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Models of Digital Corporate Governance of Enterprises Importing Food Products in the Context of Business Environment Transformation

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ABSTRACT

The article aims to substantiate the models of digital corporate governance for enterprises engaged in food imports and to develop an applied three-level management model. The study analyses contemporary scientific research devoted to digital traceability, blockchain solutions, digital platforms, AI-based analytics, and supply chain management. To assess the transformation of the import environment, statistical data of the European Commission on agri-food imports to the EU and imports from Ukraine to the EU for 2020–2024 were used. A comparative analysis of digital corporate governance models was also conducted according to the criteria of management core, instruments, outcomes, and implementation limitations. The study established that the digital corporate governance of food-importing enterprises is gradually transforming from a tool for automating individual operations into a system of continuous risk management based on integrated data. It was proven that the current volatility of EU agri-food markets, logistical imbalances, and the tightening of digital regulatory requirements create the need to shift from retrospective control to real-time management models. Within the framework of the study, five models of digital corporate governance for food-importing enterprises were systematized and conceptually substantiated: centralized platform-based, compliance-centered, distributed digital transparency, adaptive-analytical, and hybrid models. Their management cores, instruments, key outcomes, and implementation constraints were identified. The study found that the hybrid model is the most effective for importers of finished food products. An additional outcome of the research was the development of an applied three-level model of digital corporate governance, within which management functions are distributed among supervisory, executive, and transactional layers. The proposed model enables the integration of ERP systems, logistics tracking, electronic certification, digital supplier dossiers, and risk analytics tools into a unified managerial decision-making system. The practical value of the study lies in the possibility of using the proposed model by food-importing enterprises to reduce response time to logistical and regulatory risks.



KEYWORDS

management solutions, digital management, blockchain technologies, Internet of Things, artificial intelligence.



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СОЦІАЛЬНИЙ РОЗВИТОК: економіко-правові проблеми

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Моделі цифрового корпоративного управління підприємств, що здійснюють імпорт харчової продукції в умовах трансформації бізнес-середовища

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СТАТТЯ

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Метою статті є обґрунтування моделей цифрового корпоративного управління підприємств, що здійснюють імпорт харчової продукції, а також розроблення прикладної трирівневої управлінської моделі. У процесі дослідження було проаналізовано сучасні наукові праці, присвячені цифровій простежуваності, блокчейн-рішенням, цифровим платформам, AI-аналітиці та управлінню ланцюгами постачання. Для оцінювання трансформації імпортного середовища використано статистичні дані Європейської Комісії щодо імпорту агропродовольчої продукції до ЄС і з України до ЄС за 2020–2024 рр. Також застосовано порівняльний аналіз моделей цифрового корпоративного управління за критеріями управлінського ядра, інструментів, результатів і обмежень використання. У процесі дослідження встановлено, що цифрове корпоративне управління підприємств-імпортерів харчової продукції поступово трансформується з інструменту автоматизації окремих операцій у систему безперервного управління ризиками на основі інтегрованих даних. Доведено, що сучасна волатильність агропродовольчих ринків ЄС, логістичні дисбаланси і посилення цифрових регуляторних вимог формують потребу у переході від ретроспективного контролю до моделей управління в режимі реального часу. У межах дослідження систематизовано і концептуально обґрунтовано п'ять моделей цифрового корпоративного управління підприємств-імпортерів харчової продукції: централізовану платформну, комплаєнс-центричну, модель розподіленої цифрової прозорості, адаптивно-аналітичну і гібридну. Встановлено, що найбільш ефективною для імпортера готової харчової продукції є саме гібридна модель. Окремим результатом дослідження стало розроблення прикладної трирівневої моделі цифрового корпоративного управління, у межах якої управлінські функції розподілені між наглядним, виконавчим і транзакційним контурами. Запропонована модель дозволяє інтегрувати ERP, логістичний трекінг, електронну сертифікацію, цифрові досьє постачальників та інструменти аналітики ризиків у єдину систему прийняття управлінських рішень. Практична цінність дослідження полягає у можливості використання запропонованої моделі підприємствами-імпортерами харчової продукції для скорочення часу реагування на логістичні, регуляторні ризики.

