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DEVELOPMENT OF INFORMATION AND ANALYTICAL DECISION SUPPORT SYSTEMS IN GOVERNMENT RELATIONS FOR THE FORMATION OF VETERAN POLICY

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ABSTRACT

The study addresses the lack of an integrated information-analytical architecture that links interagency data, decision-support analytics, and Government Relations (GR) communication in veteran policy. The aim was to design and scenario-verify a GR-oriented decision support system (DSS) and to compare the conditions of its application in the United States, Canada, and Ukraine. The research design combined cross-national comparative analysis of strategic and regulatory documents, functional-analytical modelling, a two-round Delphi procedure, Analytic Hierarchy Process (AHP) weighting, and exploratory correlation analysis; the expert panel comprised 42 specialists (14 per country). The United States obtained the highest Veteran Governance Decision Support (VG-DSS) index (0.89), Canada reached 0.84 and showed the strongest GR adaptability, whereas Ukraine had the lowest baseline VG-DSS value (0.58). The harmonisation (HG) index was 0.91 for the United States, 0.87 for Canada, and 0.64 for Ukraine. Scenario verification projected average increases of +0.03, +0.04, and +0.08, respectively, rather than effects of completed national implementation. Exploratory associations among DI, DG, TM, and GA ranged from $r = 0.83$ to 0.92; the comparatively weaker TM-GA association indicated that technological maturity alone does not fully determine communication adaptability. The research contribution is an integrated GR-DSS architecture that combines digital integration, data governance, technological maturity, GR adaptability, and policy harmonisation within one comparative assessment framework. Its practical implication is the use of the model as a pre-implementation diagnostic tool for prioritising interoperability, data standardisation, analytical functions, and stakeholder feedback mechanisms in public-sector digital transformation.

Keywords: *Veteran Policy, E-Governance, Local Self-Government, Public Service, Government Communications*.

1. INTRODUCTION

In the 21st century, the digital transformation of public administration has significantly changed how public policy is formed, the mechanisms of interaction between the government and stakeholders, and the architecture of information and analytical systems that support decision-making. The field of Government Relations (GR), which has traditionally been based on communication and institutional mechanisms for coordinating interests, has evolved towards data-driven policy making, where analytical platforms, data processing algorithms, and digital services are

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becoming key management tools. In such conditions, the development of information and analytical decision support systems (DSS) for GR becomes a necessary element of effective public policy, particularly in areas that require complex coordination among the state, citizens, and the public sector, such as the formulation of veteran policy.

Ukrainian researchers emphasise that GR in public policy requires standardisation of processes, integrated data management and digital communication mechanisms to increase transparency and soundness of decisions [1], [2]. At the same time, the field of veteran policy in Ukraine is characterised by fragmented digital services, insufficient analytical integration between central authorities and communities, and the lack of a unified platform for collecting data on veterans' needs, their social integration, access to services, and the effectiveness of support programs [3]. These limitations complicate management decision-making, slow down policy implementation, and reduce the ability of GR mechanisms to ensure two-way interaction between the state and veteran communities.

In contrast, international experience shows a high level of digital maturity in countries with developed veteran policies. In the United States, the implementation of the Measurement-Based Care system and several analytical modules in the Veterans Health Administration provides data-driven decision support at all levels, from individual case management to strategic programme planning [4], [5]. The Veterans Data API, ACORN Veterans Health Administration Program, CDSS tools, and national analytics dashboards enable GR interaction between the government, veterans, and service organisations based on up-to-date data.

Canada has an integrated ecosystem of information systems for Veterans Affairs Canada and the OSI clinic network, including CROMIS, a results-monitoring and decision-support system that provides feedback, programme-effectiveness analysis, and adaptive-care planning algorithms [6], [7]. The Canadian experience is distinguished by a high level of organisational readiness for the digitalisation of GR processes and the systematic implementation of measurement-based policy design.

Ukrainian research provides three complementary precedents for the information-technology component of public governance. Bondarenko et al. demonstrate the role of informatization in strategic planning and coordination [8]; Hubanova et al. show how information technologies can support inter-institutional preventive mechanisms [9]; Yermachenko et al. substantiate the management relevance of smart infrastructure in a digital society [10]. Together, these studies confirm the feasibility of data-supported public management, but they do not integrate veteran-service data, analytical DSS functions, and GR communication within a single architecture. This unresolved integration gap defines the IT problem addressed in the present study.

The research problem is to determine how heterogeneous veteran-policy data, analytical decision-support functions, and stakeholder communication can be integrated into one interoperable GR-DSS architecture while remaining applicable across different institutional settings. Addressing this problem requires both a system-design contribution and a comparative assessment of the organisational conditions under which such an architecture can operate. The United States, Canada, and Ukraine therefore provide contrasting digital-governance contexts for identifying transferable architectural components and context-dependent implementation priorities.

The article aims to design and scenario-verify a conceptual information-analytical GR-DSS for veteran policy and to evaluate its comparative maturity conditions in the United States, Canada, and Ukraine on the basis of data-driven governance, integrated monitoring, and cross-sectoral interaction.

The following tasks were identified to achieve the goal:

1. Analyse international digital DSS models in the field of veteran policy in the United States and Canada, identifying the key architectural and organisational characteristics of their functioning.
2. Assess the state of digitalisation of GR and analytical tools in Ukraine, in particular, the possibilities for data integration, institutional interaction and technical requirements for building DSS.
3. Develop an original conceptual model of GR-DSS for shaping veteran policy, integrating technical, communication and management components.
4. Determine the organisational and technological conditions for implementing DSS in the public management system for veterans in Ukraine.

