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A CONCEPTUAL MODEL OF ADAPTIVE MECHANISMS IN INNOVATION-ORIENTED AGRICULTURAL ENTREPRENEURSHIP

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Abstract. The war in Ukraine has presented the agricultural sector with an unprecedented combination of risks, including the loss of production assets, climate volatility, supply chain disruption and institutional instability. In such circumstances, traditional models of entrepreneurial resilience, which are primarily designed for peacetime or isolated natural or economic shocks, lose their adaptive capacity. Meanwhile, there is virtually no comprehensive theoretical synthesis of the mechanisms by which agribusiness adapts to multiple simultaneous threats. This article *aims* to substantiate a conceptual model of adaptive management mechanisms for innovative agribusiness by integrating the theories of dynamic capabilities and adaptive management with institutional economics. The *subject* of this study is the processes through which agro-industrial enterprises adapt to conditions of institutional instability and armed conflict. The study is based on the systematic organisation and critical analysis of scientific literature on dynamic capabilities theory, classical adaptive management, and institutional economics. It also draws on a synthesis of empirical studies on agribusiness adaptability under various types of shock. As a *result*, a four-level conceptual model has been developed. This model sequentially combines an exogenous shock in the form of armed conflict with a reinterpreted triad of dynamic capabilities – sensing, seizing and transforming – for wartime conditions. It also incorporates an institutional moderator and the final outcome of 'bounce forward' adaptive resilience. The *practical value* of the model lies in its potential use as an analytical tool for assessing the preparedness of agricultural enterprises for multiple crises, developing state policy to support the agricultural sector during wartime and the post-war period, and for formulating enterprise management strategies that take into account the quality of the institutional environment.

Keywords: adaptive management, institutional environment, wartime economy, agricultural sector, entrepreneurial resilience, transformation economy, innovation, agricultural entrepreneurship.

JEL Classification: Q12, O31, L26

1. Introduction

The war in Ukraine has demonstrated the unique ability of domestic businesses to adapt and transform under martial law, even accelerating their development. The phenomenon of 'crisis entrepreneurship' has taken on new and previously unseen dimensions in Ukraine. Understanding this phenomenon is key to supporting innovative entrepreneurship, attracting international investment, and building sustainable agribusinesses amid prolonged military conflict and subsequent recovery.

Ukraine's agricultural sector is at the heart of a paradox: although the country exports large quantities of cereals, oilseeds and sunflower oil, it ranks relatively low on indices of innovative entrepreneurship in agriculture (Global Innovation Index, 2023). The discrepancy between the sector's enormous resource potential and its relatively weak innovation management mechanisms has long been one of the key challenges facing Ukrainian agribusiness.

Since February 2022, Ukraine's agricultural sector has been operating under a qualitatively new

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configuration of risks. This is increasingly being described in contemporary academic literature through the concept of a 'polycrisis': the simultaneous impact of the destruction of production assets by military means, climate volatility, disruption to logistics chains, fiscal instability, and the accelerated transformation of the regulatory framework resulting from the European integration process (Charbonneau & Giguère, 2025). None of the crisis management tools designed for stable markets provides for a situation in which so many destabilising factors are acting simultaneously.

The academic debate on the adaptive management of organisations is evolving in several different research areas. One such line of research is the theory of dynamic capabilities (Teece et al., 1997; Teece, 2007), which proposes the triadic concept of 'sensing–seizing–reconfiguring' as the basis for organisational strategic adaptability. Classical adaptive management (Holling, 1978; Walters, 1986) is based on a cyclical model of managing complex systems through feedback and learning.

Sector-specific studies (Zhou Xue et al., 2024; Corchuelo Martínez-Azúa et al., 2025; Castillo-Valero & García-Cortijo, 2021; Dubinska et al., 2025) analyse the specific nature of entrepreneurial decisions in the context of agricultural uncertainty and digital innovation. However, the systematic application of these approaches to the conditions of institutionally unstable transition economies has yet to be explored in depth.

The aim of this article is therefore to develop and justify a conceptual model of adaptive management mechanisms for innovative agribusinesses, by integrating the theories of dynamic capabilities and adaptive management with institutional economics.

2. The Concept of Adaptive Management: From the Ecosystem to the Entrepreneurial Dimension

The concept of adaptive management has its origins in the work of the Canadian ecologist C. S. Holling (1978). He proposed a cyclical model for managing natural systems that was based on feedback, learning, and reorganization. Later, Walters (1986) formalised the principles of adaptive management through four key postulates:

– Uncertainty is the norm, not the exception;
– management decisions are, at the same time, hypotheses subject to verification through practice;
– monitoring is an integral part of the management cycle, rather than an external control function;
– systems are capable of self-organisation provided that feedback loops between subsystems are correctly configured.

