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The Managerial Value of Educational Technology and Its Implications on Productivity and Resource Allocation: A Critical Literature Review

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Abstract: *Educational Technology (EdTech) is rapidly positioned not just as a pedagogical tool but also as a management resource in improving the productivity of an institution and the efficient distribution of resources. With increasing pressure on higher education institutions to improve efficiency, accountability, and strategic responsiveness, EdTech is being embraced as a means of organizational change and transformation. Although the instructional applications of EdTech are well documented in the literature, its managerial implications remain under-theorized. This critical literature review integrates knowledge on education and management to explore the role of EdTech in determining organizational productivity and institutional resource allocation/distribution. Based on the Resource-Based View (RBV) and Institutional Theory, the review interrogates the key assumptions embedded in the adoption of EdTech. Due to the recursive and contextual-sensitive nature of EdTech value creation, the study proposes a conceptual framework to integrate these findings and give support to future research. The work contributes to a theory-based view on the managerial significance of EdTech and provides the foundations for more critical, equitable and mission-based approaches to digital strategies in higher education.*

Keywords: Educational Technology, institutional productivity, resource allocation, higher education institution

1. Introduction

Educational technology (EdTech) has emerged as a transformative force in higher education across the world and has impacted not only the modes of teaching and learning but as well as the way in which institutions are governed and managed (Beaton, Gao, & Coates, 2023; Mirgorodskaya et al., 2023). The development of digital systems, data analytics, and learning management systems have increased the capacity of universities to enhance decision-making, accountability, and institutional productivity (Gonugunta & Leo, 2024). Leading universities in developed settings increasingly depend on EdTech to track performance, allocate resources efficiently, and enhance the visibility of the institution (Chugh et al., 2023; Kasmia & M'hamed 2023). Such developments highlight the managerial significance of technology as a strategic tool that can be used to improve the effectiveness of institutions of higher learning.

Despite this global trend, studies in many developing settings continues to emphasize the pedagogical role of EdTech, and how it enhances the delivery of instruction, student

engagement, and leaning outcome (Sabri et al., 2024; Zhu, 2023). Although such studies are valuable, they fail to consider the broad managerial and administrative dimensions of the use of technology. Question remains regarding how EdTech can enhance organizational performance, facilitate leadership decision-making, streamline academic administration, and improve resource accountability. This gap is especially pressing in context where underfunding, rising student populations, and the growing demands for transparency become systemic problems in institutions.

Nigeria, like most African nations, is at the intersection where universities are under pressure to improve both teaching and institutional effectiveness (Yusuf & Ibrahim, 2024). Nevertheless, the managerial adoption of EdTech remains uneven, often constrained by infrastructural, financial, and organizational challenges (Singun, 2025). Few empirical or conceptual research have been conducted on exploring the potential of EdTech as a managerial asset in such environments. This creates a critical need for not only documents these challenges but also highlights how universities can strategically leverage technology to improve productivity and accountability.

Accordingly, this study critically examines the managerial value of educational technology in higher education. The objectives are to assess how EdTech contributes to educational productivity, and to also its contribution to allocation of resources in higher education institutions. By framing educational technology rather than merely instructional phenomenon, this review contributes to a more holistic understanding of how EdTech reshapes not only learning environments but also the governance, economics and strategic functioning of educational institutions.

2. Literature Review

2.1 Educational Technology in Institutional Contexts

The concept of educational technology (EdTech) has undergone considerable changes in recent decades. Traditionally, EdTech has been mainly viewed through a pedagogical lens, mainly focused on its utility in enhancing teaching and learning processes (Alam & Mohanty, 2023; Olateju et al., 2024). While these pedagogical functions are undoubtedly crucial, they represent merely a partial understanding of broader capacities and institutional significance of educational technologies. Recently scholarly discussions advocated for a more comprehensive definition of EdTech, a one that recognizes its dual role as both an infrastructure and managerial system embedded within the operational framework of educational organizations (Ifenthaler & Yau, 2020; Williamson, 2017). In this expanded view, educational technologies include not only Learning Management Systems (LMS), digital content delivery platforms and interactive classroom tools, but also institutional systems that underpin administration, governance and strategic planning. Such systems include student information system (SIS), financial management platforms, predictive analytics dashboards and communication tools, all of which constitute a vital part of the educational infrastructure. These tools are integral to the back-end operations of educational institutions, often serving as a digital backbone for strategic initiatives such as digital transformation, quality assurance and performance-based budgeting (Reinhold et al., 2024). Therefore, reframing EdTech in these terms shifts the analytical focus from merely instructional functions to its role as a strategic organizational resource. Within this broader understanding, EdTech is not only a facilitator of education or pedagogy, but also a lever for driving institutional change and governance (Williamson & Hogan, 2021).