КЛЮЧОВІ СЛОВА

управлінські рішення, цифрове управління, блокчейн-технології, Інтернет речей, штучний інтелект.



1. Introduction

After 2020, for food-importing enterprises, the risk was no longer reduced only to the contract price or the delay of a separate batch. In 2026, it arises at the intersection of logistics, currency volatility, sanitary and phytosanitary requirements, reputational responsibility for the origin of goods, and the speed of management's response to supply chain disruptions. The Food and Agriculture Organization estimates that the global food import bill in 2023 is close to \$2 trillion. [1], which reflects a structural increase in the cost of food imports and increased price pressures in world agricultural markets. At the same time, in 2024, there was a significant aggravation of logistical imbalances: the Global Supply Chain Tension Index, calculated by the Federal Reserve Bank of New York, recorded a sharp deterioration in transportation conditions [2].

For a business that works with products sensitive to expiration dates, temperature conditions and documentary impeccability, this means a change in the very subject of corporate governance: from controlling an individual purchase to managing the dynamics of the entire supply chain in a mode of almost continuous risk.

In this logic, digitalization is moving in the direction of the management model of the enterprise. According to Eurostat, in 2023, 39% of EU enterprises already used complex or intermediate cloud services, 33% – data analytics, and in 2024, 13% of enterprises used at least one artificial intelligence technology; at the same time, 73% of small and medium-sized enterprises in the EU have achieved only the basic level of digital intensity [3], which directly indicates the gap between the growth of external requirements and the internal digital readiness of the business.

For food importers, this gap is especially dangerous, because the regulatory field is already working in digital logic: the Trade Control and Expert System (hereinafter referred to as TRACES) covers about 90 countries and more than 113 thousand. users, ensuring the digital circulation of certificates for the import of animals, food, feed and plants [4]; The EU Corporate Sustainability Due Diligence Directive (EU) 2024/1760), which entered into force on July 25, 2024, extends the responsibility of companies to all stages of global value chains [5]; and according to the World Trade Organization (hereinafter referred to as the WTO), digital SPS certificates can potentially increase the export value of individual agri-food groups by up to 32% within two years after implementation [6]. That is why the topic of digital corporate governance models for food importers is a matter of managerial capacity: who controls the data, actually controls the speed of decision, the stability of the contract and the limits of acceptable risk.

2. Literature Review

The current stage of development of digital corporate governance in the field of food imports is characterized by the transition from fragmentary automation of individual business processes to the formation of integrated management models based on continuous data exchange, digital traceability and predictive analytics. One of the most comprehensive modern studies in this area is the work of M. B. Lai, D. Vergamini and G. Brunori [7], in which digital traceability is considered not as a technical control tool, but as a separate model of agri-food chain management. It is this approach that is important for food importers, as it allows us to consider digital traceability as an element of corporate governance, and not just a logistics module.

The problems of integrating digital platforms into corporate governance are revealed in the study by A. Rai, P. Constantinides and S. Sarker [8]. The authors emphasize that the new generation of digital platforms is changing the very architecture of decision-making, as it combines analytical algorithms, automated data processing, and human management into a single system. For import companies, this means a transition from post-factum control to real-time management, where the key importance is not the amount of information, but the speed of its interpretation. A significant contribution to the development of the concept of digital traceability was made by S. Islam and J. M. Cullen [9], who formed a universal theoretical model of food traceability systems. Similar in content is the work of P. Olsen and M. Borit [10], which details the structural components of digital traceability systems.