The scientific hypothesis is that higher integration of data, analytical functions, monitoring, and unified GR communication within a common DSS architecture is associated with higher maturity and harmonisation of veteran-policy decision support. Because the proposed system was evaluated through expert scenario modelling rather than full

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national deployment, the hypothesis concerns expected system-level relationships and projected changes rather than realised causal effects.

The IT contribution of the study consists in formalising a multi-layer GR-DSS architecture that links a data layer, an analytics layer, a GR communication layer, and integrated effectiveness monitoring with a common set of maturity indicators (DI, DG, TM, GA) and the HG harmonisation measure. This architecture extends earlier public-sector informatization studies by specifying how data interoperability, decision analytics, and stakeholder feedback can be evaluated within one decision-support framework[8]–[10].

2. LITERATURE REVIEW

The issue of creating digital information and analytical systems to support GR decisions on veteran policy formation is shaped by the intersection of several research areas: digital transformation of social services, military and social policy, DSS modelling, and the evolution of mechanisms for state interaction with veterans. In the works of Ukrainian researchers, the digitalisation of social services is not treated as an additional innovation but as a necessary condition for the qualitative reintegration of veterans [11]. This approach clearly outlines the need for systems capable of collecting and analysing large amounts of data on social needs. Still, it pays less attention to the managerial and communication aspects of GR, which are important for designing complex DSS. Foreign studies reveal a broader social context of veteran policy.

Sayer et al. argue that the reintegration process depends not only on individual support, but also on society's perception of veterans [12]. This does indeed create a demand for DSS capable of analysing public opinion and communication patterns. Still, the authors' approach focuses primarily on the socio-psychological dimension. It hardly covers the institutional and technological mechanisms of decision-making, thereby limiting the applicability of its conclusions in the GR-DSS environment. In contrast, Onwujekwe and Weistroffer propose a systematic model of intelligent DSS that includes algorithmic, organisational, and communication elements; thus, their approach demonstrates a much higher fit with the needs of GR systems focused on data integration and forecasting [13].

The historical dimension is analysed by Burtin [14] and Mattocks et al. [15], but their interpretations differ significantly. Burtin shows that the interaction between the state and veteran communities in the United States actually created early forms of GR mechanisms [14]. Mattocks and colleagues, on the other hand, emphasise the managerial complexity of reforms in the VA system, where speed of data exchange and adaptability play a key role [15]. Both works emphasise the importance of communication but do not offer a comprehensive technical model for data integration, leaving room for the development of digital DSS in GR. Research on ethical and social aspects also has limitations. Blevins and Blevins emphasise the inclusiveness and non-discriminatory nature of policies, but their focus on social justice does not account for the systemic requirements of GR digital infrastructure [16]. Tomz et al., analysing the influence of public opinion on the use-of-force policy, demonstrate the importance of communication between the state and society [17]. However, their model remains rather policy-oriented and does not extend to the level of DSS algorithms.

The study by Cheney et al. reveals that veterans' access to public services is hindered by systemic barriers stemming from insufficient digital integration and weak communication channels [18]. However, the authors do not offer an analytical framework for overcoming these barriers, which again highlights the need to move from descriptive diagnostics to the construction of integrated GR-DSS. Against this backdrop, the works of Crowley [19] and Lucero-Obusan et al. [20] demonstrate a more technology-oriented approach, showing how standardised data and epidemiological monitoring systems can perform DSS functions, but mostly in the medical segment of the VA, without reaching the broader GR context.

Modern DSS solutions in veterans' healthcare also leave several questions unanswered. Brunner et al. demonstrate the potential of CDSS to reduce risks among female veterans, but focus on clinical decision support rather than on multi-level GR interrelationships [21]. In turn, Moreno and Losaria analyse support for veterans in developing countries, emphasising the dependence of programme effectiveness on the structure of managerial interaction [22]. However, their model does not detail the technical requirements for DSS or account for data interoperability, both of which are critical for building modern GR platforms.

Thus, despite the significant amount of research, the literature demonstrates a fragmentation of approaches: some authors emphasise the social context, others – the technological capabilities of DSS, but no approach integrates the social, managerial, and technical dimensions into a single conceptual GR-DSS model. It is this gap that

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justifies developing a comprehensive DSS to inform the formation of veteran policy.

3. PROBLEM STATEMENT

The central research problem is the absence of a unified information-analytical mechanism that combines interagency veteran data, analytical decision support, and GR communication in a form suitable for strategic public-management decisions. In Ukraine, digital services and analytical functions remain institutionally fragmented, while international studies emphasise the need to connect social, psychological, administrative, and service data in support of reintegration and policy coordination [11]–[13]. The resulting gap is therefore not limited to service digitalisation; it concerns the architecture, interoperability, and governance logic of the DSS itself.

In the United States and Canada, mature digital infrastructures reduce some integration barriers but do not eliminate the need to coordinate clinical, social, administrative, and communication data across organisational boundaries [16]–[21]. Existing solutions are predominantly sector-specific, especially in healthcare, and do not provide a common GR-oriented architecture for cross-sector veteran policy. The significance of the problem lies in determining which technical and governance components can be integrated into a reusable DSS model and which components remain dependent on national institutional context.

4. PROPOSED METHODOLOGY

4.1. Research Design

The study adopted a sequential cross-national comparative research design in which the United States, Canada, and Ukraine were the units of analysis and the GR-DSS maturity dimensions (DI, DG, TM, and GA) formed the common analytical framework. The design combined documentary analysis, functional modelling, expert evaluation, and scenario verification of the proposed architecture. The countries were selected to represent three contrasting configurations of digital governance: a mature data-driven DSS ecosystem in the United States [23], [24], an inclusive and standardised digital-governance model in Canada [25], [26], and an evolving digital-service and regulatory environment in Ukraine [27], [28].

