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EXPLORING THE IMPACT OF EDUCATIONAL TECHNOLOGY MANAGEMENT ON OPERATIONAL DELIVERY: CHALLENGES AND SOLUTIONS.

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Abstract

Focusing on the higher education sector in the UK, this paper investigates how the management of educational technology affects operational delivery inside educational institutions. Examining four case studies, two further education colleges, and two East Midlands universities—this study looks at how operational efficiency is affected by educational technology management practices, points up important issues and their remedies, and assesses the general effect on educational quality. The results show that using better academic assistance, simplified administrative procedures, and enhanced accessibility for different student populations, efficient educational technology management greatly improves operational delivery. However, institutions have several difficulties, including limited resources, opposition to reform, and inadequate professional growth. Through planned professional development programs, successful change management strategies, and cooperative stakeholder involvement, the study suggests a framework for overcoming these obstacles. By offering practical insights for education managers and legislators trying to maximize technology integration in educational environments, this study adds to the increasing corpus of knowledge on educational technology management.

Introduction

Educational institutions today face increasing pressure to integrate technology effectively into their operations while confronting significant resource limitations, organizational resistance, and rapidly evolving technological landscapes. Despite substantial investments in educational technologies, many institutions struggle with implementation challenges that prevent them from realizing the full potential of these tools to enhance teaching, learning, and administrative efficiency. The disconnect between technology acquisition and successful integration represents a critical problem in educational settings,

where poor technology management can lead to underutilized resources, frustrated stakeholders, and compromised educational outcomes. This research addresses this problem by examining how educational technology management impacts operational delivery across different educational contexts, with a particular focus on identifying effective strategies for overcoming common implementation barriers and maximizing the benefits of technology integration.

This research focuses on the higher education (HE) sector in the UK as a case study, exploring the implications of educational technology management for operational delivery. There is a need to understand the various internal and external pressures that influence how educational technologies are managed and the subsequent impact on the ability to deliver effective educational experiences. Practitioners operating “on the ground” are often caught in the middle of these dynamics and face very specific challenges in balancing diverse and sometimes conflicting priorities.

The issues considered here may be equally relevant across other education sectors, but the contextual differences significantly influence how these issues play out. Therefore, it is important to explicitly outline the context within which the study is situated to set the scene for the subsequent analysis. In response to the questions posed earlier, these concerns are addressed by considering the management of educational technologies through the lens of strategy. It is argued that a clearer understanding of how technologies are managed through a strategic approach to decision-making will better illuminate the implications for operational delivery. This study focuses on educational technology management as an area of professional practice important for understanding these dynamics.

1.1. Background and Rationale

Over the last 50 years, educational technology management has evolved into a professionalized field of practice. A variety of terms and interpretations have shaped the current field of educational technology management, including educational technology, instructional technology, instructional design, teaching with technology, eLearning, and, more recently, blended learning. Subjected to a wide variety of interpretations and elaborations, terms like technology and educational technology have continuously resulted in a substantial discussion on what these terms encompass (Selwyn, N. 2016). At one end of the spectrum, educational technology is described as a design-based discipline, focusing on the systematic design, development, implementation, and evaluation of learning environments. In a more comprehensive context, educational technology encompasses processes, human interactions, images, tools, and environments that are used to mediate the construction of knowledge, individually or in collaboration with others (Januszewski & Molenda (2013). This discussion has also led to a variety of professional aspirations. Currently, four types of professional roles can be distinguished: technology-as-missionary, technology-as-critique, technology-as-meaning-making, and technology-as-instruments.

The rationale for this study stems from a concern for public higher education institutions currently facing a complex array of internal and external challenges (Marshall, 2018). Technological advancements and the accompanying possibilities for the management and delivery of technology-mediated learning at public higher education institutions are both opportune and challenging. With a plethora of possibilities, sensitivity, thoughtfulness, and deliberation are prerequisites for applying technology in education, particularly in striving to achieve optimal delivery on the operational front. Accordingly, it is essential to understand what shapes and informs educational technology management and operational delivery, which will be elaborated on below (Ranbir, Dr. 2024). A secondary aim of this section is to establish a theoretical foundation for the research by outlining the key elements that underpin and drive the current discourse on educational technology management. Subsequent sections initiate the process of dissecting the intricate layers of educational technology

management, thereby laying the groundwork for a more comprehensive exploration of the topic in subsequent sections (Beckman, Henderson, Heinrich & Ochoa 2022)

