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## **MODEL FORMALIZATION OF BUSINESS STRUCTURES GROUP DYNAMICS WITHIN ADAPTIVE MANAGEMENT LOOPS**

The article substantiates a model formalization of business structures group dynamics within the frameworks of adaptive management and strategic administration under the pressure of intensifying exogenous environmental entropy.

The current stage of evolution of the global and domestic economic space is characterized by a deepening state of permanent turbulence, which is conceptualized through the BANI-world paradigm. Under these conditions, the variability of the business environment acquires an extreme, nonlinear character, accompanied by sharp fluctuations in resource flows, security shocks, and forced digitalization.

The methodological core of the research is built upon the adaptation of the non-linear Lotka-Volterra differential equations, phase space analysis, and cybernetic systems theory. The scientific novelty of the developed approach lies in the original time-discretization of the model, which accounts for inherent operational lags, and the formalization of inter-group pressure coefficients based on the Weber–Fechner psychophysical law. These dynamic functions reflect the complexity gap between external market chaos and the internal regulatory diversity of the management loop. The study incorporates a modernized integral development indicator computed via dynamic, entropy-dependent weights and endogenous growth potential. A comprehensive analytical investigation of the local asymptotic stability of the system's stationary points was conducted. This mathematical modeling successfully classified distinct scenarios of stability loss, including divergent actor displacement, non-linear oscillations via the Andronov-Hopf bifurcation, and a total transition into deterministic chaos. The practical significance of the findings lies in providing a predictive administration framework to monitor systemic degradation risks under hybrid threats.

**Keywords:** Lotka-Volterra model, discrete dynamics, bifurcation, environmental entropy, Weber-Fechner law, business structures, management lags, deterministic chaos, group dynamics