The comparative framework is reinforced by OECD recommendations on digital transformations in the public sector [29]. The study was carried out in three stages. The first stage involved a regulatory and analytical audit of strategic documents from three countries and international benchmarks, enabling an assessment of the degree of standardisation of approaches to veterans' policy. The second stage involved functional and analytical modelling of typical DSS processes, carried out using BPMN and UML activity diagrams to reproduce the logic of data collection, needs classification, analytical forecasting, and GR interaction. In addition, simplified block diagrams of algorithmic scenarios were used to model rule-based DSS-style decisions.

The third stage consisted of a comparative assessment of digital integration, data standardisation, DSS technological maturity, and GR communication quality using a normalised 0–1 index model based on the Delphi–AHP procedure. For each indicator (DI, DG, TM, GA), variables and weighting coefficients were formalised from expert agreement and documentary evidence. The resulting values were used for cross-national comparison and for a baseline/scenario verification of the proposed GR-DSS. The scenario values represent projected maturity under assumed full model integration and are not observations from national-scale implementation.

4.2. Research Methods

The study used a set of methods, each of which provided a separate analytical function within the formation of a GR-oriented DSS in the field of veteran policy. The cross-national comparative method made it possible to compare the approaches of the United States, Canada, and Ukraine to digital interaction with veterans, data management, and the use of analytical tools, based on strategic documents such as the VA Data Strategy [23], the GAO report on digital modernisation [24], Canadian recommendations [25], [26] and Ukrainian guidelines [27], [28]. The cross-national comparative analysis was based on seven regulatory and strategic documents published in 2021–2025 and selected according to criteria of relevance to digital governance, DSS architecture, GR communications, and the veterans policy sector.

Functional and analytical modelling was used to reconstruct a typical decision-making cycle: from collecting primary data and classifying needs to forecasting and GR communication. Modelling was performed in the JupyterLab 4.1 environment using BPMN diagrams (Camunda Modeler) and UML activity diagrams, which made it possible to formalise the logic of processes, reproduce the structural interaction between institutions, determine the degree of digital integration, interaction between institutions, and the readiness of systems to transition to DSS architecture. The expert panel

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included 42 specialists from the United States, Canada, and Ukraine, selected based on criteria of at least 8 years of professional experience in digital policy, GR, data management, or the implementation of DSS solutions in the public sector. The selection was carried out using the purposive sampling method, with experts checked for compliance with three profile categories: public administration, digital services, and analytical centres.

The Delphi method was implemented in two rounds: the first involved individual assessment of the DI, DG, TM and GA parameters on a seven-point scale; the second involved re-assessment after summarising the anonymous results and forming a collective position. The consistency of the assessments was verified using Kendall's concordance coefficient, after which the weighting coefficients were transferred to the AHP model to construct integral indices. The resulting level of concordance confirmed the stability of the expert decisions. Within the AHP method, a pairwise comparison matrix was formed for the four components of the GR-DSS maturity index: digital integration (DI), data governance standardisation (DG), DSS technological maturity (TM) and GR adaptability (GA). Experts assessed the relative importance of each pair of indicators (DI–DG, DI–TM, DI–GA, DG–TM, DG–GA, TM–GA) on a nine-point Saaty's scale.

Based on the resulting matrix, an eigenvector of priorities was calculated, which determined the weight coefficients of the model blocks. The consistency of pairwise comparisons was checked using the consistency index (CI) and the consistency ratio ($CR < 0.1$), after which the weights were integrated into the calculation of the final VG-DSS index. Content analysis enabled the identification of recurring management and technological models in the strategic documents of the United States, Canada, and Ukraine [23] – [28], thereby forming a comprehensive profile of national policies. Statistical analysis (Kendall's concordance coefficient) confirmed the reliability of the weighting coefficients. Kendall's coefficient was used to assess the consistency of individual expert assessments in the Delphi procedure before transferring them to the AHP model.

The system-structural method ensured the integration of the technological, managerial, and communication blocks into a single DSS architecture, consistent with OECD recommendations on evidence-based policymaking [29]. Experts were selected using purposive sampling based on criteria of at least 8–20 years of experience in digital policy, GR, public administration or digital services for veterans. The sample included: 14 experts from the United States (U.S. Department of Veterans Affairs, GAO, RAND, Digital Service Units); 14 experts from Canada (Canadian Armed Forces Transition Group, Treasury Board of Canada Secretariat, Veterans Affairs Canada); 14 experts from Ukraine (Ministry for Veterans Affairs, Ministry of Digital Transformation, sector-specific analytical centres). The first survey was conducted as an online questionnaire (February–March 2025), and the second round was conducted as focus group discussions (April–May 2025), using the AHP method to agree on the final weights. The dispersion of the aggregated expert assessments did not exceed $SD = 0.12$; this value was treated as a descriptive stability indicator alongside Kendall's concordance coefficient.

4.3. Assessment Metrics

The effectiveness of GR-oriented DSSs in the field of veteran policy was assessed using the integrated Veteran Governance Decision Support Index (VG-DSS Index), which quantifies the consistency between digital integration, standardised data management, the technological maturity of DSS tools, and the quality of GR communications. Within this approach, four basic parameters were formed, covering the technical, managerial, analytical, and communication aspects of modern decision-making systems. The structure of the indicators is presented in Table 1.