1.2. Research Aim and Objectives

The primary aim of this research is to investigate how educational technology management impacts operational delivery within educational establishments. In recent decades, the exponential growth of new and emerging technologies has provided educators with opportunities to enhance the experience and delivery of learning. The proliferation of laptops, tablets, smartphones, clickers, virtual learning environments, and cloud computing, to name but a few, has irrevocably transformed the educational landscape. As institutions strive to keep pace with technological advancements, administrators are charged with challenging operational issues relating to procurement, training, implementation, technical support, and maintenance. Educational technology management endeavors to provide the direction, alignment, and control of technology resources to address such challenges, although it is a relatively recent phenomenon that remains in its infancy. This study focused on educational technology management from the perspective of operational delivery. Four case studies based in the East Midlands region of the UK, comprising two further education colleges and two universities, were critiqued. The core objectives of the study were to examine how educational technology management was practiced in terms of operational delivery, assess the challenges and solutions encountered, and evaluate the impact on the quality of educational technology management. By focusing on these specific areas of interest, it was hoped that a clearer and more comprehensive understanding of key issues would be drawn out, as well as a more thorough examination of how they related to one another. Moreover, the objectives sought to generate insights that were actionable and relevant to the needs of educators and administrators. Educational establishments were recognized as complex systems with multi-layered hierarchies and numerous disciplinary domains. As such, a singular focus on one objective ensured that research findings were practical and useful rather than abstract and academic.

2. Educational Technology Management: An Overview

Educational technology management is defined, and its scope is described as a vital field within education that varies in meaning and practice in different educational contexts (Mishra & Koehler, 2021). Current trends and innovations that have influenced educational technology management are highlighted in a discussion on what technology means today and how it can play a multifaceted role in improving educational experiences. A simple model illustrates how good technology management can directly benefit education through enhanced academic quality, an improved working environment, increased institutional prestige, and so on. The challenges and implications of poor management in technology are also deliberated upon to provide a balanced view of educational technology management. Overall, an understanding of educational technology management is indispensable in today's world if education is to be delivered properly (Agalo & Oluoch, 2014). Thus, a brief overview of the concept, scope, and current trends of educational technology management is discussed. Educational technology management can be described as the planning, organizing, directing, controlling, and evaluating the technology resources of a particular educational setup with a view to achieving optimal educational service delivery. At the heart of this definition lie the terms technology and educational technology, which must be explained. The term technology has, in fact, a vast and variegated meaning. In its simplest form, technology can be regarded as a tool or medium intended to enhance the working efficiency of a user(s). In a more detailed context, technology can be understood as comprising three key components: the hardware, which refers to the physical devices (including tools, machines, equipment, or objects); the software, which represents the non-physical elements that

enable the hardware to function and introduce structure to the system (such as rules, procedures, and instructions); and the environmental settings, which encompass the context that influences the technology's effectiveness (including social, cultural, economic, and political factors) (Håkansson Lindqvist & Pettersson, 2019).

2.1. Definition and Scope

Educational technology management encompasses a set of critical elements, components, and actions, all centered around the deliberate selection and integration of technologies to improve educational quality. At its core, educational technology management involves carefully choosing and blending various technologies—ranging from learning environments, media, and hardware to software and resource management—with corresponding techniques, including planning, development, application, implementation, and assessment (Castañeda & Selwyn 2018). These technologies and their associated management methodologies serve to enhance the educational process. Additionally, it is essential to distinguish between technology types, as different educational technologies necessitate distinct management practices. However, the management of technological advances and resources alone does not constitute "educational technology management." Simply pouring educational technologies into a system will not naturally yield an improvement in educational quality. Therefore, it becomes critical to align the management of these technologies with the educational goals being pursued (Tondeur, Howard, & Yang, 2021). To clarify the scope of management practices, it is important to explore the frameworks and models addressing educational technologies, both from a management perspective and a broader educational viewpoint. Within this discourse, stakeholders involved in technology management practices will be identified alongside the scope of their tenure. It is also acknowledged that the educational setting—be it formal, non-formal, or informal—will invariably influence the application of management strategies. Understanding the nuances of these definitions and scopes will assist in the effective implementation of technology management practices. Thus, this groundwork lays the foundation for discussing the challenges and impacts of technology management in the following sections.

2.2. Importance in Modern Education

Education, in its broadest sense, is the doorway to opportunity, progress, and change. Consequently, it is imperative that education, teaching, and learning evolve according to societal changes. At present, technology pervades nearly every aspect of life and is gradually finding its way into teaching and learning in education (Zawacki-Richter et al., 2019). It is increasingly anticipated that, like other social developments, education will harness the potential of technology to reshape teaching and learning in order to ensure broader access to education and enhanced quality.

Technologies have the potential to make teaching and learning processes more effective and efficient. In an educational context, technology can take on multiple roles, including that of an enabler, which alters the nature of instruction and learning. When technology is integrated into education, it is hoped that not only will it improve educational quality and productivity, but it will also ensure equal access to good education for all. Thus, from an educational perspective, technology should be managed in such a way that it becomes an effective vehicle for delivering education while keeping in mind the diversity and different requirements of stakeholders (Agalo & Oluoch, 2014).