A separate area of modern research is devoted to the use of blockchain technologies in corporate supply chain management. M. P. Kramer, L. Bitsch and J. Hanf [11] prove that blockchain is transforming the management of agri-food chains by creating a distributed environment of trust in which dependence

on centralized intermediaries is reduced and transparency of operations is increased. A similar approach is developed by V. Vitaskos, K. Demestichas, S. Karetos and C. Costopoulou [12], who investigated the combination of blockchain and the Internet of Things in food traceability systems. The authors showed that the integration of sensor devices, QR codes and digital batch passports allows for continuous monitoring of products in real time and reduces the risks of falsification and data loss. In a study by other authors N. Tsolakis, R. Schumacher, M. Dora and M. Kumar [13], attention is focused on the combination of artificial intelligence and blockchain in supply chain management systems.

The theoretical foundations of digital transformation of business in general were significantly expanded in the work of P. C. Verhoef and co-authors [14]. The authors consider digital transformation as an interdisciplinary process that changes not only the technological base of the enterprise, but also corporate governance mechanisms, interaction with external stakeholders and the structure of value creation.

Of particular importance for the study of digital corporate governance is the concept of end-to-end visibility proposed by D. Ivanov [15]. The author proves that the stability of modern supply chains is formed through end-to-end digital visibility of all stages of the movement of goods, from the supplier to the final warehouse.

Despite a significant amount of current research on digital traceability, blockchain solutions, digital platforms, and supply chain resilience, most of it focuses mainly on the technological aspects of digitalization or agri-food chain management in general. On the other hand, the issue of forming an applied model of digital corporate governance for enterprises importing finished food products remains insufficiently studied.

3. Problem Statement

The article is aimed at substantiating the models of digital corporate governance of enterprises that import food products and developing an applied management model suitable for use in the context of business environment transformation.

To achieve this goal, two research tasks have been identified. The first task is to systematize and conceptualize the models of digital corporate governance of food-importing enterprises. The second task is to develop an applied model of digital corporate governance, which the food importer can use in management practice.

4. Methods and Materials

The research methodology is built as a combination of theoretical-analytical, statistical, comparative and applied managerial approaches. Such a combination was chosen because the subject of the article has a dual character: on the one hand, it is necessary to conceptualize the models of digital corporate governance, and on the other hand, to show how these models can be reproduced in the practice of an enterprise importing food products.

At the first stage, an analytical study of scientific sources on the digital traceability of agri-food chains, digital platforms, blockchain solutions, the Internet of Things, digital certification and risk management in supply chains was carried out.

At the second stage, a statistical analysis of the dynamics of agri-food imports to the EU for 2020–2024 was used. For this purpose, the European Commission's data on imports of agri-food products extra-EU27 and imports of agri-food products from Ukraine to the EU were used. The data were grouped by main product categories, after which the volumes of imports in dynamics were compared.

At the third stage, the comparative-typological method was applied. Its use made it possible to compare digital models of corporate governance according to five criteria: the core of management, tools, management result, limitations and feasibility of application for food importers. On this basis, the author's typology of models has been formed: centralized platform, compliance-centric, distributed digital transparency model, adaptive-analytical and hybrid. Each model was evaluated as a separate logic of managerial decision-making.

At the fourth stage, the method of applied management modeling was used. For this purpose, the management process was divided into three levels: supervisory, executive and transactional. At the supervisory level, risks, escalation rules and liability limits are defined. At the executive level, an

analytical exception panel is formed, which combines procurement, logistics, compliance, finance and certification data. At the transactional level, operational control of batches, electronic documents, temperature deviations, routes and supplier status are carried out.

5. Results and Discussion

The dynamics of agri-food imports to the EU indicate a significant change in the structure of demand and price risks. As can be seen from Fig. 1, the total volume of imports in 2024 reached 171,887 million euros, but the growth of certain product groups is the most indicative. In particular, imports of coffee, tea, cocoa, and spices increased from €20,564 million in 2023 to €30,326 million in 2024, representing almost 47% year-on-year growth (Figure 1).

