Challenging Assumptions: Examining Educational Technology Leadership in the Era of Artificial Intelligence

By

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Abstract

Challenging Assumptions: A Critical Inquiry Into Educational Technology Leadership in the Era of Artificial Intelligence

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This qualitative multi-case study explores how secondary school district leaders in the San Francisco Bay Area navigate the procurement and implementation of educational technology and generative artificial intelligence amid organizational complexity and persistent inequity. Grounded in a hybrid framework of educational systems change and applied critical leadership and interpreted through the lens of tempered radicalism, the study draws on semi-structured interviews with 12 district leaders and an analysis of governance documents. Findings reveal a persistent disjuncture between equity-oriented leadership commitments and the structural conditions of practice, conceptualized here as "tempered agency." Leaders operate as "outsiders within," constrained by vendor influence, institutional instability, and compliance-driven systems that limit transformative action. Across cases, equity is predominantly enacted as access, reflecting a technical orientation that leaves the instructional core largely untouched. The study identifies systemic fragmentation as a central barrier, in which decentralized decision-making and short-term governance undermine coherence. In response, an emergent shift toward coherence reflects leaders' efforts to align the technological, instructional, and ethical dimensions of practice. This study proposes a critical systems leadership framework and an equity-centered edtech procurement heuristic as conceptual tools emerging from the analysis, suggesting that equitable technology leadership depends not only on critical consciousness but also on the development of systemic coherence as a structural and moral condition for change.

Dedication

For my wife, Melanie,
whose unwavering support made this second bite at the apple possible.

For my sons, Atticus and Quinn,
who inspire me to keep learning and growing.

For the students who move through systems
that ask them to adapt more than they are supported,
whose brilliance persists despite the structures around them.
As someone shaped across identities and histories,
I offer this work in solidarity with those
who are too often asked to navigate what was not built for them.

And for the systems we have yet to build,
where equity is not an afterthought, but foundational,
where technology amplifies possibility rather than reproduces harm,
and where every student is met not with limits, but with opportunity.

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Chapter 1

Introduction

The COVID-19 global pandemic led to a dramatic surge in public school investments in educational technology (Heitin, 2023; U.S. Department of Education, 2023), as over 75% of students across the United States suddenly transitioned to online learning in March 2020 (National Center for Education Statistics, 2022; Ogundari, 2023). These investments in hardware and software, which increased from approximately $2.5 billion in 2020 to $8.4 billion in 2021, created a new digital learning ecosystem for public school districts that had never existed on such a scale before (Rauf, 2023). Following this shift to a technology-centered educational environment, the emergence and spread of generative artificial intelligence (GAI) platforms, machine-learning models that generate original content such as text, images, audio, or code from learned patterns, became widely accessible to students and educators in Fall 2022 (U.S. Department of Education, 2023). As district administrators strive to address and eliminate systemic barriers that lead to predictable disparities in educational outcomes based on race and socioeconomic status, leaders responsible for curriculum, instruction, and assessment in diverse suburban school districts in California continue to face challenges in understanding how these new instructional tools and software operate. More critically, there is an urgent need to examine how this expanding digital ecosystem can be intentionally organized to effectively serve all students, particularly those who have been traditionally underserved, including Black, Latino, and low-income students. System leaders are often overwhelmed by ongoing technology rollouts and competing emergencies, which shift their focus from proactive management to reactive approval, resulting in vendor pitches being accepted, purchases approved with minimal scrutiny, and new tools implemented without strategic oversight (Dexter & Richardson, 2020; Lamb & Weiner, 2021).

This study addresses the challenge by exploring how leaders interpret and implement equity in educational technology decision making, highlighting the organizational and systemic factors that determine whether technology acts as a tool for instructional transformation or remains limited to access-based, compliance-driven use. Simultaneously, concerns persist that the predominantly positivist approach of current guidance on educational technology may unintentionally worsen disparities in access and outcomes. Without critically addressing existing gaps in digital access, skills, and use, technology initiatives may end up reinforcing, instead of challenging, the patterns of inequality faced by historically underserved student groups (Castells, 2009, 2024; Hargittai, 2018; Ragnedda & Ruiu, 2020; Wessels, 2010).

Before describing the focus of this study in more detail, it is essential to clarify some key terms that will be used. First, educational technology (i.e., edtech or instructional technology, which I use interchangeably) encompasses the digital resources and processes that teachers use to design, deliver, and enhance effective teaching and learning experiences for students in PreK–12 (International Society for Technology in Education [ISTE], 2021). Edtech encompasses a range of tools and practices, including digital content curation, online learning platforms, interactive

whiteboards, student response systems, and more, as these tools continue to evolve. Ultimately, these tools are integrated into pedagogical practice to support and enhance the curriculum, engage students, and foster their development of digital citizenship skills. Alternatively, GAI is a form of machine intelligence that creates new content, such as text, images, music, or computer code, by learning patterns and structures from existing data (Mills et al., 2024). GAI uses neural networks or large language models to generate outputs that resemble the original data, enabling applications in various fields, including education. When applied to education, GAI uses personalized learning materials, interactive simulations, and automated feedback or tutoring to enhance students' learning experiences (Kudina & van de Poel, 2024; Pasquale, 2019; Selwyn, 2010). GAI can also automate or reduce administrative tasks for teachers and administrators (Richardson et al., 2025; Whittaker et al., 2019).

Although earlier generations of educational technology primarily supported content delivery and skill practice, GAI tools introduce qualitatively different instructional challenges. By enabling students to complete complex tasks without fully engaging in the underlying cognitive processes, GAI may reduce opportunities to develop critical thinking and problem-solving skills (Dong et al., 2024; Kalyuga, 2021). In addition, these systems can generate inaccurate, fabricated, or biased outputs, increasing the risk of misinformation and superficial understanding (Kudina & van de Poel, 2024). Scholars also warn that routine reliance on GAI for assignment completion may contribute to academic dishonesty (Klopfer et al., 2024), cognitive offloading or "cognitive atrophy" (Kamdar et al., 2025), and diminished creative thinking (Gerlich, 2025; Han, 2025).

1.1 Problem Statement

Effective and proactive system leadership of educational technology in K–12 public schools is a complex and often challenging endeavor (Afzal et al., 2023; Obert, 2025; Richardson et al., 2020; Richardson & Sterrett, 2018). Despite significant investments in educational technology and growing interest in emerging tools such as GAI, secondary school districts lack coherent, equity-centered frameworks to guide technology procurement, evaluation, and implementation (Kudina & van de Poel, 2024; Richardson et al., 2020). District leaders, typically central office administrators such as superintendents, assistant superintendents, chief technology officers, and directors of instructional technology, curriculum, or innovation, are responsible for overseeing system-wide decisions related to digital infrastructure, software adoption, data governance, and instructional integration. These leaders are often required to make high-stakes decisions under conditions of limited time, fragmented governance, leadership turnover, and compliance-driven constraints, resulting in technology adoption that prioritizes access, risk management, and short-term feasibility over instructional transformation and equity outcomes (Hargittai & Walejko, 2008; Ragnedda & Ruiu, 2020; Schradie, 2011). Consequently, technology initiatives frequently reproduce existing inequities through uneven implementation, inconsistent professional learning, and limited attention to student engagement, agency, and learning outcomes. This problem is compounded by the absence of systematic evaluation practices and shared accountability structures, leaving district leaders without clear guidance on how to leverage educational technology, including AI, to meaningfully advance educational equity rather than merely expand access. In this study,

educational equity is conceptualized by the researcher not simply as equal access to devices or digital resources, but as the intentional design of learning environments, supports, and opportunities that address systemic disparities and enable historically underserved students to achieve meaningful, transformative academic outcomes. The study then examines how district leaders understand and operationalize equity in practice, including the extent to which their approaches align with or diverge from this definition.

1.2 Statement of Purpose

This study is intended to examine how district-level leaders of secondary schools make decisions about the procurement, evaluation, and implementation of educational technology, including emerging tools such as GAI, and how these decisions are shaped by equity commitments, organizational constraints, and systems-level conditions. Guided by a hybrid framework of applied critical leadership (ACL) and educational systems change theory, this study seeks to (a) understand how leaders interpret and enact equity in technology-related decision making, (b) how they assess opportunities and risks associated with new technologies, and (c) how the needs of historically marginalized student populations are considered throughout the adoption and implementation process. By centering the perspectives of traditional public school district leaders responsible for instructional technology, this study aims to identify patterns, tensions, and structural barriers that influence whether educational technology initiatives function as instruments of equity-driven instructional transformation or remain limited to access-oriented, compliance-driven practices.

1.3 Research Questions and Methodology Overview

This qualitative study (Small, 2009; Yin, 2018), conducted in the Summer/Fall 2025, is an inquiry into the approach and investments in edtech of 12 secondary school districts in the San Francisco Bay Area, California. It leverages the ACL framework (Santamaría & Santamaría, 2013) and systems change theory (Elmore, 2000; Fullan, 2023) to analyze education system leadership practices related to educational technology integration amid this unprecedented growth in the availability of these tools and platforms. The research questions this study addresses are:

- What are the primary factors that influence leaders' decision-making process when procuring and implementing new educational technology?

- How do leaders evaluate the potential opportunities and challenges of educational technologies, including tools like generative AI?

- As they consider new technology platforms, how are the needs of various student populations (e.g., Multilingual Learners, students with disabilities, socioeconomically disadvantaged students) taken into account during the evaluation and implementation process?

This study employed a qualitative multicase design (Creswell & Poth, 2018; Yin, 2018), using semistructured interviews (Seidman, 2006) and document analysis (Bowen, 2009) to examine how district-level leaders make sense of educational technology and generative AI (GAI) adoption in relation to equity. Guided by ACL and educational systems change theory (Elmore, 2004; Fullan, 2023; Santamaría & Santamaría, 2013), the methodology foregrounded leadership sensemaking within existing governance and instructional systems.

Qualitative methods are well suited for investigating the complex, contextual, and adaptive nature of educational leadership, particularly when leadership practices are shaped by structural inequities, organizational constraints, and evolving technologies (Denzin & Lincoln, 2005; Yin, 2018). Drawing on case study methodology (Yin, 2018), this approach enabled an in-depth examination of leadership decision making within specific district contexts, aligning with scholarship that emphasizes the situated and relational nature of leadership and systems change (Elmore, 2000; Fullan, 2023). The study was theoretically guided by educational systems change theory (Elmore, 2000; Fullan, 2023), which distinguishes between technical and adaptive challenges, and by ACL (Santamaría & Santamaría, 2013), which centers leaders' values, beliefs, and equity commitments in understanding organizational practice (Santamaría & Santamaría, 2013).

Data collection included semi-structured interviews with 12 district-level leaders responsible for educational technology in TK–12 unified and high school–only districts across the San Francisco Bay Area. Participants were selected using stratified purposeful sampling to ensure variation across district contexts (Patton, 2002). Semi-structured interviews provided a consistent yet flexible format that allowed participants to articulate their experiences, perspectives, and decision-making processes in their own words, while also enabling the researcher to probe issues related to equity, leadership capacity, and adaptive versus technical change (Bogdan & Biklen, 2007; DiCicco-Bloom & Crabtree, 2006). This method supported systematic comparison across cases while preserving the depth necessary to understand how leaders navigate power dynamics, compliance demands, and instructional priorities in technology adoption (Seidman, 2006).

To triangulate interview data and situate leaders' perspectives within broader organizational contexts, the study also included document analysis (Bowen, 2009) of publicly available district materials, including Local Control Accountability Plans and board-approved technology contracts. These documents provided insight into districtwide investment priorities, sustainability planning, and governance structures, strengthening analytic credibility through data triangulation (Miles et al., 2014). Together, interviews and document analysis offered a comprehensive view of how educational technology and GAI are conceptualized, funded, and implemented, allowing the study to examine the interplay between leadership practice, equity concerns, and systems-level constraints.

1.4 Rationale and Significance

As indicated previously, the acceleration of educational technology investments and GAI's increasingly visibility in K–12 systems, district leaders are under growing pressure to make

decisions that balance equity, innovation, and risk. Yet existing research offers limited insight into how these decisions are made in practice, particularly at the district leadership level, where procurement, policy, and instructional priorities intersect. This study addresses this gap by examining how leaders interpret and enact equity within educational technology decision making, illuminating the organizational, political, and systemic conditions that shape whether technology functions as a lever for instructional transformation or remains limited to access-oriented, compliance-driven implementation. By centering leaders' lived experiences, this study contributes a nuanced understanding of the decision-making processes that underlie technology adoption, moving beyond tool-focused narratives to reveal the structural dynamics that influence equity outcomes.

The significance of this study lies in its potential to inform more coherent, equity-centered leadership practices in educational technology. Findings from this research have the potential to offer district and system leaders a clearer picture of how fragmented governance structures, leadership turnover, compliance demands, and underinvestment in professional learning constrain the equity impact of technology initiatives. By distinguishing between technical and adaptive challenges, the study provides leaders with a framework for recognizing when procedural solutions are insufficient and when deeper cultural, instructional, and capacity-building responses are required. In doing so, the study supports leaders in shifting from reactive procurement toward more intentional, sustainable, and equity-aligned technology strategies, particularly as districts grapple with the opportunities and risks associated with GAI.

Finally, this study contributes to the scholarly literature by integrating ACL and educational systems change theory to examine educational technology leadership through an equity lens. It extends existing leadership and edtech research by demonstrating how equity commitments are mediated by systems-level constraints and how leadership coherence itself functions as a moral and structural condition for equitable implementation. For researchers, policymakers, and practitioners, the study offers empirically grounded insights that can guide future research, inform policy development, and support the design of leadership practices that leverage educational technology, not merely to expand access, but to advance meaningful, just, and transformative learning experiences for all students.

1.1.1. Role of the Researcher

In this qualitative study, I served as the primary research instrument, designing the methodological framework and overseeing all phases of data collection, analysis, and interpretation (Creswell & Poth, 2018; Merriam & Tisdell, 2016). As a mixed-race (Black, White, and Native American), cisgender male educator with more than 30 years of experience in public education and currently serving as a district-level leader responsible for curriculum, assessment, and instructional technology, I entered the study with intersecting professional and racialized identities that shaped my interpretive lens. Grounded in ACL, which draws from critical race theory and critical pedagogy (Santamaría & Santamaría, 2013, 2016), I approached leadership decision making as inherently embedded in systems of power, race, and institutionalized inequity. My lived

experiences as a mixed-race leader in predominantly bureaucratic and historically exclusionary systems informed my attention to issues of voice, marginalization, and structural constraint in district edtech and AI governance (Khalifa, 2018; Shah et al., 2023).

At the same time, consistent with qualitative traditions emphasizing reflexivity and positional transparency (Denzin & Lincoln, 2005), I critically interrogated how my demographic identity, professional authority, and longstanding engagement in technology leadership might influence data collection, participant interactions, and analytic interpretation. Rather than claiming neutrality, I positioned my subjectivity as a resource and a responsibility, leveraging insider knowledge to deepen contextual understanding while systematically examining how my assumptions could shape meaning making. This reflexive stance aligns with ACL's call for leaders to engage in liberatory praxis by interrogating how power and identity operate within institutional systems (Freire, 1970; Santamaría & Santamaría, 2016).

I engaged in reflexive practices throughout the study to address issues of bias and ensure analytic rigor (Denzin & Lincoln, 2005). This included memo writing, iterative coding (Miles & Huberman, 1994), and constant comparison across cases (Creswell & Poth, 2018; Yin, 2018). In addition, I engaged in inter-rater reliability protocols with other doctoral students in the Leaders for Equity and Democracy program who were also conducting equity-centered research. During interviews, I used semistructured protocols to promote consistency while allowing participants to articulate their experiences in their own terms, and I remained mindful of my dual role as practitioner and researcher by prioritizing participants' perspectives over my own assumptions. Triangulation through document analysis further supported credibility by situating interview data within broader organizational contexts (Bowen, 2009; Creswell & Poth, 2018; Miles et al., 2014)

To enhance the trustworthiness of the findings, I combined explicit positional transparency with systematic analytic procedures throughout the research process (Denzin & Lincoln, 2005; Merriam & Tisdell, 2016). By clearly articulating my professional role and intersecting racial identities, I made visible the interpretive lenses through which data were collected and analyzed, thereby strengthening confirmability. I engaged in iterative coding and analytic memo writing (Miles et al., 2014) alongside constant comparison and cross-case synthesis consistent with qualitative multicase design (Creswell & Poth, 2018; Yin, 2018) to ensure that themes emerged from sustained engagement with the data rather than from preconceived assumptions. Triangulation of interview narratives with procurement records and policy artifacts further strengthened credibility by situating leaders' perspectives within broader organizational contexts (Bowen, 2009). I also examined rival explanations and revisited analytic memos to test emerging interpretations against disconfirming evidence (Miles et al., 2014). In this way, practitioner knowledge functioned as contextual insight rather than unchecked bias, supporting both analytic rigor and reflexive discipline.

Chapter 2

Literature Review

2.1 Conceptual Framing and Literature Review

To frame a critical research study on system leadership in educational technology and generative artificial intelligence (GAI), I used a hybrid theoretical framework combining applied critical leadership (ACL; Santamaría & Santamaría, 2013) and educational systems change theory (Elmore, 2000; Fullan, 2023) to analyze educational technology leadership practices. The ACL framework, developed by Santamaría and Santamaría (2013), integrates critical race theory (Bell, 1980; Crenshaw, 1995), critical pedagogy (Apple, 2004), and transformational leadership (Burns, 1978; Kezar, 2008; Kouzes & Posner, 2007) to offer strategies for practitioners to address racial inequalities in education. Built on an understanding of power dynamics and structural inequalities within educational environments, ACL encourages leaders to engage in critical pedagogy themselves and promote it among educators. Transformational leadership, a core part of ACL, emphasizes inspiring and empowering individuals within organizations, setting high ethical standards, and committing to social justice, aligning with culturally responsive leadership (Khalifa, 2018), critical race theory (Delgado & Stefancic, 2012; Ladson-Billings & Tate, 2016; Lynn, 2006; Solorzano, 1998; Yosso, 2005), and critical pedagogy (Freire, 1970; Kincheloe, 2008; McLaren, 2015) principles.

Leadership scholarship on educational systems, drawing on broader leadership theory such as Heifetz et al.'s (2009) distinction between technical and adaptive change, originally developed outside education, emphasizes the importance of recognizing that not all reforms can be solved with procedural fixes. Technical changes involve adjustments to structures, policies, or tools, whereas adaptive changes require shifts in organizational culture, beliefs, and professional practice. Educational technology implementation, especially at scale, presents an adaptive challenge because it demands changes in instructional norms, leadership habits, and shared assumptions about teaching and learning. As such, leaders must focus not only on the technical integration of new platforms but also on the deeper organizational conditions that influence practice (Elmore, 2000; Fullan, 2016). Successfully scaling technology reforms, therefore, depends on leaders' ability to manage both structural logistics and the human dimensions of change across schools and systems.

In this study, I applied this merged theoretical framework (see Figure 2.1) to analyze leadership practices related to educational technology and GAI. This approach supported a more comprehensive analysis of both the social justice dimensions and the organizational dynamics of technology system leadership. First, the ACL informed how I identified and analyzed participants

and district cases, given its focus on understanding how power dynamics, racial inequalities, and social justice considerations influence leadership practices. When selecting educational leaders for the study, I sought those leaders who engaged in practices that reflected critical awareness and efforts toward equity, particularly in the implementation of educational technology (edtech) initiatives. Educational systems change theory informed my articulation of the organizational context of the interviewed leaders, emphasizing the distinction between adaptive and technical challenges in implementing edtech and GAI. Educational systems change theory served as a lens for examining how leaders navigated the complexities of integrating GAI into their school systems by distinguishing between adaptive and technical challenges. This perspective helped uncover how educational leaders adjusted their strategies to align with both the cultural needs of their schools and the technical requirements of edtech and AI adoption and integration. Similar to the use of the ACL, I used these systems change theories with the interview data with system leaders and analysis of their edtech investments. This provided insights into leaders' perceptions of the challenges and opportunities associated with edtech and GAI, highlighting how they approached the need for cultural shifts and capacity building among their staff. Interviews focused on how leaders perceive the differences between adaptive changes, which require shifts in mindset, culture, and practices, and technical changes, involving the deployment of new tools and technologies.

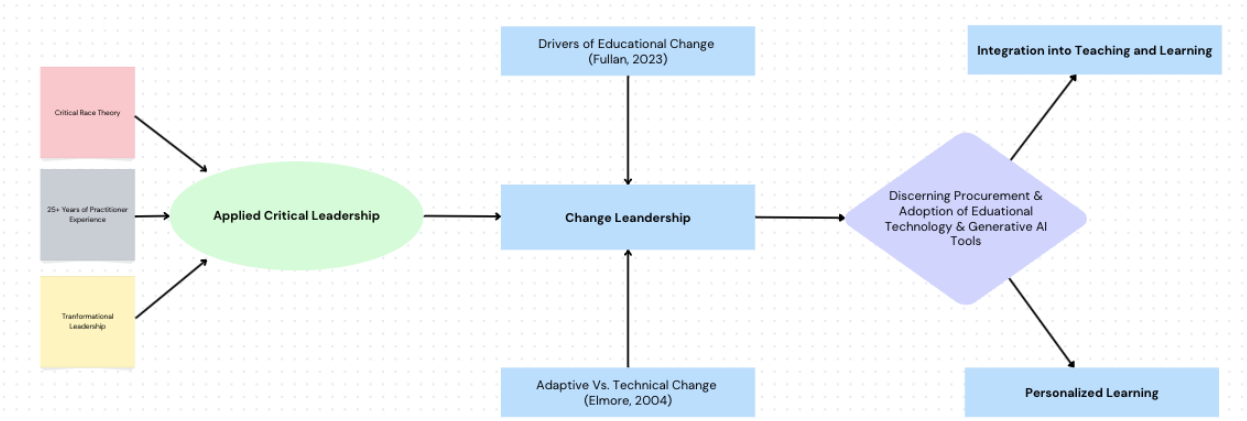

Figure 2.1 *ACL for Educational Technology Integration and Equity*

I have identified three broad strains of academic literature relevant to this study. First, given that the study is about leadership, I will review five discrete themes in educational leadership research. This includes critiques of the positivist approach to leadership practice and how that aligns with the similarly situated view of educational technology as positivist (Kaur, 2020); the impact of neoliberal policy and routines on leadership practice (Douglas et al., 2019; Steven & Courtney, 2017); research on how leaders scale up change through capacity building and leveraging key

improvement drivers (Fullan, 2023); culturally responsive technology leadership for equity (Khalifa, 2018; Khalifa et al., 2016); and critical approaches to educational leadership (Carter et al., 2022; Evans, 2022). The second area of scholarship will focus on research examining why educational technology has not achieved the level of adoption or equitable learning impact its proponents intended, both historically and during the contemporary period marked by the widespread availability of personal computers and the internet in classrooms starting in the mid-1990s. The final area of research reviewed entails critical perspectives on the intersection of instructional technology and equity. This includes several intersecting strands of scholarship. First, it considers ethics, defined here as the normative principles guiding responsible decision making about the use of AI in educational contexts, including questions of fairness, bias, and harm. Closely related are concerns about data security and privacy, which refer to the protection of student information from unauthorized access, misuse, or commercial exploitation. These issues are often situated within critiques of surveillance capitalism, a term describing economic models in which companies extract, analyze, and monetize user data—frequently without meaningful consent—for profit. The analysis also draws on critiques of the deterministic view of educational technology, which assumes that technological tools inherently produce improvement, independent of social, cultural, and instructional contexts. Additionally, the study addresses the digital divide, encompassing disparities not only in access to devices and connectivity but also in meaningful use, instructional quality, and long-term opportunity. Finally, it engages literature examining the profit-driven motivations of educational technology vendors and productivity software companies operating in public schools. Together, these bodies of research underscore the urgency of examining how system leaders interpret and enact equity in the governance of these emerging technologies.

2.1.1. Theoretical Frameworks

In this study, I combined my experiences as an educator responsible for participating in and leading educational technology initiatives over the past 25-plus years with ACL (Santamaría & Santamaría, 2013) and educational systems change theory (Elmore, 2004; Fullan, 2016) to analyze the literature on equity-focused leadership in educational technology. My experience as an equity-focused leader of educational technology initiatives provides me with insights into the everyday experiences of system leaders navigating the various actors involved in the constantly changing instructional technology landscape. I was an early adopter of technology as a high school teacher in the mid-1990s, worked in the nonprofit sector supporting schools with technology implementation, collaborated with school district leaders on creating a regional "Innovation Zone" across 23 districts while working at a county office of education, and have carried all of that experience into my current role as a central office administrator overseeing the adoption of a learning management system and numerous other software platforms. This relatively unique background enables me to go beyond surface-level understanding of how system leaders navigate and whether they do or do not intentionally shape the educational technology landscape to serve their needs, especially those aimed at redressing inequities in student outcomes. Throughout this process, I have also been strongly focused on leveraging technology (and other reforms) as a teacher or leader to address the inequitable outcomes that schools continue to reproduce among historically underserved

populations. I have always maintained a skeptical perspective regarding technology and how any application or platform might support all students, given that schools have historically been sites of social reproduction (Bourdieu & Passeron, 1977; Lareau, 2011), where students are predictably sorted rather than equitably served.

Although I have extensive experience, my expertise has limitations that the ACL and educational systems change theory (Elmore, 2004; Fullan, 2016) introduce in understanding how issues of race, class, and power interact with norms around the implementation of educational technology as a change strategy in practice. These frameworks give me analytical tools to understand how system leaders think about and apply educational technology to address long-standing and predictable inequities in student outcomes. Furthermore, these critical lenses highlight how recent advances in machine learning and artificial intelligence could potentially make educational technology both a catalyst for continued inequitable outcomes and a powerful opportunity to address inequities by supporting highly targeted and differentiated learning for students. I combine these three critical perspectives into my theoretical framework to offer a unique and essential critical view on the relevant scholarship in these areas.

The ACL framework, outlined by Santamaría and Santamaría (2013) in their foundational text, *Applied Critical Leadership in Education: Choosing Change*, has its theoretical roots in critical race theory, critical pedagogy, and the applied transformational leadership scholarship of Burns (1978), as well as Kouzes and Posner (2007) and Kezar (2008). ACL is a leadership application of CRT. CRT is a framework for examining how race, racism, and power intersect in social settings, including education. Although its roots come from law and sociology (Bell, 1980; Crenshaw, 1995), Ladson-Billings (2014) and others (Delgado & Stefancic, 2012; Lynn, 2006; Solorzano, 1998; Yosso, 2005) have explained how structural inequality, counternarratives, white privilege, and interest convergence appear in schools and schooling. As Ladson-Billings (2006) has indicated, CRT is a set of "legal scholarship theories about racial inequality and how race functions in the society" (p. 87). The theory posits that schools (among other institutions) have legitimized discrimination of nonwhite students in both their structures, access, and pedagogical practices. However, theorists of CRT have also ultimately used it to understand schools and classrooms as sites of resistance and liberation, not merely places of oppression and social reproduction.

Santamaría and Santamaría (2013) applied CRT to leadership in the ACL framework by tethering it to both critical pedagogy and transformational leadership to provide a strategy for practitioners to redress racism and racialized outcomes in their practice in ways that traditional approaches to leadership theory were not able to articulate. Critical pedagogy, built on a similar approach to understanding power in schools as CRT, is an approach to teaching and learning rooted in liberation and emancipation, not merely learning as a transaction of information between teacher and student. Drawing on Freire's (1970) foundational work in Pedagogy of the Oppressed, critical pedagogy calls on educators to engage students in sustained examination of the social, political, and material conditions that shape their lived experiences. Through this process of critical reflection and dialogue, students develop what Freire described as liberatory praxis, the capacity to connect reflection with informed action in pursuit of social justice.

Teachers and students are no longer passive recipients but become coarchitects of knowledge, constructing a tapestry of understanding from their shared experience stitched together by threads of meaningful dialogue (Giroux, 1984). This concept of collaborative knowledge generation for liberation is integrated into the ACL framework by Santamaría and Santamaría (2013) as a way for leaders to engage in the practice of critical pedagogy themselves as leaders and promote it in the leadership of other educators. In this process, leaders become responsive to the social and educational contexts in which they work and redistribute power through their collaborative and liberatory orientation (p. 141).

