COMPARATIVE ANALYSIS OF INTERNATIONAL ICT PRACTICES IN SCHOOL MANAGEMENT MODERNIZATION: AN ECONOMIC AND MANAGERIAL PERSPECTIVE

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Abstract. Modern school management has evolved into a complex socio-economic endeavor where the efficient reproduction of human capital is the primary mandate. Information and Communication Technologies (ICT) serve as the fundamental economic lever in this transformation, transitioning from auxiliary tools to the core of institutional governance. This paper provides a comprehensive comparative analysis of international ICT practices in school management, examined through the lenses of management efficiency, cost-effectiveness, and data-driven decision-making. By evaluating the digital ecosystems of Finland, Estonia, and South Korea alongside the emerging reforms in Uzbekistan, the study demonstrates how integrated systems like Education Management Information Systems (EMIS) and Enterprise Resource Planning (ERP) reduce administrative friction and enhance service quality [Abdinabiyeva, A.R. 2025. p.40]. The research utilizes management theories, including the Upper Echelon Theory and the Principle of Equifinality, to argue that digitalization facilitates a shift from rigid bureaucratic hierarchies to agile, decentralized network structures. The results suggest that the strategic integration of ICT not only optimizes resource allocation but

also ensures institutional transparency and accountability, positioning educational institutions as competitive subsectors within the global knowledge economy.

Introduction

Education is fundamentally defined as a non-material sector of the economy, combining various business entities aimed at the reproduction of human capital. Within this framework, management is both an art and a science, involving the strategic utilization of human, technical, financial, and informational resources to meet the demands of a homogeneous consumer market. As the global economy undergoes profound transformation, school management systems face the challenge of "doing more with less" while ensuring that the quality of educational services remains an economically viable category [Carataș Maria Alina an et. al. 2018, p.405].

Modernization in the educational context refers to the transition toward "evidence-based management," where decisions are no longer predicated solely on the intuition of leaders but on the rigorous analysis of data [Kosherbayeva, A.N. et al. 2023, p.145]. The emergence of ICT has linked the world together, leading to a global change in all aspects of life, including the way management technologies are adapted to the individual circumstances of economic agents. In this informational universe, "time is money," and the business field of education cannot be left behind. This paper explores how international best practices in ICT modernization contribute to organizational sustainability and economic growth by improving the efficiency and effectiveness of school governance.

Literature Review

The importance of information as a strategic resource is grounded in the "information economy," dealing with market signaling and the reduction of information asymmetry. In school management, ICT acts as a "digital nervous system," enabling organizations to operate at the "speed of thought". Management itself is viewed as the

"servant of the organization"; any management system that fails to master the conceptual apparatus of the modern economy causes institutional harm [Borodiienko, O. 2022, p.465].

Current research categorizes school management into various models, including bureaucratic, business-oriented, communication, and partnership models. The bureaucratic model is characterized by rigid hierarchical structures and formalized relationships, often resulting in institutional stagnation and the outflow of personnel with innovative mindsets. Conversely, the business-oriented model focuses on optimizing business processes, increasing automation, and focusing on revenue growth and cost optimization.

The "Upper Echelon Theory" suggests that organizations become reflections of their top managers. Through this lens, the strategic choice to adopt ICT is determined by the cognitive styles and digital competencies of the top management team (TMT) [McCants, M.H. 2024, p.19]. Furthermore, systems dynamics (SD) research highlights that organizations are non-linear systems where feedback loops and time delays in information flow can either enable or hinder the accumulation of intangible assets like institutional reputation.

SBM is a multinational change curriculum approach that transfers authority over financial and personnel matters to the local level. It is rooted in the "principle of equifinality," which posits that schools can use various methods to achieve the same high-level goals depending on their local socio-economic conditions. ICT is a critical enabler of SBM, providing the infrastructure for accountability and transparency required when central control is devolved.

Methodology

This paper adopts an interdisciplinary approach, utilizing economic analysis, synthesis, and deduction to examine management phenomena in the education sector.

The research design follows a comparative qualitative framework, evaluating the strategic planning and ICT implementation strategies of different nations [Yuzhuo Cai & Vuokko Kohtamäki (eds), 2014, p.81].

Key analytical tools used include:

- **Materiality Analysis:** Deciding which issues to prioritize based on their importance to external and internal stakeholders.
- **SWOT and PESTLE Analysis:** Identifying internal strengths and external socio-economic prerequisites for strategic development.
- **Confirmatory Factor Analysis (CFA):** Validating the components of an innovative organization, such as ICT management and organizational culture.

The study synthesizes data from international journals, doctoral dissertations, and sector-specific policy documents, such as the Uzbekistan Education Sector Plan (ESP) 2019–2023.