2.2 Theoretical Perspectives on EdTech and Management

2.2.1 Resource-based view (RBV) which view EdTech as a strategic Asset

Resource-based View (RBV) of the firm posits that sustainable competitive advantage arises from the possession and strategic deployment of valuable, rare, inimitable and non-substitutable (VRIN) resources (Barney, 1991). In educational settings, and especially in higher education, Edtech is increasingly treated as a resource, which institutions used to differentiate themselves in a setting of competition characterized by rankings, performance-based funding and marketized recruitment of students. Thus, from this perspectives, EdTech platforms such as analytics dashboards, customer relationship management (CRM) systems, and adaptive learning tools are treated not as merely operational supports but rather as strategic capabilities enhancing institutional performance, responsiveness, and decision making (Susnjak et al., 2022). RBV also encourages the analysis of how EdTech affect resource-allocation within the institution. The adoption of advanced system often redirects financial and human resources towards.

2.2.2 Institutional Theory

Where RVB focuses on internal capacities, institutional theory on the other hand shifts attention to external pressures. According to (DiMaggio & Powell, 2010), organizations often adopt new practices not solely for efficiency but to gain legitimacy within their institutional environments. This dynamic can be observed in the widespread uptake of EdTech across education sectors, with its adoption is frequently motivated by copying peers, normative pressures (i.e., professional standards), and coercive regulations (i.e., policy mandates). Educational institutions may adopt learning analytics, AI enabled chatbots, or enterprise resource planning (ERP) systems, not because these tools demonstrably improve outcomes but because other institutions have done so, or because such adoption signals modernity, innovations, and responsiveness to stakeholders (Andrades et al., 2024). Therefore, EdTech can become a symbolic artifact, a performative demonstration of strategic alignment without proof of actual productivity improvements.

3. Methodology

This study adopted a literature-based design, drawing on peer-reviewed journals and institutional reports sourced from Google Scholar, Scopus, Web of Science, ERIC, and relevant repositories. Search terms included “educational technology,” “managerial value of EdTech,” “academic productivity,” and “higher education management.” The review focused on publications from recent studies. Multiple sources were consulted, with different key references synthesized and analyzed. This structured process ensured both conceptual relevance and scholarly quality, providing a solid foundation for identifying research gaps and drawing implications for policy and practice.

4. Result

4.1 EdTech effects on institutional productivity

One of the most visible and often cited contributions of educational technology to institutional productivity lies in its ability to automate regular administrative functions (Ahmad et al., 2022; Rensfeldt & Rahm, 2023). From enrolment and course registration to grading and timetable scheduling (Abdulhamid, 2024; Tayong & Gulliver, 2023). EdTech systems increased efficiency by reducing manual workloads, improved process accuracy and accelerating service distribution, (Al Njadata et al., 2021; Okokoya, 2024). These tasks, while often peripheral for teaching and learning, are central to even operating educational institutions. As such

automation through digital platforms is often developed as a productivity improvement-freeing staff time for higher-order tasks and reducing operational costs.

Furthermore, as educational institutions are increasingly called to demonstrate accountability, keep track of performance, and adapt quickly to changes, the use of data-driven decision-making (DDDM) systems has become a key reason for embracing educational technology (Duz, 2023; Kaspi & Venkatraman, 2023) Data from Learning Management Systems (LMS), Student Information Systems (SIS), and integrated analytics platforms is now commonly utilized to guide important decisions within institutions, from student support initiatives to how resources are allocated and strategic planning (Al-Twijri et al., 2024). This shift signifies a transformation in the role of EdTech, from merely a supportive tool for teaching to a vital source of organizational intelligent.