The transfer of this concept into a management context was gradual and non-linear. Lee (1993) applied the principles of adaptive management to public institutions, showing that bureaucratic structures can learn through action. Pahl-Wostl (2009) developed the concept of adaptive water resource management, which was subsequently adopted across the agricultural sector. Williams and Brown (2012) then proposed a structured approach that incorporated explicit organisational and managerial components.

Compared with reactive and proactive management, the adaptive approach is characterised by three fundamental differences:

– The cyclical, rather than linear, nature of the management process;
– the integration of feedback as a structural element (rather than an external corrective mechanism);
– the conceptualisation of uncertainty as a resource for learning, rather than a threat to be minimised.

The aim of adaptive management is to improve the effectiveness of management decisions by developing a systematic and purposeful understanding of how the system functions and how it responds to internal and external influencing factors. Implementing this approach involves defining a strategic vision and development objectives in collaboration with stakeholders. It also involves establishing a link between these objectives and potential management measures, which can be tested through experimental implementation or by modelling various scenarios. Thus, adaptive management constitutes a continuous, cyclical process of learning, evaluation and adjustment of management actions. A comparative analysis of the approaches is presented in Table 1.

Teece, Pisano & Shuen (1997) proposed Dynamic Capabilities Theory (DCT) as a response to the limitations of the Resource-Based View (RBV) when it comes to explaining competitive advantages in an environment of rapid technological change. While the RBV focuses on value, scarcity, and the difficulty of replicating resources as sources of sustainable advantage, the DCT emphasises organisational capabilities that enable the continuous updating of the resource base in line with external environmental dynamics.

Teece (2007) elaborated on the DCT concept, identifying three fundamental components. The first is 'sensing', which is the ability to identify and assess opportunities and threats by systematically scanning markets, technologies and institutional changes. Secondly, 'seizing', defined as the ability to mobilise resources in order to capitalise on identified opportunities by developing new products, services or business models. The third component is 'reconfiguring', which is the ability to restructure and transform tangible and intangible assets in order to support long-term sustainability and avoid the lock-in effect. These three phases constitute a closed cycle in which reconfiguration creates new sensing conditions.

Table 1

Comparative analysis of enterprise management approaches

Criterios	Reactive management	Proactive management	Adaptive (classical)	Agility Framework	DCT model
Time horizon	Short-term	Long-term	Cyclical	Medium-term	Multi-level
Key driver	Crisis / disruption	Forecast / plan	Feedback	Market changes	Multiple crises / uncertainty
The role of innovation	None	Planned	Situational	Key	Systemic
Institutional environment	Ignored	Taken into account	Partial	Taken into account	Central element
Feedback	None	Weak	Strong	Moderate	Multi-level
Suitability for the agricultural sector	Low	Average	Moderate	Average	High

Note: compiled by the authors based on a review of the scientific literature.

The critical debate surrounding DCT centres on several key arguments. For example, Eisenhardt & Martin (2000) questioned the uniqueness of DC as a source of competitive advantage, arguing that, in dynamic markets, they are simply combinations of existing best practices. Winter (2003) viewed DCT as a higher-order organisational routine and criticised the tautological nature of certain versions of the concept. For the purposes of this study, however, the question of DCT's uniqueness is not decisive; rather, what is important is its operational suitability for describing adaptation processes in the context of a multi-crisis in agribusiness. It is precisely in this area that DCT demonstrates significant untapped analytical potential.

The application of Dynamic Capabilities Theory (DCT) to agribusiness is a largely unexplored area of research. Most existing empirical studies focus on individual sectoral case studies within a relatively stable institutional environment. In particular, Hartono et al. (2024) empirically confirmed that the triad of dynamic capabilities (DC) and entrepreneurial orientation positively influences farmers' resilience in the context of an endemic foot-and-mouth disease outbreak. This was demonstrated using a sample of 206 small-scale livestock farms in East Java, Indonesia. Using the agricultural sector of the department of Antioquia (Colombia) as a case study, Alzate, López, Manotas and Boada (2024) investigated dynamic capabilities such as flexibility and adaptability, which have been identified as factors in the resilience of agri-food supply chains.