Table 1: GR-DSS Evaluation Metrics for Shaping Veteran Policy

Parameter	Designation	Calculation method	Range	Interpretation
Digital integration	DI (Digital Integration)	The share of procedures and services implemented within a single digital infrastructure; compliance with the VA Digital Modernisation Strategy (United States) and Digital Government Strategy (Canada)	0–1	Availability of coordinated platforms, APIs, and interdepartmental interaction
Data governance standardisation	DG (Data Governance)	Level of compliance with data management policies – VA Data Strategy [23], Government of Canada	0–1	Quality of data structuring, protection, and unification

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		Standards [26], Ukraine's Veterans Policy Strategy [27]		
DSS technological maturity	TM (Technological Maturity)	The share of implemented functions for forecasting, needs classification, and automated analytics, and the availability of assessment and monitoring models	0–1	System readiness to perform full DSS functions
GR communication adaptability	GA (GR Adaptability)	Assessment of feedback procedures, interaction with veteran communities, and alignment of stakeholder interests in accordance with OECD Government at a Glance [29]	0–1	State responsiveness to veteran input and policy adaptability

Source: developed by the author based on VA Data Strategy (2021) [23], GAO Electronic Health Record Modernisation Report (2025) [24], Reforming Transition from Military to Civilian Life (Canada, 2024) [25], Canada's Digital Government Strategy (2021) [26], Ukraine's Veteran Policy Strategy until 2030 (2024) [27], Veteran Hub Concept (2023) [28], OECD Government at a Glance 2023 [29].

The weighting coefficients obtained formed the basis of the VG-DSS integral index, which was used to compare the maturity of national systems in the United States, Canada, and Ukraine. The final indicator was calculated using formula (1):

$$\text{VG-DSS} = (0.30 \times DI) + (0.30 \times DG) + (0.25 \times TM) + (0.15 \times GA) \tag{1}$$

The weighting coefficients were determined based on the results of a two-stage expert survey of 42 specialists from the United States, Canada, and Ukraine, including representatives of government agencies for veterans' affairs, digital departments, sector-specific analytical centres, and veterans' organisations. The weight distribution reflects the balance among the system's technological capabilities, data management quality, and the effectiveness of GR interaction.

To assess the compliance of national policies with international approaches to digital governance (OECD OPSI Framework, VA Governance Model, Canada TBS Data Framework), the HG harmonisation index was used. It reflects the level of technical and procedural consistency of government decisions with international digital policy requirements. The HG indicator was calculated using formula (2):

$$HG = (0.40 \times ST) + (0.35 \times PR) + (0.25 \times TC) \tag{2}$$

where ST is completeness of standardisation, PR is procedural robustness, and TC is technical compliance.

Expert assessments are supported by a high Kendall's coefficient of concordance (W = 0.84), indicating the reliability and stability of the agreed-upon parameters across the three countries.

4.4. Conceptual Model of the GR-DSS for Veteran Policy Formation

The proposed conceptual model of a GR-oriented decision support system (GR-DSS) aims to integrate data, analytical processes, and communication mechanisms that determine the quality of veteran policy formation. The model was developed taking into account regulatory guidelines from the United States (VA Data Strategy [23]; GAO EHR Modernisation Testimony [24]), Canada (Parliamentary Report "Reforming Transition…" [25]; Canada's Digital Government Strategy [26]) and strategic documents of Ukraine (Veteran Policy Strategy until 2030 [27]; Veteran Hub Concept [28]). The model includes technical, management and communication components, providing a full cycle of support for government decisions in the field of GR. The structure of the GR-DSS conceptual model is summarised in Figure 1, which shows three main levels – data, analytics and GR communications – as well as an integrated monitoring system that provides continuous assessment of policy effectiveness and adaptability in line with international benchmarks (USA, Canada, Ukraine).

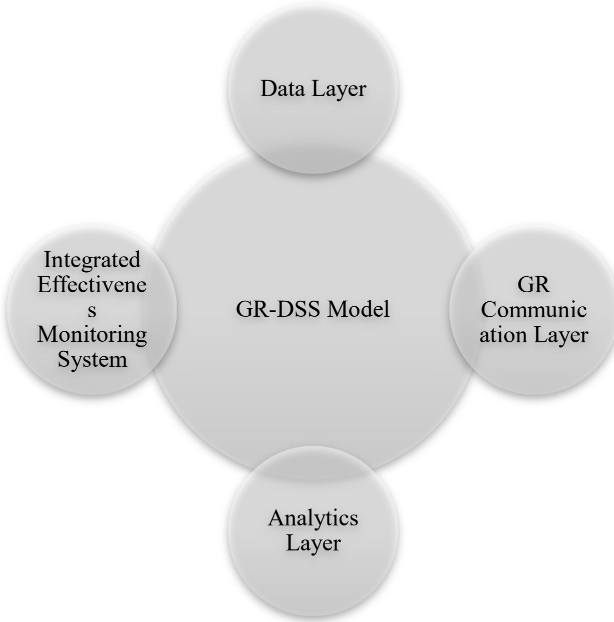

Figure 1: Structural components of the GR-DSS conceptual model for shaping veteran policy
Source: created by the author

Structurally, the model consists of three interrelated layers – data, analytics, and GR communications – that ensure digital integration and institutional consistency in decisions on veteran policy. The data level covers the collection and standardisation of information from state registers, medical systems, social services, transitional support platforms and electronic interaction tools (eVeteran), as well as data from Veterans Affairs (USA). This level applies validation and interagency integration defined by the digital strategies of the US and Canada [23], [26], as well as the OECD's evidence-based policymaking approaches [29]. The analytics layer enables DSS algorithms to classify veterans' needs, predict social dynamics, evaluate programme effectiveness, and model policy decision scenarios. It is based on the VA Data Strategy's approaches to monitoring and evaluation [23] and on Canadian mechanisms for analysing the transitional trajectories of military personnel [25]. Particular attention is paid to automatic risk stratification and adaptive forecasting. The GR communication level translates analytical results into formats suitable for government consultations, strategic planning, and advocacy. It uses transparency and accountability standards described in GAO reports [24], principles of Canadian parliamentary engagement with stakeholders [25], and national requirements for digital engagement with veterans in Ukraine [27], [28]. The module generates automated GR reports, recommendations, and scenario risk maps for government agencies. GR-DSS has a modular, scalable structure that integrates data management, analytics, GR interfaces, and a monitoring system. This architecture ensures digital compatibility, analytical accuracy and democratic accountability, in line with best practices in the United States and Canada. The implementation of the model lays the foundation for a national GR-DSS intellectual platform capable of forecasting the needs of the veteran community, supporting data-driven policies and ensuring institutional coherence of reforms.