4.2 EdTech and Resource Allocation

The way educational technology is adopted goes beyond just changing the operations of institutions; it redefines how they distribute and prioritize their resources. Even though EdTech is frequently portrayed to save money or improve efficiency, the reality of reallocating resources is much more intricate. In this section, we'll take a closer look at the financial, human, and infrastructural effects of adopting EdTech.

4.2.1 Financial Allocation: Costs, Investments, and ROI Challenges

EdTech procurement often requires adequate initial investments in hardware, software, licenses and IT infrastructure. In many cases, these are justified through the expectations of long-term cost savings-via automation, scalability, or reduced demand for physical facilities (Trucano, 2016). However, the studies consistently suggests that it is difficult for Edtech to calculate the true Return on Investment (ROI). Benefits of Technology - such as improved student outcomes or operational efficiencies, are often diffuse, delayed, or difficult to isolate from other variables (Kim & Belzer, 2021; Rothwell et al., 2024).

4.2.2 Human Resource Impacts: Roles, Skills, and Labor Redistribution

Integration of educational technology also has intensive implications for human resources. As certain administrative tasks become automated, institutions may restructure staffing, phasing out traditional roles while creating demand for new digital or hybrid posts. IT support, instructional design, digital content development, and data analytics are among the fastest-growing areas in educational employment (Ordóñnez-Olmedo et al., 2021). While this shift offers opportunities for innovation and professionalization, it also raises concerns about job displacement, deskilling and unequal access to digital career pathways. Institutions often implement Edtech without adequate reskilling programs or transition pathways, leaving some employees marginalized (Jagannathan, 2021).

4.2.3 Infrastructure and Strategic Prioritization

EdTech changes not only the budget and personnel, but also the infrastructure priorities of educational institutions. Traditional investment in physical assets such as library, classrooms, on-campus services-rapidly supplemented or even displaced by spending on digital infrastructure like cloud computing, network bandwidth, cyber security frameworks and digital campus platforms (Yusuf & Hafeez-Baig, 2023). While these changes are often framed as modernization, they also reflect deeper changes in institutional identity and strategy.

5. Critical Challenges and Future Directions

Despite the increasing managerial integration of educational technology, its extensive adoption exposes a set of persistent and interlocking challenges that constrain its strategic effectiveness. A primary concern lies in the ambiguity of productivity metric; Institutions continue to struggle with evaluating EdTech's actual impact of Edtech due to the absence of overall, multidimensional frameworks that captures both quantitative efficiencies and qualitative consequences. Standard indicators, such as the cost per student, system usage rates, or retention data-fail to account for deeper pedagogical value, long-term transformation or social mission alignment. Continued tied to this is the growing reliance on data-driven systems, which, while offering operational insights, also increases adequate concerns around datafication, privacy and algorithm surveillance. Learning analytics and predictive dashboards often operate through opaque algorithms and commercial architectures that challenge transparency and embed potentially discriminatory logics into everyday decision -making processes. This in turn intersects with the problem of vendor lock-in and loss of institutional autonomy, as many educational institutions become rapidly dependent on proprietary Edtech ecosystems-owned that limit customizability, increase long-term costs, and introduce external influence in internal governance. Additionally, fragmentation of institutional strategy, where technologies are adopted in an ad hoc or reactive manner, often in response to policy pressure or market trends rather than a coherent planning undermines the integration and sustainability of EdTech initiatives. This contributes to technical redundancy, employees' fatigue and misalignment with core academic values.

Compounding all these issues is the enduring digital inequality that permeates both institutional and student levels. While affluents universities expand digital infrastructure and analysis capabilities, under-resourced institutions struggle to maintain basic access, widening the gaps in capacity, opportunity and educational outcomes. Together, these challenges reveal that the managerial value of Edtech is not a technical, given but a competition terrain, one shaped by economic structures, governance logics and institutional cultures. Addressing them will require more deliberate, critical and equity-centred approach to the design, evaluation and strategic alignment of educational technology.

6. A Critical Framework for Evaluating the Managerial Value of Educational Technology

To synthesize diverse and context-sensitive findings of this review, this section proposes a conceptual framework for evaluating the managerial value of educational technology. Rather than assuming a direct correlation between Edtech adoption and institutional performance, the framework foregrounds the mediating organizational dynamics that shaped how value is produced, distributed and sustained. It integrates insight from resource-based approaches and institutional theory to account for the complex interactions between technology, governance and institutional context.