Educational institutions can exploit technology to enhance the operational delivery of education. Technology can smoothen the processes undertaken by educational institutions in dealing with learners, service providers, regulators, other educational institutions, etc. Furthermore, technology can

lessen the burden on human resources by automating processes, thereby reducing the potential for human mistakes. The careful management of technology in this regard can also yield economic benefits, particularly in times of rising costs and budget restraints. In this context, the management of educational technology becomes crucial for educational institutions. Simply put, educational technology management can minimize the drawbacks and maximize the positive outcomes associated with educational technology (Adedoyin & Soykan, 2020).

3. Operational Delivery in Education

Essential to the viability of any educational institution, at any level, is an understanding of operational delivery. Whether large or small, state-funded or privately owned, a university or a primary school, there are certain key components and processes that underpin successful operational delivery. An appreciation of these fundamentals is critical, not just for top-level decision makers but also for anyone involved in the day-to-day running of an institution, particularly those involved in the planning and implementation of educational strategies (Moore & Fodrey, 2018). At the heart of an institution's operational delivery are the activities that actually deliver the educational product. These are undertaken by a combination of educators, students and technology, and the resultant interaction shapes the design and character of the institution. Each different type of institution establishes its own patterns and approaches to these operational activities, determined by a mix of vision, purpose, philosophy, policy and context. However, similar challenges are faced in delivering these operations. Often the strategic vision and plans of an institution are not fully realised at the operational delivery stage. A good strategy often fails because the operational delivery is inadequate. Resource limitations – whether concerning funds, personnel, time or equipment – skew what can be realistically achieved. Bureaucratic complexity and inflexibility can hinder responsiveness to emerging opportunities or problems. This is often compounded by an excessive concentration on – or reliance upon – the strategic and financial sides of management at the expense of delivery. These various challenges can stifle the effective operational delivery of otherwise robust educational strategies, and for many institutions the desired educational vision remains persistently out of reach. Good education and training have little impact if poorly delivered. For this reason, it is vital that a clear understanding of the landscape of operational delivery is established. Indeed, much of the prevailing educational management literature focuses on institutional strategy and planning, often overlooking the importance of operational delivery. Where attention is paid to delivery, it is invariably in regard to the management of just one element rather than recognising the overall framework within which management of these elements sits (Agalo & Oluoch, 2014). The effects of such omission can be clearly seen. Considerable effort and attention may go into designing exemplary educational strategies, with the best of intentions, but unless parallel attention is paid to how these strategies will be operationally delivered, the impact will invariably be minimal. Therefore, the focus should be on establishing how the impact of educational strategies is maximised through effective operational delivery, using suitable case studies to illustrate the issues involved and the possible solutions. Beginning with an overview of operational delivery in education, attention then turns to the challenges faced and how these are best tackled. Such an understanding will provide a solid grounding before discussing the issues of technology management in more detail.

3.1. Key Components and Processes

A successful operational delivery is built on a few components. At its most fundamental, it can be thought of as a collection of components and processes that must be in place for proper delivery. In educational settings, these components include: • the determination of what is to be taught and how (curriculum design); • the specification of constituent roles and the allocation of resources to these

tasks (staffing, room booking, and others). • communicating specifications to staff and systems that perform constituent roles, schedules, and timetables, among other things; • monitoring (and, if necessary, adjusting) component performance (class observation, tracking attendance, and so on); and recording and maintaining outputs such as coursework results and others. Each of these components is critical to enabling the successful delivery of the educational outcomes stated at the outset, and their interactions can be viewed as defining the overall operational delivery systems' efficiency (L. Moore & B. Fodrey, 2018).

There are a number of processes that underpin operational delivery in educational settings. Most of these are straightforward, but some are complicated and require careful thought and management. A simple model (and associated terminology) that captures the essential components of operational delivery is outlined. This model can then be used to categorize and understand the most likely barriers to effective operational delivery (again, using simple terminology). In most cases, these barriers arise because the component is absent or underdeveloped, often due to a lack of training opportunities or resources devoted to that component. There is also a tendency for severely disadvantaged institutions to adopt simpler or more primitive solutions across the board, leading to imbalances in the development of educational technology systems. By understanding the components of operational delivery, a clearer basis for addressing these challenges is provided. With this framework in place, an assessment of how a number relevant challenges are being or can be met in a particular case is discussed (Adekola et al., 2023).