4.5. Technical Environment

The technical environment of the study was structured to meet the requirements for processing multi-source managerial, social, and administrative data, as well as modelling the architecture of GR-DSSs in the United States, Canada, and Ukraine. The main analytical procedures were performed in Python 3.12 using the *Pandas, NumPy, SciPy, scikit-learn and Matplotlib* libraries, which provided tabular analysis, statistical verification, classification modelling and visualisation. The GR-DSS structure was modelled in JupyterLab 4.1, based on a multi-level system of indicators for digital integration (DI), data standardisation (DG), the technological maturity of DSS components (TM), and the transparency of GR interaction (GA). The results were verified in Microsoft Excel 2025 and Power BI, which were used to cross-check the AHP model's weighting coefficients and aggregate the Delphi panel assessments. Regulatory and legal documents were processed through official government repositories, including VA.gov, publications.gc.ca, coilink.org, zakon.rada.gov.ua, kmu.gov.ua, and the Veteran Hub platform, as well as the OECD and ISO international standards catalogues. This technical environment ensured the reproducibility of calculations, transparency of inter-stage transitions, and integration of digital, regulatory, and expert data into a unified GR-DSS architecture adapted for the formation of modern veteran policy.

5. RESULTS

5.1. Strategic and Regulatory Differences in Digital Governance in the United States, Canada, and Ukraine

Strategic documents from the United States, Canada, and Ukraine demonstrate different models of digital governance that directly determine the possibilities for GR-DSSs. In the US, digital integration and data management standardisation are based on the provisions of the VA Data Strategy [23] and GAO recommendations on EHR modernisation [24], which ensure a high level of consistency between government registries and DSS tools. Canada, in its Digital Government Strategy [26] and parliamentary recommendations on reforming the transition of military personnel to civilian life [25], demonstrates an inclusive model of data management and interagency integration. Ukraine, based on the Veterans Policy Strategy until 2030 [27] and the provisions of Veteran Hub [28], is in the process of developing a digital infrastructure, where the level of integration and standardisation remains significantly lower. All three countries position GR communication as an element of public decision-making, but the degree of its digital support varies according to OECD requirements for evidence-based policymaking [29]. A comparison of the parameters of digital integration (DI), data governance (DG), DSS technological maturity (TM) and GR communication transparency (GA) is presented in Table 2.

Table 2: Comparative Assessment of Digital Governance Levels in the United States, Canada, and Ukraine (DI, DG, TM, GA)

Country	DI	DG	TM	GA	Interpretation
United States	0.92	0.88	0.90	0.87	High integration, mature DSS, formalised data management
Canada	0.86	0.84	0.78	0.89	Standardised governance, strong GR communication, moderate DSS maturity
Ukraine	0.63	0.58	0.52	0.61	Fragmented infrastructure, partial standardisation, potential for growth

Note. The values of DI, DG, TM, and GA are normalised Delphi–AHP expert indices that reflect a comparative expert assessment of system maturity rather than direct statistical values.
Source: compiled by the author based on strategic documents from the United States [23; 24], Canada [25; 26] and Ukraine [27; 28], as well as OECD recommendations [29].

An analysis of Table 2 shows that the United States confidently maintains its leadership in all aspects of digital governance, thanks to its well-established VA analytical ecosystem and multi-level data management policies. Canada demonstrates the highest level of openness in GR communications (GA = 0.89), which is explained by veterans' structural participation in decision-making. Ukraine, despite lower numerical indicators, is characterised by the rapid implementation of digital tools and the potential to integrate DSS models into the future GR-DSS. The consistency of the data governance (DG) regulatory framework across the three countries is shown in Figure 2.

Figure 2: Structure of regulatory harmonisation of data governance (DG) standards
Source: compiled by the author based on strategic documents from the United States [23], [24], Canada [25], [26] and Ukraine [27], [28], as well as OECD recommendations [29].

The radar chart in Figure 2 demonstrates the asymmetrical nature of regulatory harmonisation: the United States has the highest DG scores for key components – data governance (0.88), cybersecurity & privacy (0.91), interoperability (0.86), metadata & cataloguing (0.83) – indicating a well-established data management system and stable compliance with digital standards. Canada demonstrates a balanced but slightly lower level (0.82; 0.85; 0.80; 0.78, respectively), which confirms a strong but less centralised regulatory model. Ukraine is characterised by the lowest DG values (0.63; 0.68; 0.60; 0.57), indicating fragmented policies, insufficient technical protocols and limited interagency compatibility. In general, this means that the higher the regulatory structure of data management subsystems, the more stable the mechanisms of digital governance and the broader the possibilities for implementing GR-DSS; on the other hand, Ukraine's weaknesses are concentrated around non-standardised standards and the lack of a comprehensive data management system at the state level.