Using a sample of 151 small and medium-sized enterprises in Poland, Dyduch, Chudziński, Cyfert and Zastempowski (2021) examined the role of dynamic capabilities in creating and maintaining business value during a sudden exogenous shock: the lockdown caused by the COVID-19 pandemic. The researchers identified the critical first-order capabilities (i.e., management decisions made in conditions of uncertainty) for a firm's survival during a 'black swan' event. They also demonstrated the statistical correlation of these capabilities with employment, production volumes, and cash flow maintenance.

The studies cited primarily examined natural, biological, epidemiological or economic shocks (such as epizootics, climatic events and pandemics) within a relatively stable institutional and security environment. However, none of them examined situations where economic uncertainty was compounded by a direct physical threat to production assets, personnel, and logistical infrastructure – that is, the conditions of armed conflict. No systematic application of the DC triad to agribusiness in transition economies under conditions of armed conflict has been identified in the academic literature, which constitutes the original contribution of this study.

3. Innovative Entrepreneurship in the Agricultural Sector: Characteristics and Context

Agricultural entrepreneurship is distinguished by a number of inherent features that fundamentally differentiate it from entrepreneurial activity in other sectors.

Firstly, the high degree of dependence on natural factors and climatic volatility results in a risk profile that cannot be managed using standard hedging techniques.

Secondly, the seasonal nature of production cycles creates significant imbalances in cash flow, necessitating specialised liquidity management strategies.

Thirdly, a specific type of relationship between the agri-entrepreneur and the institutional environment is shaped by structural dependence on state regulatory and subsidy support.

Fourthly, agricultural entrepreneurship has a particular social significance due to its close association with social functions such as food security, employment in rural areas and the preservation of the rural way of life.

According to (OECD/Eurostat, 2018), the typology of innovations in the agricultural sector encompasses four categories:

– Product innovations (new crops, varieties, processed products with higher added value);

– process innovations (precision farming technologies, automation, IoT solutions, precision agriculture);
– organisational innovations (new forms of co-operation, vertical integration, platform-based business models, contract farming); and marketing innovations (direct sales, e-commerce, geographical indications of origin).

These innovations are entrepreneurial in that agricultural producers are willing to go beyond typical industry practices and take on the associated uncertainties and risks.

Furthermore, the institutional environment is a key determinant of entrepreneurial activity in the agricultural sector. According to Douglas North's (1990) approach to agricultural entrepreneurship , formal institutions such as land, agricultural and tax legislation, and agricultural insurance systems and capital markets determine transaction costs and the formal rules of the game. Informal institutions, such as traditions of co-operation or atomisation, attitudes to risk, trust in state institutions and entrepreneurial culture, determine unwritten rules and behavioural norms. Both groups of institutions underwent a significant and rapid transformation under martial law, making navigating the institutional environment a critical management challenge for every agricultural enterprise.

In countries with economies in transition, innovative agribusinesses face additional barriers such as:
– The institutional immaturity of land and capital markets, manifested through incomplete land reform, limited access to long-term credit, and the absence of developed derivatives markets for hedging price and weather risks;
– information asymmetry and the weakness of formal institutions protecting property rights, which, according to North (1990), is a determining factor in transaction costs and, consequently, hinders long-term investment in innovation;
– dependence on imported technologies and resources (seeds, plant protection products, machinery), which makes the innovation trajectory vulnerable to exchange rate fluctuations and disruptions to supply chains.

An important factor is the war in Ukraine, which introduces into this whole complex a fundamentally new class of risks that are not captured by standard models of entrepreneurial risk:
– Physical destruction or loss of control over production assets, such as land being mined or irrigation systems, grain silos and logistics infrastructure being destroyed;
– disruption of supply and distribution chains due to the blockading of ports and transport corridors, and changes to the geography of export routes;
– loss of human capital due to migration, mobilisation or the death of workers – which is critical for an industry where a significant proportion of tacit knowledge is not codified and is passed on through practical experience;
– a sharp increase in uncertainty regarding the planning horizon, which runs counter to the very nature of agricultural production, which requires decisions to be made seasons and years in advance (choice of crops, investment in fixed assets).

It is the combination of these four factors, rather than each factor individually, that creates a unique context in which traditional models of organisational resilience – developed largely for peacetime and natural disasters or biological shocks – require significant adaptation.