3.2. Challenges Faced in Operational Delivery

Encountered in operational delivery within educational institutions, a brief overview of these challenges will be given, drawing on the findings of recently published research. Common obstacles include inefficient processes, insufficient resources, lack of relevant training and inadequate training material for the pedagogical delivery method in question. Regardless of the setting, the impact of these identified challenges is common to all involved in education, whether they be educators or learners, and can be detrimental to educational outcomes. Compounding these challenges is the increasing use of a blended or fully technology reliant approach to educational technologies. This integration adds complexity to the challenges already faced, with this complexity possibly exacerbating existing challenges or introducing new barriers to effective educational delivery (Bond et al., 2022). It is critical to understand what these challenges are prior to exploring the proposed solutions and best practices. This review aims to provide context for the subsequent critical examination of what constitutes a thorough education technology management approach. The research presented is a summation of the review of peer-reviewed journal articles focusing on challenges faced in operational delivery and educational technology management. Ultimately, future sections will explore how these challenges can be effectively navigated through implemented strategies and best practices as informed by the research reviewed. Based on the widening participation policy, the higher education (HE) academic environment in the United Kingdom (UK) is rapidly changing, with increasing responsibilities for teaching staff and student populations becoming larger and more diverse. A natural consequence is that some teaching needs to be delivered on a mass scale. Unfortunately, previous attempts to implement effective mass education publicly using educational technologies have failed (Jaffer et al., 2007). Findings from a study of operational delivery in two case study UK higher education institutions (HEIs) illustrate how challenges similar to those faced in massive public open online courses (MOOCs) and online delivery environments more generally persist in the classroom environment. Insights are drawn from the real-life experiences of academic staff addressing these challenges. Implementing particular strategies and technologies may help navigate these challenges, and further research would benefit from collaboration across institutions.

4. The Impact of Educational Technology Management on Operational Delivery

The focus is on educational technology management and its impact on the successful operational delivery of technology in educational environments. The objective is to assess the transformative impact of educational technology management on operational delivery. It will explore how effectively managed technology management initiatives can lead to greater efficiency and effectiveness of the educational delivery process, whether these technology management applications are now being applied in the educational environment, and consideration of case studies and examples where technology management has been successfully applied to an environment similar to education (Williamson & Eynon, 2023)

Educational technology is often seen as just another addition to the educational environment rather than a strategic approach. Thus, with technology mismanaged, often the opposite effect is experienced and educational environments are filled with ‘toys’ that detract from the delivery rather than facilitate it. Therefore, an initial exploration into the impact of educational technology management on operational delivery is warranted. A review of the literature will provide a basis to explore the impacts and open up a wider discussion on the challenges and possible solutions to the educational technology management approach (Agalo & Oluoch, 2014).

There are many definitions of technology and many of its derivatives from add-on applications to infrastructure and hardware encompassing considerable expense and often subject to mismanagement. However, for the purpose of this discussion technology will be defined as any object that extends a person's natural capability. Therefore, educational technology is anything that extends a person's natural capability to teach or learn. From this definition purely passive technology such as textbooks would qualify. However, technology is more commonly thought of as some type of educational technology add-on that usually requires an operator to function such as a computer, network, or camera (Tsai & Chai, 2013).

That then leads to the definition of educational technology management, which for the purpose of this discussion will be defined as the strategic approach that ensures educational technology initiatives are evaluated, designed, planned, implemented and assessed in a way that maximizes their impact on the effectiveness of the educational delivery process. With educational technology management applied, education environments have the potential to enhance access, inclusivity, and most importantly the effectiveness of the educational delivery process.

4.1. Enhancing Efficiency and Effectiveness

Technology management can enhance the efficiency and effectiveness of how education is delivered. With the right tools and strategies in place, processes can be streamlined and communication improved among all stakeholders — students and parents, teachers, management, and external service providers. Various technological tools make it possible to manage processes more easily, record and track information, and minimize potentially costly mistakes. Resulting efficiencies allow employees to engage in more productive work that better delivers on educational promises. This improves the experience for student end-users and can lead to improved educational outcomes. Furthermore, through the sharing of successful case studies, the positive effect technology management can have on operational delivery is illustrated, along with some best practices that have developed and could be adopted by other educational institutions faced with their own challenges (Agalo & Oluoch, 2014). To be successful, education technology management needs to be constantly assessed, monitored, and improved where necessary. Otherwise, improvements may become outdated or ineffective. New challenges will always arise, particularly where technology integration is concerned. Therefore, highlighting these efficiencies is important to encourage management and other stakeholders to pursue

comprehensive and strategic integration of technology to support education delivery. Proponents may also need to push back against negative perceptions that unforeseen challenges could derail initiatives, either entirely or in part. Ultimately, the net effect of technology management is a significant positive gain that should be embraced. Education delivery is a complex process with many moving parts, but effective technology management can make challenges easier to overcome, good processes even better, and produce significant efficiencies.