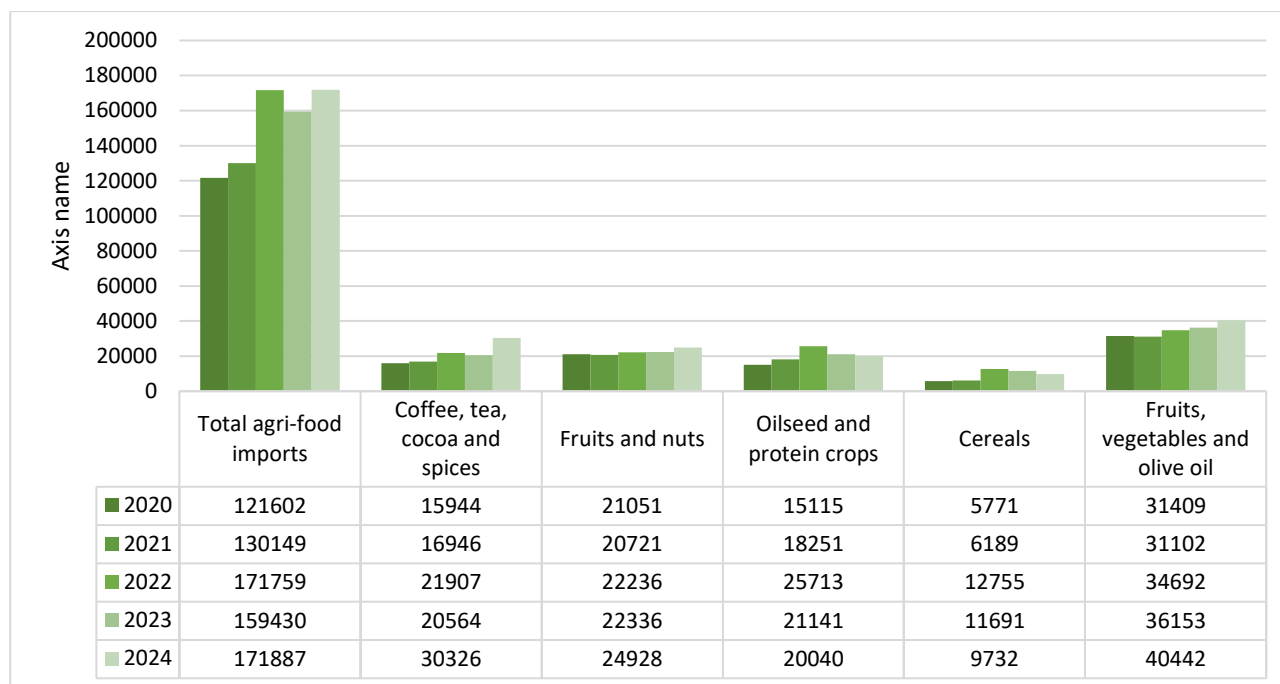


Figure 1. Structural transformation of agri-food imports to the EU (extra-EU27) by commodity groups in 2020-2024, EUR million

Source: Formed according to data [16].

Shown in Figure 1, the dynamics indicate the increased sensitivity of import operations to price fluctuations and form the need for the introduction of management models capable of promptly responding to changes in the market environment.

The analysis of agri-food imports from Ukraine to the EU shows even more pronounced instability due to external factors. As can be seen from Fig. 2, total imports increased from €6,927 million in 2021 to €13,215 million in 2022, before declining to €11,839 million in 2023 and partially recovering again in 2024. The fluctuations in the cereal segment are particularly indicative: from EUR 1,750 million in 2021 to EUR 5,065 million in 2023, followed by a decrease to EUR 4,450 million in 2024 [16]. Such dynamics reflect the high dependence of import flows on logistical and political factors, which reinforces the importance of digital management models capable of operating in conditions of uncertainty.

The given data (Figure 1 and Figure 2) demonstrate not only a change in the volume of imports, but also a fundamental transformation of the nature of the risks faced by importing enterprises. If in a stable environment, the management of import operations could be based on retrospective analysis and planning, then under conditions of sharp price fluctuations, logistical failures and regulatory changes, such a model loses its effectiveness. Under these conditions, a request is formed for a new model of corporate governance, in which the integration of information flows and continuous control of transaction parameters become the basic elements of the management system.