4. A Conceptual Model of Adaptive Mechanisms in Agricultural Entrepreneurship

The conceptual model proposed herein is formed at the intersection of three theoretical traditions, with each tradition compensating for the limitations of the others. The theory of dynamic capabilities (Teece, Pisano & Shuen, 1997; Teece, 2007) provides a meaningful triad of 'sensing-seizing-transforming', but in its classical form describes a firm's adaptation to market or technological turbulence, rather than to a physical threat to the existence of its assets. This limitation is addressed by drawing on Holling's (1978) concept of adaptive management, developed for socio-ecological systems: it introduces the cyclical logic of «crisis→learning→ reorganisation» into the model and, importantly, removes the assumption that the system will return to its previous state following a shock. The third tradition, North's (1990) institutional economics, explains how dynamically identical capabilities can be realised differently, depending on the quality of institutions, such as property rights, contract law, and access to finance.

Combining these three frameworks enables construction of a model that describes the intra-firm response mechanism (the DC triad), the logic of its evolution over time (the adaptive management cycle), and the external institutional context that defines the limits of what is possible (institutional economics) simultaneously.

The model consists of four sequential levels linked by cause-and-effect relationships, ranging from the source of the disturbance to the final outcome of adaptation (see Fig. 1).

The first level is an exogenous shock in the form of armed conflict, which causes multiple interrelated disturbances of a physical, logistical, personnel-related and institutional nature, all of which act simultaneously. This distinguishes this context fundamentally from classical DC studies, which largely consider isolated types of shock, such as biological, economic or climatic.

This complex shock activates the second level of the model, the DC triad, which acts as a filter that determines the nature and speed of an enterprise's

response. The outcome of passing through this filter is not immediate, but is moderated by the third level of the model, which is the quality of the institutional environment. This environment either facilitates or hinders the realisation of the enterprise's DC capabilities. The fourth and final level of the model represents the outcome of the entire process: the enterprise's adaptive resilience.

In the context of armed conflict, the meaning of each element of the triad differs from that described in classical DC literature (see Fig. 2). 'Sensing' is no longer merely the monitoring of market conditions; it is an enterprise's ability to track the physical security situation on its premises, changes to logistics corridors and transport routes, and the availability of state and international support. In order to exercise this capability, new sources of information are required, such as security risk analysis, interaction with the military administration and sector-specific networks for the exchange of operational data. These aspects are all absent from classical sensing models, which focus on market and technological intelligence.

In a conflict situation, seizing also changes its function. The reconfiguration of resources is not so much about optimising a new opportunity as preserving the enterprise's minimally viable core production capacity. In practice, this involves changing the crop mix to prioritise crops with shorter production cycles and lower capital intensity, relocating machinery and staff to safer areas, and diversifying sales channels through alternative logistics.

In turn, transforming is responsible for the long-term reconfiguration of the enterprise's business model. This includes horizontal diversification, which involves expanding into related sectors such as processing and product storage; vertical integration, which reduces dependence on external links in the value chain; and the formation of new organisational structures, particularly co-operation between enterprises to share resources that have survived the impact of the shock.

The third level of the model – the institutional moderator – reflects the fact that the quality of formal and informal institutions (access to preferential credit, insurance against war risks, deregulation, support from international donors) either strengthens or weakens the effectiveness of the DC triad. This is consistent with North's institutional economics: the way in which an enterprise's DC capacity is realised depends on the institutional environment in which it operates. This is precisely why the institutional moderator is depicted as a factor operating in parallel and shaping the transition from the DC triad to the final outcome, rather than as a sequential stage, in Fig. 1.

The fourth and final level of the model – adaptive resilience – is understood not as a return to the initial state ('bounce back'), but, following criticism