Santamaría and Santamaría (2016b) further weave together the ACL framework by integrating the concept of applied transformational leadership. Transformational leadership is about managing schools and inspiring and igniting the people in them. Leaders who embody this kind of leadership practice are influential in managing organizations for efficiency and impact. Still, they possess skills and habits wherein they challenge assumptions, encourage critical thinking, and create a culture of open inquiry and dialogue among those they lead (Kouzes & Posner, 2007). They also distribute leadership with other educators, students, and even families by providing coaching, mentoring, and opportunities for growth in ways that lead to educational change (Heifetz, 1994). In addition, transformative leaders offer moral leadership, which refers to the ethical responsibility of leaders to confront and challenge systemic inequalities and promote social justice within organizations, particularly in educational settings. Their approach emphasizes that leadership should not only be focused on achieving organizational goals but must also be rooted in principles of fairness, equity, and inclusion (Santamaría & Santamaría, 2016), which is the crucial nexus between CRT and critical pedagogy (Santamaría & Santamaría, 2013). Transformational leaders set high ethical standards by acting with integrity and a commitment to social justice (Ibarra et al., 2010).

Although the ACL provides a comprehensive framework for understanding the personal mindsets and leadership moves that social justice-oriented educational leaders can use to understand and take action to redress inequities grounded in race and power in schools, the framework is less illuminating about how change is enacted in educational institutions. This gap is essential for understanding how contemporary digital tools are adopted, misused, or neglected in academic institutions, because they are, by definition, relatively new resources for educating students. I look to meld the elements of systems change leadership delineated by Fullan and Elmore in their work (Elmore, 2016; Fullan, 2023). Although similar, each theorist brings a different lens to articulating the critical levers for implementing change in schools and school systems. Both acknowledge the challenges to change due to culture, beliefs, and existing institutional structure, but Elmore emphasizes the importance of distinguishing between adaptive (organizational culture) and technical change, providing a more nuanced adaptive leadership model than researchers like Heifetz, who characterized leadership as a set of activities that aim to mobilize people to face and adapt to tough organizational realities by merely evaluating trade-offs and taking the least-objectionable course (Heifetz, 1994). Educational technology implementation is often approached as a technical change. These are changes that involve improvements or modifications to existing systems, processes, or practices without fundamentally altering an organization's core values,

structures, or assumptions. In education, technical changes often focus on improving efficiency, implementing new methods, or refining current procedures, but they do not challenge the system's more profound, entrenched aspects. Still, given the myriad philosophical, pedagogical, and moral elements implicated, it is an adaptive change. Effective equity-oriented edtech stewardship requires leadership that recognizes the complex change necessary for teachers and schools (City et al., 2009; Elmore, 2004; Fullan, 2023). Meanwhile, Fullan (2016) focused on leaders' critical role in ensuring that coherence is enabled and propelled by crucial drivers of change in contemporary schools and systems—another critical element of edtech implementation. Coherence in this context is about aligning technology initiatives with district-wide goals—ensuring that technology adoption is purposeful and coordinated (Fullan, 2023).

These two analytical frameworks, ACL and change leadership, offer tools for understanding how leaders in the modern educational system interpret and act on equity goals through educational technology and GAI platforms. Notably, this framework extends beyond a narrow view of equity as access to devices or digital tools, instead emphasizing how leadership decisions shape instructional, organizational, and cultural conditions that determine whether technology use results in meaningful learning and equitable outcomes. Figure 2.1 illustrates how these frameworks, rooted in critical race theory, informed by leadership theory, and shaped by practical experience in educational technology leadership, converge to support an equity-centered approach that moves beyond provision toward pedagogical transformation and personalized learning.

Studying the literature through these critical perspectives improves scholarship by framing educational technology leadership as a system-wide and equity-focused effort, rather than just a technical task involving resource distribution. Although teachers play a key role in enhancing learning outcomes and closing achievement gaps (Chetty et al., 2014; Darling-Hammond et al., 2025b; Hattie, 2003), the tools, resources, and professional development provided to them through leadership choices are equally impactful. This view highlights that disparities in outcomes are not only about access but also about how technologies are selected, implemented, and supported within larger organizational systems. The following analysis examines three scholarly areas relevant to understanding the uneven and inequitable use of educational technology in the United States, starting with a brief history of personal computing in schools to provide a broader historical context of reform efforts shaped by persistent institutional structures and norms.

2.1.2. Central Office Tinkering

Before reviewing the history of personal computing devices in schools and the broad areas of the relevant literature, it is crucial to summarize how school system leaders navigate, perpetuate, and redress inequities in student outcomes. "Central office tinkering" is used in this study as a conceptual lens to describe incremental, nontransformative reforms that reproduce existing organizational logics while signaling change. This study builds on the concept of central office tinkering by examining how contemporary district leaders navigate similar patterns in the context of educational technology and GAI, extending the concept through the lens of ACL and systems coherence. The literature on how these leaders have or have not leveraged technology is less

explicit and is generally lumped in with other reforms that central offices have undertaken (Gamson & Hodge, 2016; Honig & Rainey, 2023). In their classic history of U.S. schooling in the 20th century, Tyack and Cuban (1997) described how central office leaders have rewritten supervisory relationships or added new programs or initiatives, such as "tinkering." These new arrangements did not change schools' underlying assumptions or "grammar" and consequently had little to no meaningful impact on inequitable student outcomes (Tyack & Cuban, 1997). Beyond being relatively inconsequential, central offices have in fact, been shown to often contribute to or perpetuate inequitable outcomes (Gamson & Hodge, 2016) through inequitable resource allocation (Anyon, 1997; Khalifa et al., 2016; Wright et al., 2020), curriculum adoption decisions (Brayboy et al., 2007; Horsford, 1998; Ladson-Billings, 1995), teacher and leader training (Honig & Rainey, 2020; Milner, 2008), discipline policies (Khalifa et al., 2016), school boundary setting (Lopez, 2003) and family engagement efforts (Rotberg, 2020). Inequity is so deeply embedded into the institutional structures and norms of central offices and their leaders' practice, like the rest of schooling (Love & Hayes-Greene, 2018), that reforms of any kind, including educational technology, have had limited impact on equity (Honig, 2009). This analysis of the limited equity impact of central office leadership reform also reflects one of the central ideas of the ACL framework. It posits that systems have been complicit in educational inequality, so only through a sober acknowledgment of that reality can any reforms initiated by leaders be advanced to redress these inadequacies.

In addition to district central offices contributing to inequitable outcomes through policy and resource allocation decisions beyond the classroom, central office leaders have often made episodic or misaligned investments in professional learning and instructional initiatives that fail to support culturally sustaining pedagogies for historically marginalized students (Paris & Alim, 2017). These investments, typically directed toward short-term programs or compliance-driven initiatives, frequently diverge from the equitable teaching practices that research shows are necessary to improve achievement and affirm the identities of students from racially, linguistically, and culturally diverse communities. For example, some leaders have recently invested in antiracism/bias training to shift teacher mindsets (Sparks, 2020). However, changing teachers' attitudes and beliefs does not necessarily translate into effective teaching practices (Honig & Rainey, 2023), and it often conflicts with or is not aligned with other initiatives usually implemented simultaneously (Payne, 2008). District leaders are often even aware of the incongruence of the activities and yet continue to implement these competing initiatives because they either do not see the incoherence or are following the direction of superintendents with short tenures or who have their own myopia about priorities (Nitta et al., 2009). Although the literature is pessimistic about the structural and cultural impediments to system leaders positively impacting student equity, there is some emergent evidence that the following four factors are at play in districts where subgroup achievement discrepancies are being redressed. First, leaders use research about district best practices to guide their actions. Second, they design their reforms from a real problem of practice rooted in producing equitable outcomes. Third, they avoid trying to reform the elements of the district that are not directly tied to teaching and learning, like the allocation of resources or budgets. Finally, they build intentional theories of action about how each department

or unit of the central office supports equity-focused instructional practice improvement and monitor implementation and impact (Honig & Rainey, 2023).

In the context of educational technology, central office tinkering provides a useful framework for interpreting patterns of adoption that prioritize tool acquisition over instructional transformation. Districts frequently introduce new technologies, including digital platforms and AI-enabled tools, without fundamentally rethinking pedagogy, assessment, or equity-oriented design. As a result, technology initiatives may signal innovation while reproducing existing inequities and institutional logics.

In this study, central office tinkering is used as an analytic construct to interpret how district leaders navigate the pressures of adopting new technologies within established bureaucratic systems. It helps explain why leaders, despite articulated commitments to equity, often engage in reactive and incremental decision-making that maintains systemic incoherence. This concept also serves as a precursor to understanding the conditions under which leaders attempt to move beyond compliance-driven routines toward more coherent and equity-centered approaches.

2.1.3. Technological Determinism vs. Pedagogical Innovation as an Analytic Tension

Building on this foundation, this study conceptualizes educational technology leadership through the tension between technological determinism and pedagogical innovation. Technological determinism assumes that the introduction of new tools will inherently drive improvements in teaching and learning, positioning technology itself as the primary agent of change. This assumption has been widely critiqued in the literature, which documents recurring cycles of enthusiasm and disappointment in educational technology reform (Cuban, 1986; Selwyn et al., 2017). By contrast, pedagogical innovation emphasizes the role of instructional practice, professional learning, and organizational conditions in shaping meaningful educational outcomes, viewing technology as a mediating tool whose impact depends on how it is integrated into teaching and learning (Elmore, 2004; Fullan, 2016).

This tension provides a critical analytic lens for examining how district leaders interpret and implement educational technology and GAI. Leaders operating within deterministic frames often prioritize access, adoption, and scale, focusing on device distribution, platform implementation, or AI capabilities, reflecting what prior research has identified as a persistent emphasis on technological provision over instructional transformation (Reich, 2020; Warschauer & Matuchniak, 2010). Such approaches frequently assume that expanding access will, in itself, produce equitable outcomes. In contrast, a pedagogical innovation orientation requires attention to how technologies reshape the instructional core, including curriculum design, assessment practices, and culturally responsive teaching, as well as the professional learning systems that support educators in this work (Darling-Hammond et al., 2017; Fullan, 2016).

In this study, the tension between technological determinism and pedagogical innovation helps explain why equity is frequently operationalized as access rather than as transformation. This pattern reflects what the literature describes as the "digital access divide," giving way to a "digital use" or "design divide," where disparities persist in how technology is meaningfully integrated into learning (Lachner et al., 2024; Warschauer, 2004). It also illuminates how vendor narratives, policy pressures, and organizational constraints reinforce deterministic assumptions, contributing to patterns of incremental reform consistent with central office "tinkering" (Selwyn et al., 2017; Tyack & Cuban, 1997). Together, these dynamics shape leaders' capacity to align technology adoption with broader equity goals, often limiting the extent to which digital tools function as mechanisms for transformative, justice-oriented change.

Taken together, central office tinkering and the tension between technological determinism and pedagogical innovation provide complementary lenses for understanding the limitations of current educational technology reform efforts. Tinkering describes the structural pattern of incremental change; technological determinism helps explain the underlying assumptions that drive those patterns. ACL and educational systems change theory extend this analysis by identifying what is required to disrupt these cycles.

ACL foregrounds the role of leaders' critical consciousness in recognizing how technology adoption is embedded in systems of power, race, and inequality. Systems change theory emphasizes the importance of coherence, capacity, and the distinction between technical and adaptive change, suggesting that meaningful transformation requires shifts in beliefs, relationships, and organizational routines (Elmore, 2004; Fullan, 2016).

Together, these frameworks guide this study's analysis of how district leaders navigate the adoption of educational technology and AI. They also provide a foundation for examining the conditions under which leaders move beyond patterns of tinkering and deterministic thinking toward more coherent, equity-centered approaches to technology leadership. These conceptual lenses inform the analysis that follows, particularly in interpreting how leaders' decision-making reflects both structural constraints and underlying assumptions about the role of technology in advancing equity.

2.2 A Brief History of Personal Computers in Schools

For over 150 years, schools have frequently introduced new technologies with great fanfare. Recognizing this historical pattern is essential for this study because it places current investments in educational technology and GAI within a long-standing cycle of reform that has repeatedly promised transformation but often led to uneven and unfair outcomes. By exploring this history, the study highlights how persistent organizational structures, leadership practices, and systemic constraints, rather than the technologies themselves, determine whether innovations result in meaningful instructional change or merely reproduce existing disparities.

For example, in 1841, the new technology of the chalkboard was met with great anticipation from one observer, similar to what one might say about the internet today: "The inventor or introducer

of the system deserves to be ranked among the best contributors to learning and science if not among the greatest benefactors of mankind" (Tyack & Tobin, 1995, p. 40). In addition to this observation being recognizable today, it also shows what would become the predominant way in which those outside schools have articulated technological innovations over the last 2 centuries. As Selwyn et al. (2017) have described it, instructional technology has most often followed a cycle of "hype, hope, [uneven access], and disappointment" throughout the post-electrification era of U.S. schools (p. 51). This cycle begins with vigorous promotion and optimism about revolutionizing student learning, followed by a period of hopeful implementation, and ultimately gives way to disappointment when technologies fail to produce sustained improvements in student outcomes or instructional practice (Cuban, 1986; Selwyn et al., 2017).

New technologies often fall short of transforming classroom routines, deepening learning, or delivering promised efficiencies, resulting in recurring disillusionment until the next innovation restarts the cycle (Cuban, 1986; Selwyn et al., 2017). This pattern underscores a persistent challenge in education: technological change alone does not produce systemic improvement. Instead, the success or failure of innovation depends on how it is taken up within existing institutional structures, leadership practices, and instructional systems. Recognizing this historical continuity provides a critical foundation for this study's focus on how contemporary leaders navigate similar dynamics in the adoption of educational technology and AI, particularly in relation to equity and organizational coherence.

This cycle has been repeated numerous times over the past century (Selwyn et al., 2017). For instance, early 20th-century technologies like film, radio, and television were all initially hailed as revolutionary educational tools (Cuban, 1986). Despite their potential, each faced significant challenges in implementation and impact. For example, films were introduced with great expectations for their educational value but often fell short in practice due to logistical and student interest issues (Ferster, 2014). This historical pattern highlights the complexity of effectively integrating new technologies into educational systems. In addition, from an equity and access perspective, as prompted by the ACL framework, there has been very uneven access to these 20th-century technologies across the country due to inequities in school funding (National Research Council, 1999; Pew Center on the States, 1998; Schramm, 1961; U.S. Department of Commerce, 1995), which would prove to be a feature of access to future innovations as well.

Personal computing in the classroom has repeated the hype-hope-disillusionment cycle described previously for other technological innovations. This pattern is intended to illustrate the cycle and show the Digital Divide's emergence. Many historians situate the beginning of this period with the invention of the pocket calculator and the Speak & Spell machine, both developed and widely distributed in the mid-1970s. The personal computer followed soon after – the central instructional technology innovation of the last 50 years. The spread of these devices accelerated in the early 1980s. By 1983, computers were being used for instructional purposes in over 40% of all U.S. elementary schools and over 75% of all U.S. secondary schools (Cuban, 2001). There were several applications of computers in schools during this era.

Computer assisted instruction (CAI) was one of the most common uses of computers in K–12 schools during the 1980s. CAI programs were designed to provide additional teaching tools and educational reinforcement. Programs focused on subjects like math, reading, and science, offering interactive exercises that could adapt to different skill levels. In addition to CAI, there was coding or programming education. Learning to program was a significant focus in the early days of educational computing. Some schools in this era began to introduce students to primary programming languages such as BASIC, Logo, or Pascal, encouraging problem-solving and logical thinking skills. In addition, computers introduced students to word processing, a significant shift from typewriters. Finally, these were the first instances of using computers for simulations and educational games, which helped illustrate complex academic concepts in subjects like history, science, and mathematics through interactive and engaging activities. That is different from saying that all students had daily access to these resources; low-income students often found themselves in schools with disproportionately little access (Digital Divide Network, 1999). However, the devices were in schools nationwide, and the expansion would proliferate (Cuban, 2001). Supported by federal government investments and private sector donations from new technology firms such as Apple, Tandy, and IBM, the proportion of U.S. public schools with computers, including rural schools, rose from 18% to 98% between 1981 and 1991. Similarly, the ratio of "students-per-computer" dropped from 125:1 to 18:1 over the same time (Cuban, 2001).

Despite claims of substantial improvements in teaching and learning, personal computers were not sustained across school systems or even within individual schools (Reich, 2020). Although some teachers and students did make frequent use of technology, nationally representative studies suggested that educational use of computers was sporadic and inconsistent across most K–12 school types and settings (Becker, 1994; Cuban, 2001; Warschauer, 2004). Research during this period reported that most computers were accessible to teachers and learners only via dedicated computer labs and that the most frequent uses of the technology were for writing assignments through word processing tools and creating drill-and-practice and tutorial software. As Conte concluded in 1997, "In many schools, computers sit idle much of the time or are used for passive rote learning through drill-and-practice routines rather than to cultivate higher order thinking skills like synthesis, analysis, and communication" (Conte, 1997, p. 1) As with film, radio, and television before it, the apparent failure of the personal computer to transform education has been linked to several factors that share commonalities with previous technologies. First, many research studies from the early era of computers in schools often highlighted teacher expertise and confidence with computers; issues are usually reported as exacerbated by a lack of training. In addition, early research has also found that teachers are, in some cases, "resistant" to computers or have "antipathy" toward them. This only expanded the technical issues teachers experienced, due to uneven and unequal access and general technical issues, it did not work as promised or as efficiently as expected. Although personal computers have grown in their availability (exponentially during the COVID-19 pandemic) and power, their day-to-day use continues to be quite variable (Phan et al., 2023; Reich, 2020).

This brief review of the history of personal computers in schools was intended to show standard patterns in the life cycle of instructional technology. Although the evolution of this technology has,

like previous technological innovations, been accompanied by vendor and educator promises of significant improvements in student learning, all have failed to realize the lofty educational expectations and equity, while each simultaneously became very successful among the mainstream public (Reich, 2020; Selwyn et al., 2017). This cycle always begins with substantial promises for the transformative potential of the technology, backed by research evidence and other instances of scientific credibility. However, despite the initial enthusiasm and expectations, educators use the new technologies inconsistently for various technical, professional, and personal reasons. Perhaps most importantly, few changes occur in public educational institutions' fundamental arrangements, which are at the heart of this predictable historical cycle. This pattern is on top of the significant barriers to access based on the material resources that schools and their students have had access to, which have all contributed to these innovative instructional tools never really taking hold at scale in schools. In the next section of this literature review, I will examine empirical research on the structural and cultural dynamics in schools and school systems that have driven this cycle of unfulfilled promise for instructional technology innovations.

2.3 Educational Technology: Simultaneously There and Not There

This first domain of the literature takes up the question of why "technology-enhanced learning" (Bayne, 2014), intended to support and improve student learning, has not had either the level of adoption or equitable learning impact its promoters have intended (Reich, 2020). As Larry Cuban once indicated when referring to the wide availability of personal computers in schools: "Putting computers into schools, like putting radios and televisions in classrooms in earlier generations, has changed little in how teachers teach and students learn" (Cuban, 2001, p. 24) The intent, of course, was that these technologies would have changed and ultimately improved teaching and learning. Although this quote is over 20 years old, the lack of large-scale change in teaching or learning through technology persists (Reich, 2020). The question is, why?

This study identifies five broad themes in the literature explaining why public secondary schools have struggled to achieve sustained, large-scale integration of instructional technology. Interrogated through ACL and Systems Change frameworks, these themes highlight the structural limitations of positioning educational technology as a strategic equity lever.

First, technology must contend with the instructional or "technical" core, the human-mediated relationship among teacher, student, and content, which ultimately determines how and whether tools are used (Ball, 2018). Second, secondary schools are organizationally complex systems; reforms that challenge the traditional "grammar of schooling" are difficult to implement coherently at scale (Park et al., 2022; Tyack & Cuban, 1997). Third, longstanding inequities in access across districts, particularly in under-resourced communities, often referred to as the Digital Divide, have constrained adoption and deepened disparities (U.S. Department of Education, 2024). Fourth, educational technology is often treated as experimental and episodic, adopted with limited evidence or sustained accountability (Cohen & Mehta, 2017). Finally, meaningful integration requires sustained professional learning and organizational support, which remain chronically underfunded

amid competing instructional priorities (Ertmer & Ottenbreit-Leftwich, 2010; Tondeur et al., 2020; U.S. Department of Education, 2024).

2.3.1. The Technical Core and "Banking" Trumps New Technologies

At the heart of school-based learning is the foundational relationship between the teacher, the content to be learned, and the student (Ball, 2018). This triad has been called the instructional core (City et al., 2009; Elmore, 1996). This set of relationships describes the central interplay between the educator, the learner, and the skills or knowledge to be learned at the heart of the educational interaction. The human elements of the triad, teacher and student, are primary, with content as the coequal medium of their interaction (Ball, 2018). Instructional resources, including the vast array of instructional technology available today, are secondary to the foundational relationship between teacher and student (Fullan, 2016). In addition, given the primacy of teachers in the relationship, a teacher-centric orientation has been promoted to what is to be learned in the classroom. This model of knowledge dissemination has been referred to by Freire (1970) and other critical theorists like Santamaría and Santamaría (2013) in the ACL framework as a "Banking" approach to education wherein teachers deposit information into passive students, who receive and memorize, and regurgitate it without critical thinking or understanding. This model treats students as empty vessels rather than active participants in their learning process (Freire, 1970). Instructional technology tools can potentially enhance learning in ways that de-center teachers by allowing for self-directed or inquiry-driven learning, especially in the era of artificial intelligence (Digital Promise, 2024); their implementation and ultimate effectiveness are governed by the teacher's pedagogical expertise and decision making. Therefore, educational technology can be seen as a threat to teachers' primacy in the instructional core and, consequently, be resisted by teachers for that reason (Reich, 2020).

In the instances where technology is implemented with fidelity and more equitable academic outcomes are achieved, there are some key commonalities in the support and implementation regime (Cheung & Slavin, 2013; Darling-Hammond et al., 2025a; Means et al., 2013; Pane et al., 2014). These issues include equitable access to technology (Darling-Hammond et al., 2025b), teacher training (Means et al., 2013), personalized learning approaches (Pane et al., 2014), curriculum integration, data-driven instruction, and a focus on supporting underserved students. These conditions and supports collectively ensure that educational technology is not just a peripheral supplement but a transformative tool that helps reduce achievement gaps and foster more equitable learning outcomes for all students. However, these instances are relatively rare (Means et al., 2013) and are often not enabled by the structure and culture of schools.

Given teachers' role as the arbiters of what happens in the instructional core and their general orientation toward dictating what is to be learned, it is no wonder that the widespread adoption of instructional technologies has been episodic and uneven, subject to exuberance and disillusionment cycles. Teachers have historically been described as cautious toward externally imposed reforms, in part because the organizational structure of schools, what Lortie (1975) termed the "egg crate," referring to the physical and professional isolation of teachers in individual classrooms, which limits collaboration and reinforces stable but unique instructional routines. This physical and

cultural compartmentalization has led to significant autonomy, isolation, and a culture of individualism, making common professional practice almost impossible (Elmore, 1996). Consequently, a substantial proportion of teachers feel they remain "cautious onlookers" when it comes to instructional technology instead of being "enthusiastic innovators" (Crook, 2008, p. 34). Although teachers are sometimes portrayed as resistant to innovation, such characterizations overlook the organizational conditions that shape their practice. Teachers' capacity to learn about and meaningfully integrate instructional technology is constrained by the structural features of their work, including classroom isolation, limited collaborative planning time, standardized pacing requirements, and accountability pressures that prioritize coverage and test performance over experimentation (Selwyn et al., 2017). These institutional conditions reduce opportunities for sustained professional learning and risk taking. At the same time, the historical predominance of the "banking" model of education (Freire, 1970) has normalized teacher-centered instructional routines, further limiting the adoption of student-centered approaches that many educational technologies are designed to support (City et al., 2009; Fullan, 2023). Together, these structural and cultural dynamics constrain leaders' efforts to transform instructional practice toward more equitable and participatory models, particularly when teachers receive limited systemic support or incentives to shift established routines.

2.3.2. Secondary Schools: Complexity and Incoherence

Beyond the main structural barriers that prevent teachers from using instructional technology in public secondary schools, the schools themselves add extra layers of complexity to the broader adoption and implementation of any reform, including technology (Cohen & Mehta, 2017; Fullan, 2016). Effectively integrating instructional technology to genuinely enhance learning requires shifting from traditional teaching methods to more student-centered approaches that focus on active learning, student agency, project-based learning, differentiated instruction, and opportunities for students to engage meaningfully with content, collaborate with peers, and apply knowledge in real-world situations.

However, changing deeply rooted pedagogical practices is difficult (Hew & Brush, 2007). This difficulty is increased by secondary school teachers focusing on their subject matter. These teachers often have strong "subject cultures" or identities tied to their content areas (Siskin & Little, 1995). Such cultures are often central to teachers' identities (Khalifa et al., 1996). As a result, any instructional technology tool must meet the specific needs related to the subject matter for teachers, the end users. Many U.S. high schools are organized into strict disciplinary zones and large institutional frameworks, which create impersonal and isolating environments for students and staff (Bill & Melinda Gates Foundation, 2005; Bloom & Unterman, 2010). Since the late 1990s, research (Bloom et al., 2010; Bloom & Unterman, 2012; Cotton, 1996; Hughes et al., 2012; Lee & Smith, 1997; Wasley et al., 2000) has shown that these schools tend to be too large. Although these large sizes greatly harm student outcomes, especially for historically underserved students, the literature also shows that such large institutions pose major challenges to implementing reforms like instructional technology (Fullan, 2016). These structural obstacles have serious implications for the wide adoption and effective use of instructional technology in secondary schools. Additionally,

leaders who critically examine school districts (Santamaría & Santamaría, 2013) must address these organizational challenges when using technology to promote equity-focused improvements.

2.3.3. Uneven District Central Office Leadership of Reforms

District central offices also often contribute to the complex array of impediments to instructional technology adoption in ways that reflect other challenges to systemic secondary school reform. As indicated earlier, several school district central offices have worked to craft coherence through various continuous improvement strategies in recent years (Park et al., 2022). However, most central offices struggle with challenges of coherence when addressing equity imperatives. First, multiple pressures and conflicting reforms often occur in districts simultaneously. I experience this as a district leader myself. I oversee a systemic math intervention task force, an artificial intelligence initiative, an instructional framework rollout, a Restorative Justice Practice initiative, and a Career Technical Education-Dual College Enrollment partnership with three local community colleges. Each of these initiatives could be the focus of district-wide effort for 1 or more years, but is being prioritized simultaneously, and there are numerous other initiatives underway, as is often the case in school districts (Coburn et al., 2009). Even when one brings an applied critical lens to these efforts (Santamaría & Santamaría, 2013), the sheer diversity and scale of the initiatives prompt incoherence. In addition to the challenge of "weaving" coherence, system leaders struggle to align means to goals, levels of coordination across the organization and system, and degrees of intentioned autonomy among school-level personnel (Park et al., 2022).

2.3.4. Access and Equity

In addition to challenges of coherence and focus within district central offices, particularly in large, urban, and under-resourced districts, persistent inequities in access to instructional technology continue to shape implementation outcomes across U.S. public schools. These disparities are most pronounced in high-poverty districts and rural communities, where funding instability, infrastructure gaps, and limited technical capacity constrain both hardware access and meaningful integration (U.S. Department of Education, 2023; Warschauer, 2004; Warschauer & Matuchniak, 2010). As a result, inequitable access within and across districts compounds organizational fragmentation, further impeding the effective adoption of instructional technology at scale. District leaders looking to leverage technology to redress inequities must confront this fundamental enabling condition. First, there is a wide variation in secondary schools' and districts' access to various instructional technology components. Many schools struggle with insufficient or outdated technology, lack high-speed internet access, and make significantly different investments in technical support (Warschauer & Matuchniak, 2010). These digital divides are not random or geographically incidental; they reflect longstanding racialized and class-based inequities that disproportionately affect Black, Latino, Indigenous, immigrant, and low-income communities. As a result, students and teachers in historically marginalized districts often face limited access to reliable devices, broadband connectivity, and high-quality digital learning tools both in and out of school, constraining meaningful participation in technology-mediated instruction (Warschauer, 2004; Warschauer & Matuchniak, 2010). Additionally, the episodic nature of district technology

investments is a significant barrier to the widespread adoption of instructional technology (Zhao & Frank, 2003). Initial investments in hardware, software, and training can be substantial, and securing ongoing funding for updates, maintenance, and professional development is a persistent challenge. Budget constraints often force many schools to make difficult choices about where to allocate resources, and technology initiatives can be challenging to sustain over time (Hatch, 2002; Honig & Rainey, 2023; Rauf, 2023). This only exacerbates student access issues, which are well documented (Reich & Ito, 2017; World Economic Forum, 2020).