Results and Discussion

Finland: Professionalization and Holistic Integration. The Finnish model is characterized by a high degree of teacher professionalism and institutional trust. Management in Finnish universities and schools emphasizes "strategic development" as a long and complex process aimed at enabling better integration between institutional strategy and core operations. ICT is used here not just for administrative reporting but to foster collaborative teaching and learning practices, creating a "Common Information Platform" that syncs global strategy with local execution [Yuzhuo Cai & Vuokko Kohtamäki (eds), 2014, p.84].

Estonia and the Digital Ecosystem. Estonia represents a "digital first" governance model. By integrating school management into a broader national e-governance ecosystem, Estonia has minimized administrative costs. The use of cloud technologies (e.g., Google Drive) and specialized communication software (Slack,

Zoom) allows for real-time virtual communication and project-management-based governance [Borodiienko, O. 2022, p.467]. This reduction in "administrative friction" allows staff to focus on key aspects of interaction with stakeholders.

South Korea: Smart Governance and Autonomy. South Korean schools have leveraged ICT to support "Greater School Autonomy". Randomized natural experiments indicate that schools with higher autonomy, supported by robust data dashboards and tracking systems, show significant improvements in administrative effectiveness. The focus is on the "Triple Helix" collaboration—triple-helix interaction between universities, industry, and schools to ensure that human capital production matches market needs [C. Boafo and U. Dornberger, 2024, p.4].

The Uzbekistan Education Sector Plan (ESP) 2019–2023 identifies that management at the system level was previously sub-optimal due to poor capacity and a lack of specialized training in institutional management for school leaders. Area 7 of the ESP explicitly focuses on supporting education service delivery through "evidence-based policies, programming, and monitoring, facilitated by an EMIS".

The modernization strategy in Uzbekistan includes the creation of a comprehensive EMIS that covers:

- Institutional and Student Information Systems.
- Financial Management Information Systems and payrolls.
- Human Resource Information Systems (HRIS).
- School Inspection and Quality Tracking Systems.

The economic goal of these systems is a consistent increase in real income and job creation by optimizing the allocation of resources and ensuring that budget allocations for the Higher Education and General Secondary sectors reach their intended SDG indicators [ESP Uzbekistan, 2018].

The introduction of ICT into the management structure leads to what is known as the "strategic apex" model, where top managers can directly control the activities of performers via the Internet and internal channels. This removes the need for multiple layers of middle management, creating "network structures" that increase operational speed.

Performance is further enhanced through "Quality Management Systems" (QMS). In the big data era, Business Intelligence (BI) and Internet of Things (IoT) devices provide real-time feedback on resource usage and customer (student/parent) preferences [Cao, Y. and Alyousuf, F. 2025, p.8]. Applying these tools alleviates the challenges of conventional paperwork, augmenting overall effectiveness and allowing for more accurate "What-If" analysis in resource planning.

From a managerial perspective, ICT modernization is an investment that leads to the reduction of operational costs in the long term. Digital records for staff employment, financial transactions, and alumni engagement facilitate easy referencing and swift retrieval. This systematic storage reduces the labor costs associated with traditional administrative duties.

In resource-constrained environments, "materiality analysis" is used to identify where to invest limited time and funds. The synergy between financial orientation and product (service) innovation allows schools to redefine prices for services towards creating higher added value. Digital governance ensures that institutional actions are subject to general principles recognized by all stakeholders. A "Common Information Platform" integrated with ERP tools ensures that correspondence, calendaring, and documents are centralized, making the governance process traceable. Transparency in accounting information is vital for achieving good corporate (institutional) governance, providing a "True View and Fair Value" of the institution's financial health to the state and community.

Quality in education is a multidimensional concept. It is split into the "quality of the educational system as a whole" (strategies, policies) and the "quality of educational services" (modernize curriculum, resource quality). In the market of educational services, competition creates a need for a "marketing orientation".

Service quality is an economic category because it determines institutional reputation and brand image, which in turn attract talented faculty and students, thus enhancing the overall economy of the nation. Metrics like "student satisfaction trends" and "serviceability" are now standard managerial KPIs.

Conclusion

The modernization of school management through ICT is an economic imperative for sustainable development in the 21st century. The comparative analysis shows that high-performing nations have transitioned from bureaucratic, manual administrative models to integrated, data-driven digital ecosystems. Systems like EMIS and ERP are not merely software upgrades; they are structural interventions that redefine the "scalar principle" of hierarchy and empower the "strategic apex" with real-time intelligence.

For countries like Uzbekistan, the implementation of the ESP 2019–2023 represents a "Theory of Change" where ICT integration serves as a value-added management tool. By prioritizing technological facilities, reconstructing laboratories, and investing in EMIS-facilitated research, educational institutions can achieve a synergy between efficiency (resource optimization) and effectiveness (service quality).

Ultimately, innovation in management must be viewed as a transformative process where outdated methods are replaced by those that provide a balanced "value for money" proposition. The integration of BI, IoT, and cloud computing will decide the business success and sustainability of educational institutions in the next fifty years, ensuring they remain resilient in a volatile global market.

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