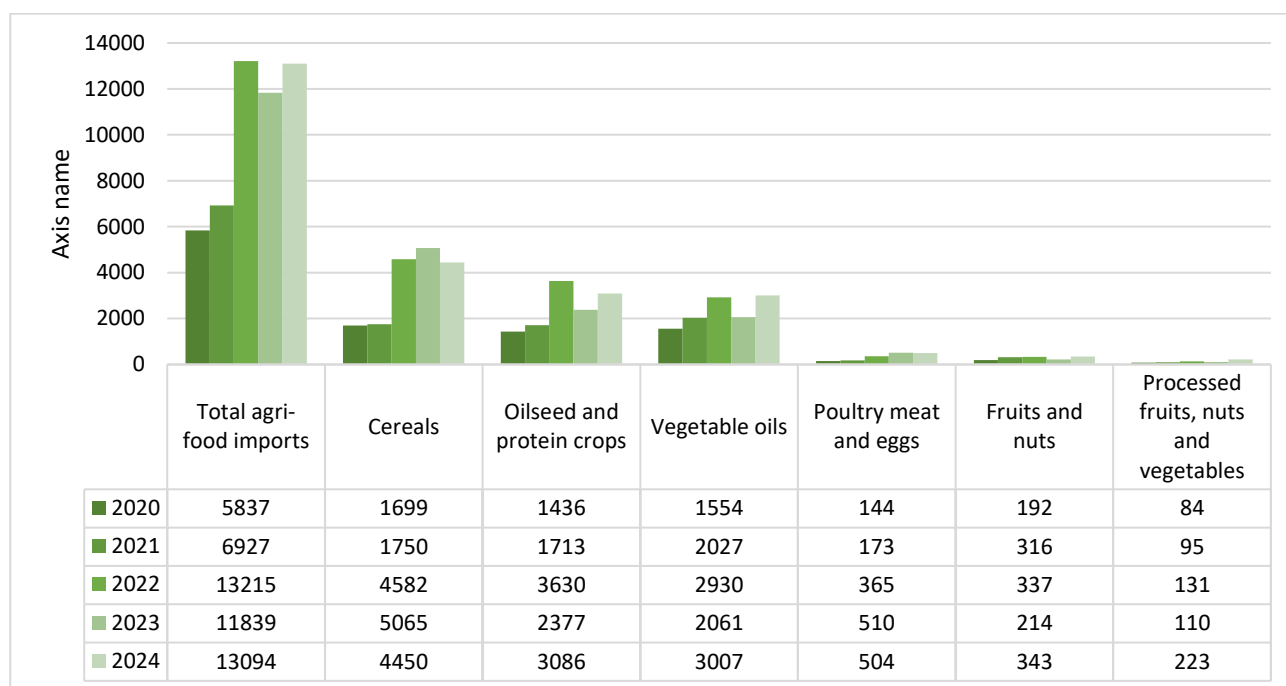


Figure 2. Dynamics and structural changes in imports of agri-food products from Ukraine to the EU in 2020–2024, EUR million

Source: Formed according to data [16].

For a food importer, it is advisable to define digital corporate governance as a system in which the supervisory level, executive management, compliance and operational logistics are combined through a single data architecture [7; 8]. In this architecture, the corporate center no longer waits for the completion of a month, quarter, or audit to assess risk. It works through a set of digital thresholds: the permissible concentration of the supplier, the maximum time for crossing the border, the share of batches with a complete documentary dossier, the frequency of temperature deviations, the speed of recall or blocking of a dangerous batch. It is from this point of view that corporate governance in an import company increasingly resembles a system of continuous monitoring with management with exceptions.

The first model that can be recognized as basic is the centralized platform model. It is based on an integrated ERP/CRM/BI infrastructure, which combines procurement, inventory, finance, sales, contract control and internal reporting. The strength of this model lies not only in automation, but in the fact that it moves managerial power to the transaction data center. currency position, the documentary status of the party, the balance in the warehouse and the deviation of demand, then it receives not just faster reporting, but a different quality of management decision. However, this model has a distinct scale effect. In 2023, ERP was used by 43.3% of EU enterprises, but the size gap was very large: from 38% among small enterprises to 86% among large enterprises; for BI tools, the gap was even deeper – from 11% to 63%, and for CRM – from 22% to 61% [17]. Therefore, the platform model works best where the importer has sufficient resources to build a “digital core”, and not a set of disparate tables and local services.