2.3.5. Imperfect Support and Resistance

Leaders seeking to implement equity-oriented technology initiatives at scale must navigate organizational and cultural resistance within schools (Cuban, 2001). Research suggests that some teachers express skepticism about instructional technology not simply out of reluctance to change, but due to concerns about professional autonomy, pedagogical integrity, and the potential deskilling of teaching practice (Selwyn et al., 2017). Teachers may worry that technology-mediated instruction diminishes their role within the instructional core or reduces complex pedagogical work to standardized digital routines (City et al., 2009; Elmore, 1996). From a labor perspective, scholars have also documented apprehension that educational technologies, particularly those emphasizing automation, data tracking, or algorithmic personalization, can intensify surveillance, increase workload, or shift professional judgment toward externally defined metrics (Selwyn, 2016; Selwyn et al., 2017). At the administrative and policy levels, resistance may additionally stem from concerns about over-reliance on screens, developmental appropriateness, or the diversion of limited resources away from other instructional priorities. Together, these dynamics illustrate that resistance to instructional technology is often grounded in legitimate professional and ethical concerns rather than simple fear of edtech. Effecting change requires strong leadership that brings a critical eye to investing in and supporting technology solutions, a clear vision for integrating technology, and strategies to manage the transition and address the concerns of all stakeholders (Fullan, 2023).

Another issue is teachers' preparedness to integrate technology effectively into their instruction (Ertmer & Ottenbreit-Leftwich, 2010). Despite the ever-increasing push for instructional technology in classrooms, many teachers continue to feel the need to be sufficiently trained or supported to use new technologies effectively (EdSurge, 2023; Foulger et al., 2017; Tondeur et al., 2017, 2020). Given their location in the technical core as the primary mediators of instructional decision making, this means that if they do not feel prepared, they will not implement. In addition, professional development opportunities are often inadequate, episodic, or not aligned with teachers' needs and the demands of their curriculum, making it difficult for teachers to adapt to and incorporate new technologies into their teaching practices (Selwyn et al., 2017).

I have argued here that educational technology has had a limited impact on student learning overall and on reversing inequitable outcomes in particular despite its widespread availability (An & Fuentes, 2023; Escueta et al., 2020; U.S. Department of Education, 2024; Warschauer et al., 2014; Warschauer & Matuchniak, 2010). Introducing computers into classrooms has not significantly

altered teaching methods or student learning, similar to past introductions of film, radios, and televisions (Selwyn et al., 2017).

Although I will take up leadership more directly in the last section of this literature review, for educational leaders, this domain underscores the need for strategic approaches to technology integration. Leaders must address five critical areas: the fundamental human-mediated relationship in teaching, the complexity of implementing reforms in large and culturally entrenched school systems, the incoherence and conflicting priorities within district central offices, the inequitable access to technology across schools, and the persistent lack of adequate training and support for teachers. Effective equity leadership involves creating a coherent vision for technology use (Fullan, 2023), ensuring equitable access, and providing continuous professional development to empower teachers. In addition, leaders must navigate these challenges by bringing a critical perspective aligned with the ACL and Systems leadership imperatives to harness the potential of educational technology and drive meaningful change in teaching practices.

2.4 Critical Educational Technology Studies

The second area of scholarship to be reviewed here is related to critical studies of educational technology—essential to any critical leadership engagement with these platforms and tools. Although this area of scholarship is less extensive than the vast research on secondary schooling's structural and cultural impediments to equity-oriented reforms, it is arguably most important for understanding how system leaders understand the merits and limitations of instructional technology for equity or social justice purposes. Integrating contemporary instructional technology into educational settings raises complex ethical and moral issues, particularly with the increasing reliance on GAI platforms. Educators (T. G. Wang et al., 2024; Waters, 2020; Williamson, 2017) and other technology critics (Zuboff, 2015) voice concerns about the ways personal data is handled by edtech vendors and big tech companies, posing significant privacy risks to students and their families (Stockman & Nottingham, 2022; N. Wang et al., 2024; Williamson, 2017). Any leader intending to leverage educational technology to address equity imperatives must consider these critical issues in alignment with the ACL and an understanding of the structural impediments outlined in the domain reviewed previously (Fullan, 2023).

The first area to review involves the moral and ethical aspects of educational technology, including issues related to ethics, data security, and vendors' profit motives—both those in edtech and those with long-term interests in potential exploitative uses of student data. In its most ethically troubling form, educational platforms can collect extensive personal information, raising concerns about data privacy and the potential for it to be used for commercial purposes beyond enhancing education. This "surveillance capitalism" (Zuboff, 2015) can foster a culture where student data is treated as a commodity rather than a private educational record, raising serious ethical questions about consent and safeguarding children's privacy (Pasquale, 2019).

Besides critiques of educational technology and the commodification of students and their learning, there is also a critique of "technology determinism" and whether educational technology should

drive teaching methods or if teachers should lead pedagogical innovation (Selwyn, 2016). Relying too much on technology can lessen the role of careful pedagogy, resulting in a tech-focused approach where technology is wrongly viewed as a cure-all for educational problems rather than a tool to be integrated thoughtfully into teaching (Selwyn, 2011). It can also reinforce the "banking" ethic of schooling mentioned earlier (Freire, 1970). Effective use of technology in education should support and improve pedagogical goals rather than control them (Mishra & Koehler, 2006).

Along with the literature critical of "technology determinism," there is a group of scholars who analyze the claims made by educational technology vendors and theorists, such as Clayton Christensen (Christensen et al., 2011), and others advocating for significant, positive "disruption" to outdated schooling models across the country. They believe this disruption will be driven by technology and solutions like charter schools promoted by private interests (Blikstein, 2013; Cuban, 2018; Ravitch, 2013; Reich, 2020; Strauss, 2019). As previously noted, educational technology often does not live up to its promises of transformation. Meanwhile, scholars and educators are concerned that many educational technology companies prioritize shareholder profits and market growth over student learning and educational equity, even when their marketing emphasizes commitments to equity (Selwyn et al., 2017; Williamson, 2017). Critics contend that profit-driven business models tend to favor rapid expansion, data extraction, and scaling products over rigorous evaluation of pedagogical effectiveness or community-driven educational goals.

Scholars have argued that many educational technology companies operate within market logics that prioritize product expansion and data monetization over pedagogical depth or equity commitments, contributing to the broader commodification of public education (Selwyn et al., 2017; Webster, 2017; Williamson, 2017). This reality carries at least three implications for district leaders. First, leaders must critically interrogate vendor claims, distinguishing marketing narratives from evidence of instructional efficacy and equitable impact, consistent with ACL's emphasis on questioning power and dominant discourses (Santamaría & Santamaría, 2013). Second, leaders should require independent evidence of effectiveness and subgroup impact before large-scale adoption, recognizing that market popularity does not equate to educational value (Reich, 2020). Third, leaders must ensure that procurement processes prioritize community-defined educational goals over vendor-defined solutions, centering the instructional core and equity commitments in decision making (City et al., 2009; Elmore, 2004). Taken together, these practices reposition leaders as stewards of public purpose rather than passive consumers of technological innovation.

Another area of critical scholarship regarding edtech is related to commercialization and corporate influence in educational technology, which has led to concerns about prioritizing business interests over educational objectives (Watters, 2017). As technology companies increasingly shape the tools and platforms used in schools, there is a risk that education becomes secondary to profit making. This commercial influence can skew educational content and priorities, potentially undermining the pedagogical integrity and leading to a market-driven rather than a student-learning-driven approach to school tech use (Hogan et al., 2016). As leaders and school leaders bring criticality to purchasing and implementing these tools, purchases need to be made judiciously to understand the motives and investors in the companies.

A final area of the literature relates to critiques of educational technology to close the Digital Divide described previously in Domain II (Castells, 2024; Hargittai, 2018). From a critical perspective, the Digital Divide comprises three elements: the Digital Use Divide, which relates to student engagement with technology for learning enhancement and the access differentials among student groups; the Digital Design Divide, which relates to the differentials in educators' skills in creating tech-enabled learning experiences based on their access to tools, training, and ongoing support; and the Digital Access Divide, which ensures equitable technology access for both students and educators, focusing on connectivity, devices, content, and digital well-being (U.S. Department of Education, 2024). Moreover, these preexisting divides must be addressed when accessing the new GAI tools (Deonandan, 2023).

Social justice–oriented leaders, those who intentionally work to disrupt inequitable systems, center the experiences of historically marginalized communities, and align institutional decisions with principles of fairness and inclusion, must understand the competing interests, power dynamics, and embedded values within instructional technologies to make ethical and equity-centered procurement and implementation decisions (Lynch, 2019; Selwyn, 2016). Rather than treating technology as neutral, such leaders critically examine how platforms may reproduce or challenge existing inequalities and ensure that deployment strategies advance, rather than undermine, educational justice. Leadership of educational technology requires a careful balancing act: adopting and implementing technologies that address rather than increase disparities and ensuring these tools are used to enhance learning and teaching. Leaders must critically evaluate technologies for their functional capabilities and broader social and ethical impacts on students and learning environments. What follows is a more in-depth analysis of the literature in each of the areas summarized here.

2.4.1. Privacy, Ethics, Data Security, and Surveillance Capitalism

This strand of the literature is focused on concerns related to the commodification of education, children, and their learning. Integrating contemporary instructional technology into educational settings brings a complex array of moral and ethical dimensions that leaders must closely analyze (Selwyn, 2016). Those issues have only become more complicated with the proliferation of GAI platforms (N. Wang et al., 2024). As schools increasingly rely on digital platforms for teaching and learning, the ethics of using such technologies have become as important as their effectiveness or value (Watters, 2017; Williamson, 2017). Moreover, although the public–private relationship between schools and publishers or other vendors has always warranted a critical eye (Ball, 2007), examining the intentions and practices of edtech vendors is more complex because of the nature of personal data transfer that is the crucial currency in contemporary technology companies' business models (Watters, 2017). Traditional vendors who worked with schools were generally in the business of selling instructional materials to schools, like textbooks or other tools. However, those instructional resources did not have a way to track information about how those tools were being used or the impact of the tools on individual students (Reich, 2020). In addition, there is the issue of how data is handled by the edtech companies and their ultimate profit motives. The big tech companies, like Google, Microsoft, and Apple, although publicly concerned with privacy, are

routinely fined for breaches of data protection laws (Lyon, 2018). Consequently, significant concern exists about these platforms' existential threats to students and their parents/guardians (Stockman & Nottingham, 2022).

In addition, researchers like Zuboff (2015) have argued that integrating "surveillance capitalism" in schools through edtech platforms raises significant ethical concerns (Lyon, 1994; Stockman & Nottingham, 2022). There is a growing unease about how these technologies can undermine students' privacy and their development of a healthy sense of self, with commercial surveillance becoming a norm in educational settings (Fedders, 2019). Zouboff defined this student data collection as data mining; like its application in the commercial sphere, data is gathered about individuals and groups of people for profiling, advertising, and marketing purposes. Educational technology vendors thereby operate in a dual capacity. On the one hand, they provide an essential service that enhances learning through innovative digital platforms. On the other hand, they are businesses with financial interests, some involving long-term strategies that could exploit student data for economic gain. This dual role raises questions about aligning their educational missions and commercial incentives (Selwyn, 2019a). The potential for conflict between these motives necessitates examining how vendors manage the delicate balance between advancing educational goals and pursuing financial benefits. People turn to complex technologies for the promises of convenience, efficiency, security, and certainty they offer. At the same time, there is a concern that relying on such technologies might compromise essential aspects of a fulfilling human life. However, identifying precisely what we might be losing is becoming increasingly difficult. The issues at stake are not merely technical but are deeply intertwined with the ethics of how student information is used and potentially exploited.

Handling student data by educational technology platforms brings significant ethical dilemmas about consent and protecting children's privacy to the forefront. Pasquale's (2019) insights highlight the concerns about whether students and parents are adequately informed about how student data is used and whether they have genuinely consented to these uses. Protecting children's privacy must be paramount, requiring stringent measures to ensure that data use aligns with ethical standards and respects the rights of students as minors. This involves securing the data from unauthorized access and transparently communicating its use to students and their families. This ensures that educational technology is committed to enhancing education without compromising privacy and ethics. By addressing these concerns systematically, partners in the educational technology sector can work toward solutions that respect student privacy and data integrity, ensuring that technological advancements serve educational purposes without sacrificing ethical standards.

2.4.2. Commercialization and Corporate Influence

The increasing commercialization of educational technology has sparked a significant debate within academic circles (Reich, 2020; Selwyn, 2022). As corporations exert more influence over the tools and platforms used in educational settings, concerns about prioritizing business interests over genuine educational goals have become more pronounced. This trend raises critical questions

about the integrity of educational content and the objectives driving its delivery. As noted by Watters (2017), there is a significant risk that educational imperatives are becoming subservient to profit-making activities, suggesting a shift toward a marketplace-driven model in education that may not necessarily align with public, ethical, or equity-oriented priorities.

The growing presence of corporate actors in K–12 education, particularly through instructional technology platforms, can reshape educational priorities, governance structures, and classroom practices, thereby normalizing market logics within public schooling (Stockman & Nottingham, 2022). These shifts may occur incrementally and with limited transparency, allowing commercial interests to influence educational decision making without explicit public deliberation. Companies that develop educational technologies often do so primarily for profit, which can lead to a focus on marketability rather than educational efficacy. Commercial influence can skew educational priorities, leading to the adoption of technologies that prioritize profitability over pedagogical outcomes (Hogan et al., 2016). This market-driven approach risks undermining the pedagogical integrity of educational institutions, making technology a driver of education rather than merely a supportive tool that improves academic outcomes or accelerates learning for historically underserved students in secondary schools (Selwyn et al., 2017).

The commercial interests of tech companies can also impact curriculum design, influencing what is taught, how it is taught, and ultimately how it is assessed—especially as there is increasing use of AI-enhanced self-guided tutoring platforms (Buolamwini, 2023). There is a concern that curricula may be tailored to better serve the technologies being promoted rather than to meet the educational needs of students (Ball, 2022; Reich, 2020; Watters, 2017; Williamson, 2017). This can particularly affect education equity, as not all students may benefit equally from these technologies. For example, students in lower socioeconomic settings might not have access to the latest technologies pushed by these companies, thereby widening the educational divide (An & Fuentes, 2023). This highlights the need for educational leaders to critically assess the implications of new technologies and ensure that they are used to genuinely enhance learning outcomes for all students.

To address these challenges, educational leaders must develop strategies prioritizing educational goals over commercial interests. This involves rigorous evaluation of educational technologies before integrating them into the curriculum, ensuring they offer substantial pedagogical benefits (Reich, 2020; Selwyn, 2019a). Leaders must require vendors to provide evidence-based information about how their products may affect instructional practice, student learning outcomes, data use, and equity across student groups. Additionally, fostering partnerships with companies that align with the educational institution's mission and values can help mitigate the risks associated with commercial influence.

In summary, although the commercialization of educational technology offers potential benefits, such as increased access to new learning tools and potentially more progressive pedagogical approaches, it poses significant risks. Educational leaders must ensure these technologies' deployment within schools prioritizes educational ethics and equity over corporate profit. By

maintaining a critical stance, like that articulated in the ACL framework, and advocating for technology that aligns with pedagogical priorities, leaders can help ensure that educational technology is a tool for enhancing learning rather than compromising it. Educational technology leadership must navigate these waters with a keen eye on balancing leveraging new technologies and protecting leaders' vision rooted in equity and social justice.

2.5 Disrupted Disruption and Unfulfilled Promises

The promise of contemporary technology as a transformative force in education, like its predecessors described earlier in this literature review, has been championed by theorists like Clayton Christensen (2011) and supported by various educational technology vendors who advocate for "disruptive" changes to all elements of schooling, including pedagogical practice, access to content, and assessment and data practices. However, a significant body of scholarly work presents a critical counter-narrative to these optimistic claims. Researchers (Blikstein, 2013; Ravitch, 2013; Reich, 2020; Selwyn, 2010; Watters, 2017) have explored the reality behind the purported benefits of educational technology and other reform initiatives like charter schools, which are often driven by private interests and profit motive. These scholars provide a comprehensive critique, highlighting the frequent gap between the transformative potential ascribed to educational technology and its actual impact on educational practices and outcomes. Whether it is the profit motive, data privacy concerns, or unfulfilled promises of the platforms themselves to create impactful educational experiences for students, critical educational technology scholars are clear that leaders and teachers must drive procurement decisions based on values rooted in equity and pedagogical best practices.

"Disruptive innovation" in education suggests that technological advancements can fundamentally change how education is delivered, making it more efficient and aligned with the modern world's needs. Proponents like Christensen et al. (2011) have argued that technology can overhaul outdated schooling models, making content more accessible and tailored to individual needs, given the rapid pace of tools' ability to assess students and provide remediation or new content. However, critics rightfully argue that this perspective often overlooks the intrinsic value of traditional educational models and the importance of teacher–student interactions that technology cannot replicate (Cuban, 2001; Reich, 2020). Moreover, they point out that the evidence supporting the effectiveness of such disruptions in genuinely improving educational outcomes is mixed at best (Selwyn, 2022).

A significant concern involves the motivations behind the push for educational technology and charter schools (Ravitch, 2013; Watters, 2017). Private interests, rather than genuine educational concerns, often drive these initiatives. These interests are primarily concerned with opening up the education sector to market forces, which can prioritize profitability over pedagogical effectiveness (Labaree, 2007). The risk is that technology-driven reforms become more about financial gain for technology companies and private investors than improving student outcomes.

The educational technology ecosystem involves various actors, including vendors, policymakers, educators, and investors, each with their agendas. Understanding these varied interests is necessary

to fully grasp the implications of technology-driven educational reforms (Reich, 2020; Selwyn, 2016; U.S. Department of Education, 2023). For instance, although technology companies may push to adopt their products under the guise of innovation, district leaders may resist such changes if they feel these tools do not contribute positively to the educational outcomes they seek or undermine their professional autonomy (Thomas et al., 2013).

Although using technology to "disrupt" traditional education models is appealing, it is crucial to critically assess these claims and consider the broader implications of such reforms. Educational leaders must ensure that ethical and equity-oriented priorities, as well as sound pedagogical principles, drive technology adoption and that it genuinely enhances learning outcomes. These system leaders must also be wary of the influence of private interests that may not always align with the goals of public education (Ravitch, 2013). By fostering a critical and informed approach to educational technology, leaders can better navigate the complexities of this dynamic landscape and work toward genuine improvements in education that benefit all students.

2.6 The Digital Access and Design Divides

The Digital Divide, or the gap between individuals, households, and communities who have access to modern information and communication technologies (such as computers and the internet) and those who do not, leads to disparities in opportunities, knowledge, and economic advancement, and remains a critical issue in educational technology. This issue challenges educators and policymakers to find practical solutions to ensure equitable access to technology. The divide is not merely about access to technology but also involves the utilization and application of technology in educational settings (Hargittai, 2018) and, of course, in the broader society across the globe (Castells, 2024). The U.S. Department of Education (2024) has identified three main aspects of the Digital Divide: the Digital Use Divide, the Digital Design Divide, and the Digital Access Divide. These components underscore the multifaceted nature of the divide, encompassing issues of access, application, and the ability to integrate technology into teaching and learning processes effectively.

The Digital Use Divide concerns disparities in how students engage with technology for learning. This divide goes beyond having the necessary hardware and software; it involves how effectively technology enhances education (Reich, 2020). Different levels of engagement and access among student groups can lead to varying educational outcomes, with students in underserved communities often experiencing lesser benefits. Addressing this divide requires not only the provision of devices but also ensuring that all students have the support and resources to use technology to enhance their learning (U.S. Department of Education, 2024). This mirrors the well-documented limitations of superficial approaches to professional learning, activities that focus on surface-level content or compliance rather than fostering deep, reflective, and sustained learning that leads to meaningful changes to practice (Darling-Hammond et al., 2025a; Didion, 2024; Harvard et al., 2018). These researchers have similarly shown that approaches must be rooted in practicality, relevance, and ongoing support.

The Digital Design Divide deals with the gap in educators' abilities to create tech-enabled learning experiences, which depends significantly on their access to tools, training, and ongoing support (U.S. Department of Education, 2024). This divide underscores the importance of professional development and resource allocation to ensure that all educators can effectively incorporate technology into their teaching (Digital Promise, 2024; ISTE, 2021). Without adequate training and support for educators, there is a risk that technology integration becomes superficial, failing to improve educational outcomes and possibly widening the gap between more and less-equipped teachers and schools (U.S. Department of Education, 2024).

The Digital Access Divide focuses on the fundamental issue of equitable access to technology, which includes reliable internet connectivity, modern devices, quality digital content, and considerations of digital well-being. This foundational divide directly impacts technology use and design (Hargittai, 2018). Ensuring every student and educator has access to the necessary technological tools is a primary step toward closing the Digital Divide. This access must be consistently supported by policies that recognize and address the varying needs across different regions and communities (U.S. Department of Education, 2024).

With the advent of GAI tools in education, there is a potential risk of exacerbating the existing digital divides. The introduction of advanced AI tools in educational settings must be managed carefully to avoid deepening the disparities in technology access and usage (Deonandan, 2023). The deployment of AI in education should be accompanied by measures that ensure all students and educators can benefit from these innovations rather than creating further barriers to educational equity (U.S. Department of Education, 2023). For example, AI tools should be designed and deployed with accessibility in mind, ensuring they accommodate students with disabilities and those from diverse linguistic and cultural backgrounds. Features like text-to-speech, adaptive learning, and multilingual support can help make AI tools more inclusive. In addition, we must ensure all students, especially those from underserved communities, have access to the devices, internet, and infrastructure required to benefit from AI-powered educational tools. This can be achieved through government programs, school partnerships, and community initiatives that provide subsidized technology and internet access to low-income families.

Educational technology leadership is crucial in addressing and bridging these divides (Selwyn, 2019b). Effective leadership involves advocating for and implementing policies that ensure equitable student access to technology, supporting robust professional development for educators, and overseeing the thoughtful integration of emerging technologies like AI. By focusing on these areas, educational leaders can help ensure that technology is a powerful tool for enhancing learning and does not become a source of greater inequality. This proactive approach is essential for leveraging technology to support educational equity and inclusivity across all levels of the educational ecosystem.

2.7 Evaluating Leadership Paradigms in Educational Technology

The first domain in this literature review concerned the organizational constraints and opportunities that schools and districts present for educational technology implementation. An inquiry into the critical analyses of educational technology itself followed. This third section will conclude by examining key themes in the educational leadership literature that are particularly relevant to the implementation of educational technology. The analysis will conclude with a review of critical gaps in the scholarship that future scholarship should address. Education system leaders play a crucial role in bridging the gap between the promises of educational technology and its practical realities, ensuring it is seamlessly integrated into the educational process. They must understand the potential and pitfalls of educational technology, developing strategies that promote technical adoption and pedagogical innovation aligned with equity and social justice. Through a dialogical approach (Bakhtin, 1981), I interrogate the following themes I have identified in the leadership literature:

- Positivism and Educational Technology Leadership
- Neoliberalism in Leadership Practice
- Scaling up change via capacity building and leveraging "drivers" of educational change
- Tempered Radicals and Culturally Responsive technology leadership for equity
- Critical School Leadership Research

Each of these themes has been chosen to address both discrete leadership practices relevant to educational technology and the effective stewardship of school reform. Despite much research about edtech leadership, the amount of critical scholarship on such leadership is limited. This literature review is intended to investigate those limitations.

2.7.1. Positivism and Educational Technology Leadership

Much of the research and guidance for practitioners in educational technology leadership reflects a largely positivist approach, one that tends to favor technical, measurable outcomes while remaining insufficiently critical or theoretically grounded (Watters, 2021). Here, positivism is understood as an approach that reduces complex social phenomena to observable and quantifiable variables, often assuming a single, objective truth and, in doing so, obscuring the power dynamics, contextual factors, and inequities that shape educational leadership practice. Much traditional social science research on social phenomena, particularly educational leadership, has used this approach to understand reality (Evans, 2022). With the emergence of critical theory over the past several decades, a more nuanced understanding of social phenomena has been developed. However, these more complex and vital understandings have not been as frequently applied when interpreting and making sense of educational technology. One professional organization for leaders in the edtech field is the International Society for Technology in Education (ISTE). The Society promotes a positivist perspective on the use of ed tech. For example, ISTE has a set of standards for educational leaders with themes such as:

1. Equity and Citizenship: Leaders use technology to increase equity, inclusion, and digital citizenship practices;
2. Visionary Planner: Leaders engage others in establishing a vision . . .for transforming learning with technology;
3. Empowering Leader: Leaders create a culture where teachers and learners are empowered to use technology in innovative ways to enrich teaching and learning;
4. Systems Designer: Leaders build teams to implement, sustain, and continually improve the use of technology to support learning;
5. Connected Learner: Leaders model and promote continuous professional learning for themselves and others. (ISTE, 2021, p. 7)

As evidenced by the descriptions of the standards, the language implies that technology is a neutral actor that simply needs to be leveraged with a strategic and inclusive vision for ongoing improvement and equity. This theme is common in how educational technology leadership initiatives are described (Heath, Krutka, & Staudt Willet, 2024; Jones & Kennedy, 2023). In the realm of educational technology leadership, there is a tendency to see technology as a benign set of tools that are unaffected by the complex factors influencing all human activity, such as power, control, racism, or other forms of bias.

This positivist orientation has aligned with the popularization of results-oriented accountability that began in earnest in the early 1990s (Cuban, 1988; Hallinger & Heck, 1996). This managerial-oriented literature carved an excellent path into which a benign and positivist set of educational technology tools could neatly fit, and they have reinforced one another ever since. With both of these sets of literature, more attention needs to be paid to critical appraisals of the role of race and power and how they play out in the leadership of these evolving tools. This study seeks to contribute to the literature on educational technology and the administration of these ever-evolving tools to guide leaders toward strategies that support equitable outcomes and encourage researchers to inquire further into this critical element of the educational environment.

2.7.2. Neoliberalism in Leadership Practice

Aligned with the positivist orientation of much of the guidance and research on educational technology leadership, Neoliberalism is also significant in contemporary leadership research and practice. In this context, Neoliberalism refers to a leadership approach that aligns with the norms and practices of free-market capitalism and a deregulated state role in providing public entitlements like education (Giroux, 2018). Although this form of leadership has long-standing roots in U.S. schools, it became the predominant guidance on effective leadership in the 1990s (Anderson & Cohen, 2018). By the end of the 1990s, the managerial, data- and results-oriented approaches described above became educational leaders' primary "best practice" (Trujillo, 2014). This approach to effective leadership practice has persisted since then and into the present. Although the standards and metrics for accountability have evolved, the same basic premise underlies effective leadership practice today. This conception of leadership is especially important for edtech governance because it fits neatly with edtech platforms' ability to gather data from students

(presumably to support the development of their understandings) and then prescribe the next topic or intervention. Neoliberal approaches to leadership have always fallen short of adequately considering the sociopolitical context of schools (Anderson & Cohen, 2018). They reduce leadership to a series of calculated (literally) moves, and, if done in the appropriate sequence and informed by data, leaders would be successful at producing efficiencies and ending inequities (Fuller, 2022). The current inefficiencies and inequalities in schools are evidence that these superficial approaches to complex problems are inadequate and will certainly prompt effective, equity-driven edtech leadership as well.

2.7.3. Scaling Up Change Via Capacity Building and Leveraging "Drivers"

Alongside and often used to inform the positivist, managerial, and neoliberal strains of the literature of the last 3 decades is the foundational systems change scholarship of Elmore (2011) and Fullan (2016). These two theorists' scholarship on leadership and educational change has sought to describe the critical leverage points that schools and districts can use to improve practice and performance most effectively. Although Elmore's (2004) emphasis on the need for greater accountability in education is similar to the Neoliberalism described previously, his focus on accountability is not merely for measurement but as a tool for continuous improvement in educational systems. Furthermore, he has argued that education accountability should focus on student learning outcomes, not greater efficiencies or other potential outcomes (Elmore, 1996). In contrast to Elmore's focus on accountability, Fullan emphasized the human side of change, stressing the importance of capacity building and nurturing collaborative cultures (Fullan, 2016) in schools and districts. Although Fullan acknowledges the role of accountability championed by Elmore, his focus tends to be more on capacity building and fostering a positive culture of change rather than using accountability as a primary driver of improvement (Fullan, 2023).

