the topic and identify a number of key factors contributing to the sustainable development of the region through strengthening information security.

Application of the research results in practical activities of the Lviv region can lead to significant positive political consequences. First of all, improving legislation in the field of information security and sustainable development will create a solid legal basis for data protection and cybersecurity, taking into account modern challenges and threats. This will not only increase the stability of the region's information systems but will also ensure better interaction between government agencies, businesses and citizens on digital security.

Based on the results obtained, key directions for political action have been identified, which focus on the need to develop and implement targeted administrative and legal measures to strengthen information security. This includes creating a comprehensive strategy that integrates different sectors and levels of management to ensure information systems resilience, as well as enhancing the role of education and public awareness in creating an information security culture. It is also important to attract international cooperation to develop universal standards and exchange best practices.

These actions should be aimed at creating effective preventive and reactive mechanisms to counter cyber threats, which will not only help ensure information security, but will also become an important factor in maintaining sustainable development. Identifying priority areas for action and reform based on the ranking of key drivers opens up ways to improve policy strategies in the field of information security and sustainable development at the regional and global levels.

However, the study also identified limitations, particularly its focus on a specific region, which may limit the overall ability to extrapolate the findings to other contexts. This highlights the need to expand the research framework to other regions and include a wider range of drivers that can influence sustainable development through information security.

Future research in this area should pay attention to changing technological and social conditions that may influence the effectiveness of administrative and legal instruments in ensuring information security. Integration of interdisciplinary approaches and use of novel data can significantly improve understanding of this dynamic field.

In conclusion, this study highlights the importance of further analysis and development of strategies that can effectively integrate information security governance into overall sustainability efforts. We therefore call for continued research in this critical area, with a particular emphasis on expanding geographical and thematic coverage, to ensure greater relevance and effectiveness in the implementation of sustainable development policies.

REFERENCES

[1] Hama, H.H. (2017). State security, societal security and human security. Jadavpur Journal of International Relations, 21(1): 1-19. https://doi.org/10.1177/0973598417706591

[2] Pylypenko, P., Vashchyshyn, M., Fedorovych, V., Naida, K., Kolisnichenko, R. (2023). Legal security of land relations in the system of sustainable development. International Journal of Sustainable Development and Planning, 18(5): 1597-1604. https://doi.org/10.18280/ijsdp.180531

[3] Addanki, S.C., Venkataraman, H. (2017). Greening the economy: A review of urban sustainability measures for developing new cities. Sustainable Cities and Society, 32: 1-8. https://doi.org/10.1016/j.scs.2017.03.009

[4] Kim, S., Kim, B., Seo, M. (2020). Impacts of sustainable information technology capabilities on information security assimilation: The moderating effects of policy—Technology balance. Sustainability, 12(15): 6139. https://doi.org/10.3390/su12156139

[5] Saleh, A.J., Alazzam, F.A.F., Aldrou, K.K.A.R., Zavalna, Z. (2020). Legal aspects of the management of cryptocurrency assets in the national security system. Journal of Security and Sustainability Issues, 10(1): 235-247. https://doi.org/10.9770/jssi.2020.10.1(17)

[6] Yemanov, V., Dzyana, H., Dzyanyi, N., Dolinchenko, O., Didych, O. (2023). Modelling a public administration system for ensuring cybersecurity. International Journal of Safety and Security Engineering, 13(1): 81-88. https://doi.org/10.18280/ijsse.130109

[7] Khomyshyn, I., Ortynska, N., Skochylias-Pavliv, O., Andrusiak, I., Rym, O. (2022). The main systemic engineering problems of using computer and digital technologies in legal activities in the context of ensuring security. International Journal of Safety and Security Engineering, 12(5): 597-602. https://doi.org/10.18280/ijsse.120507

[8] Añón Higón, D., Gholami, R., Shirazi, F. (2017). ICT and environmental sustainability: A global perspective. Telematics and Informatics, 34(4): 85-95. https://doi.org/10.1016/j.tele.2017.01.001

[9] Višinskis, V., Žalėnienė, I., Tvaronavičienė, A. (2009).