The framework consists of four interconnected components:

1) **Inputs** refer to the institutional and technological foundations that influence how EdTech is integrated. This includes the types and functionalities of technologies being used (like LMS, analytics systems, and CRM tools), the structural features of the institution (such as its size, governance style, and funding model), and its current digital infrastructure. Relationships with vendors, procurement strategies, and available financial resources also play a crucial role in shaping the groundwork for implementation, defining both the possibilities and limitations.

2) **Mediating Logics:** The inputs are shaped by the mediating logics, encompasses strategic governance motivations or rationales such as efficiency, legitimacy, or competitive edge, along with the institution's culture, leadership vision, and level of digital capacity. These logics influence how technologies are implemented; interpreted and embedded into institutional routines, they are influenced by and reflect the internal politics, ideologies, and skills of the organization.
3) **Outcomes** fall into three primary categories: operational productivity (for instance, automating administrative tasks), data-informed decision-making (like planning based on data), and resource allocation (including changes in budgeting, labor, and infrastructure investments). These outcomes are not stable or equal, it can be positive, negative, or somewhere in between, and they often vary among different institutional stakeholders. Importantly, the framework brings attention to equity, recognizing that the advantages of technology may benefit certain groups while disadvantaging others, especially in settings with limited resources.
4) **Feedback and Reconfiguration** complete the framework, emphasizing the iterative and reflexive nature of EdTech integration. institutions continuously reassess their technological strategies in response to new data, stakeholder feedback, policy shifts or system failures. This recursive loop allows for adaptation, resistance, or even withdrawal from certain technologies, underscoring the dynamic rather than the static nature of managerial value creation. See figure 1.