The second model is the compliance-centric model of digital corporate governance. In this case, the management center shifts from internal processes to regulatory compatibility of the supply chain. This is especially true for food importers, as regulatory requirements directly affect the passage of a batch, its legality and reputational status. This model relies on digital certification systems, unified registers and chain due diligence tools. TRACES already functions as a mandatory digital corridor for a significant part of imported food flows to the EU, and its task is not only to formalize, but also to monitor, transparently and quickly, trace the batch in the event of a food incident [4]. The Corporate Sustainability Due Diligence Directive extends this logic even further, making the supply chain an object of the company’s own management responsibility [5]. In addition, more than 100 countries are connected to the ePhyto system, and a significant part of them regularly exchange electronic

phytosanitary certificates [18]. For the importer, this means that compliance becomes part of the management model even before the conclusion of the contract.

The third model is a distributed model of digital transparency and traceability. Its essence lies in the fact that the source of managerial value is not so much the centralized internal base of the company, but the strength of digital communication between all participants in the chain. The approach is associated with improving quality, security, trust and protection against falsification [11–13]. At the same time, this model is quite expensive. The analysis of factors in the study [11] on the implementation of blockchain solutions in the food supply chain shows that the key limitations remain cost, scalability, enterprise size, managerial competence and regulatory environment. Therefore, distributed transparency is most appropriate where the cost of reputational or sanitary failure significantly exceeds the cost of digital traceability.

The fourth model is the adaptive-analytical model, in which digital corporate governance relies on data analytics, forecasting and scenario modeling. For the importer of food products, this is especially important where decisions have to be made before the occurrence of a failure, and not after it. It is about choosing a route, the volume of safety stock, a supplier advance scheme, diversifying sources of purchase, or adjusting the assortment under the pressure of a price shock. In 2023, 55% of EU enterprises already used at least one of such advanced technological pillars as AI, advanced cloud solutions, or data analytics, and the European Union directly links the digital intensity of business with its economic sustainability [17].

Table 1 presents a comparative description of the models of digital corporate governance of enterprises importing agri-food products.

Table 1. Comparative Characteristics of Digital Corporate Management Models of Agri-Food Importers

Model	The basis of management	Tools	Management result	The main limitation
Centralized platform	Internal transactional data	ERP, CRM, BI, warehouse, finance and procurement integration	Quick consolidated solution, inventory and contract control	High entry threshold for SMEs
Compliance-centric	Regulatory Circuit Compliance	TRACES, e-certification, digital supplier dossiers, due diligence	Less delays, lower regulatory risk, faster batch recall	Dependence on the quality of external data and certificates
Distributed transparency	Share Chain Data	Blockchain, QR, IoT, Digital Party Passport	Proven origin, trust, protection against falsification	Cost, scalability, compatibility barriers
Adaptive-analytical	Forecasting and scenarios	AI, data analytics, risk dashboard, forecasting	Preventive management of procurement, routes and stocks	The need for mature data and personnel
Hybrid	Combination of all models	Platform, compliance, transparency and analytics	Highest stability and controllability in turbulent environments	Complexity of architecture and change management

Source: Systematized by the author based on analysis [7-13].

At the same time, none of the described models is self-sufficient. The experience of studying five agri-food chains in Italy has shown that management structures directly determine the logic of implementing product traceability systems: in dependent networks, they focus mainly on compliance with regulatory requirements, while in networks with flexible organization of interaction, on product differentiation and decentralized coordination [7]. It should also be added that only 30% of the firms in the studied cases had fully integrated systems, and the fixed costs from digital transparency often did not decrease [7]. In other words, the most realistic for the importer is a hybrid in which the platform core ensures internal integrity, the compliance loop ensures regulatory compatibility, distributed transparency ensures trust in the origin of the product, and the analytical unit ensures the speed of adaptation. It is this hybrid configuration that constitutes, in our opinion, the conceptual basis of digital corporate governance of food imports.