4.2. Improving Access and Inclusivity

Role of educational technology management in improving access and inclusivity within education is discussed. Technology can be harnessed to create equitable learning environments for all students, especially those with disabilities (Watling, 2011). Outside of the more normative discourse surrounding the role of technology in education, there are questions of what technology is most effective and how its affordances can be best and most appropriately exploited for the benefit of all learners. The effectiveness of a range of digital tools and resources for supporting a diverse range of learners and ensuring they are able to participate fully in a shared learning experience is examined. Access and inclusivity are complex and multifaceted concepts, so it is important to clarify how they are understood here and in relation to educational technology management. Access is concerned with removing barriers to learning so that all students can fully engage with and benefit from it, whilst inclusivity refers to implementing practices that ensure all students can successfully participate in learning. Managing educational technology should be accompanied by efforts to implement the inclusive practices being supported by that technology. Discussing the potential of technology to overcome geographic and socioeconomic barriers to education is simple and commonly used to illustrate the promise technology holds in fostering an equitable educational landscape. The flip-side consideration here is of access issues in relation to some countries' problematic technology implementation, as well as wider concerns about the digital divide. Access is considered a challenge facing educational technology management, bringing issues of resources and training as knowledge gaps inhibiting effective technological implementation. Access here refers to access to technology as a resource. Access to the necessary infrastructure and training to utilize technology effectively is a related concern. Recognizing the particular complexities of access and inclusivity in different contexts is critical and by understanding how technology can be harnessed to promote inclusivity, educators are better able to implement suitable solutions. Questions of how and why technology introduces new barriers to learning as well as supporting inclusivity are naturally brought to the foreground by an awareness of the disabled access issues that have arisen within otherwise inclusively designed digital spaces (Czerniewicz et al., 2020).

5. Challenges in Implementing Educational Technology Management

The purpose of this research is to investigate the impact of educational technology management on the effective operational delivery of educational institutions. Educational technology is defined as hardware and software systems deployed as a delivery mechanism for education, training, assessment, and support of learners. The management of educational technology refers to the procurement, implementation, support, evaluation, and strategic assessment of technology systems in educational environments. A good technology system can support the effective operational delivery of education, while a poorly managed system can hinder it. This research focuses on challenges associated with educational technology management and potential solutions developed through action research that has been implemented in practice (Carter & Youssef-Morgan 2022).

To set the context for this research, it is essential first to explain what is meant by the terms educational technology and the management of educational technology. There are many definitions of technology, but broadly, it refers to any instrument used to perform a task. Educational technology can be interpreted as hardware and software systems deployed as a delivery mechanism for education, training, assessment, and support of learners. Examples include computers, networks, audio-visual equipment, and multimedia resources. The management of educational technology refers to the procurement, implementation, support, evaluation, and strategic assessment of technology systems in educational environments (Ludvigsen et al., 2021). It is possible to consider educational technology management at various levels, including government, institutional, department, and individual academic levels. This research focuses on the institutional level, where technology systems are delivered across the whole institution to support departments and activities such as teaching, learning, and assessment.

The effective operational delivery of an educational institution refers to its ability to fulfil its goals and objectives to the required quality standards. This generally involves the design and implementation of educational processes, including course and curriculum design, scheduling, resource allocation, assessment strategy design, learner engagement, and support (academic and pastoral). The technology systems in use impact most of these processes. The introduction of a good technology system can enhance and support effective educational processes, while a poor, unwieldy, or unsuitable technology system can hinder and prevent processes from being conducted effectively. The aim of this research is to explore the impact of educational technology management on the effective operational delivery of educational institutions.

5.1. Resource Constraints

Resource constraints are often cited as the most significant impediment to effective educational technology management. A tight financial climate and limited access to resources, personnel and infrastructure have been acknowledged as critical challenges (Erlandson, 1999). Beyond general budget cuts, specific financial limitations include a lack of funds for new equipment and software subscriptions, difficulties in securing external funding, and an inability to redirect existing budgets towards educational technology provision. Additional hurdles include insufficient staff to manage technology effectively, a lack of internal staff dedicated to educational technology support, difficulty in recruiting appropriate staff, and inadequate infrastructure such as unreliable access to computers and Wi-Fi. Joint incapacity on the part of institutions to address infrastructural challenges and the very lack of outside support can severely limit the effectiveness of any program designed to promote technology use or manage related resources. As with many other institutions, internal management and support programs tend to be reactive rather than proactive, reliant on a specific resource becoming available after a problem has already occurred. Increasing the effectiveness of any program therefore requires a careful understanding of the associated resource challenges; otherwise, efforts are likely to become increasingly pointless. Beyond failing to adequately meet institution needs, scarcity in key resources can exacerbate wider inequities in access to technology across educators and students alike, ensuring that only the relatively privileged enjoy its benefits. Where resources are scarce but still effective technology use is desired, attention must focus on how best to manage what is available, allocating resources in the most effective manner possible. Often this involves simply prioritizing some areas of educational technology use over others. Though approaches may vary, institutions in similar positions can share experiences, successes, and failures, highlighting options worth emulating. Higher education institutions in particular have made advances in addressing overlapping resource constraints and achieving relative success by being simply more strategic in how existing resources are managed (Jaffer et al., 2007). It is important to remember that by definition a strategy is only a means

to an end, and any approach will thus differ in effectiveness depending on the desired outcome. Before elaborating effective strategies, it is therefore important to be aware of what relative resource constraints exist and how these shape what is deemed a desirable outcome, educational technology management in this case. In other words, one must understand the strategies being driven by a specific resource limitation before being able to implement them.