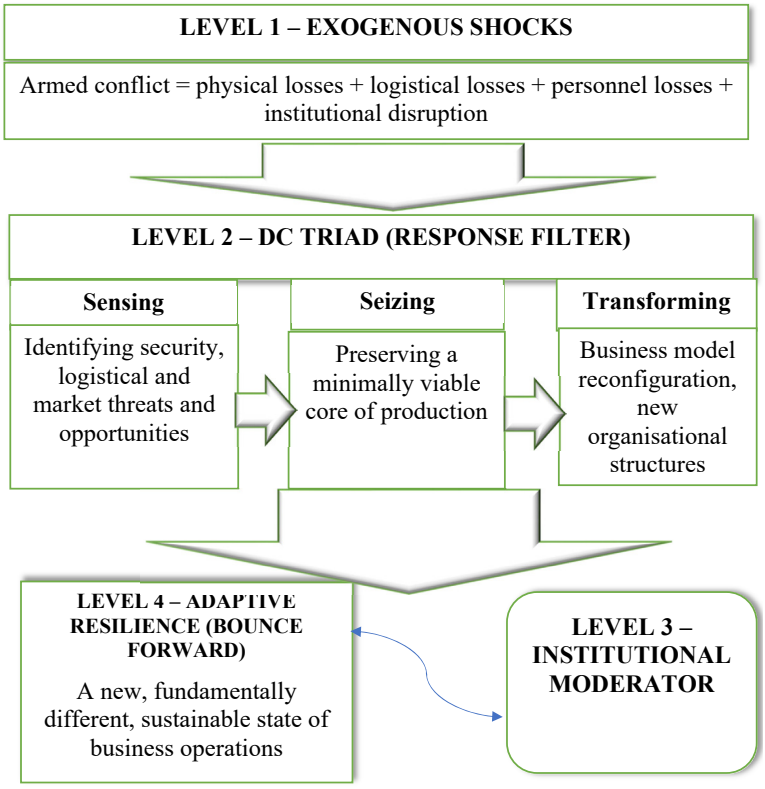


Figure 1. A four-level conceptual model of adaptive mechanisms in agribusiness in the context of armed conflict

Source: developed by the authors

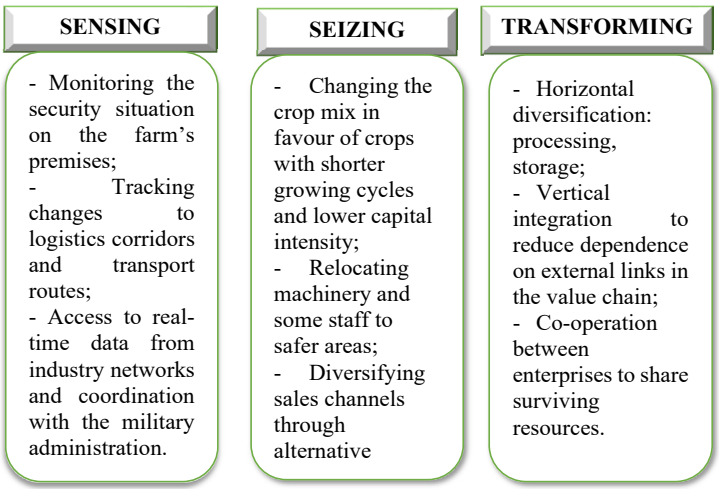


Figure 2. The essence of the DC triad (sensing–seizing–transforming) in the context of armed conflict
Source: developed by the authors

of a narrow interpretation of resilience, as the enterprise's ability to establish a new, often qualitatively different, resilient state of operation ('bounce forward'). This represents a fundamental difference from classical models of SME resilience, which focus on the recovery of businesses from temporary crises through the reversion to previous norms.

5. Conclusions

The study made it possible to address the research question concerning the key adaptive mechanisms for managing innovative agribusinesses in conditions of institutional instability and multiple crises. A review of theoretical approaches to business management – including reactive, proactive, classical, adaptive, the Agility Framework, and the dynamic capabilities model – has shown that, when considered in isolation, none of these approaches is suitable for describing situations involving economic uncertainty compounded by direct physical threats to production assets, personnel, and logistical infrastructure, as is characteristic of armed conflict.

Based on the integration of three theoretical traditions – as set out in the theory of dynamic capabilities, the concept of adaptive governance and institutional economics – a four-level conceptual model has been developed which sequentially links: the exogenous shock of armed conflict as a source of numerous simultaneous disruptions; the triad of dynamic capabilities – 'sensing–seizing–transforming' – the significance of each element of which has been reinterpreted in light of the conditions of war; and an institutional moderator, which operates in parallel and either enhances or weakens the effectiveness of dynamic capabilities depending on the quality of formal and informal institutions. The ultimate outcome is 'bounce forward'-type adaptive resilience. This does not involve the enterprise returning to its pre-war state, but rather forming a qualitatively new and stable state of operation.

The scientific novelty of the study lies in three interrelated aspects:

– The integration of the DC triad with the cyclical logic of adaptive management, which allows for the multiplicity and recurrence of shocks inherent in armed conflict, as opposed to one-off shocks;

– the introduction of an institutional moderator as a separate level of analysis, which explains the variability in adaptation outcomes among enterprises in transition economies with differing institutional quality;

– a reinterpretation of the model's final outcome not as a return to the previous state, but as transformational resilience, relevant to the specific nature of agricultural enterprise during and after war.