Fullan and Elmore have contributed valuable perspectives to our understanding of educational change and improvement. Their overlapping emphasis on instructional quality and taking a systems approach to leadership challenges has done much to inform contemporary leadership practice. Although Fullan has continued to apply his theories of educational change to educational technology and AI as they have evolved, his scholarship has provided limited guidance for system leaders, as he focuses primarily on school leaders (Fullan, 2016, 2023). In addition, educational technology is simultaneously similar to and quite different from traditional educational reforms. It is similar because it is intended to improve outcomes and is mainly mediated by teachers in school contexts. The fundamental difference with ed tech, and AI in particular, with its emphasis on personalized interactive chatbots and tutors, is that the locus of change is not a pedagogical strategy or approach implemented by teachers but rather a tool or ecosystem of tools over which students have agency and direct interaction sometimes outside of the guidance or even knowledge of the teacher, and in some cases, and increasingly with AI tools, even supplant the traditional roles of teachers, if not altogether. Educational technology leadership is, therefore, a more complex enterprise than conventional educational change. The very nature of the "technical core" of teaching and learning, as described by Elmore (1996), is being transformed by educational technology. We need new ways of understanding and leading educational enterprises, increasingly

facing existential threats to how they are organized. In addition, leaders need an understanding of the merits and limitations of the technology related to everything from bias and misinformation to what is behind the algorithms that guide and inform students' learning.

2.7.4. Tempered Radical Technology Leadership for Equity

Although educational technology and AI are prompting new leadership imperatives and arrangements in schools, the ways education system leaders advance an equity agenda and navigate and lead are always constrained by policy, politics, and people (Meyerson & Scully, 1995). This has been called tempered radicalism (Kirton et al., 2007; Meyerson & Scully, 1995; Shah et al., 2023). The term describes leaders' efforts to pursue substantive, equity-oriented reform within their organizations while doing so strategically and incrementally to preserve their institutional credibility, political viability, and continued employment (Shah et al., 2023). This approach is particularly important for leaders with an equity or social justice orientation in the era of rapid deployment and implementation of educational technology and AI tools. Tempered educational technology leaders for equity work as both insiders and outsiders in their organizations, and this frequently places them in tenuous positions, advocating for more equitable practices or uses of resources while also toeing the line of the status quo in their respective organizations (Meyerson & Scully, 1995).

This literature on tempered radicalism in educational leadership is critical to understanding how leaders work to leverage or ask questions about the impact of technology tools and platforms on historically underserved groups of students. System leaders, in collaboration with or in opposition to their governing school board, are often the final decision makers regarding procuring such tools and ultimately marshaling the resources to support the successful implementation of the platforms. As Shah et al. (2023) noted, more studies on this concept in K–12 school district leadership must be done. Moreover, this literature review found no application of this theory to educational technology leadership. System leaders must understand how to articulate and sustain a vision of equity while applying a critical lens to educational technology, particularly in collaboration with district governance teams operating within increasingly politicized and contentious school board contexts (Rogers et al., 2022).

2.7.5. Critical School Leadership Research

As indicated previously, there is a decidedly positivist bent to research on educational leadership (Courtney et al., 2021) and, even more so, to research on the impact of educational technology (Heath, Gleason, et al., 2024; Young & Lopez, 2005). However, over the last 3 decades, a growing body of critical research on educational leadership has flourished, and there are now theoretical frameworks like the ACL framework (Santamaría & Santamaría, 2013) described previously. However, this concern is one of many with how power, race, and politics play out in schools and school districts. For example, Horsford et al. (2011) have used culturally relevant pedagogy to understand how leaders become race-conscious and how racialized inequality plays out in schools. Meanwhile, traditional researchers and practitioner–researchers have done empirical and

theoretical research into social justice leadership. This literature combines social justice theory, CRT, and sociocultural learning theory with issues related to leaders' identity formation to make sense of how educational leaders can advance equity for historically underserved student populations (Khalifa et al., 2016).

This research is most comprehensively articulated by the Culturally Responsive Leadership (CRL) framework advanced by Khalifa (2018). The critical leadership behaviors found in the ethnographic inquiry of this study found that leaders were "critically self-reflective; develop and sustain culturally responsive teachers and curricula; promote inclusive, antioppressive school contexts; and engage students' indigenous (or local neighborhood) community contexts" (Khalifa, 2018, p. 13). This practitioner-oriented social justice leadership research is broadly informative of antiracist, equity-oriented leadership practices that leaders who have worked as tempered radicals possess to promote more equitable school outcomes. Although Khalifa's CRL framework emphasizes responsiveness to students' cultural backgrounds, the ACL framework would encourage a broader intersectional approach. This means not only considering race and culture but also critically examining how other factors like gender, socioeconomic status, and disability intersect and impact students' experiences. CRL must address these overlapping identities more explicitly to create a transformative leadership practice. In addition, the ACL applies a more comprehensive intersectional systems lens (Santamaría & Santamaría, 2013) that is crucial in the complex dynamics of educational technology adoption and implementation.

2.8 Areas for Further Inquiry

The literature on educational technology leadership is broad and complex. It has evolved from a primarily managerial and positivist orientation during the first two thirds of the 20th century to a more complex and critical orientation as critical theory has simultaneously evolved over the last 60 years. Although critically oriented scholarship has grown in quantity and influence, managerial and positivist research continues to dominate educational practitioners' most popular understandings of leadership (Anderson & Cohen, 2018). In addition, research on culturally responsive and race-conscious leadership needs to engage with educational technology. Across multiple epistemological traditions, educational leadership scholarship has tended to treat technology as one variable among many within broader reform efforts rather than as a structurally transformative force requiring distinct governance frameworks (Elmore, 2004; Fullan, 2016; Leithwood & Jantzi, 2005). Much of the leadership literature situates digital tools within discussions of instructional improvement, professional learning, or systems coherence, without theorizing their unique implications for data governance, algorithmic decision making, or platform-based power dynamics (City et al., 2009; Elmore, 2004). Even scholars who anticipate substantial disruption from artificial intelligence position these tools within existing change architectures rather than as fundamentally reconfiguring educational authority or institutional control (Fullan, 2023). As a result, leadership theory has often emphasized capacity building and coherence while devoting comparatively less attention to the political economy and ethical governance challenges specific to AI-enabled platforms.

Moreover, the research on the implications of AI for educational leadership is relatively scant (Fullan, 2023; Hejres, 2022; Richardson et al., 2025; N. Wang et al., 2024). This new set of tools and conditions is unlike any we have seen. The implications for learning in general and for those students whom our schools have historically underserved are likely to be among the most significant in the history of K–12 public education. Educators and researchers require more robust conceptual heuristics to guide leaders in interpreting rapidly evolving technological conditions and organizing their systems in alignment with equity-centered values, particularly as they operate as tempered advocates within politically constrained environments (Santamaría & Santamaría, 2016b; Shah et al., 2023). As the pace of technological change accelerates, leadership scholarship underscores the importance of coherence-building and adaptive capacity to ensure that innovation aligns with instructional purpose rather than market momentum (Fullan, 2023; Honig & Rainey, 2023).

From a critical perspective, the intersection of instructional technology, equity, and leadership requires that leaders navigate complex challenges to ensure technology integration enhances educational fairness and effectiveness. Leadership in educational technology requires a careful balancing act: adopting and implementing technologies that address rather than increase disparities and ensuring that these tools are used to genuinely enhance learning and teaching. Leaders must critically evaluate technologies for their functional capabilities and broader social and ethical impacts on students and learning environments (Lynch, 2019; Selwyn, 2016).

2.9 Conclusion

The literature summarized here shaped my understanding of the challenges and opportunities that educational technology and GAI present for promoting equity in educational system leadership. Three main themes emerged as particularly influential: the systemic role of leaders in addressing inequities, the complexities of implementing educational technology in diverse school contexts, and the critical examination of technology's impact on equity. First, the literature underscores how school leaders often navigate complex structural barriers that can perpetuate inequities, especially when introducing new educational initiatives. Insights from research on leadership practices and the limitations of traditional, positivist approaches have informed my focus on how leaders make decisions that either challenge or reinforce systemic inequities. This awareness has directly influenced my research questions, which center on how equity frames decision-making around technology investments. Second, the research emphasizes distinguishing between adaptive and technical changes when integrating technology in schools (Heifetz et al., 2009). This concept has been extended by others who have highlighted that successful implementation of school reforms requires a deep understanding of organizational culture (Fullan, 2023) and technical aspects of new approaches to teaching and learning (Elmore, 2004). This understanding guided the design of my study, focusing on the leadership strategies that facilitate or hinder effective technology use within the constraints of complex secondary school systems. Finally, the critical perspectives in the literature on educational technology, including issues like the digital divide, data privacy, and the role of technology in reinforcing or mitigating existing inequities, have influenced my methodological choices. Using a hybrid framework combining ACL (Santamaría & Santamaría,

2013) and educational systems change theory (Elmore, 2004; Fullan, 2016) allows for an examination of the broader societal impacts of technology adoption and how leaders navigate these complexities to promote equitable outcomes. It is clear from this literature review that leadership mindsets and practices that critically engage with technology's potential to either reproduce or dismantle inequities are needed. This focus drives the study's design and methods, aiming to explore how leaders can strategically leverage technology, including GAI, to bridge gaps in student performance and ensure that digital tools equitably serve all students' needs.

Chapter 3

Methodology

3.1 Research Design and Methods

As indicated previously, this investigation employed a qualitative approach (Creswell & Poth, 2018; Small, 2009; Yin, 2018) of 12 district cases in the San Francisco Bay Area, California, school districts that oversee secondary schools, conducted in spring, summer, and fall 2025. The goal of this study was to address three research questions:

- *What are the primary factors that influence leaders' decision-making process when procuring and implementing new educational technology?*

- *How do leaders evaluate the potential opportunities and challenges of educational technologies, including tools like Generative AI?*

- *As they consider new technology platforms, how are the needs of various student populations (e.g., Multilingual Learners, students with disabilities, socioeconomically disadvantaged students) taken into account during the evaluation and implementation process?*

3.1.1. Research Design

This study employs a qualitative multi-case study design to examine how secondary school district leaders navigate the procurement, implementation, and evaluation of educational technology and generative artificial intelligence (GAI) within complex, compliance-driven organizational systems. A qualitative approach is appropriate given the study's focus on how leaders interpret and enact decisions within environments shaped by competing pressures related to equity, risk management, and innovation (Merriam & Tisdell, 2016). Rather than measuring outcomes, this design prioritizes understanding leadership sensemaking and practice as situated within broader organizational and sociotechnical conditions.

The study is structured as a multi-case design, with each district leader representing a bounded case embedded within a specific district context (Yin, 2018). This approach enables both within-case and cross-case analysis, allowing for the identification of patterns in how leaders navigate common structural conditions, such as fragmented governance, vendor influence, and limited capacity, while also examining variation across district contexts. Consistent with the study's focus on systemic coherence, the multi-case design supports analysis of how organizational conditions shape leaders' ability to move beyond incremental or "tinkering" approaches toward more aligned and equity-centered practices.

Guided by a hybrid theoretical framework of applied critical leadership (ACL) and educational systems change theory, the study conceptualizes leadership as both values-driven and structurally mediated. ACL foregrounds how leaders' critical consciousness informs their commitments to addressing inequities rooted in race, access, and power (Santamaría & Santamaría, 2015), while systems change theory emphasizes the importance of coherence, capacity, and the distinction between technical and adaptive change in shaping organizational transformation (Elmore, 2004; Fullan, 2016). These frameworks, in combination with the analytic tension between technological determinism and pedagogical innovation, inform the study's design and guide interpretation of how leaders' equity commitments are translated, or constrained, in practice.

Data sources include semi-structured interviews with district leaders and analysis of organizational artifacts such as procurement records, board agendas, and technology planning documents. This combination supports methodological triangulation and allows for analysis of both leaders' stated intentions and the structural routines through which decisions are enacted (Creswell & Poth, 2018). Interviews provide insight into how leaders make sense of emerging technologies, including AI, while document analysis reveals how those decisions are operationalized within compliance-oriented systems.

Overall, this qualitative approach, centered on both interviews and edtech invest analysis, is particularly practical for investigating how leaders' perspectives on equity influence their practices in real-world settings, providing rich, qualitative data that can illuminate the power dynamics and social justice considerations that shape leadership actions. Moreover, the research design enables the study to examine educational technology leadership as a form of "tempered agency," in which

leaders operate as "outsiders within" systems that both enable and constrain action. By integrating multiple cases and data sources, the study is designed to surface patterns of fragmentation, access-oriented equity framing, and emerging efforts toward coherence, providing a foundation for theorizing how district leaders might move from compliance-driven decision-making toward more intentional, equity-centered system design.

3.1.2. Research Sites

This study was conducted across multiple secondary school districts in the San Francisco Bay Area. The selected districts varied in size, governance structures, and student demographics, including differences in socioeconomic status, racial composition, and organizational capacity. These variations provided a comparative context for examining how district leaders navigate educational technology and GAI adoption under differing structural conditions.

District selection was guided by purposeful sampling to capture variation in levels of technological adoption, leadership structures, and resource availability (Patton, 2002). This approach enabled the study to explore how contextual factors shape leadership decision-making related to educational technology and equity.

3.1.3. Participants

The study included 12 district-level leaders responsible for educational technology, curriculum, and/or instructional innovation across participating districts. Participants held roles such as chief academic officer, director of educational technology, assistant superintendent, and chief technology officer. All participants were directly involved in decisions related to the procurement, implementation, or evaluation of educational technology and GAI tools.

A purposeful sampling strategy was used to select participants with direct responsibility for district-level technology leadership (Patton, 2002). The sample included leaders from districts with varying levels of organizational capacity, resource availability, and student demographics, enabling analysis of how contextual conditions influence leadership practices. Table 3.1 provides an overview of participant roles, years of experience, and district characteristics. As shown in Table 3.1, participants spanned a range of leadership roles and district contexts, enabling cross-case comparison of decision-making processes and equity orientations.

Table 3.1 *District and Leader Profiles*

Characteristic	Detail	*n*	Years in K–12	Central Office years
Professional role	Assistant/associate superintendent	4	16–20+	5–15
	Director (IT/curriculum)	6	11–20+	< 5–15
	Coordinator/manager	2	16–20+	< 5
Gender	Female	8	—	—
	Male	4	—	—
Race/ethnicity	White	7	—	—
	Asian	3	—	—
	Latina	1	—	—
	Decline to state	1	—	—
District context	Urban	4	—	—
	Suburban	6	—	—
	Mixed	2	—	—
Adoption culture	Early adopters	4	—	—
	Moderate adopters	6	—	—
	Late adopters	2	—	—

3.2 Data Collection

Data for this study were collected through semi-structured interviews and document analysis, allowing for triangulation between leaders' reported practices and the organizational routines through which those practices were enacted (Creswell & Poth, 2018).

3.2.1. **Interviews**

Twelve semi-structured interviews were conducted with district-level leaders responsible for educational technology across TK–12 unified and high school–only districts in the San Francisco Bay Area. Participants were selected using a stratified, purposeful sampling approach to ensure variation across district size, student demographics (e.g., socioeconomic status and racial/ethnic diversity), and governance structures related to technology decision-making (Cohen & Crabtree, 2006; Patton, 2002).

Each interview lasted approximately 60 minutes and was conducted via Zoom. With participants' consent, interviews were audio-recorded and transcribed to support systematic analysis. The use of a virtual platform enabled flexibility in scheduling and ensured participation across geographically distributed districts.

The semi-structured interview protocol provided a consistent set of guiding questions while allowing for probing and follow-up based on participants' responses (DiCicco-Bloom & Crabtree, 2006). Questions were designed to elicit how district leaders make decisions about the

procurement, implementation, and evaluation of educational technology and GAI, with particular attention to issues of equity, governance, and instructional impact. Specifically, participants were asked to describe their decision-making processes, how equity considerations were incorporated into those decisions, who held authority within procurement and implementation structures, and how they navigated both technical and adaptive challenges related to technology integration.

The interview design was informed by the study's conceptual frameworks, including ACL and educational systems change theory. Questions prompted participants to reflect on how they addressed social justice concerns, navigated organizational power dynamics, and balanced competing demands related to compliance, innovation, and instructional priorities. The semi-structured format allowed participants to articulate their experiences in their own words while enabling the researcher to probe more deeply into areas such as equity framing, leadership agency, and system-level constraints (Bogdan & Biklen, 2007; Seidman, 2006).

3.2.2. Document Analysis

In addition to interviews, district documents were collected and analyzed to examine how decision-making processes were formalized and enacted within organizational systems. These documents included procurement records, board agendas, consent calendars, and technology planning materials. Document analysis provided insight into the structural and procedural dimensions of educational technology adoption, including patterns of investment, governance routines, and the role of compliance mechanisms such as data privacy agreements.

These materials were used to triangulate interview data by comparing leaders' descriptions of decision-making processes with documented evidence of procurement and implementation practices. This approach allowed for a more comprehensive understanding of how equity considerations, instructional priorities, and organizational constraints were reflected—or absent—in formal district actions.

3.2.3. Procedures

Data collection followed a consistent set of procedures. Participants were recruited via email outreach and provided informed consent prior to participation. Interviews were scheduled at times convenient for participants and conducted in a private virtual setting to ensure confidentiality. Recordings were securely stored and transcribed for analysis.

Document collection occurred concurrently with interviews and included publicly available materials as well as documents referenced by participants during interviews. All data were organized and prepared for coding using qualitative analysis software, enabling systematic comparison across cases. In summary, data collection took place during the summer and fall of 2025 and included the following steps:

1. A short screening survey identified eligible leaders and contextual variables.

2. Structured, video-recorded interviews (60–90 min) with the 12 leaders probed decision making, equity frames, and adaptive-technical moves.
3. Concurrent document gathering secured board agendas, strategic plans, publicly available accountability reports, and vendor contracts (FY 2022-25).
4. A systematic artifact inventory of each district's licensed platforms, license scope, usage analytics, and privacy terms, triangulating leaders' narratives with objective investment patterns.

3.3 Data Analysis

Data analysis was conducted using an iterative, multi-stage qualitative approach designed to examine patterns within and across cases while remaining grounded in the study's conceptual frameworks. Interview transcripts and collected documents were imported into MaxQDA qualitative analysis software to support systematic coding, memoing, and data organization. The analysis proceeded through four interconnected phases.

First, coding was conducted using a hybrid deductive–inductive approach. An initial set of a priori codes was derived from ACL (e.g., equity framing, identity, power dynamics) and educational systems change theory (e.g., adaptive vs. technical challenges, coherence, capacity). These codes provided an initial analytic structure aligned with the study's theoretical framing. Concurrently, open coding was employed to allow additional themes to emerge directly from participants' accounts and the document data (Miles et al., 2014). Through this iterative process, codes were refined, collapsed, and organized hierarchically into broader categories and themes aligned with the research questions. For example, codes related to compliance requirements, data privacy concerns, and risk aversion were grouped under a broader theme of compliance-driven decision-making, while codes such as teacher-driven adoption and pilot-based diffusion informed the theme of reactive and decentralized procurement.

Second, within-case analysis was conducted to develop detailed case-level understandings. Analytic memos were used to trace relationships between leaders' beliefs, decision-making processes, and observed patterns of technology investment and implementation within each district. This stage enabled the identification of how leadership practices were shaped by contextual factors such as governance structures, resource constraints, and organizational priorities.

Third, cross-case analysis was conducted to identify patterns and variation across districts. Pattern matching and thematic comparison were used to examine similarities and differences in how leaders navigated educational technology and AI adoption across varying district contexts (Yin, 2018). This process enabled the identification of recurring patterns, including fragmented governance structures, access-oriented equity framing, and emerging efforts toward coherence. District characteristics, including geographic classification (urban, suburban, and mixed) and levels of socioeconomic disadvantage, were used as contextual lenses to interpret variation across cases (Miller et al., 2019; National Center for Education Statistics, 2022).

Fourth, analytic refinement and validation were conducted through iterative review. Data displays, matrices, and analytic memos were used to examine relationships among themes and to test emerging interpretations against the data. Rival explanations were considered and assessed to strengthen the credibility of findings. Where applicable, analytic decisions were reviewed in consultation with peers to ensure consistency in coding and interpretation.

Document analysis was integrated throughout these phases to triangulate interview findings. Publicly available materials, including board agendas, procurement records, contracts, and accountability plans, were analyzed to examine how leaders' reported decision-making processes were reflected in formal district actions (Bowen, 2009). This allowed for comparison between leaders' stated intentions and the structural routines through which educational technology decisions were enacted.

Overall, this analytic approach enabled the study to move from detailed, case-specific accounts toward broader thematic insights, while remaining attentive to the interplay between leadership agency and systemic constraints. By combining deductive and inductive strategies, the analysis was designed to surface patterns of fragmentation, compliance-driven decision-making, and emerging coherence, providing a foundation for interpreting how district leaders navigate the adoption of educational technology and GAI in relation to equity goals.

3.4 Positionality

The researcher's positionality is central to the methodological framing of this study. He is a mixed-race (Black, White, and Native American), cisgender male educator in his mid-50s who has worked in public education for more than three decades and currently serves as a system leader in a 9,000-student suburban high school district in the San Francisco Bay Area. His racialized identity and lived experience navigating predominantly white, bureaucratic educational institutions inform his understanding of how power, privilege, and structural inequity operate within district decision-making contexts. Grounded in ACL (Santamaría & Santamaría, 2013), he approaches educational technology governance not as a neutral managerial task but as a site where race, class, authority, and institutional norms intersect.

Professionally, he was an early adopter of instructional technology as a high school teacher in the mid-1990s, later worked in the nonprofit sector supporting school technology implementation, collaborated with district leaders to establish a regional "Innovation Zone" across 23 districts while serving at a county office of education, and now oversees district-level adoption of learning management systems and other digital platforms. These experiences provide both insider knowledge and critical distance, enabling analysis beyond surface-level descriptions of technology adoption. At the same time, consistent with critical race and social reproduction scholarship (Bourdieu & Passeron, 1977; Lareau, 2011), he brings a sustained skepticism regarding the assumption that technological innovation inherently advances equity. Schools have long functioned as sites of stratification, and technology reforms can either disrupt or reinforce these patterns. Accordingly, this study was conducted with a deliberate commitment to interrogating how leaders

may intentionally, or unintentionally, reproduce or challenge inequitable outcomes through educational technology governance.

3.5 Limitations and Delimitations of Study

This study is subject to several limitations inherent in qualitative, case-based research. First, the findings are based on a purposive sample of 12 district-level leaders from school districts in the San Francisco Bay Area, a region with distinct political, economic, and technological characteristics. As such, the findings are not intended to be statistically generalizable to all K–12 public school districts, particularly those in rural settings or regions with markedly different governance structures or resource constraints. Instead, the study aims for analytic generalization by identifying patterns and mechanisms that may be transferable to similar contexts (Yin, 2018). Additionally, the study relies primarily on self-reported data from interviews, which may be influenced by participants' positional perspectives, recall limitations, or social desirability bias. Although document analysis and artifact review were used to triangulate interview data, leaders' interpretations of equity, decision making, and impact may not fully capture the perspectives of teachers, students, or community members.

The study is further limited by its deliberate focus on district-level leadership rather than site-level administrators or classroom practitioners, aiming to examine system-level decision-making processes that influence educational technology procurement, implementation, and equity outcomes. Although this focus was intentional and aligned with the research questions, it necessarily restricts understanding of how district decisions are interpreted and enacted at the school or classroom level. Similarly, the study analyzed publicly documented technology investments and contracts rather than direct measures of classroom implementation fidelity or student learning outcomes. Therefore, conclusions about equity impacts are based on leaders' sensemaking and organizational patterns rather than causal claims about instructional effectiveness. The study's temporal scope, covering data collected during spring, summer, and fall of 2025, captures a specific moment of rapid technological change, particularly regarding GAI, and findings may evolve as district policies, tools, and norms continue to develop.

Finally, my positionality as a district-level educational leader constitutes both a strength and a limitation of the study. Professional experience in instructional technology leadership enabled informed probing, contextual interpretation, and alignment with theoretical frameworks; however, it also introduced the potential for bias in data interpretation. To mitigate this limitation, the study employed reflexive memoing, systematic coding procedures, triangulation across data sources, and peer debriefing during analysis. These strategies were used to enhance credibility, dependability, and confirmability, while acknowledging that qualitative inquiry is inherently interpretive. Despite these limitations, the study provides contextually grounded insights into the structural, adaptive, and equity-related challenges of educational technology leadership, offering contributions relevant to both scholarship and practice.

3.6 Research Methods Summary

In summary, this study employed a qualitative, multicase research design to examine how district-level leaders make decisions about educational technology and GAI in relation to equity. Drawing on semistructured interviews and document analysis, the study investigated leadership sensemaking, organizational conditions, and systems-level dynamics across 12 San Francisco Bay Area school districts serving secondary students. A stratified, purposeful sampling approach ensured representation across varied district contexts, while semi-structured interviews provided a consistent yet flexible method for eliciting leaders' perspectives on procurement, implementation, evaluation, and equity-oriented decision-making. Document analysis of publicly available board agendas, accountability plans, and contractual records complemented interview data by situating leaders' narratives within broader institutional investment patterns.

Data analysis followed an iterative, four-stage qualitative process. Interview transcripts and documents were coded using a combined deductive/inductive approach informed by ACL and educational systems change theory, allowing both theoretically grounded and emergent themes to be identified. Within-case analytic memos traced relationships between leaders' beliefs, organizational constraints, and resource allocation decisions, while cross-case synthesis and pattern matching were used to examine regularities and variations across districts. Data displays, logic modeling, and peer debriefing supported the examination of rival explanations and strengthened analytic rigor. Throughout the process, reflexive memoing and systematic coding practices were employed to enhance credibility and dependability.

Collectively, these methods enabled a contextually grounded analysis of how equity commitments are interpreted and enacted within educational technology leadership. By triangulating leaders' perspectives with documentary evidence and applying established qualitative analytic strategies, the study offers insight into the adaptive and technical challenges shaping technology adoption and implementation. This methodological approach supports the study's aim of contributing transferable knowledge to educational leadership practice and scholarship, particularly as districts navigate the evolving opportunities and risks associated with educational technology and GAI.

Chapter 4

Findings

This chapter presents the findings of this qualitative, multicase analysis examining how district-level leaders make decisions about educational technology and generative artificial intelligence (GAI) in relation to equity. Data were drawn from semistructured interviews with 12 district leaders (Seidman, 2006) and triangulated with document analysis of board agendas, accountability plans, and technology investment records (Bowen, 2009). Analysis followed an iterative, deductive–

inductive process consistent with qualitative multicase design (Creswell & Poth, 2018; Yin, 2018) and was theoretically informed by applied critical leadership (ACL; Santamaría & Santamaría, 2016) and educational systems change theory (Elmore, 2004; Fullan, 2023). An a priori coding framework centered on equity framing, power dynamics, and adaptive versus technical leadership was combined with open coding to capture emergent themes across cases (Miles et al., 2014; Saldaña, 2016). Within-case analytic memos documented relationships among leaders' beliefs, organizational structures, and resource allocation decisions, while cross-case synthesis and pattern matching were employed to identify recurring mechanisms and contextual variation (Miles et al., 2014; Yin, 2018). This analytic approach enabled the study to move beyond descriptive accounts toward explanatory insights into how leadership sensemaking and systemic constraints shape technology adoption and equity outcomes.

Findings are organized according to the study's three research questions and reflect the interaction between leaders' equity commitments and the structural conditions in which those commitments are enacted. Findings related to Research Question 1 reveal that technology procurement and implementation are shaped by an interconnected set of organizational and cognitive factors that operate in sequence. First, decentralized governance structures distribute decision-making authority across departments and sites, creating fragmented responsibility for technology adoption. Within these fragmented systems, leaders often engage in reactive decision making, responding to immediate needs, teacher requests, or vendor proposals rather than following a coherent strategy. This reactivity is further compounded by leadership turnover, which disrupts continuity and institutional memory, reinforcing short-term, inconsistent approaches. In this context of instability, vendor influence becomes more pronounced, as external actors help define problems and solutions in the absence of strong internal coherence. Underlying these dynamics is bounded rationality, as leaders make decisions under constraints of limited time, information, and capacity, resulting in procurement choices that prioritize feasibility and risk management over strategic alignment and equity outcomes. These themes illuminate how misalignment between values and institutional structures constrains leaders' ability to pursue coherent, equity-centered technology strategies.

Research Question 2 examines how leaders evaluate opportunities and challenges associated with educational technologies, including GAI, revealing patterns of cautious curiosity, compliance-driven evaluation, limited use of disaggregated impact data, and underinvestment in professional learning. Together, these findings highlight how legal safeguards and capacity constraints narrow decision criteria and limit instructional transformation.

Findings related to Research Question 3 reveal that how equity is conceptualized directly shapes how it is operationalized in technology adoption and implementation. Leaders most often framed equity as access—particularly through one-to-one device initiatives—which established a technical foundation for equity but also constrained subsequent decision making. Because equity was defined primarily in terms of provision, less attention was given to the adaptive dimensions of change, such as pedagogy, student engagement, agency, and learning outcomes. This access-oriented framing was reinforced by broader organizational conditions, including isolated accessibility initiatives,

inconsistent site-level leadership, and short-term funding structures, all of which limited districts' ability to sustain coherent, systemwide approaches to equitable technology use.