5.2. Assessment of Operational Decision-Making Processes in Veteran Policy

The operational processes of decision-making in veteran policy in the United States, Canada, and Ukraine vary in maturity and structure. The assessment is based on the results of a Delphi–AHP expert survey, which made it possible to measure the quality of implementation of key operational blocks quantitatively: data collection and structuring, classification of veterans' needs, application of DSS algorithms, GR communication and stakeholder involvement, as well as monitoring of existing programmes. The maturity of operational cycles in the United States is due to the multi-level VA ecosystem and standardised data processing procedures [23], [24], while in Canada it is due to an integrative model of government-public interaction [25], [26], while in Ukraine, the processes are still in their infancy, in line with the Veterans Policy Strategy [27] and the conceptual models of Veteran Hub [28]. Comparative values are presented in Table 3.

Table 3: Index of the Quality of Operational Decision-Making Processes in the United States, Canada, and Ukraine (rated on a scale of 0–1)

Country	Data collection and structuring	Classification of needs	DSS analytics	GR interaction and stakeholder participation	Programme monitoring	Average index
United States	0.91	0.88	0.90	0.86	0.89	0.89
Canada	0.84	0.81	0.79	0.92	0.83	0.84
Ukraine	0.58	0.55	0.49	0.62	0.57	0.56

Note: The indices listed are standardised expert assessments obtained using the Delphi–AHP procedure and do not constitute direct statistical measurements; they reflect the agreed expert view of the operational maturity of the processes under study.

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Source: calculated by the author based on data from strategic documents of the United States [23], [24], Canada [25], [26], Ukraine [27], [28] and the Delphi–AHP expert panel.

Comparative values show that the United States provides the highest level of operational efficiency (0.89), due to standardised data collection and mature DSS procedures. Canada stands out with the strongest communication mechanisms for stakeholder participation (0.92), which enhances the quality of GR interaction. Ukraine shows moderate values across all blocks, reflecting fragmented operational cycles and the need to implement unified DSS procedures. At the same time, the balance of indicators indicates growth potential, provided that data collection processes are standardised and communication mechanisms with veteran organisations are improved. The structure of stakeholder participation in GR processes is presented in Figure 3.

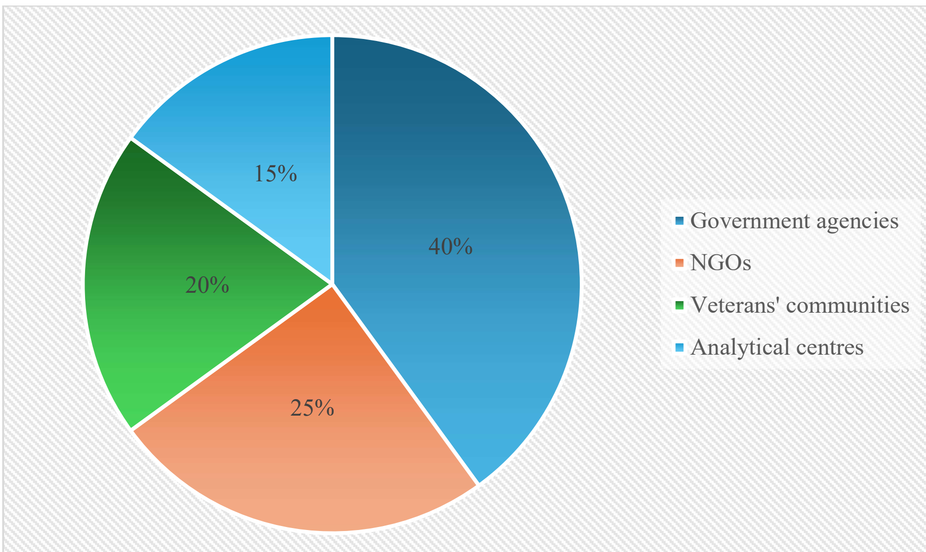

Figure 3: Structure of stakeholder participation in GR processes
Source: compiled by the author based on the results of the Delphi–AHP expert assessment.

Figure 3 shows an uneven structure of stakeholder participation in GR processes: government agencies account for 40% of interactions, NGOs for 25%, veterans' communities for 20%, and analytical centres for 15%. The distribution indicates that public authorities retain the largest share of participation, whereas veteran communities and analytical centres jointly account for 35%. This structure points to a practical need to strengthen formal feedback and analytical participation mechanisms when designing GR-DSS workflows, because broader stakeholder representation can improve the diversity of inputs used in decision support.

5.3. HG Comprehensive Assessment of Systems According to the VG-DSS Index and the Degree of HG Harmonisation

A comprehensive assessment of digital and management systems in the United States, Canada, and Ukraine was conducted based on the VG-DSS integrated index, which covers four key dimensions: digital integration (DI), data governance standardisation (DG), technological maturity of DSS tools (TM) and adaptability of GR communications (GA).

The integral indicator was calculated using formula (1), and the degree of harmonisation of national policies with international digital governance benchmarks was calculated using formula (2), enabling assessment of the consistency of government decisions with the OECD, VA Governance, and Canada TBS Digital Framework models. Expert data (Delphi–AHP) comprised assessments from 42 specialists in the United States, Canada, and Ukraine; statistical consistency was confirmed by Kendall's concordance coefficient ($W = 0.84$; $\sigma = 0.12$). Comparative values are presented in Table 4.