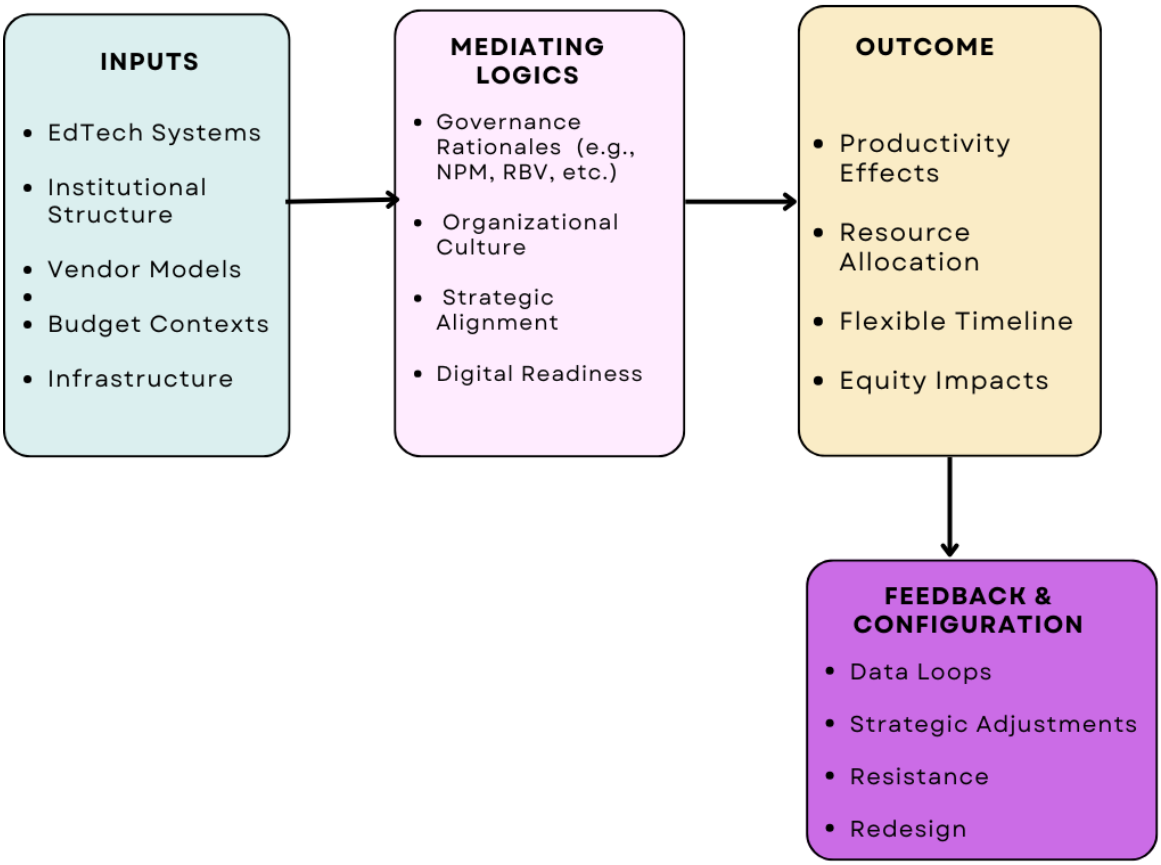

Figure 1: A Critical Framework for Evaluating the Managerial Value of Educational Technology

6.1 Framework Applications and Contributions

The framework comprises four interrelated components. Inputs include the technological tools adopted, institutional structure, funding models, vendor relationships, and infrastructural readiness, these establish the baseline conditions for EdTech integration. These inputs are shaped by mediating logic, including strategic rationales (e.g., efficiency, legitimacy, competitive positioning), organizational culture, and digital capacity. These logics influence how technologies are implemented, interpreted, and embedded into institutional routines. The resulting outcomes span operational productivity, data-informed decision-making, and resource reallocation, often with uneven effects across institutional actors. Crucially, outcomes are not static or uniform; they are subject to ongoing feedback and reconfiguration as institutions respond to analytics outputs, stakeholder experiences, and external pressures. This recursive element highlights the need for adaptive strategies and continual alignment between EdTech use and institutional goals.

This framework offers a diagnostic lens for critically assessing EdTech initiatives. It shifts focus from technological determinism to strategic coherence, emphasizing that managerial value arises not from the technology itself, but from how it is situated within complex institutional systems.

This framework offers many contributions. First, it serves as a diagnostic tool for institutions to evaluate the performance and strategic value of their EdTech investments. This encourages leaders to go beyond the usage statistics and assess whether technologies are advancing their core mission, improving equity, and promoting sustainable innovation. Second, it provides a research scaffold for future empirical work, providing a basis for case studies, comparative institutional analyses and policy evaluations. Finally, it contributes to theory by synthesizing fragmented perspectives on Edtech through a system-level lens that accounts for structure, agency and feedback.

Future applications of this structure may be involved:

- Evaluating Edtech integration strategies in institutions with differing governance models.
- Identifying failure points or resistance patterns in digital transformation processes.
- Mapping out different mediating logics (e.g., audit cultures vs. collegial governance) influences Edtech outcomes
- Examining how institutions reconfigure their digital strategies in response to shifting policy, economic or ethical pressures.

7. Conclusions and Recommendations

This critical literature review has examined the multifaceted managerial value of educational technology, highlighting its growing role in shaping institutional productivity and resource allocation. While Edtech is often promoted as the driver of innovation, efficiency and modernization, its real impact is deeply contingent on institutional contexts, governance logics and strategic alignment. The review has shown that technologies such as learning management systems, analytics dashboards and enterprise platforms provide potential gain in automation and decision making, yet these are frequently constrained by ambiguous productivity metrics, fragmented implementation strategies and ethical concerns related to datafication and equity.
In addition, the financial and human resource implication, ranging from long-term cost to labour restructuring underscore the need for careful institutional planning and inclusive governance. To realize the productive potential of Edtech without exacerbating structural

inequities or undermining institutional autonomy, this review recommends the development of multidimensional evaluation frameworks that accounts for both operational and ethical dimensions of value. Institutions must also invest in professional development, data ethics and participatory planning processes to ensure that Edtech serves broader educational missions rather than narrowly defined efficiency goals. Future research should focus on longitudinal and comparative studies that assess the real-world outcomes of EdTech integration in various contexts, the theoretical work that continues to interrogate the political economy of digital governance continues in education continues. Ultimately, the managerial value of Edtech cannot be eclipsed or abstract-it should be severely interacted, strategically aligned, and to support inclusive, durable and mission-operated education systems morally.

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Conflict of Interest Statement
The authors declare that there is no conflict of interest regarding the publication of this study.

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