5.2. Resistance to Change

Change is a natural part of life. However, change can also cause hesitance, particularly to those outside the initiators of that change. This is especially relevant in education, where even well-laid technology strategies can falter at the first hurdle because of resistance from educators and/or administrators (Ramnarain & Schuster, 2014). Resistance to change is a well-documented phenomenon that strikes even the best efforts to implement technological solutions. In a rapidly advancing world, such hesitance can often be a barrier to simply keeping up (Sood et al., 2022). Many factors are at play when examining why a group may resist a proposed change, particularly psychological and cultural factors. Considering the implications such resistance has on the successful implementation of technology strategies is key. In past case studies, initiatives have stalled or outright derailed due to such resistance to change.

Most commonly, the technology provider's perspective is considered in implementation plans. This often leads to failure, as those outside that perspective are not considered, nor their positions addressed (Oreg & Berson, 2019). There are ways to tackle and ameliorate such resistance, fostering a culture of acceptance and readiness for change (Ferreira, Goncalves, & Parker, 2023). After all, it is imperative to realize that the hesitance is not with the technology itself, but rather how it relates to the existing customs and practices of the resisting group (Watling 2011). The strategy should thus center on finding a way for the new to fit in with the old. However, prior to strategy formulation, an understanding of what this resistance entails must be reached. Addressing the attitudes and perceptions of the change, from the viewpoint of those affected, is vital (Van der Merwe & Bozalek, 2022). Most importantly, the need for effective communication about the change is paramount, as is the active involvement of all stakeholders in the change process (Hofmann & Wilson, 2022). Building trust and understanding to hold open dialogue about the change is essential, as it provides adequate support to address the fears of those who will be affected by the change (Adekola et al., 2023). Finally, it must be understood that while resistance to change can often take on a negative connotation, it does not always stem from a desire to maintain the status quo. Resistance can take many forms that will affect how things need to be addressed (Granić, 2022).

Solutions and Best Practices

To address the challenges identified, various solutions and best practices are suggested. Firstly, it is important to recognize that many of these challenges are not unique to a single institution but are part of a wider issue in the education system (Henderson et al., 2017). Awareness of this helps focus attention on finding solutions. It is also critical to learn from institutions that have successfully adopted the suggested best practices (Martin et al., 2024). Finally, the emphasis is on the need for these practices to improve educational outcomes rather than operational delivery alone. Each institution can adapt the suggestions based on its context.

Professional development and training for educators are essential for enhancing technology integration in teaching and learning activities. There is a clear need for time-intensive technology training, ideally attended by all relevant staff. Technical workshops should emphasize the pedagogical rationale behind adopting particular technologies so that educators can choose appropriate technologies in the future. Trainers should have educational backgrounds and understand how technologies enrich pedagogy.

Access to technology training should be broad, including online resources containing best practices to inspire educators (Niederhauser et al., 2018).

There are various approaches to change management, but three overall strategies are highlighted, promoting a systematic approach to technology initiatives. Firstly, it is crucial to align technology initiatives with institutional strategic goals and priorities. Change that is not part of a longer-term vision and commitment is often short-lived. Secondly, it is important to balance top-down and bottom-up approaches to change management. While it is essential to have a clear implementation plan and designated teams to oversee it, other staff should also feel ownership of the change and have a say in shaping it. Thirdly, it is vital to identify “quick wins” for technology initiatives. Educators are often overloaded and skeptical about adopting new practices unless they see clear benefits (Ghavifekr et al., 2013).

Collaboration among all stakeholders is important to build a shared vision and collective action. This collaboration should start with a broad consultation process with all stakeholders to identify their views and needs (Chugh, Turnbull, Cowcerv et al., 2023). Educators should be involved in designing responses to those needs (Chugh, R., Turnbull, D., Cowling, M.A. et al. 2023). During implementation, working groups comprising various stakeholders should monitor the process (Jobst et al., 2012). Communication is vital throughout and should include regular forums where stakeholders can share feedback and suggestions (Kotter, 2012). Whenever possible, education technology initiatives should be piloted in various departments and then rolled out more widely. A “champion” could also be leading the change from an influential position but still advocating for it rather than imposing it (Kvernbekk & Jarvis, 2023).

Institutions that have successfully adopted most of the suggested best practices include the University of Cape Town, University of Groningen, and the University of Hong Kong, illustrating the diversity of contexts (Brown et al., 2022). Acknowledging that addressing the challenges will require effort and resources and that these resources may be limited is essential. However, it is also crucial to recognize that technology has great potential to enhance educational practices (Greenhow & Lewin, 2021). A persistent effort is vital to fully utilize this potential. All educational technologies and their pedagogical applications need to be continually assessed and understood, and feedback loops built into processes and practices involving educational technologies (Williamson & Eynon, 2020). Continuous assessment must consider the broad impact of educational technologies (Facer & Selwyn 2021).