The model's practical significance lies in its potential use as a diagnostic tool to assess the adaptive capacity of specific agricultural enterprises. It could also serve as a methodological basis for government programmes supporting the agricultural sector during wartime and the post-war period, such as preferential lending, insurance against wartime risks and deregulation. Furthermore, it could provide guidelines for formulating management strategies for enterprises, taking into account the institutional environment in which they operate.

A limitation of the study is its conceptual, theoretical and methodological nature. The proposed model also requires further empirical verification. Promising areas for further research include developing operationalised tools (such as scales and indicators) to measure each element of the DC triad in the context of agribusiness, and conducting an empirical study on a sample of Ukrainian agribusinesses to test the formulated theoretical propositions.

References:

Global Innovation Index (2023). *Innovation for a resilient world*. World Intellectual Property Organization (WIPO).

Charbonneau, B., & Giguère, A. (2025). The polycrisis and the uncertainty possibility space. *Global Sustainability, 8*, e4. https://doi.org/10.1017/sus.2025.9

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal, 18*(7), 509–533. http://www.jstor.org/stable/3088148

Teece, D. J. (2007). Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal, 28*(13), 1319–1350. https://doi.org/10.1002/smj.640

Holling, C. S. (1978). *Adaptive environmental assessment and management*. Wiley.

Walters, C. J. (1986). *Adaptive management of renewable resources*. McGraw-Hill.

Xue, Z., Hou, Y., Cao, G., & Sun, G. (2024). How does digital transformation drive innovation in Chinese agribusiness: Mechanism and micro evidence. *Journal of Innovation & Knowledge, 9*(2), 100489. https://doi.org/10.1016/j.jik.2024.100489

Corchuelo Martínez-Azúa, B., Dias, Á., & Sama-Berrocal, C. (2025). The key role of market orientation in innovation ambidexterity in agribusiness firms. *Review of Managerial Science, 19*(1), 39–65. https://doi.org/10.1007/s11846-024-00732-6

Castillo-Valero, J. S., & García-Cortijo, M. C. (2021). Factors that determine innovation in agrifood firms. *Agronomy, 11*(5), 989. https://doi.org/10.3390/agronomy11050989

Dubinska, I., Irtyshchev, O., & Cherkaskyi, H. (2025). Prerequisites for securing business activities in the conditions of global economic turbulence. *Baltic Journal of Economic Studies, 11*(1), 86–94. https://doi.org/10.30525/2256-0742/2025-11-1-86-94

Lee, K. N. (1993). *Compass and gyroscope: Integrating science and politics for the environment*. Island Press.

Pahl-Wostl, C. (2009). A conceptual framework for analysing adaptive capacity and multi-level learning processes in resource governance regimes. *Global Environmental Change, 19*(3), 354–365. https://doi.org/10.1016/j.gloenvcha.2009.06.001

Williams, B. K., & Brown, E. D. (2012). *Adaptive management: The U.S. Department of the Interior applications guide*. U.S. Department of the Interior.

Eisenhardt, K. M., & Martin, J. A. (2000). Dynamic capabilities: What are they? *Strategic Management Journal, 21*(10–11), 1105–1121. https://doi.org/10.1002/1097-0266(200010/11)21:10/11<1105::AID-SMJ133>3.0.CO;2-E

Winter, S. G. (2003). Understanding dynamic capabilities. *Strategic Management Journal, 24*(10), 991–995. https://doi.org/10.1002/smj.318

Hartono, B., Toiba, H., Putritamara, J. A., & Rahman, M. S. (2024). Do dynamic capabilities, and entrepreneurial orientation promote farm resilience? Insights from Indonesian beef-cattle farmers facing foot and mouth disease outbreak. *Cogent Food & Agriculture, 10*(1), 2409486. https://doi.org/10.1080/23311932.2024.2409486

Alzate, I. C., López, Y. M., Manotas, E. C., & Boada, A. (2024). Flexibility and adaptability: Dynamic capabilities for building supply chain resilience. *Journal of Infrastructure, Policy and Development, 8*(16), 9749. https://doi.org/10.24294/jipd9749

Dyduch, W., Chudziński, P., Cyfert, S., & Zastempowski, M. (2021). Dynamic capabilities, value creation and value capture: Evidence from SMEs under Covid-19 lockdown in Poland. *PLoS ONE, 16*(6), e0252423. https://doi.org/10.1371/journal.pone.0252423

OECD/Eurostat. (2018). *Oslo manual 2018: Guidelines for collecting, reporting and using data on innovation* (4th ed.). OECD Publishing. https://doi.org/10.1787/9789264304604-en

North, D. C. (1990). *Institutions, institutional change and economic performance*. Cambridge University Press.