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Table 4: VG-DSS Integral Indicators and HG Harmonisation Levels in the United States, Canada and Ukraine

Country	DI	DG	TM	GA	VG-DSS	HG	Interpretation
United States	0.92	0.88	0.90	0.87	0.89	0.91	Highest level of DSS maturity and compliance with international standards
Canada	0.86	0.84	0.78	0.89	0.84	0.87	Balanced system with high GR adaptability
Ukraine	0.63	0.58	0.52	0.61	0.58	0.64	Initial level of digitalisation and partial standardisation of practices

Note: DI, DG, TM, GA, VG-DSS integral index and HG harmonisation degree are normalised expert indices obtained by aggregating expert assessments rather than direct statistical measurements; they reflect a consensus assessment of the maturity of national digital governance systems.
Source: calculated by the author based on strategic documents of the United States [23], [24], Canada [25], [26], Ukraine [27], [28], OECD recommendations [29] and an expert Delphi–AHP survey.

An analysis of Table 4 shows that the United States has the highest VG-DSS index score (0.89), due to its high level of structural digital integration (DI = 0.92) and the technological maturity of DSS tools (TM = 0.90). Canada scored 0.84, maintaining the highest GR adaptability value among the three countries (GA = 0.89), confirming its focus on inclusive models of public consultation. Ukraine has the lowest VG-DSS scores (0.58) but shows potential for growth through the rapid expansion of digital services and the gradual standardisation of data management. The HG harmonisation index confirms structural differences: the United States has the most harmonised system (0.91), Canada has a stable average level (0.87), and Ukraine is in the early stages of development (0.64). The correlation structure of the DI–DG–TM–GA parameters in the US, Canada and Ukraine is presented in Figure 4 as a correlogram, where each cell reflects the strength of the relationship between the DI, DG, TM and GA parameters, and the colours – from green (high correlation) to terracotta (lower) – enhance the visual distinction between the levels of consistency.

	DI	DG	TM	GA
DI	1	0,92	0,88	0,85
DG	0,92	1	0,9	0,87
TM	0,88	0,9	1	0,83
GA	0,85	0,87	0,83	1

Figure 4: Correlation structure of DI–DG–TM–GA parameters in the United States, Canada, and Ukraine
Source: constructed by the author based on calculations of digital governance indices (DI, DG, TM, GA) for three national systems.

The correlation matrix in Figure 4 shows positive exploratory associations among the four digital-governance parameters, with the highest coefficient between digital integration and data governance (r = 0.92) and the lowest between technological maturity and GR adaptability (r = 0.83). The DG–TM coefficient (r = 0.90) is consistent with the expectation that more standardised data governance supports technically mature analytical functions. Because the coefficients summarise expert-standardised indicators for only three national systems, they are interpreted descriptively rather than as inferential evidence of causal relationships. The comparatively lower TM–GA association is important because it suggests that improvements in technical capability require additional institutional and communication mechanisms to translate into stronger GR adaptability.

5.4. GR-DSS Verification and Its Impact on Digital Integration, Data Standardisation and GR Communication

Scenario verification of the GR-oriented DSS assessed the projected change in digital integration (DI), data governance standardisation (DG), DSS technological maturity (TM), and GR communication adaptability (GA) under an assumed full-integration scenario. The assessment used Delphi–AHP expert data in a baseline/scenario comparison for the United States, Canada, and Ukraine. The scenario values are predictive, expert-standardised maturity estimates rather than outcomes of national-scale implementation; therefore, inferential significance tests were not used to interpret the projected deltas. The comparative results are presented in Table 5.

Table 5: Projected Dynamics of DI, DG, TM and GA under GR-DSS Integration (baseline/scenario comparison)

Country	DI (baseline)	DI (scenario)	DG (baseline)	DG (scenario)	TM (baseline)	TM (scenario)	GA (baseline)	GA (scenario)	Average growth
United States	0.92	0.95	0.88	0.91	0.90	0.93	0.87	0.90	+0.03
Canada	0.86	0.89	0.84	0.88	0.78	0.82	0.89	0.92	+0.04
Ukraine	0.63	0.71	0.58	0.66	0.52	0.61	0.61	0.69	+0.08

Source: calculated by the author based on strategic documents of the United States [23], [24], Canada [25], [26], Ukraine [27], [28] and Delphi–AHP expert assessments.

The results presented in Table 5 indicate systematic but uneven projected changes under the GR-DSS integration scenario. The United States showed an average projected increase of +0.03, consistent with optimisation of an already mature infrastructure. Canada showed +0.04, with the strongest change in GR communication adaptability (GA: 0.89 → 0.92). Ukraine showed the largest projected increase (+0.08), particularly in DI (0.63 → 0.71) and TM (0.52 → 0.61), reflecting the greater scope for structural improvement from a lower baseline. These values describe scenario-based maturity gains and should not be interpreted as observed post-implementation effects.

Overall, the scenario indicates that the potential GR-DSS contribution is greatest where the initial institutional and technical baseline is weakest. For the United States, the model primarily supports coordination and optimisation; for Canada, it reinforces stakeholder-oriented GR mechanisms; for Ukraine, it prioritises interoperable data infrastructure, analytical maturity, and formalised communication procedures. The comparative pattern supports the use of GR-DSS as a configurable decision-support architecture rather than a universal implementation package with identical effects across countries.

6. DISCUSSION

The results indicate that the maturity of veteran-policy decision support is associated with the joint development of data consistency, standardised management procedures, technological DSS functions, and stable GR communication channels. This finding is consistent with Crowley [19] and Lucero-Obusan et al. [20], who emphasise completeness of information flows and monitoring in veteran services, and with Brunner et al. [21], who show the value of structured clinical decision-support procedures. The present study extends those sector-specific findings by evaluating the same logic at the cross-sector public-governance level rather than within a single clinical or surveillance application.