These structural conditions also interacted with political and community constraints, which further narrowed the scope of equity-oriented innovation by encouraging low-risk, compliance-driven decisions rather than deeper instructional transformation. In this context, emerging conversations about AI and equity remained largely conceptual and exploratory, as districts lacked the coherence, capacity, and shared frameworks needed to translate awareness into practice. Taken together, these themes do not operate independently; rather, they form a reinforcing cycle in which access-based definitions of equity, combined with fragmented leadership and systemic constraints, produce fragile coherence. This condition ultimately shapes whether educational technology functions as a lever for equity or reproduces existing inequities, highlighting the central role of leadership alignment, capacity, and systems design in enabling transformational change.

The coded interview transcripts and document analysis, using the ACL and Systems Change theoretical frameworks and the thematic coding scheme I developed, provide insights into the core questions asked at the beginning of this study. The findings are organized below according to each of the three research questions.

4.1 Finding 1: Fragmented Systems Produce Reactive and Constrained Decision Making

Findings related to Research Question 1 show that educational technology procurement and implementation are influenced by a set of interconnected structural and cognitive factors, rather than a single one. A pattern of fragmented system design is at the core, where decentralized governance disperses authority across departments and sites, reducing coherence and strategic alignment. In these fragmented systems, leaders often resort to reactive procurement practices, responding to immediate needs, teacher requests, or vendor timelines instead of engaging in long-term, equity-focused planning. This dynamic is further amplified by external vendor influence, which steps in to fill decision-making gaps when internal priorities and evaluation frameworks are underdeveloped.

These structural conditions are worsened by organizational and cognitive limitations, such as limited time, competing initiatives, and bounded rationality, which cause leaders to focus on feasibility and risk management rather than strategic alignment. Additionally, leadership turnover and capacity gaps reinforce these patterns by disrupting institutional memory, weakening ownership, and hindering the consistent implementation of coherent technology strategies. Together, Findings 1.1 through 1.4 show a cycle where fragmented governance leads to reactive decision making, which further increases vendor influence and pragmatic constraints, resulting in short-term, inconsistent, and often inequitable technology adoption practices.

4.1.1. Finding 1.1: Values/Practice Misalignment due to Fragmented Decision-Making Structures and Reactive Procurement

Across coded interview transcripts and supporting investment documents, leaders consistently described decentralized and reactive decision-making structures that constrained their ability to enact coherent, equity-centered technology strategies. Decision authority was frequently dispersed across curriculum departments, IT divisions, and individual school sites, producing overlapping tools, inconsistent implementation practices, and limited systemwide alignment. Maya, a fourth-year director of instructional technology in a mid-sized suburban district, described inheriting a fragmented ecosystem of platforms adopted prior to her tenure: "It's all over the place . . . my job is cleaning up and streamlining things." Her account reflects a broader pattern of leaders assuming responsibility for rationalizing systems rather than strategically designing them.

Similarly, Daniel, an Assistant Superintendent overseeing teaching and learning, explained how informal site-level autonomy compounded fragmentation: "Everyone bought what they thought was best for their site, and now we're stuck trying to integrate five tools that all do the same thing." When governance structures were unclear, "favorite tools" proliferated through decentralized adoption pathways, resulting in redundant contracts, uneven campus-level implementation, and limited capacity to evaluate instructional or equity impact coherently across the district.

At the same time, leaders articulated strong equity commitments, frequently describing their work as a moral effort to expand opportunity and remove structural barriers for historically underserved students. Yet they acknowledged that day-to-day procurement decisions were often shaped more by expedience than by long-term strategy. Kevin, a chief academic officer responsible for curriculum, assessment, and instructional technology oversight, framed his leadership vision around strengthening opportunity structures and ensuring equitable access to rigorous learning experiences. However, he conceded that in practice, teacher-driven requests, compressed timelines, and vendor sales cycles often dictated purchasing decisions. Similarly, Lauren, a director of educational technology overseeing platform adoption and professional learning, reflected that districts sometimes adopted tools "when I was too busy to evaluate them deeply," only to later realize they were "stuck with platforms that didn't do what we thought." Document and investment analyses corroborated these accounts, revealing multiple districts with overlapping software contracts serving similar functions, underscoring the persistent gap between articulated equity commitments and enacted procurement practices.

Effective system leadership in educational technology requires leveraging positional authority to ensure that procurement and implementation decisions align with culturally responsive pedagogy and district equity commitments (Khalifa, 2018). Many leaders who transition into central office roles do so out of a desire to influence change at scale rather than remain confined to classroom-level impact (Honig & Rainey, 2023). Kevin, a chief academic officer overseeing curriculum, assessment, and instructional technology, explained that he sought district leadership because "I saw the need for change in the system and wasn't able to do at the scale I wanted as a teacher." For Kevin, the move to central office created an opportunity to influence policy adoption, funding

priorities, and instructional expectations across multiple schools. Similarly, Lauren, a director of educational technology responsible for platform selection and professional learning, described her transition from site-level leadership as motivated by the desire to "shape the direction, not just implement what was handed down." Both leaders framed district leadership as a means of embedding equity considerations into technology governance decisions. Their reflections illustrate how positional authority at the system level expands leaders' capacity to align procurement processes, professional learning structures, and instructional priorities with broader equity goals, rather than leaving such efforts isolated at individual school sites.

However, leaders described technology adoption processes that were decentralized and frequently reactive rather than strategically coordinated. Decision-making authority often shifted among IT departments, curriculum offices, and site-level champions, resulting in uneven oversight and limited systemwide coherence. Anne, a director of instructional technology charged with rationalizing district platforms, explained that in the absence of a clearly articulated technology plan, "favorite tools" tended to proliferate informally across campuses, creating redundancies and complicating integration efforts.

Although leaders consistently articulated strong commitments to equity and social justice, many acknowledged difficulty reconciling those aspirations with the operational demands of their roles. Lauren, a director of educational technology responsible for procurement and implementation, reflected that her time was frequently consumed by urgent technical issues and teacher-driven requests rather than long-term strategic planning: "We adopted a lot of those platforms because teachers wanted them, and I was too busy to evaluate them deeply—and then we just got stuck with these tools that didn't do what we thought they were going to do." Her account illustrates how expedience, capacity constraints, and decentralized authority can undermine leaders' efforts to align technology decisions with their stated equity visions.

4.1.2. Finding 1.2: Vendor Influence and External Framing of Priorities

Across the coded interview transcripts and supporting investment documents, leaders consistently described decentralized and reactive decision making that constrained their ability to enact equity-centered technology strategies. Decision authority was often distributed across curriculum teams, IT departments, and school sites, producing overlapping tools, inconsistent practices, and limited systemwide coherence. Maya captured this fragmentation bluntly: "It's all over the place . . . my job is cleaning up and streamlining things." Leaders reported that when governance structures were unclear, "favorite tools" proliferated through informal adoption pathways, leaving districts with redundant platforms and uneven implementation across campuses. Similarly, Daniel, an Assistant Superintendent overseeing teaching and learning, described how site-based autonomy often outpaced district coordination: "Each campus had something they swore by, and no one was looking at the bigger picture." He noted that by the time central office attempted to standardize platforms, contracts were already in place and teachers had built routines around disparate tools. Leaders reported that when governance structures were unclear, "favorite tools" proliferated

through informal adoption pathways, leaving districts with redundant platforms, overlapping expenditures, and uneven implementation across campuses.

At the same time, leaders expressed strong commitments to equity, often framing their efforts as a moral obligation to expand opportunity. However, they also acknowledged that daily procurement decisions were often driven by convenience rather than strategy. Kevin outlined an equity goal focused on improving opportunity structures for students, yet leaders repeatedly admitted that teacher requests, time constraints, and vendor-driven timelines influenced decisions in practice. Lauren noted that districts sometimes adopted tools "when I was too busy to evaluate them deeply," and later found themselves "stuck with platforms that didn't do what we thought." Document and investment reviews supported these observations, revealing a wide range of purchased platforms with overlapping functions within single districts—highlighting the gap between declared values and actual practice. Together, these findings expose a consistent tension between leaders' expressed equity ambitions and the realities of district technology governance. Although they consistently framed their work as promoting opportunity and reducing disparities, decentralized decision making, limited coordination, and vendor-driven timelines often shaped procurement more than strategic planning. In the absence of clear governance structures, informal preferences at the site level and externally driven priorities filled the void, leading to redundant contracts, uneven implementation, and reactive standardization efforts. These conditions directly impact equity: when decisions are inconsistent across sites, students' access to high-quality tools, instructional supports, and learning experiences depends heavily on their school or teacher. This variability can perpetuate and even worsen existing disparities, as more resource-rich schools or more tech-savvy educators are better equipped to adopt and effectively use new tools. Without coherent, system-wide oversight, districts struggle to ensure that technology investments align with the needs of historically underserved students—ultimately reinforcing patterns of inequality instead of fostering equitable outcomes. Document analysis reinforced leaders' accounts, showing overlapping platforms and fragmented investments within individual districts. Overall, the data suggest that without strong system-level oversight and dedicated space for strategic discussion, vendor influence and operational expedience can subtly shift district priorities, widening the divide between aspirational equity goals and actual technology practices.

4.1.3. Finding 1.3: Pragmatic Decision Making Under Constraints

Resource limitations, competing initiatives, and constrained staff capacity emerged as dominant factors shaping leaders' pragmatic approach to technology procurement and implementation. Across interviews, participants emphasized that although educational technology was widely viewed as a mechanism for innovation and equity, its adoption often occurred under conditions of fiscal and organizational scarcity. Many districts operated without dedicated instructional technology staff or long-term funding commitments, forcing leaders to make tactical rather than strategic decisions. As Daniel, an assistant superintendent overseeing teaching and learning in a large suburban district, described succinctly, "We pilot small, see what works, and let teachers spread the word." This incremental, grassroots method of diffusion reflected both a culture of

cautious experimentation and a lack of system-level structures to evaluate and scale effective practices.

In practice, this meant that procurement decisions were often guided more by feasibility than by coherence. Districts prioritized tools that were affordable, required minimal professional learning, or had visible champions among staff. The process was not necessarily evidence based but rather survival oriented, an adaptive response to the overlapping pressures of limited budgets, initiative fatigue, and competing district priorities such as literacy reform, social–emotional learning, and postpandemic recovery. Leaders described making choices that "fit within the current budget cycle" or that could "piggyback" on existing grants or categorical funding. This pattern aligns with prior scholarship identifying bounded rationality in educational leadership, where decision making is shaped by time, information, and cognitive constraints rather than idealized rational models (Datnow & Park, 2018). This bounded rationality carries both benefits and drawbacks. On one hand, incremental piloting and resource-conscious decision making allow districts to mitigate risk, avoid large-scale implementation failures, and remain responsive to immediate contextual needs. Small-scale experimentation can empower teacher agency and surface promising practices before committing substantial resource investments. On the other hand, when bounded rationality becomes the default mode of governance, it can entrench fragmentation, limit long-term coherence, and prevent sustained equity-focused transformation. Decisions driven by short-term feasibility may privilege tools that are easiest to implement rather than those most aligned with instructional vision or equity goals. Over time, this survival-oriented logic can normalize reactive procurement cycles, making it more difficult for leaders to shift from tactical adaptation toward strategically aligned, systemwide innovation.

Leaders across the study districts described this informal, site-driven approach to technology adoption, an account corroborated by procurement records, as both a practical necessity and a structural liability. On one hand, it created space for experimentation and responsiveness to teacher initiative. Lauren, a director of educational technology in a mid-sized suburban district, explained, "Teachers can try something out, and if it sticks, we can find a way to fund it later." This flexibility allowed districts to pilot emerging tools without immediate large-scale commitments. On the other hand, leaders acknowledged that such reactivity undermined coherence and long-term sustainability. Anne, a chief technology officer in a neighboring district, reflected, "We end up with a patchwork of tools that nobody fully owns," noting that fragmented adoption often left unclear lines of responsibility for training, evaluation, or renewal. Similarly, Kevin, a chief academic officer, described inheriting "multiple platforms doing the same thing" after years of informal site-level purchases. Together, these accounts illustrate how adaptive flexibility, although responsive in the short term, frequently produced fragmented systems that were difficult to evaluate, sustain, or align with districtwide equity goals.

4.1.4. Finding 1.4: Leadership Turnover and Capacity Gaps

Leadership instability and limited internal capacity have been identified in the literature as significant impediments to sustained instructional reform and organizational coherence (Fullan,

2016; Honig & Rainey, 2023). Consistent with this scholarship, leadership turnover emerged in this study as a structural barrier to strategic and sustained implementation of educational technology initiatives. Across interviews, district leaders described a recurring cycle of transitions among cabinet-level administrators, directors of curriculum and instruction, and technology leads, each introducing new priorities, frameworks, and vendor relationships. Such instability weakened institutional memory and interrupted long-term planning, reinforcing what Elmore (2004) described as the difficulty of sustaining focus on the instructional core amid shifting leadership agendas. These dynamics left many districts in a continual state of recalibration rather than consolidation. Maya, a fourth-year director of instructional technology in a mid-sized suburban high school district, explained that frequent turnover created ambiguity about ownership and accountability for technology initiatives: "There's no one to really own these things, either at the site or district level." Her reflection underscores how the absence of stable leadership structures and clearly defined roles can fragment responsibility, making it difficult to align procurement, professional learning, and instructional strategy to advance coherent, equity-centered implementation.

In many cases, leaders reported relying on Teachers on Special Assignment (TOSAs) or other temporary instructional coaches to fill critical implementation gaps created by limited staffing and budget constraints. Although these educators often brought strong pedagogical expertise and enthusiasm for innovation, their appointments were typically grant-funded or time-limited and lacked formal authority over procurement, budgeting, or long-term planning. Lauren, a director of educational technology in a suburban high school district, described this pattern as "heroic but fragile," explaining that districts frequently depended on individual champions rather than durable infrastructure. Similarly, Kevin, a chief academic officer in a mid-sized district, noted that when a grant-funded TOSA position ended, "the initiative basically ended with it," resulting in the loss of institutional knowledge, training continuity, and implementation momentum.

This capacity challenge extended beyond staffing to encompass broader organizational structures and accountability systems. Daniel, an assistant superintendent overseeing teaching and learning in a large suburban district, acknowledged that his district lacked a formal evaluation framework or centralized digital learning department to monitor technology lifecycles, measure instructional impact, or coordinate professional development. Instead, responsibility for educational technology was dispersed across IT, curriculum offices, and site administrators, producing duplication of effort and ambiguity regarding ownership. Maya, a director of instructional technology, reflected that without clearly defined governance structures, "things just fade out after a year or two." Together, these accounts illustrate how limited institutional capacity—both human and structural—undermined districts' ability to sustain coherent, equity-aligned technology implementation over time.

Procurement data provide quantitative evidence of this organizational volatility. Several contracts across the sample, particularly in Highland View and Central USD, appear as single-year agreements with no renewal or sustainability clauses. These short-term contracts mirror the human capital instability within leadership teams. As Maya noted, "We adopt things on 1-year pilots

because no one knows who will still be here next year." This practice, although fiscally cautious, perpetuates a cycle of short-term thinking that prioritizes compliance and risk avoidance over strategic innovation.

Leadership turnover also had distinct consequences for equity-focused technology initiatives. Participants observed that programs intended to expand opportunity—such as device and connectivity supports for multilingual learners or adaptive platforms designed for students with disabilities, required sustained advocacy, stable funding, and cross-departmental coordination to succeed. Kevin, a chief academic officer in a mid-sized suburban district, explained that equity-centered technology efforts "need someone constantly pushing," noting that without cabinet-level sponsorship, initiatives quickly lose visibility amid competing operational priorities. Similarly, Anne, a chief technology officer in a neighboring district, described how leadership transitions often shifted attention toward budget stabilization and compliance mandates, leaving inclusion-focused technology projects vulnerable to cuts or neglect.

Several leaders described this pattern as cyclical. Lauren, a director of educational technology, referred to the phenomenon as "equity amnesia," explaining that with each new superintendent or cabinet reorganization, "we have to start over and remind people why we invested in these supports in the first place." In these moments of transition, operational efficiency and fiscal management frequently eclipsed longer-term equity strategies. As a result, digital access programs and adaptive learning initiatives were not necessarily dismantled outright but gradually deprioritized, illustrating how leadership instability can interrupt the sustained political and financial commitment necessary to advance inclusive technology governance.

4.2 Finding 2: Evaluation Systems Prioritize Risk Management Over Instructional and Equity Impact

Findings related to Research Question 2 (i.e., How do leaders evaluate the potential opportunities and challenges of educational technologies, including tools like generative AI?) indicate that leaders' evaluation of educational technologies, including GAI, is shaped by an interconnected set of conditions that collectively prioritize risk management and feasibility over instructional and equity impact. At the center of this finding is a pattern of cautious innovation, in which leaders balance interest in emerging technologies with concerns about ethics, privacy, and unintended consequences. This orientation reflects not resistance to innovation, but an adaptive response to uncertainty and evolving governance demands. Within this context, compliance mechanisms, particularly data privacy agreements, emerge as the dominant evaluative framework, providing necessary safeguards but also narrowing the criteria through which technologies are assessed.

This compliance-centered approach is reinforced by limited evaluation capacity, as districts rely on anecdotal feedback, teacher usage, and informal indicators rather than systematic evidence of student learning or subgroup impact. As a result, evaluation becomes reactive and operational rather than analytical and equity focused. At the same time, underinvestment in professional learning constrains leaders' ability to translate technology adoption into meaningful instructional

change, further limiting the depth of evaluation and implementation. Taken together, Themes 2.1 through 2.4 illustrate a reinforcing system in which cautious exploration, compliance-driven screening, limited evaluative infrastructure, and constrained capacity collectively shape how technologies are understood and assessed. This system ultimately positions districts in a "preimplementation" or exploratory phase, where technologies are filtered for risk but not yet systematically evaluated for their potential to advance equitable learning outcomes.

4.2.1. Finding 2.1: Balancing Innovation With Risk

Across the interviews, district leaders expressed both enthusiasm and apprehension about the rapid emergence of artificial intelligence (AI) and other advanced technologies. Interpreted through ACL, these responses reflect leaders' efforts to interrogate the ethical, racialized, and power-laden dimensions of AI adoption, particularly concerns related to bias, surveillance, and unequal impact on historically marginalized students (Santamaría & Santamaría, 2016). Simultaneously, educational systems change theory helps situate their caution within the recognition that AI constitutes an adaptive challenge rather than a simple technical enhancement, requiring shifts in beliefs, instructional norms, and governance structures (Elmore, 2004; Fullan, 2023). Although many participants described AI as holding promise for increasing efficiency and personalizing instruction, they also acknowledged profound uncertainty about its pedagogical and operational implications. Daniel, an Assistant Superintendent overseeing teaching and learning, captured this tension succinctly: "We're trying to figure out how to make it safe, not just cool." His reflection illustrates how leaders are attempting to balance innovation with ethical stewardship and systemic coherence.

This duality, innovation tempered by caution, emerged as a defining feature of district leaders' sensemaking about AI. Through an ACL lens, this ambivalence reflects leaders' efforts to interrogate the power dynamics embedded in vendor narratives that position AI as a comprehensive solution to instructional and operational challenges (Santamaría & Santamaría, 2016). At the same time, educational systems change theory helps explain why most districts have resisted rapid adoption: leaders recognized that AI integration represents an adaptive shift requiring new governance routines, professional learning structures, and policy safeguards rather than a simple technical upgrade (Elmore, 2004; Fullan, 2023). Kevin, a chief academic officer in a mid-sized suburban district, described being "bombarded" with vendor presentations promising efficiency gains in lesson planning and assessment, yet emphasized that his district was proceeding cautiously through small pilots. Similarly, Lauren, a director of educational technology, explained that her team preferred "testing with a few teachers first" rather than committing to multiyear contracts. Procurement data reinforced this exploratory posture: as of 2025, only 5 of the 12 participating districts—including Redwood Coast HSD and Summit Ridge Union HSD—had formal contracts explicitly tied to AI products or services. Most recorded investments remained concentrated in established platforms such as learning management systems and assessment dashboards, indicating that institutional readiness and policy frameworks lag behind technological enthusiasm.

Leaders consistently identified data ethics, privacy, and intellectual property as central barriers to formal AI adoption. Viewed through ACL, these concerns reflect leaders' recognition that AI governance is inseparable from questions of equity, surveillance, and potential harm to marginalized student populations (Santamaría & Santamaría, 2016). From a systems change perspective, existing compliance structures, such as Data Privacy Agreements (DPAs), were designed for static software environments and are ill-equipped to regulate adaptive, generative systems that continuously collect and process user input (Elmore, 2004). Daniel, an assistant superintendent, articulated this shift in regulatory complexity: "We've always had to think about FERPA; now we're thinking about what happens when the algorithm learns from our kids." His reflection captures the transition from traditional compliance concerns toward deeper ethical deliberation about algorithmic bias, data permanence, and institutional responsibility. Together, these findings suggest that leaders' caution is not resistance to innovation but an adaptive response to governance frameworks that have not yet evolved to address AI's structural implications.

Another dimension of this tension involved educator capacity and trust. Leaders acknowledged that enthusiasm for AI varied widely among staff. Early adopters saw it as a time-saving tool for differentiation and administrative efficiency, while others feared it would devalue teacher expertise or widen inequities between tech-comfortable and tech-resistant educators. This mirrors existing literature suggesting that technology innovation in education is mediated not only by policy and infrastructure but also by professional culture and identity (Selwyn, 2016; Zhao & Frank, 2003).

From a leadership perspective, the interviews revealed a consistent theme of intentional caution. Many districts chose to delay major AI investments until clearer state or federal guidance emerged around compliance, security, and ethical use. As Melissa, a unified school district assistant superintendent indicated, they preferred to "stay informed, but not commit until we know where the guardrails are." Others emphasized collaboration with regional networks or county offices of education to share resources and monitor emerging best practices.

This cautious approach, although often framed as prudent risk management, also reflects and potentially reinforces longstanding racial inequities across districts. Districts serving higher proportions of Black, Latino, Indigenous, immigrant, and low-income students were more likely to delay AI pilots or limit exploration to small-scale trials, citing concerns about data privacy, surveillance, and algorithmic bias. In communities historically subjected to both technological underinvestment and disproportionate monitoring, leaders expressed heightened sensitivity to the risks of exposing students to opaque AI systems. At the same time, more affluent and predominantly white districts appeared better positioned to experiment with AI tools, leveraging institutional stability and political insulation to absorb uncertainty. This divergence echoes longstanding patterns identified in digital divide scholarship, which demonstrates that technological inequities extend beyond access to encompass differences in meaningful use, capacity, and opportunity structures (Warschauer, 2004; Warschauer & Matuchniak, 2010). Although caution in historically marginalized communities may reflect responsible stewardship, prolonged deferral risks producing a new stratification in AI literacy and infrastructure, reproducing racialized opportunity gaps within emerging technological systems.

Taken together, this theme highlights the paradox of innovation in educational leadership: Although district leaders are compelled to explore emerging technologies as part of their strategic modernization efforts, they must do so within systems historically oriented toward conservatism, compliance, risk avoidance, and public accountability. In this context, innovation cannot simply be about technological adoption it becomes a careful negotiation between aspiration and protection, experimentation and control. The absence of formal AI-related procurement in the data, coupled with the discourse of "cautious curiosity" expressed in the interviews, suggests that most districts are still operating in the "preimplementation" phase of AI integration, characterized by exploration, ethical deliberation, and anticipatory governance rather than large-scale transformation.

4.2.2. Finding 2.2: Compliance as Helpful Gatekeeper

Data privacy and compliance processes have become both the default evaluative framework and a protective mechanism for districts navigating the rapidly expanding educational technology marketplace (Clark, 2024; Consortium for School Networking [CoSN], 2024; Engeness & Gamlem, 2025). Across all interviews, leaders consistently emphasized the centrality of data privacy agreements (DPAs) and related compliance protocols in determining whether a tool could be adopted. Melissa summarized this prevailing mindset succinctly: "If there's no DPA, it doesn't get installed."

This emphasis on compliance serves an important, and often underappreciated function in the procurement ecosystem. In the absence of robust evaluation rubrics or research capacity, legal compliance has effectively become a proxy for quality assurance. Districts rely on DPA verification processes to screen for vendor legitimacy, student data security, and alignment with state and federal laws such as the Family Educational Rights and Privacy Act (FERPA) and the Children's Online Privacy Protection Act (COPPA). As a result, the compliance review stage has evolved from a bureaucratic hurdle into a central governance tool, providing structure and accountability in otherwise fragmented decision-making environments (Clark, 2024; CoSN, 2024).

Leaders described the DPA process as a "safety net," a safeguard against both external vendor malpractice and internal oversights. By requiring vendors to meet specific data-handling standards, districts can ensure a minimum threshold of protection even when they lack the technical expertise to evaluate software code or algorithmic behavior. For example, Margaret, the South County Unified technology director, explained that compliance "narrows the field" to vendors who can meet legal and ethical standards, thereby simplifying decision making for nontechnical administrators. Similarly, Daniel, an Assistant Superintendent overseeing teaching and learning in Foothill Summit Union High School District, described the DPA review as "our first filter," noting that if a vendor could not satisfy privacy and security expectations, "the conversation stops there." Together, these accounts illustrate how compliance mechanisms function as both protective infrastructure and a pragmatic screening tool within capacity-constrained systems.

Although compliance mechanisms function as necessary gatekeepers, the data suggest they also narrow the scope of leadership deliberation in ways that can inadvertently constrain equity-centered

decision making. Under conditions of bounded rationality, privacy documentation and legal vetting become the most visible and administratively manageable criteria for approval, effectively redefining "due diligence" as procedural compliance rather than instructional or ethical evaluation. Several leaders acknowledged that this compliance-first orientation can eclipse equally consequential considerations such as pedagogical quality, differential impact on marginalized students, and the lived experience of teachers and learners. In this sense, the DPA operates not only as a safeguard but also as a ceiling, setting a minimum threshold of acceptability without guaranteeing meaningful instructional value. Maya, director of instructional technology in Coastal Ridge Unified, reflected on this tension: "We've gotten really good at checking the boxes on privacy, but not necessarily at asking, 'Does this make learning better for kids who need it most?'" Her comment illustrates how procedural rigor can coexist with substantive ambiguity, reinforcing the central finding that compliance, while protective, can inadvertently displace deeper equity-oriented inquiry.

This compliance-centered approach is also reflected in the procurement data. Across multiple districts, including Sierra Vista HSD and Redwood Union HSD, agenda items and public board documents emphasize contract attachments, legal reviews, and consent calendar listings over pedagogical or equity-oriented evaluations. Terms such as "contract over $25,000," "data sharing agreement," and "privacy compliance verification" dominate the notes section of these records, while there is little to no mention of instructional outcomes or subgroup impact analysis. This pattern is significant because it illustrates how district governance routines institutionalize compliance as the primary measure of responsible decision making, potentially crowding out deliberation about instructional transformation and equity impact. When legal sufficiency becomes the dominant frame for approval, questions about who benefits, who may be harmed, and how learning is improved risk becoming secondary—thereby reinforcing a procedural conception of accountability rather than a substantive commitment to equitable educational outcomes.

In effect, compliance functions as both a shield and a ceiling: it protects districts from legal exposure and vendor exploitation but also narrows the evaluative lens to risk mitigation rather than educational transformation or equity. The dominance of compliance culture reflects a broader tension in public education governance, between accountability and innovation (Organisation for Economic Co-operation and Development, 2025; Wilkins & Mifsud, 2024). As leaders operate within environments of increasing public scrutiny and limited bandwidth, compliance becomes a manageable, objective measure of due diligence. Yet this also perpetuates what Lauren called a "defensive posture," where districts prioritize avoiding mistakes over pursuing bold experimentation.

Although compliance mechanisms were often described as constraining, several leaders reframed them as potential leverage points for more responsible innovation. Rather than viewing the DPA as a bureaucratic hurdle, some participants suggested it could serve as an entry point for broader conversations about instructional alignment, accessibility, and equity, an approach consistent with governance models that integrate legal safeguards with ethical and pedagogical standards (Kudina & van de Poel, 2024; Williamson, 2017). Margaret, the technology director in South County

Unified, argued that "the DPA could be more than a checkbox, it could force us to ask better questions upfront," proposing that privacy review be expanded to include accessibility requirements and subgroup impact analysis. Similarly, Kevin noted that the rise of AI had prompted his team to reconsider their review templates: "If we're rewriting the privacy agreement anyway, why not include language about algorithmic bias and transparency?" These perspectives align with what might be described as "compliance-plus" governance, where formal vetting processes become vehicles for embedding equity and instructional criteria into procurement structures rather than serving solely as legal shields.

