FACTORS INFLUENCING THE DEVELOPMENT OF NATIONAL INNOVATION SYSTEMS: MODERN APPROACHES AND METHODOLOGICAL FOUNDATIONS

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Abstract: This article analyzes modern methodological approaches to assessing the impact of various determinants on the development of national innovation systems (NIS). It synthesizes qualitative and quantitative research methods and evaluates multiple theoretical perspectives on factors shaping innovation performance at the firm, regional, and national levels. Drawing on the sources referenced in the uploaded material, the study examines institutional, economic, technological, informational, integrational, human capital, and market-related influences on innovation activity. The article concludes with a structured classification of determinants and discusses their relevance for strengthening innovation policy and system design, especially within developing economies.

Keywords: National Innovation System, Innovation Determinants, Human Capital, Innovation Policy, R&D, Competition.

National innovation systems represent a complex interplay of institutions, actors, and processes that collectively shape a country's technological progress and socio-economic development. The uploaded document correctly highlights that a universal methodology for assessing innovation systems does not yet exist, creating the need for flexible, adaptable analytical tools capable of reflecting country-specific conditions [1, p.3]. Contemporary research consistently emphasizes that innovation outcomes are shaped not only by technological factors but also by institutional arrangements, cultural norms, human capital composition, and competition environments.

The literature referenced in the original text underscores four broad methodological approaches: deep interviews, case studies, qualitative exploration, and quantitative modelling [1, p.5]. Deep interviews provide contextualized empirical insight, enabling researchers to capture behavioural aspects of innovation management. Case studies help understand concrete organizational environments and allow structured tools such as SWOT, situational assessments, and strategy analysis [1, p.6]. Broader qualitative methods—field observations, informal interviews, mini-symposiums—offer multi-layered views of institutional and cultural influences [1, p.7]. Quantitative approaches make it possible to construct statistical models, examine causalities, and test hypotheses using R&D data, patent indicators, and innovation outputs [1, p.8].

Institutional and Contextual Influences

A.V. Brijan stresses that institutional, political, cultural, and social factors form the structural foundation of an effective innovation system [2, p.10]. Countries with consistent long-term innovation policy, strong mediating institutions such as technology transfer centers and innovation intermediaries, and clear strategic coordination tend to demonstrate higher system performance [2, p.11]. These insights align with broader global research showing that institutional coordination reduces transaction costs and facilitates knowledge flows among universities, industry, and government.

Competition serves as a major driver of firm-level innovation. A. Axmedjonov finds positive relationships between the intensity of domestic competition and product-line renewal, confirming that rivalry compels firms to update processes and offerings [3, p.12]. OECD

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perspectives similarly argue that competition improves innovation quality by incentivizing efficiency, product differentiation, and organizational renewal [4, p.13]. However, excessively strong or disorderly competition may reduce innovation incentives by lowering expected returns. Balanced competitive environments—neither monopolistic nor chaotic—are considered optimal.

R&D Investment and Knowledge Accumulation

Erqian Zhu's cross-country analysis of OECD members (1973-1996) reveals that research investment, knowledge stock, industrial clustering, and university research funding are strong predictors of national innovative capacity [5, p.14]. T.N. Kashchina classifies regional innovation drivers into financial, legal, technological, informational, consulting, and human resource-related elements, highlighting the multidimensional nature of innovation systems [6, p.15]. R.R. Baxtiev identifies key determinants at the regional system management level—resources, technologies, equipment, standardization, certification, metrology, and executive capability [7, p.17]. Y.E. Aliev further expands this taxonomy to include economic, technological, organizational, social-legal, and environmental factors [8, p.18].

Firm-Level Determinants

Firm characteristics represent one of the most influential groups of innovation determinants. Studies indicate that firm size, age, R&D engagement, managerial competence, employee skill level, training programs, inter-organizational collaboration, and sector-specific conditions significantly shape innovation outcomes [9, p.22]. O.S. Avanesyan identifies strong correlations between firm value and innovation potential, intangible assets, synergy capability, and the condition of R&D infrastructure [10, p.27]. Larger firms tend to have greater resource availability, stronger brand reputation, better access to capital markets, and higher capability for sustaining long-term research projects [11, p.25]. However, smaller firms may compensate through agility, speed, and closer customer relationships.

Human Capital as a Core Determinant

Human capital stands out as one of the most critical drivers of innovation. The uploaded material shows that a 20% increase in the share of highly educated workers can significantly increase the probability of new product creation [3, p.30]. Training programs similarly raise probabilities of innovation outcomes by over 12% [3, p.31]. Djokovic and Souitaris find that IT strength, skilled personnel, managerial experience, accountability, and reward systems substantially influence innovation success [12, p.32]. Research consistently supports the idea that firms with strong human capital foundations are better positioned to absorb external knowledge, generate internal ideas, and transform insights into marketable innovations.

Sectoral and Organizational Dimensions

Innovation intensity varies across economic sectors. Manufacturing firms, given their technological requirements, demonstrate higher probabilities of engaging in innovation than service-sector organizations [11, p.33]. Organizational structure also matters: J. Galende argues that strong human resources, advanced technologies, and concentrated specialization are essential for sustainable innovation [13, p.36]. Damanpour and Mumford highlight professionalization levels, technological knowledge resources, administrative support, communication strength, and leadership style as critical determinants of innovation performance [14, p.37].

Innovation Culture

Benner & Tushman and Luthans et al. emphasize cultural elements such as risk-taking, adaptability, learning orientation, and self-development as foundations for continuous innovation [15, p.38]. Innovation thrives in environments where employees are empowered to experiment, organizations tolerate controlled failure, and leadership promotes long-term learning.

Classification of Innovation Determinants

Synthesizing the insights from the original material, the article proposes a seven-group classification:

legal-institutional support, financial-economic support, technological support, informational support, integrational mechanisms, education and human-capital systems, and market-related factors. This framework captures the multifactorial nature of innovation environments and provides a comprehensive structure for assessing innovation systems.

Innovation development results from the interaction of institutional structures, competition dynamics, research investment, firm characteristics, human capital, organizational design, cultural norms, and market conditions. The absence of a universal assessment methodology reflects the diversity and complexity of national innovation systems. The classification developed here, based on the uploaded sources, provides a systematic foundation for further empirical assessment and policy development, especially for countries seeking to strengthen their innovation ecosystems.

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