The cross-national results are also consistent with literature describing differentiated institutional strengths. The United States VG-DSS value (0.89) corresponds with the multi-level digital-service capacity discussed by Wray et al. [30]. Canada's stronger GR adaptability is consistent with studies that emphasise partnership and stakeholder-oriented service design [31], [35]. Ukraine's larger projected scenario gain is compatible with Shepherd et al. [36], who stress the importance of institutional coherence during transition. At the same time, Moreno and Losaria [22] and Rossi et al. [34] caution that greater digital centralisation can create access, workload, or implementation risks. These positions qualify the scenario results: data standardisation and interoperability are beneficial only when accompanied by accessible interfaces, distributed accountability, and feedback channels.

The principal difference from earlier DSS studies lies in the level and structure of integration. Earlier work mainly examines clinical decision support, epidemiological monitoring, social-service access, or general public-sector informatization as separate domains [8]–[10], [19]–[21]. The present model combines four maturity dimensions (DI, DG, TM, GA), an HG harmonisation measure, a three-layer information architecture, and scenario verification within one GR-oriented framework. The significance of this difference is methodological: the model makes it possible to compare technical, data-governance, and communication readiness using the same analytical structure and to identify which subsystem constrains overall maturity in each national context.

The exploratory correlation structure (r = 0.83–0.92) supports the interdependence of the GR-DSS dimensions without establishing causality. Its strongest DI–DG relationship is consistent with Meerwijk et al. [33] and Melillo et al. [32], who emphasise the importance of interoperable and reliable data for analytical decision support. A secondary and partly unintended result was that the weakest association occurred between technological maturity and GR adaptability (TM–GA, r = 0.83), despite both being central components of the proposed system. This finding indicates that technical upgrading alone is insufficient to produce equivalent gains in stakeholder communication and that organisational routines remain an independent implementation condition.

A second unexpected pattern was the largest projected gain for Ukraine (+0.08) despite its lowest baseline maturity. This does not imply superior implementation performance; rather, it reflects greater headroom for improvement in a system with more fragmented starting conditions. In light of the literature on implementation complexity [22], [34], the result should be interpreted as a prioritisation signal: countries with lower baseline integration may obtain larger relative gains, but they also face greater organisational, interoperability, and change-management demands. Overall, the four study objectives were addressed by comparing national DSS arrangements, assessing Ukraine's digital-governance conditions, designing the integrated GR-DSS architecture, and identifying implementation priorities through scenario verification.

6.1. Limitations

The study has several limitations that constrain the generalisability of the results. The expert sample comprised 42 specialists from three countries and therefore reflects differences in professional roles and institutional exposure. Access to internal management documents, technical protocols, and service-level operational data was incomplete, particularly for United States and Canadian systems. The aggregated DI, DG, TM, and GA indices simplify variation among individual veteran services, while the Ukrainian data environment remains comparatively fragmented. In addition, the baseline/scenario comparison represents expert modelling rather than longitudinal observation after national implementation, and the exploratory correlation coefficients are based on a very small number of national-level cases. Consequently, the projected deltas should be interpreted as comparative decision-support estimates rather than causal effects. Further validation should use pilot GR-DSS deployments, larger and more diverse expert panels, service-level datasets, longitudinal monitoring, and independent testing of the weighting structure.

6.2. Practical Implications

For current public-sector digital transformation, the GR-DSS can be used as a pre-implementation diagnostic and prioritisation framework. In Ukraine, the results identify the most immediate IT priorities as interoperable data schemas and APIs, common data-governance rules, analytical monitoring, and formal digital feedback channels with veteran communities and local self-government bodies. In Canada, the model is more relevant for strengthening analytical integration around already mature stakeholder-participation mechanisms, whereas in the United States it can support coordination and optimisation across established DSS components.

At the implementation level, agencies can use the DI, DG, TM, GA, and HG indicators as a maturity dashboard before committing to large-scale platform deployment. Repeated assessment can reveal whether investments in technical infrastructure are accompanied by improvements in governance and communication, thereby reducing the risk of technology-led modernisation that leaves organisational processes unchanged. The model is therefore applicable to procurement planning, interoperability roadmaps, pilot selection, and evaluation of cross-agency digital-service programmes in the veteran-policy domain.

7. CONCLUSIONS

The study achieved its objectives by comparing the digital DSS arrangements of the United States and Canada, assessing the digital-governance conditions of Ukraine, designing an integrated GR-oriented decision-support architecture, and defining organisational and technological priorities through scenario verification. The cross-national comparison showed three distinct configurations: the United States combined the strongest digital integration and technological maturity, Canada demonstrated the strongest GR adaptability, and Ukraine had the lowest baseline maturity but the greatest scope for projected structural improvement.

The VG-DSS index differentiated the three systems at 0.89 for the United States, 0.84 for Canada, and 0.58 for Ukraine, while the HG values were 0.91, 0.87, and 0.64, respectively. Exploratory

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associations among DI, DG, TM, and GA ranged from r = 0.83 to 0.92, with the strongest relationship between digital integration and data governance and the weakest between technological maturity and GR adaptability. The baseline/scenario comparison projected average maturity gains of +0.03 for the United States, +0.04 for Canada, and +0.08 for Ukraine. These values represent expected changes under the model assumptions and do not constitute observed post-implementation effects.

The research contribution is an information-analytical GR-DSS framework that integrates data governance, analytical maturity, communication adaptability, and policy harmonisation within a common system architecture. Compared with sector-specific DSS and public-sector informatization studies, the model adds a cross-national maturity framework and a scenario-based mechanism for identifying implementation priorities. Its practical value is greatest as a diagnostic and planning instrument: for Ukraine, it identifies interoperability and data standardisation as primary prerequisites; for Canada, it supports deeper analytical integration of stakeholder-oriented processes; and for the United States, it supports optimisation of mature DSS components. Future work should validate these conclusions through pilot implementation and longitudinal measurement of realised outcomes.

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