Ultimately, the theme of compliance as a helpful gatekeeper underscores a paradox: districts have built strong procedural defenses against risk but lack equally robust mechanisms for evaluating educational value. As Anne, North Valley Union Assistant Superintendent, summarized, "Compliance keeps us safe, but it doesn't tell us if we're doing the right work." This tension between protection and purpose reveals the broader leadership challenge of balancing legal accountability with the moral imperative to foster equity and innovation in digital learning.

4.2.3. Finding 2.3: Rare and Inconsistent Evaluation and Anecdotal Equity Impact

Across districts, leaders acknowledged that formal evaluation mechanisms for educational technology implementation were rare or inconsistent. In the absence of structured impact studies or subgroup analyses, determinations of whether a tool "worked" were often based on informal feedback loops rather than systematic evidence. Lauren, a director of educational technology, captured this dynamic candidly: "We know it's working when people stop complaining." Her remark reflects a broader pattern in which the absence of negative feedback, fewer help-desk tickets, fewer teacher objections, functioned as a proxy for effectiveness. Similarly, Daniel, an assistant superintendent overseeing teaching and learning, noted that after initial rollout, "if it's not blowing up my inbox, we assume it's fine," acknowledging that operational calm often substitutes for instructional evaluation. Together, these accounts illustrate a reactive model of assessment in which stability and reduced friction are conflated with meaningful impact, limiting districts' ability to determine whether technology initiatives actually advance student learning or equity goals.

In practice, leaders described relying on anecdotal evidence, teacher enthusiasm, and usage data as their primary measures of effectiveness. Pilot programs were often initiated with small groups of teacher champions whose positive classroom experiences became the basis for broader adoption. Christy, a director of instructional technology, explained that when early adopters "come back excited and want to keep using it, that's usually enough to move forward." However, these judgments were rarely formalized through documented evaluations or linked to disaggregated student learning outcomes. Instead, districts emphasized short-term indicators such as login frequency, perceived ease of implementation, and teacher satisfaction. As Margaret, the technology director in South County Unified, put it, "If teachers are using it, that's our proof point." Although expedient under capacity constraints, this evaluative logic privileges usability and uptake over

evidence of instructional effectiveness or equity impact, reinforcing a pattern in which adoption decisions outpace rigorous assessment of outcomes.

This pattern reflects what scholars of educational change describe as the "implementation fallacy," the mistaken assumption that adoption or visible uptake signals success (Fullan, 2023; Penuel & Gallagher, 2017). In the absence of structured evaluation frameworks, districts risk conflating enthusiasm and activity with demonstrable instructional improvement. Daniel, an Assistant Superintendent, acknowledged this limitation directly, explaining that his district lacked the analytic infrastructure to conduct rigorous impact studies: "We don't have a research office . . . so we use what we can. Items like surveys, teacher feedback, and anecdotes. It's not perfect, but it's something." His reflection illustrates how capacity constraints and competing initiatives push districts toward pragmatic but methodologically thin forms of evaluation. Although these approaches provide some feedback, they rarely generate disaggregated evidence of student learning or equity impact, reinforcing a cycle in which implementation proceeds without systematic accountability for outcomes.

The procurement data reinforce this finding. Across the sampled districts, there were no documented postcontract evaluations or renewal justifications linked to performance outcomes. Board agendas and notes across all districts focused exclusively on contract approvals, compliance verification, and renewal dates, with no evidence of cost–benefit analyses or equity impact reviews. This suggests that once a contract is approved, ongoing evaluation is often deprioritized, absorbed into routine operational oversight rather than continuous improvement processes.

The reliance on anecdotal evaluation also has equity implications. Without systematic analysis of which students or teachers benefit most, or are left behind, districts lack the insight necessary to ensure that technology investments close rather than widen opportunity gaps. For example, tools that are enthusiastically embraced in high resource schools may not be equally accessible or effective in lower income contexts, yet few districts disaggregate usage or outcome data by site, subgroup, or socioeconomic status. This creates a "visibility gap" in which inequities persist unmeasured and unaddressed.

Some leaders, however, expressed growing recognition of these evaluative shortcomings and a desire to move toward more evidence-informed practices. Rather than abandoning innovation, they described the need to build analytic partnerships and shared frameworks capable of balancing practical constraints with meaningful outcome measures. Lauren, a director of educational technology in a mid-sized suburban district, articulated this aspiration clearly: "We need to stop guessing. We need to know what actually moves learning, not just what teachers like." Her reflection signals an emerging shift from usability-driven adoption toward impact-oriented governance. Several participants suggested partnering with county offices of education, universities, or external research organizations to strengthen evaluation capacity. This impulse toward structured inquiry suggests that leaders are increasingly aware that sustainable, equity-centered technology integration requires not only implementation but also disciplined assessment of instructional and subgroup outcomes.

Ultimately, this finding reveals a persistent tension between responsiveness and rigor in district-level technology governance. Leaders consistently valued the immediacy of teacher feedback and the practicality of informal evaluation methods, particularly under conditions of limited time and staffing. At the same time, many acknowledged that reliance on anecdotal evidence and usage metrics provided limited insight into long-term instructional or equity impact. The procurement data reinforced this pattern: although contracts documented compliance and cost, there was little evidence of structured postadoption evaluation or systematic review of student outcomes. Together, these findings suggest that district technology systems are organized primarily around adoption and risk management rather than iterative learning and impact assessment. This orientation has implications for equity, as the absence of sustained evaluative infrastructure makes it difficult to determine whether tools meaningfully improve opportunities for historically marginalized students or simply maintain existing patterns under a veneer of innovation.

4.2.4. Finding 2.4: Professional Learning is Critical Yet Underfunded and Undervalued

Across all participating districts, professional learning emerged as a pivotal yet chronically under-resourced element of educational technology implementation. Leaders consistently emphasized that the success or failure of a technology initiative depended less on the inherent quality of the tool and more on the district's capacity to build teacher confidence, competence, and pedagogical fluency. Alex, a chief technology officer in a mid-sized suburban district, summarized this sentiment directly: "The tech isn't the issue—it's the learning that goes with it." Similarly, Kevin, a chief academic officer overseeing curriculum and instruction, noted that "we can buy the platform in a week, but it takes years to really shift teaching practice," underscoring the asymmetry between procurement speed and instructional change. Lauren, a director of educational technology, echoed this concern, observing that without sustained coaching, "it just becomes another login teachers are expected to manage." Collectively, these accounts suggest that professional learning functions as the mediating variable between technology adoption and instructional transformation. Yet leaders' acknowledgment of its importance contrasts with the limited fiscal and structural investment dedicated to sustained coaching and collaborative inquiry. The findings indicate that although districts recognize professional learning as central to equitable technology integration, it remains vulnerable to budget cycles and competing priorities, thereby constraining the depth and durability of implementation efforts.

In recent years, districts have begun to shift their professional learning models away from one-time technical workshops toward more sustained, instructional coaching frameworks (Honig & Rainey, 2023; Kraft et al., 2018; Woulfin et al., 2022). This evolution reflects a growing recognition that teachers require ongoing, job-embedded support to translate digital tools into meaningful instructional practices. Professional learning, in this sense, is no longer viewed merely as skill acquisition but as pedagogical transformation, helping educators reimagine curriculum design, assessment, and differentiation in digitally mediated environments. Maya described this shift as moving from "button training" to "instructional coaching," emphasizing that the goal is not to teach teachers how to use tools, but how to use them well.

However, this pedagogical reorientation (from "button training" to "instructional coaching") has outpaced available funding and personnel. Leaders expressed frustration that professional learning budgets are typically the first to be cut when fiscal pressures mount, even as districts continue to invest in new technologies. "We can buy the software," one assistant superintendent observed, "but we can't afford the training to make it work." The procurement data reinforce this disconnect: although multiple districts, including Coastal Ridge HSD and Redwood Coast HSD, recorded multiple technology contracts exceeding $25,000, none included corresponding professional learning components or training deliverables in their agenda notes. This disconnect suggests that districts structurally privilege capital expenditures over human capacity-building, reinforcing a technical conception of innovation rather than an adaptive one. When professional learning is decoupled from procurement, technology implementation becomes transactional rather than transformational, increasing the likelihood that tools will be underutilized or inequitably deployed. The absence of embedded training commitments in contract documentation further institutionalizes this imbalance, signaling that instructional change is treated as ancillary rather than integral to technology adoption. Over time, this pattern risks reproducing the very inequities leaders seek to redress, as teachers with greater prior expertise or informal support networks are better positioned to leverage new tools, while others struggle without sustained coaching or collaborative structures.

Evidence of funding-driven instability appeared in 9 of the 12 participating districts, spanning both higher poverty and more affluent communities. Leaders in these districts described professional learning for technology integration as heavily dependent on short-term funding streams, including pandemic recovery allocations, digital equity grants, or one-time state initiatives (California Legislative Analyst's Office, 2024; CoSN, 2025; Roza, 2025). When these funds sunset, the coaching positions and support structures created through them frequently disappear.

Although the reliance on episodic funding was widespread, the implications varied by context. Districts serving higher proportions of low-income students were more likely to tie technology coaching to categorical or grant-funded positions, making those roles especially vulnerable to expiration. More affluent districts, though somewhat better positioned to absorb funding fluctuations, still described reallocating professional learning funds toward competing priorities during budget contractions. Across contexts, leaders referenced a recurring cycle of rebuilding capacity, what one described as "retraining the same ground every few years," as institutional knowledge dissipated with staff turnover and the conclusion of temporary funding streams. Collectively, these patterns indicate that the sustainability challenge is systemic rather than isolated, though its severity is amplified in districts with fewer flexible local resources.

Moreover, districts continue to grapple with the challenge of differentiated technology professional learning (U.S. Department of Education, 2023). Teachers' comfort and experience with technology vary widely, creating disparities in adoption and efficacy (Sun & Yan, 2025; Wohlfart & Wagner, 2024). Leaders noted that without dedicated time, incentives, or instructional coaches, professional learning often privileges early adopters and leaves more reluctant educators behind (Amemasor et al., 2025; Lewis & DeSantis, 2024). This unevenness compounds equity challenges at the classroom level: students' exposure to effective technology integration can depend largely on

which teacher they have, rather than district policy or infrastructure (Darling-Hammond et al., 2025a; Lacner & Schetier, 2024).

Despite these obstacles, leaders demonstrated a strong conceptual understanding of the transformative potential of professional learning. Several interviewees described promising shifts toward peer-led models, learning cohorts, and asynchronous microcredentialing that align more closely with teachers' schedules and professional identities. These emergent approaches suggest a growing awareness that sustainable change requires capacity-building ecosystems, not isolated workshops. As one technology director put it, "If we want equity through technology, we need equity in learning how to use it."

Ultimately, this theme reveals that professional learning functions as both the linchpin and the bottleneck of educational technology reform. Leaders consistently recognized that sustained coaching and pedagogical support were essential for translating digital tools into equitable instructional practice, yet structural and fiscal constraints repeatedly undermined those efforts. Without stable funding streams, dedicated coaching infrastructure, and systematic feedback mechanisms, procurement cycles moved more quickly than districts' capacity to support meaningful classroom integration. As Maya, a director of instructional technology, concluded pointedly, "We're good at buying; we're not as good at building capacity."

Analytically, this pattern suggests a systemic misalignment between technical acquisition and adaptive change. When capacity-building is treated as supplemental rather than integral to implementation, districts institutionalize a reform model that privileges visible purchases over sustained instructional transformation. Over time, this imbalance risks normalizing surface-level adoption while limiting the depth, durability, and equity impact of technology initiatives.

4.3 Finding 3: Equity Remains Defined Primarily as Access Because Structural Conditions Limit Transformative Implementation

Findings related to Research Question 3 (i.e., As they consider new technology platforms, how are the needs of various student populations [e.g., multilingual learners, students with disabilities, socioeconomically disadvantaged students] taken into account during the evaluation and implementation process?) show that the needs of different student groups are most often addressed through an access focused rather than transformational equity framework. At the core of this finding is a pattern where leaders define equity mainly in terms of providing devices, connectivity, and basic digital participation, instead of redesigning instructional systems to promote engagement, agency, and varied learning outcomes. This access-based approach is not accidental; it is influenced by broader district poverty contexts, as districts serving higher poverty communities are more likely to face staffing shortages, decentralized governance, and unstable funding, which hinder coherent, equity-centered implementation. In this way, structural resource inequalities not only affect what districts can purchase but also how equity is understood and implemented.

These access-focused strategies are further supported by targeted but disjointed efforts, where supports for multilingual learners, students with disabilities, and other historically underserved groups are often seen as add-ons or compliance requirements rather than core design principles. Simultaneously, ongoing systemic barriers, including divided responsibility, initiative fatigue, political pressures, and inconsistent leadership, restrict districts' ability to maintain coordinated, justice-focused technology strategies across schools and student populations. In this broader context, conversations about AI and equity are emerging, but they mostly remain theoretical and exploratory because districts have not yet established the governance structures, professional development systems, or evaluative frameworks needed to move from awareness to accountability. Overall, Findings 3.1 through 3.5 highlight a recurring pattern where structural inequality influences access-based definitions of equity, fragmented implementation hampers transformative practices, and weak system coherence limits the potential for technology to serve as a tool for meaningful educational justice.

4.3.1. Finding 3.1: District Poverty Context Shapes the Coherence and Intentionality of Educational Technology Adoption

Analysis across the cases revealed a clear pattern of differential investment strategies and levels of intentionality in educational technology adoption between districts serving higher poverty student populations and those serving lower poverty communities. Structural economic disadvantages often dictate the degree to which edtech implementation can move beyond fragmented adoption toward systemic coherence (Arhimah et al., 2025; Sundowo et al., 2024). Leaders in the higher poverty districts in this study described decentralized procurement models that prioritized site-level autonomy out of necessity, while leaders in lower poverty districts articulated more centralized, strategic approaches supported by greater per-pupil resources, staffing capacity, and sustained professional learning. These differences had meaningful implications for equity, coherence, and instructional consistency across schools.

In districts like Central and South County serving higher proportions of low-income and historically underserved students, leaders described decentralized procurement as a pragmatic response to limited central-office capacity and constrained budgets. Lilly, a leader in one such district, explained that her district "essentially gives sites their budgets and lets them choose," noting that although this approach allowed responsiveness to local needs, it also resulted in uneven implementation and limited districtwide coherence. She added, "We don't have the staff or infrastructure to manage everything centrally, so we do what we can—but it means every school looks different." Leaders in similar contexts acknowledged that this model often left site administrators and teachers to navigate complex vendor landscapes without consistent guidance, resulting in what Margaret described as "good intentions but wildly different experiences for students depending on the school." Viewed through the lens of ACL, this decentralized model reflects leaders' attempts to exercise pragmatic agency within structurally inequitable conditions, yet it also reveals how constrained capacity can inadvertently reproduce uneven opportunity structures (Santamaría & Santamaría, 2016). From a systems change perspective, the absence of coherent governance routines and shared instructional frameworks limits districts' ability to shift

from technical adaptation to adaptive transformation (Elmore, 2004; Fullan, 2016). Together, these findings suggest that without coordinated infrastructure and equity-centered leadership moves, site-based autonomy risks amplifying variability rather than advancing systemwide justice-oriented reform.

By contrast, leaders in districts serving significantly fewer students in poverty, who also reported higher per-pupil funding and more stable staffing, described greater intentionality in both procurement and implementation. Anne explained that her district had moved toward centralized adoption decisions paired with sustained support structures: "Because we have the capacity, we can be more thoughtful about what we adopt, why we adopt it, and how we support teachers afterward." Kevin similarly emphasized that intentionality required resources beyond licenses: "It's not just buying the tool, it's the coaching, the time, the follow-up. That's what makes it equitable." These leaders framed centralization not as a loss of autonomy, but as a mechanism for ensuring consistency, quality, and equitable access to instructional support across sites.

Importantly, this contrast suggests that decentralization in high-poverty districts functions less as empowerment and more as a compensatory strategy for structural under-resourcing. Although site-level choice was often framed as flexibility, leaders acknowledged that it frequently shifted the burden of decision making and implementation onto schools with the least capacity to absorb it. Michael reflected on this dynamic across districts, noting that "autonomy sounds equitable on paper, but without support, it actually widens gaps." In this way, districts serving higher need populations were more likely to rely on fragmented, site-driven adoption, while districts with greater resources were better positioned to enact coherent, equity-aligned technology strategies.

This finding underscores that equitable educational technology leadership is inseparable from broader resource inequities (Honig & Rainey, 2023; Luo & Liu, 2025; Sahl, 2025). Differences in funding, staffing, and organizational capacity shape not only what districts purchase, but how intentionally and sustainably technologies are implemented. As a result, districts serving historically underserved communities face a double bind: they are tasked with advancing equity through technology while operating within structures that limit their ability to do so coherently. This pattern complicates access-based equity narratives and highlights the need for systems-level support that accounts for differential capacity across districts.

4.3.2. Finding 3.2: Equity Defined as Access, Not Transformation

Across interviews, district leaders overwhelmingly equated educational equity with technological access, ensuring that every student possessed a device, had reliable internet connectivity, and could log into required digital platforms. Although this access-driven framing has advanced the goal of universal participation in digital learning, it has not necessarily translated into the deeper pedagogical transformation required for equitable outcomes (Lachner et al., 2024; U.S. Department of Education, 2024). Linh, in Redwood Mountain Unified, captured this distinction clearly: "We became a one-to-one district, but access didn't equal engagement."

This distinction between access and engagement reflects a broader tension in the field (Robinson et al., 2023; U.S. Department of Education, 2024). Following the pandemic-era push toward one-to-one computing, many districts invested heavily in hardware and infrastructure but devoted comparatively fewer resources to culturally responsive pedagogy, differentiated digital instruction, or authentic student voice in technology design (Pozol et al., 2024). The underlying assumption, as several leaders admitted, was that providing devices would "level the playing field." Yet, as multiple studies have shown, technology alone cannot equalize opportunity without parallel investments in teaching practices, professional learning, and inclusive pedagogical design (Reich, 2020; Selwyn, 2016; Warschauer & Matuchniak, 2010).

Leaders frequently acknowledged that device access initiatives, while celebrated as equity milestones, did not automatically translate into equitable learning outcomes. Across districts, one-to-one Chromebook rollouts were described as necessary but insufficient steps toward closing opportunity gaps. Participants noted that students who already possessed digital fluency, stable internet access, and home-based academic support were better positioned to leverage new devices productively, whereas multilingual learners, students with disabilities, and students from low-income households continued to encounter structural barriers (U.S. Department of Education, 2024). Daniel, the Assistant Superintendent in Redwood Coast HSD overseeing instruction, articulated this limitation candidly: "We can get a Chromebook into every student's hands, but that doesn't mean they know how to use it to learn." His reflection underscores the distinction between technical equity (distribution of hardware) and instructional equity (capacity to use technology for higher order learning). The quote suggests that absent intentional pedagogical scaffolding and culturally responsive supports, access initiatives risk reproducing existing hierarchies of knowledge and participation rather than disrupting them.

The procurement records further corroborate this access-first paradigm, revealing investments concentrated primarily in hardware acquisition and platform licensing rather than in instructional redesign or equity-centered implementation supports (Warschauer, 2004; Warschauer & Matuchniak, 2010). Across the sample, the majority of contracts focused on infrastructure, compliance systems, or general-purpose instructional tools rather than products explicitly designed to serve multilingual learners, students with disabilities, or socioeconomically disadvantaged populations. In contrast, very few entries referenced platforms centered on accessibility, translation, or adaptive learning. This pattern illustrates what one leader termed "equity by provision" a philosophy grounded in distribution of tools rather than transformation. This idea is supported by the National Educational Technology Plan (U.S. Department of Education, 2024), which identifies a critical gap between the provision of access and the closing of the 'Digital Design Divide.' As Lachner et al. (2024) argued, districts that focus solely on hardware distribution fail to address the systemic second-order change barriers to pedagogical transformation, effectively stalling equity at the level of the device rather than the learner.

Several participants expressed a growing awareness of this limitation and a desire to evolve toward a more intentional equity framework—one that integrates pedagogy, culture, and student agency into technology planning. At the same time, they identified systemic barriers, including fragmented

leadership structures, constrained professional learning capacity, and increasingly polarized political debates over the meaning of "equity" in public education (Kormos & Wisdom, 2023). Anne, a chief technology officer in Summit Ridge Union HSD, reflected on the measurement dilemma: "It's easier to measure how many Chromebooks we've handed out than whether students feel empowered to learn." Similarly, Kevin, Chief Academic Officer in Redwood Coast HSD, noted that "access is visible and defensible, engagement and agency are harder to prove at a board meeting." Together, these reflections illuminate the central tension animating this study: district routines and accountability structures tend to privilege quantifiable indicators of distribution over deeper transformations of teaching and learning. This finding directly advances this study's larger aim: to examine how procurement processes, compliance norms, and governance structures function as de facto AI and educational technology policy. The data suggest that without structural shifts in how districts define and measure success, equity risks remaining framed as access rather than as transformation, reinforcing the need for leadership approaches that move beyond technical compliance toward adaptive, justice-centered coherence.

The persistence of this access-oriented model underscores the challenge of moving from technical equity, the provision of tools, to instructional equity, the transformation of teaching and learning practices (Laskar, 2025; Luo & Liu, 2025). Districts in the study (and more broadly) have achieved remarkable progress in closing the digital access divide (Albakri & Wood-Harper, 2025), but they continue to struggle with closing what might be called the pedagogical divide: disparities in how technology is used to foster engagement, critical thinking, and inclusion. Without systemic investment in professional learning, culturally responsive design, and student-centered innovation, equity risks remaining a metric of gadget distribution rather than transformation.

4.3.3. Finding 3.3: Targeted but Limited Accessibility Efforts

Districts leaders interviewed demonstrated a clear commitment to accessibility and inclusion, yet their efforts remained targeted, fragmented, and often peripheral to core instructional improvement efforts. Leaders highlighted initiatives such as automated captioning for video content, translation software for multilingual families, and platforms designed to improve communication with non-English-speaking caregivers. These tools represent meaningful steps toward equity, particularly for multilingual learners and students with disabilities. However, such initiatives were frequently isolated pilots rather than coordinated districtwide strategies.

Nine of the 12 leaders described accessibility as important but not integrated, reflecting an understanding that compliance obligations, such as meeting ADA or Section 504 requirements, often drive accessibility work more than pedagogical vision. Daniel explained, "We meet the legal minimum, but accessibility is rarely part of instructional planning conversations." This emphasis on compliance and the "legal minimum" over pedagogy mirrors broader patterns in educational technology adoption, where technical or logistical concerns eclipse considerations of culturally responsive or universally designed learning practices (Al-Azawei et al., 2016; CAST, 2024).

Analysis of procurement data underscores this fragmentation. Across 8 of the 12 participating district leader cases, contracts rarely referenced accessibility clauses, adaptive technologies, or services explicitly designed for diverse learners. Instead, the dominant entries focused on infrastructure, data systems, and general-purpose instructional tools. Even when accessibility features were embedded in purchased products, they were seldom documented or evaluated as central components of procurement decisions. This omission suggests that accessibility remains an add-on rather than a design principle guiding technology planning.

Leaders also reported uneven capacity among educators to leverage accessibility features effectively. They reported that some teachers routinely enabled captioning, text-to-speech, or translation supports, while many others were unaware that such tools existed. This variability points to the absence of systemic professional learning on inclusive digital pedagogy. As Maya observed, "We buy tools that could make learning more inclusive, but if teachers don't know how to use them, the potential stays locked." This variability highlights a structural gap between technological capability and instructional enactment. The presence of accessibility features within platforms does not guarantee equitable use; without coordinated professional learning and clear expectations, implementation remains dependent on individual teacher initiative and awareness. As a result, inclusive design becomes discretionary rather than systemic, reinforcing uneven access to supports across classrooms. Maya's observation underscores a broader finding of the study: districts may invest in tools with inclusive potential, but without institutionalized capacity building, that potential remains unrealized, limiting the equity impact of technology initiatives.

Despite these challenges, several leaders expressed optimism about emerging opportunities. They noted that the growing focus on Universal Design for Learning (UDL) and multilingual learner engagement could help shift accessibility from a reactive compliance issue to a proactive instructional priority (CAST, 2024; Kamdar et al., 2025). Some described plans to embed accessibility standards into procurement rubrics or to partner with special-education and language-services departments during technology selection. These steps mark early moves toward coherence, aligning digital equity with teaching, learning, and communication systems.

In summary, this theme shows that although districts have made significant progress in expanding access to tools for diverse learners, accessibility still remains mostly superficial, compliance-driven, and inconsistently applied instead of being fully integrated into instructional design. The data indicate that the main obstacle is not a lack of awareness or commitment but a lack of coherent integration across procurement, professional development, and classroom practices. When accessibility is viewed as a technical feature or legal requirement rather than a central pedagogical principle, its effectiveness depends on individual teacher capacity and initiative, leading to unequal experiences for students across different classrooms and schools. From an ACL perspective, this pattern reveals a missed chance to examine and redesign systems to prioritize historically marginalized learners. From a systems change perspective, it highlights the ongoing tendency to rely on technical solutions for what are fundamentally adaptive challenges. Moving forward, promoting equitable outcomes will require shifting accessibility from an add-on to a core

framework, one that is intentionally embedded into decision-making processes, professional learning systems, and definitions of high-quality teaching and learning.

4.3.4. Finding 3.4: Persistent Systemic Barriers

Despite well-intentioned efforts to advance equity and inclusion through educational technology, districts continue to confront systemic barriers that undermine coherence and long-term sustainability. Leaders described organizational environments marked by initiative fatigue, frequent leadership transitions, and uneven teacher engagement across sites. These conditions diluted institutional focus and made it difficult to sustain reforms beyond initial rollout phases. Lilly, the director of curriculum and instruction in Central Unified, summarized this instability candidly: "Every year brings a new platform and a new priority, but no one sticks around long enough to see it through." Similarly, Daniel, Assistant Superintendent in a neighboring district, observed that "by the time we're starting to understand one system, we're already talking about replacing it." Together, these reflections illustrate how structural instability, rather than resistance alone, erodes reform continuity. The constant layering of initiatives without sustained leadership stewardship fragments attention and weakens organizational learning. As a result, even equity-oriented technology efforts struggle to move from adoption to institutionalization, reinforcing the study's broader finding that coherence, not simply commitment, is the limiting factor in district-level transformation.

A recurring theme across interviews was the fragmentation of responsibility. Technology, curriculum, and professional learning departments often operated in parallel rather than in partnership. Leaders across multiple role groups, including chief academic officers, directors of edtech and chief technology officers, acknowledged that this structural separation made it difficult to align technology adoption with broader instructional or equity goals. Participants described equity considerations as peripheral to the initial vetting process, often entering deliberations only after contracts were drafted or pilots were underway. In 10 of the 12 participating districts, equity officers or diversity, equity, and inclusion directors were consulted only after major technology decisions had been made, if at all. This sequencing positioned equity review as retrospective rather than formative, limiting its influence on platform selection, contract terms, and implementation design.

These structural issues were compounded by cultural resistance within schools. Veteran teachers, especially those accustomed to predigital instructional models, were often reluctant to adopt new tools, perceiving them as burdensome or misaligned with their pedagogical philosophy. As Linh observed, "Some teachers see tech as an add-on, not a support. They'll do it if required, but not because they believe in it." Such reluctance illustrates what Cuban (2018) termed the "persistence of traditionalism" in schooling, where technological innovation rarely transforms the underlying grammar of teaching.

Procurement records reflect these patterns of short-termism and limited institutionalization. Districts such as Highland View Unified and Innovation Valley Unified frequently approved 1-

year or pilot contracts without clearly articulated evaluation metrics or renewal pathways, reinforcing what scholars describe as episodic reform cycles rather than sustained implementation (Cuban, 2001; Datnow & Park, 2018). This pattern aligns with longstanding findings that educational change efforts often struggle to move beyond initial adoption when leadership stability and coherent evaluation structures are absent (Elmore, 2004; Fullan, 2016). Without institutionalized routines for assessing impact and revisiting decisions, even promising initiatives are vulnerable to dissolution amid personnel transitions or shifting fiscal priorities (Honig & Rainey, 2023; Penuel & Gallagher, 2017). Over time, this cycle of adoption and abandonment contributes to reform fatigue and diminishes educator trust in district-level innovation efforts (Bryk et al., 2010; Tyack & Cuban, 1997), reinforcing instability rather than building adaptive capacity.