Legal environment within the EU: Free movement of lawyers and legal services. Business: Theory and Practice, 10(1): 30-37. https://doi.org/10.3846/1648-0627.2009.10.30-37

[10] Alazzam, F.A.F., Aldrou, K.K.A.R., Berezivskyy, Z., Zaverbnyj, A., Borutska, Y. (2023). State management of the system of rational environmental use in the context of commercial development of the bioeconomy: Ecological aspect. International Journal of Environmental Impacts, 6(4): 155-163. https://doi.org/10.18280/ijei.060401

[11] Krupa, O., Dydiv, I., Borutska, Y., Yatsko, M., Bazyka, S. (2023). Evaluating E-business performance in tourism within the digital era: A novel information system model. Ingénierie des Systèmes d'Information, 28(6): 1689-1694. https://doi.org/10.18280/isi.280627

[12] Kryshtanovych, M., Dragan, I., Grytsyshen, D., Sergiienko, L., Baranovska, T. (2022). The public and environmental aspect of restoring sustainable regional development in the face of the negative impact of military actions on the territory of the country. International Journal of Sustainable Development and Planning, 17(5): 1645-1651. https://doi.org/10.18280/ijsdp.170530

[13] Al Azzam, F.A.F., Alshunnaq, M.F.N., Lesko, N., Lukianova, H., Smotrych, D. (2022). The main threats in the practice of a lawyer to ensure environmental safety in the context of COVID-19. International Journal of Safety and Security Engineering, 12(3): 387-393. https://doi.org/10.18280/ijsse.120313

[14] Rushchyshyn, N., Halkiv, L., Rushchyshyn, M., Medynska, T., Hrytsak, O. (2022). Management of innovative development of enterprises considering their financial and resource opportunities in the context of security. International Journal of Safety and Security Engineering, 12(1): 13-20. https://doi.org/10.18280/ijsse.120102

[15] Shafique, M., Asghar, M., Rahman, H. (2017). The impact of green supply chain management practices on performance: Moderating role of institutional pressure with mediating effect of green innovation. Business, Management and Economics Engineering, 15(1): 91-108. https://doi.org/10.3846/bme.2017.354

[16] Alazzam, F.A.F., Shakhatreh, H.J.M., Gharaibeh, Z.I.Y., Didiuk, I., Sylkin, O. (2023). Developing an information model for e-commerce platforms: A study on modern socio-economic systems in the context of global digitalization and legal compliance. Ingénierie des Systèmes d'Information, 28(4): 969-974. https://doi.org/10.18280/isi.280417

[17] Kronivets, T., Yakovenko, O., Tymoshenko, Y., Ilnytskyi, M., Lasechko, S., Lasechko, M. (2023). The legal foundations for the utilization of artificial intelligence in educational processes. Relocoes Internacionais no Mundo Atual, 4(42): 686-702. https://revista.unicuritiba.edu.br/index.php/RIMA/article/view/6556/371374725

[18] Bazyliuk, V., Shtangret, A., Sylkin, O., Bezpalko, I. (2019). Comparison of institutional dynamics of regional development publishing and printing activities in Ukraine: Methodological and practical aspects. Business: Theory and Practice, 20: 116-122. https://doi.org/10.3846/btp.2019.11

[19] Rushchyshyn, N., Medynska, T., Nikonenko, U., Kostak, Z., Ivanova, R. (2021). Regulatory and legal component in ensuring state's financial security. Business: Theory and Practice, 22(2): 232-240. https://doi.org/10.3846/btp.2021.13580

[20] Alazzam, F.A.F., Salih, A.J., Amoush, M.A.M., Khasawneh, F.S.A. (2023). The nature of electronic contracts using blockchain technology - Currency bitcoin as an example. Revista De Gestão Social E Ambiental, 17(5): e03330. https://doi.org/10.24857/rgsa.v17n5-014

[21] Pyliavskyi, I., Pushak, H., Molnar, O., Dzyana, H., Kushniriuk, V. (2021). Modeling ways to improve green growth and environmental protection in the context of governance. Journal of Environmental Engineering and Landscape Management, 29(3): 178-186. https://doi.org/10.3846/jeelm.2021.14662

[22] Yesimov, S., Borovikova, V. (2023). Methodological foundations of information security research. Social and Legal Studios, 6(1): 49-55. https://doi.org/10.32518/sals1.2023.49

[23] Sylkin, O., Shtangret, A., Ogirko, O., Melnikov, A. (2018). Assessing the financial security of the engineering enterprises as preconditions of application of anti-crisis management: practical aspect. Business and Economic Horizons, 14(4): 926-940. https://doi.org/10.15208/beh.2018.63

[24] Kryshtanovych, M., Petrovskyi, P., Khomyshyn, I., Bezena, I., Serdechna, I. (2020). Peculiarities of implementing governance in the system of social security. Business, Management and Economics Engineering, 18(1): 142-156. https://doi.org/10.3846/bme.2020.12177