6.1. Professional Development and Training

Professional Development and Training The successful implementation of educational technology management rests primarily on professional development and training. A variety of training programs have been developed for schools and universities, ranging from intensive workshops to semester courses designed to enhance educators’ technology skills and confidence in integrating new technologies into their teaching. These initiatives often lead to more successful integration of technology into teaching and learning. However, in order to be effective, training programs need to be tailored to meet the specific needs of faculty and staff (Giandelone Broussard, 2006). A wide range of technology training options exist, from introductory workshops on basic computer skills and programs used on campus to one-on-one consultations with technology specialists focusing on specific needs within a particular course.

Whatever the format, there is a critical need for ongoing support and resources after the initial training to ensure that faculty and staff are able to adequately use what they learned and effectively integrate new technologies into their teaching. Without this support, initial training efforts are likely to be ineffective and wasted. Offering a range of services allows faculty and staff to choose what is best

for them. The case studies also illustrate that when professional development is targeted to the needs of faculty, departments or schools can create positive outcomes. Training that emphasizes practical use and focuses on a specific educational context is more beneficial than general training. Potentially effective strategies for professional development include a peer mentoring model and creating opportunities for collaborative learning.

In addition to initial training, the importance of ongoing support is paramount. Training alone is not sufficient; it needs to be part of a larger support network. Without this, there is a danger that new technologies will be under-utilized or ignored altogether. Educational institutions need to create a culture of continuous learning. The work undertaken shows that effective professional development can support educational technology management. By examining how professional development is implemented at three universities, four different models of professional development training are identified. Research has shown that training focused on the particular educational context is more effective than general training (Blackmon, 2013).

6.2. Effective Change Management Strategies

Effective change management strategies are necessary for the successful implementation of educational technology for operational delivery. It is important for leaders to recognize that change management is required as their institutions take steps towards educational technology integration. Despite the risks, some still progress blindly without the necessary precautions. Throughout decades of dealing with educational change, it has been noted that the majority of failures are not due to a lack of vision or good ideas, but because insufficient attention was paid to the complexities of implementing changes in practice involving people (Ghavifekr et al., 2012). In addition to a compelling vision and strong rationale for undertaking change, there needs to be clear communication about what changes will mean for those involved, as well as plans for how to involve them and support them through the change process. Transparency is vital concerning what is expected of staff and students during transitions, as well as acknowledging that things may go wrong and outlining plans to manage this.

While robust planning and the establishment of goals is something that most academic leaders now take as imperative, it needs to be noted that effective change management strategies additionally involve ensuring that all members of staff are included in the planning process, including those in non-academic roles (Kezar, 2018). Given that change involves shifting people from one set of practices to another, it is important to ensure that those with expertise in existing practices help shape plans for new ones (Fullan, 2016). If not invited to participate, academic staff may feel undervalued or anxious about their role during transitions, potentially resulting in counter-productive behavior (Brown, 2020). Convening cross-department committees to formulate plans involving officeholders representing the full spectrum of non-academic roles can ensure that all voices are heard and help foster unit-wide ownership of plans (Bolman & Deal, 2017).

There is a significant body of literature dealing with various frameworks and models to assist leaders in shaping successful change initiatives in educational contexts (Levin & Fullan, 2008). As a starting point, it is often useful to think of educational change in terms of four components: the contexts, the participants, the processes, and the outcomes. For the purposes of this discussion, strategies regarding processes are the focus, as these concern the steps taken to implement change and are essential to addressing resistance. Various authors have proposed different models regarding the processes involved in educational change; they include at least some of the following key aspects: • Establishing a sense of urgency • Formulating a strategic vision and initiatives • Implementing change • Communicating the change vision • Generating short-term wins • Anchoring changes in the organization's culture