Finally, participants highlighted political and community pressures as additional barriers. Debates over equity-related initiatives, such as social–emotional learning, digital citizenship, or culturally responsive curricula, often spilled into discussions of technology use. Leaders expressed frustration that political controversies could derail otherwise pragmatic conversations about instructional improvement. This climate of scrutiny further incentivized cautious, low-risk decision making, reinforcing compliance culture over innovation, which is a theme often exhibited by districts (CoSN, 2025). In sum, these persistent systemic barriers, organizational, cultural, and political, create a paradoxical condition in which districts possess both the tools and the desire for equitable transformation but lack the stability, trust, and structural coherence to realize it.

4.3.5. Finding 3.5: Emerging Equity Lens in AI Conversations

Although most districts remain in the early stages of exploring GAI, interviews revealed an emerging discourse of equity around its potential applications. Leaders recognized AI's promise to support multilingual learners, students with disabilities, and those needing personalized academic support. One administrator reflected, "AI could level the playing field for multilingual learners, but we're not there yet." This statement captures both aspiration and restraint. The quote suggests that leaders conceptualize AI as a potentially compensatory tool capable of mitigating structural language and learning barriers, yet they simultaneously recognize gaps in governance, professional learning, and policy readiness. Analytically, this tension reflects a broader finding of the study: equity narratives around AI are emerging faster than the institutional conditions necessary to realize them, positioning AI as a site of possibility that remains constrained by existing system capacity and coherence challenges.

Participants described early pilot discussions focused on using AI for tasks such as translation, adaptive feedback, and individualized tutoring. However, these conversations remained largely conceptual. As of 2025, none of the procurement data reviewed from participating districts, including Bayview Union HSD and Redwood Union HSD, who referenced formal AI-related contracts or platforms. This absence reflects both institutional caution and ethical uncertainty. Leaders expressed interest in AI's potential while navigating limited policy guidance, unresolved data privacy implications, and a lack of AI-specific governance frameworks (Kudina & van de Poel, 2024; U.S. Department of Education, 2023). Their hesitation also mirrors broader concerns

in the literature about surveillance capitalism and opaque algorithmic systems operating within public education (Williamson, 2017; Zuboff, 2015). In this context, exploratory discourse outpaced formal policy action.

Equity considerations within these AI discussions tended to emphasize access, ensuring that students and teachers could experiment with AI tools, rather than interrogating differential outcomes or systemic impact. This orientation parallels longstanding critiques of the digital divide literature, which caution that access alone does not guarantee meaningful or transformative use (Warschauer, 2004; Warschauer & Matuchniak, 2010). Few leaders described structured processes for examining whether AI systems might reproduce bias, reinforce tracking patterns, or differentially shape learning opportunities for historically marginalized students (Reich, 2020; Selwyn, 2016). As Daniel admitted, "We talk about bias, but we don't yet have the framework to act on it." This statement reflects a broader governance gap: ethical awareness exists, but institutional mechanisms for operationalizing that awareness remain underdeveloped.

Nine of the 12 informants nevertheless identified the potential for AI to advance differentiated instruction and linguistic inclusion if implemented intentionally. Leaders noted that AI-enabled translation and voice synthesis tools could improve communication with multilingual families, while adaptive systems might provide dynamic scaffolding for students with disabilities. Such possibilities align with scholarship suggesting that AI can expand personalization when coupled with strong pedagogical mediation and educator agency (Holmes et al., 2022; Reich, 2020). Yet participants cautioned that without deliberate instructional framing, AI risks defaulting to automated remediation models that replicate the "banking" paradigm of knowledge transmission critiqued by Freire (1970). In other words, technological affordances alone do not guarantee emancipatory outcomes.

Leaders also acknowledged a significant professional learning gap surrounding AI. Teachers' familiarity and confidence varied widely across sites, producing uneven experimentation and inconsistent classroom application. This variability echoes research showing that technological innovation without sustained professional learning exacerbates disparities in instructional quality (Ertmer & Ottenbreit-Leftwich, 2010; Tondeur et al., 2020). Districts lacking clear ethical guidelines or AI-specific professional development structures reported heightened anxiety about compliance, misuse, or reputational risk. As Michael, a director of secondary education, noted, "We don't want to ban AI, but we also don't want to unleash it without a plan." Analytically, this finding reinforces the study's central argument: AI governance in secondary districts is emerging within preexisting procurement and compliance structures that privilege risk mitigation and access over adaptive instructional transformation. Without coherent frameworks that integrate ethics, pedagogy, and equity, AI risks following historical patterns of technology adoption, high promise, uneven implementation, and stratified impact (Cuban, 2001; Selwyn et al., 2017).

In this context, the emerging equity lens around AI represents both opportunity and fragility. Districts are beginning to ask critical questions: Who benefits? Who might be excluded? How do we safeguard fairness? But leaders are only starting to translate those questions into policy and

practice. As Erin leader aptly concluded, “We’re in the awareness phase. The next step is accountability.” This reflection captures the transitional nature of district AI leadership: moral awareness is surfacing, but institutional mechanisms for enforcement and evaluation remain underdeveloped. The movement from questioning to accountability requires more than rhetorical commitment; it demands formalized policy frameworks, role clarity, and measurable standards for equity impact. Without these structural shifts, the emerging equity lens risks remaining aspirational rather than operational, leaving districts positioned in a state of ethical recognition without systemic capacity to act.

4.4 Cross-Cutting Meta Theme: From Compliance to Coherence

Across all three research questions, a central theme emerged: district leaders are working to shift from a technology adoption culture focused on compliance, characterized by reactive decision making and risk management, to a culture of intentional coherence, where edtech investments align with instructional, ethical, and explicitly equity-centered goals. This change marks a fundamental shift in leadership practices. Compliance-driven systems are defined by policies that ensure adherence to state mandates, data privacy standards, and procurement procedures. Although these structures provide necessary safeguards, they often prioritize legal defensibility over equitable learning transformation, leading to technology systems that offer access without necessarily improving outcomes for historically underserved students. As Linh noted, “We’ve built good fences but not necessarily good pathways,” highlighting how protection without deliberate design can keep inequities in place.

This compliance orientation has roots in the bureaucratic DNA of public education (Tyack & Cuban, 1997), where accountability systems emphasize risk avoidance and procedural correctness. Leaders operate within a complex ecosystem in which transparency and oversight are paramount, yet these same structures can inadvertently reproduce inequities by fragmenting decision making across departments such as technology, curriculum, professional learning, and human resources. Each unit operates according to its own mandates, often without a shared, equity-driven vision. The result, visible in both interview narratives and procurement data, is structural incoherence: single-year contracts, inconsistent evaluation processes, and leadership turnover that disrupts continuity. In such environments, equity efforts are often episodic rather than systemic, and innovation occurs despite the system rather than as a coordinated effort to redress disparities. As Fullan (2023) noted, coherence requires shared purpose and collective meaning making, conditions that remain unevenly developed across the districts studied, particularly with respect to equity.

At the same time, the findings reveal early signs of adaptive coherence-building oriented toward more equitable outcomes. Leaders are increasingly recognizing that compliance, innovation, and equity are not competing priorities but interdependent components of responsible and just governance. Some districts are beginning to repurpose compliance mechanisms, such as data privacy agreements and procurement rubrics, as opportunities to embed questions about instructional quality, accessibility, and differential impact on student subgroups. Rather than treating compliance as an endpoint, these leaders are using it as an entry point for deeper equity-

oriented inquiry, asking not only whether a tool is safe, but whether it meaningfully expands opportunity for students who have been historically marginalized. This reframing signals an important shift from procedural accountability toward substantive equity.

Still, the transition from compliance to coherence remains uneven and fragile. Achieving equity-centered coherence requires more than alignment; it demands institutional learning systems capable of sustained reflection, data-informed iteration, and distributed leadership focused on dismantling inequitable structures. It also depends on stable infrastructure for professional learning, cross-departmental collaboration, and explicit evaluation of how technology impacts different student populations. As districts navigate the emerging challenges of AI integration, data ethics, and accessibility, their capacity to act coherently will determine whether technology serves as a catalyst for equity or reinforces existing disparities. The path forward, therefore, lies not in abandoning compliance but in transforming it into a coherent, equity-driven framework for ethical innovation, one that not only safeguards students but also actively disrupts patterns of inequity and expands meaningful learning opportunities for all.

Chapter 5

Analysis and Synthesis

The purpose of this chapter is to synthesize the findings from Chapter 4 and interpret them using the study's main theoretical frameworks: applied critical leadership (ACL; Santamaria & Santamaria, 2012) and educational systems change theory (Elmore, 2011; Fullan, 2023). Chapter 4 described patterns in district leaders' educational technology decision making, and this chapter explores why those patterns persist, how they are shaped by systems-level conditions, and what they reveal about the possibilities and limits of equity-focused leadership in today's public school systems.

By integrating critical and systems perspectives, this chapter argues that educational technology leadership aimed at equity is best understood by researchers and practitioners as a form of critical systems leadership that requires both moral clarity and organizational coherence. The analysis demonstrates that district leaders often show strong commitments to equity but work within systems that fragment responsibility, restrict learning, and prioritize compliance over coherence. These conditions influence technology adoption in ways that often reinforce rather than challenge existing inequalities.

5.1 ACL and "Tempered Radicalism" in a Reactive System

The study's findings highlight a significant gap between district leaders' critical understanding of edtech and the fragmented approaches to decision making, often referred to as "loosely coupled"

(Kim, 2026; Weick, 1976) within their systems. Although earlier data described the mechanics of reactive procurement and underfunded professional development, this synthesis shows how leadership sensemaking is often hindered by a bureaucratic mindset that emphasizes risk management over social justice. Across these 12 cases, a common theme emerged: district leaders are working to shift from a technology adoption culture focused on compliance and "equity as access" toward a goal of systemic coherence and instructional equity.

This shift has been characterized by what Shah and colleagues called *tempered radicals*, leaders who maintain a dual commitment to their organization and a cause or community that often conflicts with the dominant institutional culture (Shah et al., 2023). These leaders "rock the boat and stay in the boat," navigating the "tempered" space between their outrage over systemic injustice and the need to suppress those feelings to remain effective, employed, and relevant within the district. This often leaves them tinkering at the margins and not addressing fundamental shifts in practice. As "outsiders within," they use their positional power to challenge traditional organizational narratives and prepare the system for significant changes that external advocates are better positioned to demand.

For these leaders, tempering (Shah et al., 2023) is often a strategic necessity rather than a choice. They operate in a state of ongoing ambivalence, acting as critics of the status quo while also leveraging its benefits, such as formal procurement processes and board-approved mandates, to promote equitable change. However, this "tempering" comes with a high price for the leaders, including feelings of isolation, self-doubt, and the professional burden of managing impressions to sustain internal legitimacy without being co-opted by the system's "whiteness" or neoliberal logics. Ultimately, the ability to lead for equity in the era of artificial intelligence (AI) is not just a technical implementation challenge (Kim, 2026); it is an adaptive struggle to uphold one's equity-oriented vision while navigating the structural constraints of the district institution.

5.1.1. Social Justice Leadership and EdTech: Navigating Structural Constraints

Through the lens of ACL, leadership is seen not just as a neutral act of administrative management but as a deeply values-driven expression of personal and professional identity. Many participants in this study entered their roles motivated by a "critical consciousness" and a strong desire to dismantle systemic barriers that uphold racial and class disparities. Yet, study findings reveal a clear tension between these personal commitments to equity and the external professional realities (e.g., time and capacity vs. equity vision; vendor influence vs. critical evaluation; or compliance pressures vs. transformative goals). Leaders described feeling "stretched thin" by a relentless wave of technology rollouts and district crises, which compel them to adopt a reactive stance. In such settings, the proactive leadership necessary for justice often yields to the immediate demands of rubber-stamping vendor purchases and prioritizing short-term feasibility goals.

This dynamic creates a complex state of "tempered radicalism," where leaders must navigate the challenges of advocating for racial justice within systems designed to uphold the status quo (Shah

et al., 2023). As "outsiders within," these administrators operate in a constant state of ambivalence, acting as critics of the system while using its formal structures, such as board-approved contracts and compliance protocols, as tools for gradual change. The "tempering" of their radical vision is often a strategic survival tactic; they must suppress their outrage at systemic inequalities to avoid alienation or professional retaliation. This navigation requires a refined set of skills, including knowing when to voice concerns, how to ask subversive questions at the table, and when to protect oneself to ensure the longevity of the work (Collins, 1986; Guinier & Torres, 2002; Meyerson, 2001).

Ultimately, the study shows that for these leaders, ACL functions as a moral compass, often at odds with the district's bureaucratic DNA. Although they remain skeptical of the "hype" surrounding educational technology and the profit motives of external vendors, their daily choices are frequently limited by bounded rationality and organizational constraints. The disconnect between their critical identity and the district's reactive infrastructure makes leadership "coherence" more of a fragile goal than a daily reality. Without a system realignment to support the "whole selves" of these leaders, their efforts toward instructional equity are heroic but remain vulnerable to ongoing pressures of compliance and institutional turnover.

5.1.2. Differentiating Leadership Stances: Beyond the Tempered Radical

Although the concept of tempered radicalism offers a powerful perspective for understanding how secondary district leaders manage tensions between equity commitments and institutional constraints, the findings indicate that this stance varies among participants. Instead of representing a single leadership identity, leaders in this study occupy a range of leadership roles influenced by organizational context, resource availability, and political risk. Three themes emerged across the cases:

- Tempered Radicals: Navigating Within Constraints
- Constrained Pragmatists: Compliance-oriented Leadership
- Opportunistic Radicals: Leveraging Situational Awareness

5.1.3. Tempered Radicals: Navigating within Constraints

As described by Shah et al. (2023), some leaders in this study acted as tempered radicals, balancing a dual commitment to their organizations and to equity-focused change. These leaders demonstrated a strong critical awareness of systemic injustices and the potential risks of AI technologies, yet they worked strategically within bureaucratic systems to promote gradual change.

For these leaders, tempering was not just a personal trait but a strategic response to organizational realities. They used formal governance structures like procurement processes, compliance reviews, and board policies as tools for gradual influence, even as those same structures limited more transformative actions. This created a form of "tempered agency," where leaders acted both as critics and stewards of the system.

5.1.4. Constrained Pragmatists: Compliance-Oriented Leadership

Not all leaders in the study showed the same level of equity-centered disruption. A second group of participants acted in ways that can be described as constrained pragmatism, focusing on feasibility, compliance, and risk mitigation rather than explicit equity transformation. These leaders were not indifferent to issues of equity; however, their decision making was more closely aligned with existing institutional routines and expectations. In situations marked by high levels of bureaucratic oversight, limited staffing capacity, or increased political sensitivity, leaders often defaulted to established procurement practices and compliance-driven decisions.

In these situations, equity was most often seen as providing access, ensuring that tools were available, rather than as a deeper analysis of how those tools influence teaching and learning. This perspective reflects how organizational conditions can limit the perceived options for leadership, steering even well-meaning leaders toward cautious approaches.

5.1.5. Opportunistic Radicals: Leveraging Situational Awareness

A smaller yet important pattern in the data highlights leaders who, under specific conditions, were able to move beyond moderation and adopt more assertive, equity-focused leadership. These context-driven radicals did not operate outside the system, but they actively shaped it in particular moments. They used policy ambiguity, emerging AI guidance, or organizational flexibility to reframe technology decisions around instructional and equity goals. For instance, instead of accepting vendor claims or compliance standards as enough, they raised new questions about student agency, pedagogical impact, and differential outcomes among student groups. In doing so, they viewed policy not just as a constraint but as a tool for promoting more equitable practices. Importantly, this stance was not consistent across different situations. The same leader might act as a tempered radical in one scenario and as a more assertive change agent in another, depending on the circumstances they faced.

5.1.6. Contextual Conditions Shaping Leadership Stance

These variations in leadership stance were not merely due to individual differences but were heavily influenced by the structural and organizational contexts in which leaders operated. The findings indicate that tempered radicalism, along with its nuanced variants, should be viewed as a position dependent on the context rather than a fixed identity. Several key factors emerged as especially influential.

5.1.7. Governance Structures and Decision-Making Authority

District governance structures significantly shape leaders' ability to act. In more centralized systems with clear instructional priorities and coordinated leadership teams, leaders are better positioned to align technology decisions with equity objectives. Conversely, decentralized systems,

often a response to limited central-office capacity, lead to fragmented decision making and a dependence on site-level autonomy, which frequently reproduces inequalities across schools.

5.1.8. Organizational Capacity and Resource Availability

Resource conditions played a crucial role in shaping leadership action. In districts lacking resources, leaders described functioning in a constant state of scarcity, where demands of procurement, compliance, and crisis management limited their ability to focus on deeper instructional or equity-focused work. This frequently led to reactive decision making and prioritizing short-term feasibility.

On the other hand, districts with higher staffing capacity and more stable infrastructure were better able to engage in ongoing sensemaking, cross-functional collaboration, and strategic alignment, which fostered more decisive equity-oriented leadership.

5.1.9. Political Risk and Community Context

Leaders' willingness to challenge existing practices was also shaped by local political factors. When there was increased scrutiny from school boards or community groups, leaders tended to hold back on advocacy to maintain organizational legitimacy and professional stability. In less contentious environments, leaders had more freedom to question dominant narratives and pursue more transformative change.

5.1.10. Organizational Coherence and Learning Culture

Finally, the level of organizational coherence, characterized by aligned goals, shared instructional vision, and structures for collective learning, proved to be a key factor. In fragmented systems, leaders often relied on compliance-focused routines because there was no stable framework to support more ambitious change. In more coherent systems, leaders were better able to connect technology adoption with instructional priorities, moving from "equity as access" toward instructional equity.

5.2 Reframing Tempered Radicalism as Structurally Produced

Taken together, these findings suggest that tempered radicalism should not be viewed solely as an individual leadership trait but as a socially constructed aspect of leadership in modern school systems. Leaders' positions along the spectrum, from constrained pragmatists to situational radicals, are influenced by the interaction of governance structures, resource conditions, and political environments. This reframing emphasizes a key implication of the study: promoting equity in the age of AI requires not only developing critically conscious leaders but also designing systems that allow these leaders to act on that awareness in ongoing and transformative ways.

5.3 Bridging Theories of Action and Systems Change

The systemic failure to move beyond "equity as access" reveals a fundamental misunderstanding of the challenge, viewing a deeply adaptive problem as merely a technical one. In education, technical changes often improve existing processes without challenging deep-rooted institutional beliefs (Hillman, 2022; Witzenberger & Gulson, 2021). The data show that school districts frequently equate equity with providing hardware, a technical fix, instead of implementing the pedagogical changes necessary to close opportunity gaps. According to Elmore's (2004) framework, any resource added to the classroom is less significant than the "instructional core," the vital human relationship between teachers, students, and content. When leadership focuses on acquiring tools rather than redesigning this core, the implementation remains "hollow," expanding access but not truly increasing student agency or engagement.

This misalignment worsens due to a lack of systemic coherence, which Fullan (2023) describes as aligning technology initiatives with purposeful, coordinated district-wide goals. The findings emphasize effort fragmentation, especially in higher-poverty districts where decentralized decision making and the proliferation of tools and platforms have become common (Reich, 2020). As tempered radicals, leaders in these areas struggle to maintain a clear vision while navigating the bureaucratic DNA that divides innovation. This fragmentation causes technology integration to be episodic and inconsistent, functioning like a "survival of the fittest" form of innovation, where student experiences rely on individual teacher skill rather than deliberate system design.

Ultimately, the study highlights a major breach of Elmore's (2004) principle of "reciprocal accountability": the idea that responsibility for student learning should be matched by equal systemic support for educators. Although districts are quick to adopt new platforms, they consistently underfund professional development and the necessary "human infrastructure" to make those tools effective. Leaders expressed frustration that professional learning budgets are often the first to be cut, leaving teachers to handle complex adaptive changes like integrating GAI with only superficial training (Heifetz et al., 2009; Whalen et al., 2025). This creates a pedagogical gap where providing tools outpaces transforming practice, effectively blocking equity from advancing beyond the device level and into the learner.

5.4 The Fragility of Systemic Coherence: A Structural Barrier to Equity

Applying the drivers of change identified by Fullan (2023), the findings reveal a fragmentation of effort that effectively undermines systemic equity. Although leaders aim to foster a culture of intentional coherence, the "bureaucratic DNA" of their districts, characterized by single-year contracts and isolated departments or school platform adoptions, often pushes them toward structural incoherence. This environment encourages a "defensive posture," where leaders focus on avoiding mistakes rather than engaging in the bold experimentation necessary for true digital transformation. As tempered radicals (Shah et al., 2023), these administrators find that although they have the "political will" to disrupt, the system's reliance on compliance-driven gatekeepers,

such as Data Privacy Agreements, often serves as both a real and perceived ceiling—real in the form of legal, fiscal, and organizational constraints (e.g., compliance requirements, limited capacity, and fragmented governance), and perceived in leaders' assumptions that risk avoidance must take precedence over experimentation, thereby limiting their work to risk mitigation rather than instructional empowerment.

This lack of coherence is most visible in the districts serving high-poverty student populations, where decentralization functions not as an empowering strategy but as a reactive response to structural under-resourcing. Leaders in these areas explained a practical need to give schools autonomy but admitted that this leads to vastly different and inequitable student experiences across campuses. This pattern reveals a systemic meritocracy of innovation, where only students with "early adopter" orientations, or access to teachers and schools with the capacity to experiment, implement, and sustain new technologies, are positioned to benefit, while others remain excluded from more meaningful and transformative learning opportunities.

The fragility of these systems is made worse by a leadership culture that sees frequent turnover, which diminishes institutional memory and causes a state of perpetual restarting. When cabinet-level leaders or technology heads leave, the moral and strategic importance of inclusion often lessens, resulting in what participants called "equity amnesia." This instability is especially harmful because racial justice is an "intergenerational and collective struggle." The findings reveal that when a district lacks a stable framework for organizational learning, it effectively blocks ACL from moving beyond individual, heroic, but fragile actions toward a sustained, collective effort for educational equity.

5.5 Coherence as a Moral and Structural Imperative

The final synthesis of this study argues that systemic coherence is a moral requirement for fair leadership. For a leader's ACL to succeed, it must be supported by an organizational "theory of action" that reaches the instructional core and offers the necessary resources for change. Without alignment in budgets, professional development, and evaluation capacity, a leader's critical identity remains disconnected from daily classroom practices. The study ultimately views the district leader as a moral agent whose effectiveness depends on their ability to shift the system away from "equality by provision," which is simply distributing tools, toward a philosophy based on intentional, human-centered design.

Leader's moral obligation is complicated by the impossibilities inherent in the role of the social justice leader. As tempered radicals, these leaders constantly navigate economies of risk, forced to choose between causing harm to historically oppressed communities and risking professional repercussions by challenging a hostile system. The findings suggest that placing social justice leaders within racially hostile systems without structural support is an act of violence that results in their dehumanization and marginalization. Therefore, achieving instructional equity requires more than just critical consciousness; it demands a fundamental redesign of the district's cultures and structures to cultivate the expansive creativity and wholeness of leaders who prioritize justice.

As districts transition from the "awareness phase" to full AI integration, shifting from compliance to coherence becomes essential. Although leaders express "cautious curiosity" about AI's potential for personalization, they lack the institutional methods to proactively address ethical risks and algorithmic biases. The study concludes that the future of fair digital learning relies on a district's ability to move beyond merely "checking boxes" and develop a coherent accountability framework. Only by transforming compliance into a values-based strategy can districts ensure that technology acts as a catalyst for meaningful, equitable, and transformative learning for all students.

5.6 Conclusion: The Moral Necessity of Coherence

The analysis in this chapter shows that shifting from "equity as access" to "instructional equity" is not just a logistical change but a major adaptive challenge. District leaders may acknowledge systemic barriers, but their power is often limited by the bureaucratic structure of school systems, which are built more for technical compliance than for pedagogical innovation, as discussed earlier with the history of technology in schools (Cuban, 2018; Honig & Rainey, 2023; Tyack & Cuban, 1997).

The synthesis of ACL (Santamaria & Santamaria) and educational systems change (Elmore, 2004; Fullan, 2016) theory reveals a persistent visibility gap in district governance. The following points summarize the main conclusions of this analysis.

- The Tempered Agency of Leaders: Leaders act as "tempered radicals," navigating the "impossibilities" of leading for racial justice within systems that often reward maintaining the status quo at the expense of true community integrity. This results in a state of "reactive acquiescence," where the moral imperative to dismantle inequities is often postponed to address the immediate demands of vendor-driven procurement.
- The Instructional Core Breach: Equitable technology integration still centers on devices and apps, as districts view this adaptive challenge as only technical. By neglecting the instructional core, the human-mediated relationship between teacher, student, and content, districts unintentionally broaden access while clinging to a "survival of the fittest" approach to adoption that favors those already proficient.
- Coherence as a Structural Imperative: curriculum and instruction incoherence is a structural barrier to justice. The "fragmentation of effort" found in high-poverty contexts is not a choice but a byproduct of structural under-resourcing of these districts, which forces leaders into a survival-oriented state of commendable, but fragile acts, rather than sustained, intentional design.

5.7 Toward an Aspirational Pursuit of EdTech Justice in the Era of AI

Ultimately, this study argues that the shift from compliance to coherence is a crucial yet uneven change in leadership practices across the districts examined. Although many leaders acted as tempered radicals—navigating institutional constraints while pursuing incremental, equity-focused

change—the findings also reveal notable variation in how leaders engaged with systems of power and possibility. In some cases, leaders remained largely confined by routines of compliance and resource shortages, using pragmatic strategies that prioritized practicality over transformation. In other instances, leaders demonstrated the capacity to actively challenge and reshape organizational conditions, leveraging moments of flexibility, emerging ambiguities in AI policy, or aligned leadership structures to more directly emphasize equity, pedagogy, and student agency in decision making. These leaders show that although systems often constrain actions, they do not fully control them; under certain conditions, leaders can bend organizational routines toward more justice-driven outcomes.

As districts face the rapid rise of AI, the central equity challenge no longer just concerns access to devices or platforms. Instead, it expands to a growing pedagogical gap: who can use these tools for learning, creativity, and agency in meaningful ways, and who cannot (U.S. Department of Education, 2023; Warschauer, 2010). In this context, systemic coherence becomes not just a management goal but a moral and political necessity. It demands aligning leaders' commitments to equity with the organizational capacity, governance structures, and professional learning systems needed to ensure that digital technologies, from Chromebooks to large language models, serve as tools for empowerment rather than mechanisms of social reproduction. The following chapter builds on this analysis by outlining policy and practice recommendations aimed at helping districts shift from reactive, compliance-focused adoption to intentional, equity-driven system design, empowering leaders not only to manage constraints but to actively transform them.

Chapter 6

Conclusions, Contributions, and Recommendations

This study aimed to explore how a group of Bay Area district leaders make decisions about procuring and implementing educational technology and emerging artificial intelligence (AI) tools, and how they incorporate equity considerations into those decisions. By interviewing 12 district leaders and analyzing procurement records and governance documents, the study examined how leaders interpret new policy guidance, assess technology platforms, and manage institutional constraints when implementing technology to promote equitable student learning opportunities. Additionally, findings suggest that inequitable technology implementation is not only a failure of leadership intent but also a result of how educational systems and policies are currently designed. Consequently, advancing equity in the era of AI requires not only new leadership practices but also policy changes that establish the structural conditions necessary for equity-centered decision making.

Findings show district leaders hold a complex and often conflicting leadership role. They frequently demonstrate strong commitments to educational equity and acknowledge the potential benefits and

risks of emerging AI technologies. However, their ability to translate these commitments into clear actions is often hindered by fragmented governance, reactive purchasing habits, and decisions that focus on compliance. As a result, technology adoption often reflects what this study calls tempered agency (Meyerson & Scully, 1995; Shah et al., 2023): leaders have the awareness to challenge inequities in educational systems but operate within institutional environments mainly designed to preserve operational stability and legal compliance.

Analyzed through the lenses of applied critical leadership (ACL; Santamaria & Santamaria, 2015) and educational systems change (Elmore, 2004; Fullan, 2016) theory, these findings demonstrate that equitable educational technology leadership depends not only on leaders' personal commitments but also on the structural conditions in which they operate. District procurement processes, compliance systems, and organizational capacity function as mediating structures that determine whether technological innovations reinforce existing inequalities or foster more inclusive and engaging learning.

6.1 Implications for Leadership: A Critical Systems Leadership Model for Educational Technology and AI Governance

The findings of this study reveal that existing frameworks for understanding educational technology leadership often neglect the organizational systems that influence technology adoption decisions. Much of the research on educational technology concentrates on classroom implementation, teacher adoption, or student access (Han, 2025; Reich, 2020). However, the cases examined in this study show that the most significant decisions affecting educational technology use often happen earlier in the process, within district governance structures responsible for procurement, compliance, and policy interpretation.