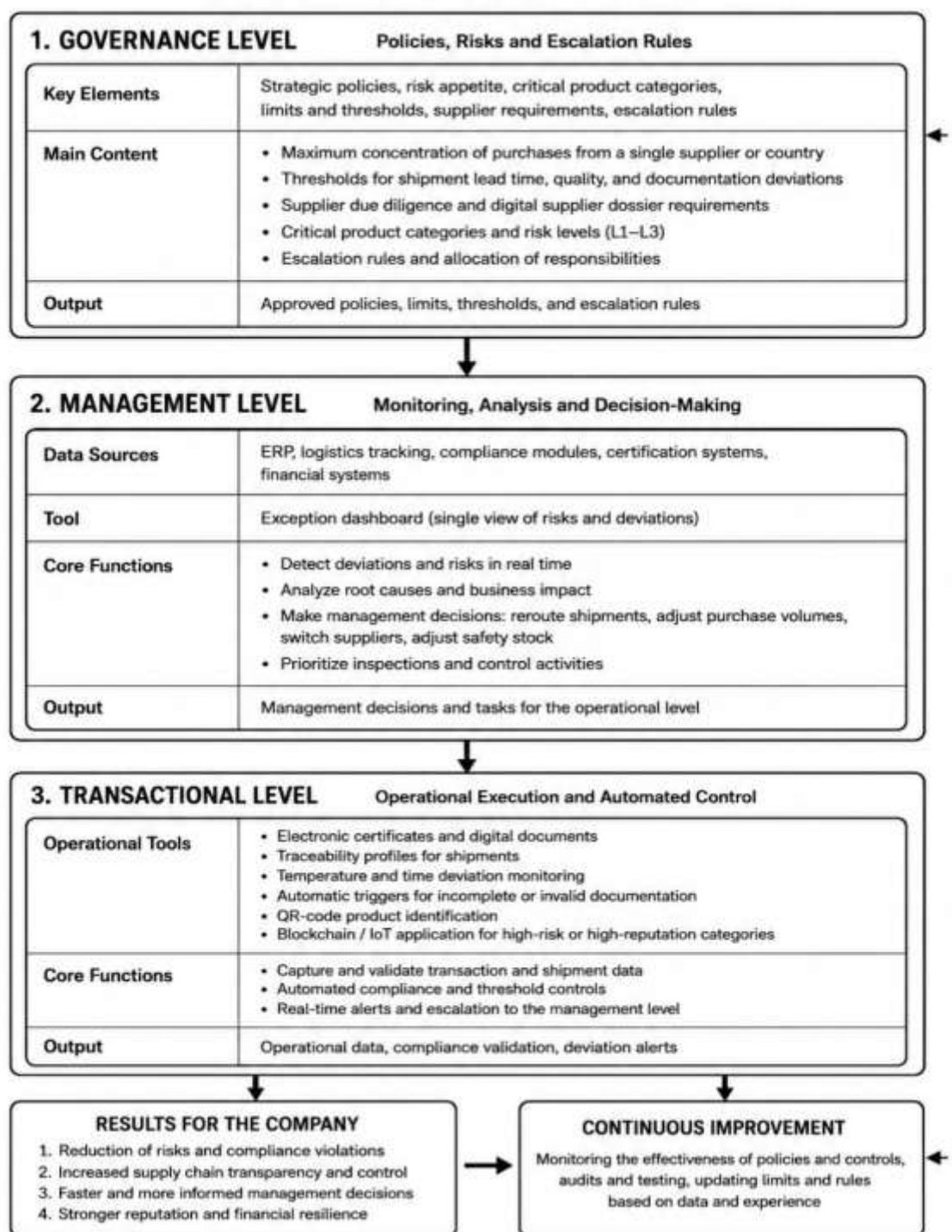


Figure 3. Three-level applied model of risk and liability management of enterprises importing finished products

Note: Risk-appetite is the aggregate value for all types of risks and separately for each of the risks, determined in advance and within the acceptable level of risk, for which there is a decision on the expediency or necessity of their retention to fulfil the goals established by the planning documents of the financial company.