Particularly with regard to large, high-stakes transitions, strategies for addressing and easing resistance during educational technology change processes are detailed. A consideration of these will help leaders develop best practices to mitigate the possible pitfalls relating to resistance that have been experienced elsewhere. Resistance is a natural and common part of any process of organizational change that involves new technology, and therefore educational leaders need to proactively manage it. While some level of resistance may be deemed unacceptable and thus mitigated, in certain respects it can even be a positive force, and leaders need to recognize that it is inappropriate to try to eliminate it entirely. Therefore, the focus here is on outlining strategies for dealing with resistance effectively rather than eliminating it. Efforts to address resistance are more likely to prove successful if adequate resources and support for all involved are provided throughout the change process. This is a general tenet of change management that is particularly important when implementing technologies. However, maximize the likelihood that the necessary technical resources will be made available if requirements are anticipated and clearly articulated in planning documents. Ideally, principles and practices developed over many years in formulating and implementing technology management plans should be followed, which can help ensure appropriate funding is acquired and applied (Bates & Sangrà, 2011). In terms of staffing, it is crucial to ensure that the necessary time, expertise, and support are available for staff undertaking new technological initiatives (Chugh et al 2023). Institutions that have successfully employed effective change management strategies are cited as illuminating examples of best practices, which educational leaders would be prudent to heed in order to facilitate smoother transitions (Smith 2022). The scenarios, while diverse in many ways, share common characteristics that had a significant impact on their successful implementation of educational technology change strategies. First, they had leaders who took an active and visible role in the change processes (Vaughan et al., 2023). Second, robust change management strategies were established at the outset to guide planning and implementation (Kotter, 2007). Third, they ensured that appropriate technical and human resources were available and actively engaged in providing staff support throughout transitions (Johnson & Adams, 2014). By drawing on the experiences of these institutions, it is hoped that practitioners will be better placed to anticipate and avoid potential pitfalls (Sulecio de Alvarez, & Dickson-Deane, 2018).

7. Conclusion

The synthesis of the research findings emphasizes the impact of educational technology management on operational delivery. The study identified challenges arising from educational technology management, which remain pertinent to educational institutions today. When effectively managed, technology management serves as a facilitator for improving educational results. The insights gained from the research can contribute to future practices and better decision-making. Recognizing the diversity of educational contexts, this research offers a perspective for policy and strategic planning. It may assist decision-makers at various levels, from global institutions to local schools, in considering some aspects of technology management that may have been overlooked. It is important to highlight that although the research identifies good practices and provides recommendations, the intention is not to prescribe universal solutions. There is an acknowledgment that some gaps still exist, and challenges persist. Consequently, continued attention to educational technology management as a key element of educational success is crucial. Considering the challenges uncovered and questions answered, an overview of the entire research effort is presented, beginning with the context and objectives of the study. The methodology employed is briefly described. The main findings are outlined, followed by deliberations on their significance and recommendations for further research (Bond et al., 2023).

7.1. Summary of Findings

This section provides a succinct summary of the key findings that have emerged from the research. The fundamental insights acquired concerning educational technology management's impact on operational delivery are encapsulated, including the relationship between effective technology management and improved educational outcomes. Furthermore, the challenges that have been encountered and the resolutions that have been identified are reflected upon. Recommendations arising from the findings, intended to guide future practices for educators and administrators, are also discussed. Finally, the importance of continued research in this area is acknowledged, highlighting opportunities for further examination. Overall, this summary reiterates the research's overarching themes, ensuring clarity and focus on its most critical takeaways. Throughout the conducted research, it has become evident that many institutions invest heavily in educational technologies without a comprehensive understanding of how these technologies will be managed or their impact on operational delivery. Through interviews, it was determined that those responsible for educational technology management often possess little to no formal training in technology management and that their institutions lack policies concerning the management of educational technologies. While there are a number of degrees and courses available, many interviewed felt that the management of educational technologies was a niche area of educational technology management that was simply overlooked or forgotten by both academia and industry. Without appropriate education and training concerning the management of educational technologies, institutions could find themselves either sunk by unnecessary costs or overly reliant on technologies that could fail at any moment. As such, it is vital that this area of educational technology management be explored further (Ribeiro, 2017). Through this research, a framework that comprehensively outlines the areas and challenges educational technology management impacts on operational delivery has been produced. When piloted, institutions found that the framework not only highlighted challenges they had faced for years but also challenges they were unaware of. It is hoped that this framework will serve as a stepping-stone for further exploration into the niche area of educational technology management.

7.2. Implications for Practice and Future Research

This section addresses the implications of the research findings for present educational practices and opportunities for future research. It discusses the practical applications of the insights obtained through the research, outlining how they could be used to improve the management of educational technology. It emphasizes that the findings could guide the decision-making processes of those responsible for the management of educational technology in schools and help to shape a policy framework and a series of strategies aimed at managing educational technology more effectively. This section also highlights the need for ongoing evaluation of the effectiveness of educational technology and the initiatives implemented to introduce new technologies, as well as for continued adaptation to address emerging challenges (Niederhauser et al., 2018).

Following this introductory overview, the discussion moves on to consider possible avenues for future research that would enhance understanding of issues, such as those that have not been fully explored by this research, as well as new issues that have emerged from it. It suggests how research could be conducted in these areas and, in doing so, seeks to demonstrate that there remains a need for research into educational technology both within the contemporary educational context and as educational contexts evolve (Castañeda & Selwyn, 2024).

By setting out these implications for practice and avenues for future research, stakeholders involved in the management of educational technology are provided with guidance on how to draw on the insights derived from this research. Essentially, it outlines how the findings of the research could

help in the pursuit of effective management of educational technology, while also acknowledging that there is still much to learn about the management of educational technology.

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