Building on the findings of this research and the theoretical frameworks of ACL (Santamaria & Santamaria, 2015) and Educational Systems Change (Elmore, 2004; Fullan, 2016), this dissertation introduces the critical systems leadership model for educational technology and AI governance (see Figure 6.1). Although the model is a new conception of equity-oriented system leadership of edtech and AI, it relies heavily on ACL and Systems Change research. The model considers technology leadership as a systems process where district leaders manage the interplay of external pressures, internal governance routines, and equity-focused leadership practices.

External pressures include vendor narratives, technological innovation cycles, policy guidance, and community expectations about digital learning. These pressures often shape new technologies toward efficiency, personalization, and innovation, encouraging rapid adoption. Within districts, these pressures interact with governance structures such as procurement procedures, risk management protocols, data privacy reviews, and instructional technology committees. Although these systems provide important safeguards, they also influence the types of questions leaders feel able to ask when making technology adoption decisions.

In this environment, district leaders engage in what this study calls critical edtech systems leadership, a leadership approach that combines awareness of structural inequities with systems-focused methods for organizational change. ACL (Santamaria & Santamaria, 2012) encourages leaders to examine how power, race, and structural inequalities can be embedded in technological systems. Systems change theory (Elmore, 2004; Fullan, 2016) emphasizes the need for organizational coherence, alignment, and capacity building to translate leadership goals into sustainable practices.

The critical systems edtech leadership model indicates that equitable technology governance occurs when leaders use these frameworks to connect district governance structures with the core of teaching and learning. Instead of allowing procurement systems or vendor stories to influence decisions, leaders engage in organized sensemaking processes that explicitly link technology choices to instructional goals, equity objectives, and organizational readiness.

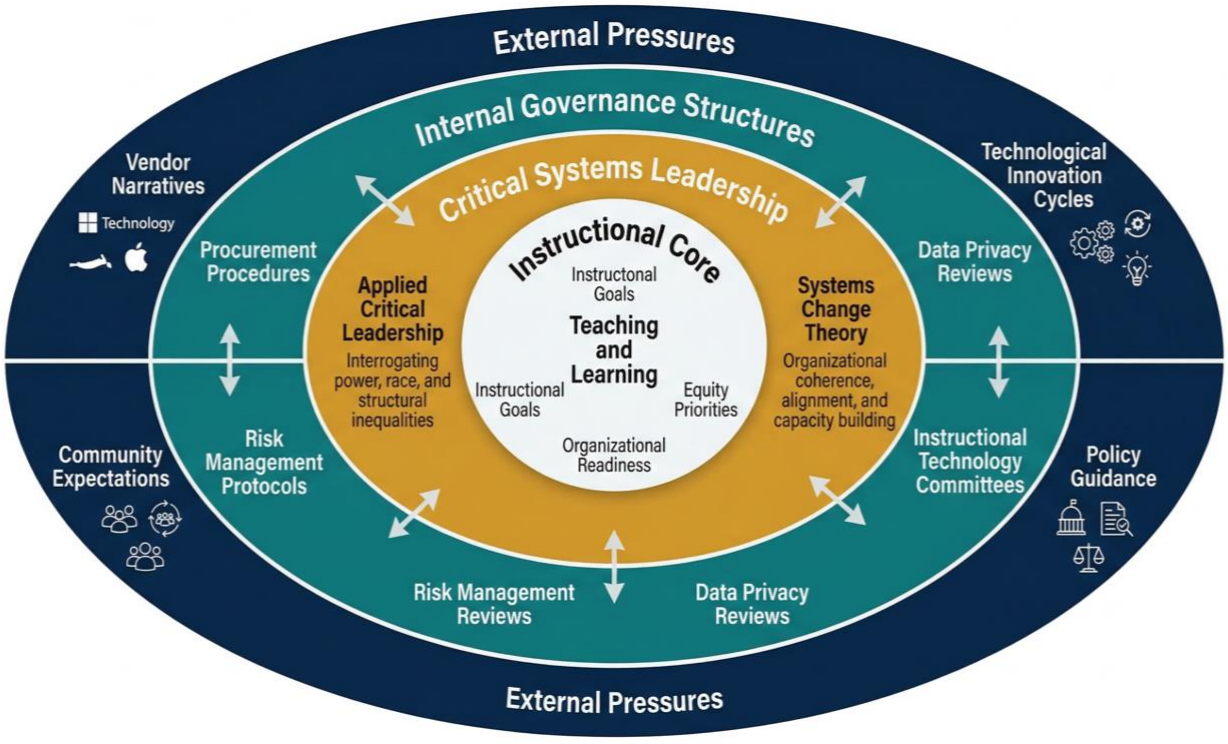

Figure 6.1 *Critical Systems Leadership Model for AI and EdTech Governance*

At the heart of this model is an equity-centered edtech procurement heuristic, which transforms critical systems leadership into a practical decision-making tool for district leaders (see Table 6.2).

Instead of viewing technology procurement as just a technical or compliance task, the heuristic frames decision making around key leadership questions that link technology adoption to instructional goals, equity commitments, and organizational preparedness. These questions help leaders go beyond reactive purchasing influenced by vendor marketing or immediate operational needs and instead base technology adoption on the core of teaching and learning. By explicitly highlighting instructional, ethical, and organizational factors at the start of the decision process, the heuristic urges leaders to pause and examine the broader educational impact of technology adoption before allocating public resources.

Table 6.2 *Equity-Centered EdTech Procurement Heuristic*

Decision stage	Leadership questions	Purpose
1. Define the Instructional Problem	• What instructional challenge are we trying to solve? • Which student populations are most affected?	Anchors technology adoption in the instructional core rather than vendor marketing.
2. Interrogate Vendor Claims	• What independent evidence supports the tool's effectiveness? • What assumptions about learning are embedded in its design?	Encourages critical evaluation of market narratives and technological hype.
3. Evaluate Equity Implications	• How might this tool affect multilingual learners, students with disabilities, or historically underserved groups?	Ensures equity considerations move beyond device access toward instructional impact.
4. Assess Organizational Readiness	• Do teachers have the training and support needed to use this tool effectively? • What professional learning systems exist?	Connects technology adoption to organizational capacity and systems change.
5. Pilot, Evaluate, and Adapt	• How will the district monitor impact and adjust implementation over time?	Encourages iterative learning rather than one-time purchasing decisions.

The initial set of questions encourages district leaders to identify the instructional challenge that the technology intends to address. Instead of focusing on the tool itself, leaders should ask: *What specific teaching and learning problem are we trying to solve? Which students are most impacted by this problem? How does this tool align with our district's overall instructional and equity goals?* This approach keeps technology adoption centered on the instructional core, as described by Elmore (2004), which involves the relationships among teachers, students, and content. For instance, a district exploring an AI-powered writing assistant might start by pinpointing a common instructional issue, such as helping multilingual learners improve their academic writing skills. Framing the decision around this instructional challenge helps leaders assess whether the technology genuinely addresses the problem, rather than simply adding another digital tool to the district's platform ecosystem.

The second set of questions encourages leaders to critically evaluate vendor narratives and technological claims. Educational technology markets often promote tools as transformative solutions without independent evidence of their effectiveness. Leaders following this guideline are therefore advised to ask: *What research supports the vendor's claims? What assumptions about teaching and learning are built into the platform's design? Who benefits most from the tool's use?* For example, a vendor might claim that an AI tutoring system "personalizes learning for every student." Using this stage of the guideline, leaders might investigate whether personalization results from pedagogically sound feedback or simply algorithmic pacing adjustments that may not address deeper learning or motivation needs. This critical questioning aligns with the principles of ACL (Santamaria & Santamaria, 2015), encouraging leaders to consider whose knowledge is embedded in technological systems and whose perspectives might be marginalized or excluded.

The third set of questions focuses specifically on equity and accessibility considerations. Leaders should ask: *How will this technology impact historically underserved students, including multilingual learners, students with disabilities, and those from low-income backgrounds? Could the technology unintentionally reinforce or worsen existing inequalities? What accessibility features are integrated into the platform?* For example, an AI-powered homework support tool might offer advanced help to students with reliable home internet, while providing limited offline options for students with unstable connectivity (Reich, 2020; U.S. Department of Education, 2023; Warschauer & Matuchniak, 2010). By evaluating such disparities during procurement discussions, leaders can better predict how implementing the technology might lead to uneven educational experiences and can take measures to address these issues through targeted supports or alternative solutions.

The heuristic also urges leaders to assess organizational readiness and implementation capacity. Even the most promising technology will fail to bring about meaningful instructional change if

teachers lack the time, training, or support needed to incorporate it into their practice. At this stage, leaders should ask questions such as: *What professional learning structures are crucial for successful implementation? Do we have staff with the expertise to help teachers use this tool? What additional resources are necessary to sustain this initiative over time?* For instance, implementing an AI-based formative assessment system might require professional development to assist teachers in interpreting algorithmically generated feedback and integrating it into instructional planning. Without these capacity-building efforts, the technology may remain underutilized or used superficially, hindering progress toward instructional goals.

Finally, the heuristic encourages districts to adopt an iterative, small-scale pilot-and-continuous-improvement approach to implementation and to consider how the technology will be evaluated over time. Key questions include: How will we measure whether this technology improves learning outcomes? What data will we collect to assess its impact across different student groups? How will we adapt our approach based on what we learn? For example, a district piloting an AI-based language translation tool might track not only usage data but also measures of family engagement and communication effectiveness across linguistic communities. By embedding evaluation into the adoption process, the heuristic reinforces the idea that technology implementation should be an iterative learning process rather than a one-time procurement decision.

Taken together, these questions turn technology procurement into a structured leadership practice that aligns with both ACL (Santamaria & Santamaria, 2015) and systems-change principles (Elmore, 2004; Fullan, 2016). The heuristic helps district leaders shift from reactive technology adoption to more intentional governance practices that focus on instructional coherence, organizational capacity, and equitable learning opportunities for all students.

6.2 Implications for Policy: From Compliance to Coherence

The findings of this study indicate that promoting equity in the era of artificial intelligence requires a fundamental rethinking of how policy functions within district technology governance. Although existing policy frameworks, especially those related to data privacy, procurement, and risk management, offer essential safeguards, they tend to emphasize compliance (Hillman, 2022; U.S. Department of Education, 2023; Witzenberger & Gulson, 2021). As a result, these frameworks often prioritize legal defensibility and procedural correctness over instructional consistency and equitable learning outcomes.

This compliance-focused approach creates a structural limitation: policies define what districts cannot do more than what they should do to enhance teaching and learning. Without specific policy mechanisms that connect technology adoption to instructional goals and equity issues, decision-

making becomes fragmented, reactive, and heavily influenced by vendor narratives or immediate operational pressures.

To transition from compliance to coherence, policy must be redefined not just as a set of constraints but as a design tool for aligning systems around a shared instructional and equity-focused vision. This change requires policies that explicitly connect procurement processes, instructional priorities, professional learning systems, and evaluation practices. Instead of viewing these areas as separate administrative functions, coherent policy frameworks integrate them into a unified approach to educational technology governance.

First, policy should incorporate equity as a fundamental criterion at every stage of technology decision making. This involves requiring districts to assess not just access to technology but also its unequal effects on student learning opportunities, especially for historically underserved populations. Policies that include equity impact assessments, disaggregated outcome data, and culturally responsive design considerations can help ensure that technology adoption goes beyond mere access to promote meaningful participation and empowerment.

Second, policy frameworks must shift from static compliance checklists to adaptive, inquiry-driven processes. Given the rapidly evolving nature of AI technologies, districts need policy structures that support ongoing evaluation, reflection, and revision. This includes promoting iterative, small-scale piloting approaches paired with clear expectations for data collection, cross-group analysis, and continuous improvement. In this way, policy can serve as a mechanism for organizational learning rather than just risk mitigation.

Third, policymakers should encourage cross-functional governance structures that bring together instructional leaders, technology staff, and equity-focused departments. The fragmentation seen across districts, where different units operate with limited coordination, directly contributes to disorganized implementation. Clear policy can help institutionalize collaboration, ensuring that decisions about technology adoption are informed by pedagogical, technical, and ethical perspectives all at once.

Finally, policy must address the ongoing imbalance between investing in technological tools and investing in human capacity. As this study shows, the lack of ongoing professional learning and instructional support often leads to “hollow implementation,” where technologies are available but underused or not aligned with instructional goals. Effective policy should therefore focus on funding and establishing structures for professional development, recognizing that building human capacity is crucial for turning technological access into fair and meaningful outcomes.

Based on the findings of this research, I have developed a new conceptual framework: the critical systems leadership model for educational technology and AI governance. This model, illustrated in Figure 6.2, represents a fundamental shift from traditional, compliance-heavy routines toward a more holistic approach of intentional coherence.

By integrating ACL (Santamaría & Santamaría, 2015) and educational systems change theory (Elmore, 2004; Fullan, 2016), this framework redefines policy as a proactive tool for system design and organizational learning rather than a mere mechanism for risk management.

6.3 The Equity-Centered Policy Framework for AI Governance

This framework facilitates a transition across four key dimensions of district leadership:

- From Compliance to Coherence: Moving beyond legal defensibility and "checking boxes" to ensure every edtech investment is purposefully aligned with district-wide instructional and ethical goals.

- From Technical Fixes to Adaptive Design: Shifting the focus from "equity as access" (simply distributing hardware) to instructional equity, which addresses the pedagogical transformations required to close true opportunity gaps.

- From Fragmented Silos to Integrated Governance: Replacing decentralized, reactive decision making with cross-functional structures where curriculum, IT, and equity departments collaborate on shared outcomes.

- From Capital Expenditure to Human Infrastructure: Rebalancing the system to prioritize sustained professional learning and instructional coaching, ensuring that the "human infrastructure" can effectively leverage technological tools.

Ultimately, this model positions policy as a vehicle for systemic change, empowering district leaders to move from reactive acquiescence to proactive, justice-centered stewardship in the era of artificial intelligence.

Figure 6.2 *Critical Systems Leadership Model for Educational Technology and AI Governance*

This reconceptualization of policy also highlights a broader theoretical contribution. By showing how edtech governance routines act as de facto policy mechanisms that influence leaders' ability to fulfill their equity commitments, this study expands current understandings of educational technology leadership beyond individual decisions into the realm of organizational systems and structures. In doing so, it emphasizes the need for a theoretical framework that explains the dynamic interaction between leaders' critical consciousness, the bureaucratic systems they operate within, and the policy environments that determine what is possible in practice. The following section builds on this insight by explaining how the integration of ACL (Santamaria & Santamaria, 2015) and educational systems change theory (Elmore, 2004; Fullan, 2016) offers a more comprehensive perspective for understanding district-level technology governance and the conditions needed to achieve coherence in equity-centered educational technology implementation.

6.4 Contribution to Theory

This study contributes to the expanding field of educational technology leadership by integrating insights from ACL and educational systems change theory into a cohesive framework for understanding district-level technology governance.

First, the study expands research on educational technology adoption by showing that district governance routines, such as procurement processes, compliance systems, and risk management practices, serve as practical policy tools that influence technology adoption decisions. However, this pattern was not consistent across all districts. In contexts with higher levels of organizational capacity, leadership stability, and clearer instructional vision, these routines were more likely to be used strategically to align technology decisions with system-wide goals. Conversely, in districts facing greater resource constraints, leadership turnover, or fragmented governance structures, these routines tended to reinforce reactive, compliance-driven decision-making. In these cases, procurement processes and risk management practices often limited the scope of deliberation, leading to fragmented adoption patterns and reduced instructional coherence. These findings imply that governance routines are not inherently constraining or enabling; instead, their impact depends on the broader organizational and resource conditions in which they are implemented.

Second, the findings deepen theoretical discussions of ACL (Santamaria & Santamaria, 2015) by showing how leaders' critical awareness changes depending on bureaucratic organizational structures. Although many district leaders showed strong commitments to equity and voiced concerns about algorithmic bias, data ethics, and digital access gaps, their efforts to put these commitments into action varied widely across different settings. Some leaders acted as what might be called tempered radicals, navigating institutional limits while making small, equity-focused changes within existing systems. Others, especially in areas with more political support, clearer roles, or greater organizational capacity, were more able to go beyond routine compliance, using moments of flexibility, such as uncertain AI policies or cross-departmental collaboration, to intentionally prioritize equity and instructional change in decision-making. Conversely, some leaders, particularly those in highly constrained environments, tended to adopt practical, risk-averse approaches that focused on what is feasible and maintaining system stability rather than pursuing bold change.

Taken together, these variations suggest that leaders' ability to serve as equity-focused change agents depends not only on individual traits or awareness but is also heavily influenced by contextual factors such as resource availability, governance consistency, political climate, and organizational capacity. This more nuanced view complicates the idea of district leaders as

uniformly “tempered radicals,” instead revealing a range of leadership approaches, from compliance-based pragmatism to more assertive, justice-driven efforts to transform systems.

Finally, this study presents a new conceptual framework, the critical systems edtech leadership model, that merges critical leadership principles with systems-oriented change theory. By treating educational technology governance as an adaptive systems challenge, the model highlights the importance of aligning leadership practices, organizational capacity, and instructional priorities when implementing emerging technologies like artificial intelligence.

6.5 Contribution to Practice

Beyond its theoretical contributions, this study offers practical guidance for district leaders responsible for navigating the growing challenges of educational technology and artificial intelligence adoption.

One of the most vital practical implications of this research is the need to reconceptualize educational technology procurement as a form of instructional leadership rather than a solely technical or administrative task. Decisions regarding which technologies districts select influence the conditions in which teaching and learning occur and must therefore be closely aligned with instructional goals and equity priorities.

The equity-centered edtech procurement heuristic introduced in this study offers district leaders a structured decision-making tool to assess emerging technologies. By guiding leaders through key questions about instructional goals, vendor claims, equity impacts, and organizational readiness, the heuristic turns procurement from a reactive purchase into a strategic leadership process.

The findings also emphasize the importance of investing in human infrastructure alongside technological tools. In the 12 districts examined, professional development and instructional coaching were consistently underfunded compared to software investment. This imbalance often led to what one participant called “hollow implementation,” where platforms were widely available but rarely used in ways that genuinely improved teaching and learning.

Finally, this study provides both practical and policy guidance by recommending that districts establish formal collaborative governance structures that unite information technology staff, site instructional leaders, and departments in shared equity-driven technology decision making. From a practical perspective, cross-functional leadership teams support more comprehensive decision making by addressing technical feasibility, instructional alignment, and equity considerations simultaneously instead of separately. From a policy perspective, districts should formalize these structures through governance protocols that mandate multidepartmental review and shared

accountability for technology decisions. Such policies can help transition decision making from fragmented, siloed processes to more integrated, equity-focused systems, increasing the chances that educational technologies are both safe and instructionally meaningful for diverse student groups.

6.6 Conclusion

The growth of digital learning technologies and Artificial Intelligence continues to present both opportunities and challenges for public education systems. Although these tools can promote more responsive and inclusive learning environments, their success depends on the coherence of the systems that govern, implement, and evaluate them. Without deliberate alignment, technology initiatives risk reinforcing existing inequalities instead of reducing them, and may also prolong the long-standing cycle of technological reform in education characterized by initial hype, optimistic adoption, and eventual disillusionment when expected results are not achieved (Cuban, 1986; Selwyn et al., 2017).

This study demonstrates that equity-focused educational technology leadership depends not only on individual leader traits but also on how well district systems are organized to support consistent decision making. When procurement and implementation are disorganized or reactive, technology adoption often fails to produce meaningful instructional improvements, resulting instead in short-term excitement followed by abandonment. However, when leaders align instructional priorities with governance structures, invest in professional and organizational capacity, and critically evaluate tools through an equity-centered lens, technology can serve as a catalyst for more just and effective learning environments (Fullan, 2016; Santamaría & Santamaría, 2015). In this way, coherence is not just essential for equity but also a critical challenge to break the cycle of hype, hope, and disappointment. Moreover, the need for coherence and alignment becomes especially critical as artificial intelligence advances at an unprecedented and consequential pace, forcing leaders to navigate high-impact decisions with increasing urgency (Fullan & Gallagher, 2024).

These findings have significant policy implications at both the district and state levels. First, procurement policies need to go beyond compliance-focused frameworks and adopt models that explicitly prioritize instructional coherence and equity. This involves setting clearer criteria for evaluating educational technologies based on their alignment with pedagogical goals and their potential impact on historically underserved student populations. Second, districts must formalize cross-functional collaboration among instructional, technology, and procurement teams to reduce fragmentation and support more integrated decision-making processes. Third, policy should focus on sustained investment in human infrastructure, including professional learning, leadership development, and organizational routines, that enable educators to effectively implement and adapt

technologies in practice (Elmore, 2004). Collectively, these changes reposition policy as a tool for sustaining learning and improvement rather than merely fueling cycles of rapid adoption followed by disuse.

Ultimately, the challenge for district leaders is not just to adopt new technologies but to redesign the systems that influence their selection and use. By applying the principles of ACL alongside systems-based approaches to organizational learning, districts can move beyond reactive and compliance-driven practices toward more intentional, equity-centered models of technology leadership (Elmore, 2004; Fullan, 2016; Santamaría & Santamaría, 2015). This approach offers a pathway toward not only more equitable outcomes and access for students but also breaking the historic pattern of technological reform in education, replacing cycles of hype, hope, and disillusionment with sustained, coherent, and equity-driven progress.

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Appendices

Appendix A: Pre-Interview Survey

Thank you for participating in this study. This short survey will collect basic demographic and professional background information to help contextualize your interview responses. Your answers will remain confidential.

Section 1: Professional Background

1. Last Name
2. First Name
3. Email Address
4. What is your current job title? (Open-ended response)
5. Which of the following best describes your role? (Select all that apply)
    - District Superintendent
    - Assistant Superintendent
    - Chief Technology Officer (CTO)
    - Chief Academic Officer (CAO)
    - Director of Instructional Technology
    - Director of Curriculum & Instruction
    - Other (please specify)
6. How many years have you worked in K-12 education?
    - *Less than 5 years*
    - *5–10 years*
    - *11–15 years*
    - *16–20 years*
    - *More than 20 years*
7. How many years have you worked in a central office leadership role?
    - Less than 1 year
    - 1–3 years
    - 4–7 years
    - 8–12 years
    - More than 12 years
8. What grade levels does your work primarily impact? *(Select all that apply)*
    - Elementary (PreK–5)
    - Middle School (6–8)
    - High School (9–12)
9. What geographic area does your district serve?
    - Urban
    - Suburban
    - Rural

Section 2: District & Technology Context

10. How would you describe the size of your school district?
    - Fewer than 5,000 students
    - 5,000–14,999 students
    - 15,000–49,999 students

11. How involved are you in decisions about instructional technology adoption in your district?
    - Not involved
    - Somewhat involved
    - Moderately involved
    - Highly involved

12. How would you describe your district's approach to integrating instructional technology?
    - Early adopter (frequently pilots and implements new technologies)
    - Moderate adopter (thoughtfully integrates technology after research and planning)
    - Late adopter (slow to integrate new technology)
    - Not sure

13. Has your district implemented or piloted Generative AI tools (e.g., ChatGPT, Gemini, MagicSchool, SchoolAI, etc) for instructional use?
    - Yes
    - No
    - Not sure

14. If you are using one or more of these platforms, please name it below.

Section 3: Demographics (Optional)

15. Which racial/ethnic group(s) do you identify with? *(Select all that apply)*
    - *American Indian or Alaska Native*
    - *Asian*
    - *Black or African American*
    - *Hispanic or Latino/a/x*
    - *Native Hawaiian or Pacific Islander*
    - *White*
    - *Another race or ethnicity (please specify)*
    - *Prefer not to answer*

16. What is your gender identity?
    - *Female*
    - *Male*
    - *Non-binary/Third gender*
    - *Prefer to self-describe*
    - *Prefer not to answer*

Appendix B – Interview Protocol

Proposed Research Participants: *K-12 District administrators who oversee the procurement and implementation of Instructional technology. Instructional technology entails the technological resources and processes to be used by teachers to design, deliver, and enhance effective teaching and learning experiences for PK-12 students. It encompasses many tools and practices, including digital content curation, online learning platforms, interactive whiteboards, student response systems, and more, all aimed at improving educational outcomes. Instructional technology integrates the tools into pedagogy to support and enhance the curriculum, engage students, and develop their digital citizenship skills. (ISTE, 2021)*

Interview Protocol

Warm-up Questions

1. Can you describe your role and responsibilities as a district leader?
2. What initially motivated you to pursue school district leadership, and how long have you been in a central office role?
3. How do you define educational equity?
4. How does your role specifically relate to instructional technology and equity initiatives?

Main Interview Questions

Research Area 1: Positionality, Instructional Technology, and Equity

1. Can you describe your experience leading instructional technology initiatives in your district, including decision-making, implementation, and evaluation? If relevant, how has this evolved since the pandemic?
2. What are your core suite of tools?
3. What lessons have you learned in implementing instructional technology?
4. What are the most significant unresolved challenges you see in making technology truly a tool for equity?
5. In what ways does instructional technology support your district's broader equity goals?
6. What obstacles have you encountered when aligning instructional technology with equity priorities? How have you worked to overcome them? What has been challenging to overcome, and why do you think that is?

Research Area 2: Generative AI Tools and Equity

1. How has your district approached the implementation of Generative AI tools such as ChatGPT or Gemini?
2. To what extent has your equity focus influenced how you assess or adopt these tools?
3. How do your strategies for implementing AI tools compare to previous instructional technology initiatives? What lessons have you learned?

4. What concerns, if any, have been raised by educators, students, or families about the role of AI in education?

Research Area 3: Disparities in Educational Technology

1. Based on your observations, are there disparities in how different student populations access or benefit from instructional technology? If so, can you provide examples?
2. What do you believe are the main factors contributing to these disparities?
3. Have any unintended consequences of technology adoption exacerbated inequities? How has your district addressed these issues?

Research Area 4: Disrupting Technological Disparities

1. What strategies has your district employed to reduce technology access and usage disparities among historically underserved students?
2. Can you share an example of a successful initiative where instructional technology made a measurable difference for an underserved student group? What contributed to its success?
3. How do you assess the effectiveness of instructional technology in advancing equity? What indicators or measures do you use?

Closing Questions

1. As a leader, what additional support, resources, or professional development would help you more effectively lead instructional technology initiatives?
2. What changes or advancements in educational technology would you like to see to support equitable outcomes better?
3. Is there anything we haven't covered that you think is important to discuss?

Conclusion

- *Thank you for sharing your insights. Your perspectives are incredibly valuable to this research. I will analyze the data and ensure that findings are shared in a way that respects confidentiality. If you'd like, I can follow up with a summary of key takeaways once the study is complete. Do you have any final questions?*
- Offer to answer any questions they may have about the research.
- Close the interview and confirm the way and timing of any follow-up.

Appendix C: IRB Approval Letter

Berkeley
UNIVERSITY OF CALIFORNIA
Committee for Protection of Human Subjects (CPHS)
Office for Protection of Human Subjects (OPHS)

1608 Fourth Street, Suite 220
Berkeley, CA 94710-5940
510 642-7461
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FWA# 00006252

NOTICE OF APPROVAL FOR HUMAN RESEARCH

DATE:	*August 04, 2025*
TO:	*Travis Bristol, School of Education* Brian Simmons, School of Education
CPHS PROTOCOL NUMBER:	*2025-01-18174*
CPHS PROTOCOL TITLE:	*CHALLENGING ASSUMPTIONS: A CRITICAL INQUIRY INTO EDUCATIONAL TECHNOLOGY LEADERSHIP IN THE ERA OF ARTIFICIAL INTELLIGENCE*
FUNDING SOURCE(S):	*NONE*

A(n) *new* application was submitted for the above-referenced protocol. Your submission has been reviewed by the Office for Protection of Human Subjects (OPHS) and granted exemption, as it satisfies the Federal and/or UC Berkeley requirements under category(ies) *2* .

Effective Date: *August 04, 2025*

Expiration Date: *August 03, 2035*

Amendments/Modifications: Any change in the design, conduct, or key personnel of this research must be approved by the OPHS ***prior*** to implementation. For more information, see Amend/Modify an Approved Protocol.

Please note that although your research has been deemed exempt from full committee and subcommittee review, you still have a responsibility to protect your subjects, and the research should be conducted in accordance with the principles of the Belmont Report. Download the Belmont Report at this link: www.hhs.gov/ohrp/humansubjects/guidance/belmont.html.

This approval is issued under University of California, Berkeley Federalwide Assurance #00006252.

Note: Exempt determinations are good for ten years. If the study continues beyond the ten-year period, the protocol must be cloned and re-submitted for an updated exempt determination.

If you have any questions about this matter, please contact the OPHS staff at 642-7461 or email ophs@berkeley.edu .

Sincerely,

Office for Protection of Human Subjects (OPHS)
UC Berkeley