Source: Author's elaboration.

The second task of the study is to develop an applied configuration that the importing enterprise can actually use in management practice. To do this, it is advisable to proceed from the following principle: digital corporate governance should be built not around basic tools, but around critical decisions that the enterprise makes weekly or daily. For an importer of food products, such decisions are the choice of supplier, the admission of a country or region to the procurement matrix, confirmation of the documentary status of the batch, the choice of route, the size of the safety stock, the procedure for recalling products and the speed of response to a price or logistical shock. If these solutions are not

connected to a single digital logic, the business will have digital services, but will not have digital corporate governance in the full sense of the word.

The applied model for such an enterprise should be three-level (Figure 3).

At the supervisory level, the company records risk appetite and escalation rules: the maximum concentration of purchases per supplier or one country, critical categories of goods, thresholds for deviation of the time of passage of the batch, requirements for due diligence and the supplier's digital dossier. At the executive level, an exception dashboard is formed, which includes data from ERP, logistics tracking, compliance modules, certification systems, and the financial block. It is here that routing, correction of purchase volumes, replacement of the source of supply, change of safety stock and priority of inspections are accepted. At the transactional level, operational tools work: electronic certificates, traceability profiles of batches, control of temperature and time deviations, automatic triggers of an incomplete documentary package, QR identification of goods, and the selective application of blockchain or the Internet of Things to categories with high reputational weight.

It is appropriate to build the practical implementation of such a model in stages. The first stage should begin with an inventory of management decisions and data: which decisions require repeated coordination, where exactly information is lost, who owns the data, what indicators are delayed, and where manual duplications occur. At the same stage, the company must segment suppliers and product categories according to risk, because without ranking, it is impossible to justifiably invest in deep digitalization.

The second stage is related to the integration of the basic core – ERP, compliance module, electronic certification and internal analytics. It is here that a single digital dossier of the supplier and the batch is formed.

Only the third stage should include expensive solutions such as blockchain, the Internet of Things or digital product passports, and then selectively, for those groups where there is a high risk of a food incident, origin from sensitive regions, or a significant premium brand component. Such a sequence directly corresponds to the conclusions of modern research: digital transparency brings value when it is consistent with the management structure of the chain, and not mechanically imposed on it.

As a result, the application model for a food importer should combine a rigid platform core, regulatory compliance, selective deep traceability, and an analytical module for rapid scenario response. Its value lies not in the fact that the enterprise “goes digital”, but in the fact that it reduces the time between a risk signal and a legitimate management decision. It is this speed, and not the very availability of software, that is now the main resource of corporate governance in the import of food products.

6. Conclusions

Thus, according to the first task, it is established that digital corporate management of food-importing enterprises cannot be interpreted as simple automation of purchases or document flow. Its content is to change the management architecture: the center of gravity moves from periodic control to continuous monitoring, from administrative approval to management through digital risk thresholds, from the local responsibility of an individual unit to the integrated control of the entire supply chain. Within the framework of the study, five working models were identified. For importers of food products, the most adequate is not an isolated, but a hybrid model.

According to the second task, an applied model of digital corporate governance for an enterprise-importer of food products is substantiated. It is based on the distribution of decisions between the supervisory, executive, and transactional circuits with a single digital dossier of the supplier and the batch. For practice, this means that the enterprise should not start with expensive technologies, but with an inventory of critical solutions, vendor segmentation, and building an integrated platform core. Only then does the selective introduction of blockchain, the Internet of Things, or advanced analytical modules become justified.

So, the managerial sense of digital transformation for the food importer is to make the corporate decision faster, more accurate, and documented flawlessly in an environment where delay has already become a form of loss in itself.

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