Artificial Intelligence Governance and Strategy Implications for K-12 Education: Global Guidance from a Canadian Context

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Abstract

Primary and secondary education have transformed significantly in recent decades, shifting digital technology from a peripheral novelty to an essential pedagogical infrastructure. During the COVID-19 pandemic and in the years following, cloud computing and ubiquitous access to learning resources online have escalated. A nearly constant connection to cloud computing resources has also facilitated the wide adoption of Artificial Intelligence (AI). This paper outlines the evolution of educational technology infrastructure in Western Canadian K-12, including the foundations for the proliferation of AI. This paper will also discuss emerging AI governance challenges in education. As IT systems evolve, the challenges for contemporary leaders in education and technology are shifting from questions about the execution of initiatives to the long-term implications of those initiatives, both intended and unintended. In addition to the binding legal considerations of AI use within the K-12 context, determined by legislation such as the European Union Artificial Intelligence Act, leaders must be similarly attentive to more nuanced and less clearly defined challenges, such as viability, sustainability, stakeholder perceptions, and cultural shifts. This paper will explore these complex global issues relating to AI governance within K-12 education, as these foundational and structural topics continue to have an increasing impact on student learning in the classroom and beyond.

Keywords: *AI Governance, K-12 Strategy, Cloud Computing, Education, EU AI Act, Innovation Adoption*

1. Introduction

Since late autumn of 2022, when ChatGPT and Artificial Intelligence (AI) entered the broader public consciousness, jurisdictions around the globe faced similar challenges regarding the governance of this powerful technology. This paper will draw parallels between the evolution of the governance of cloud computing and the emerging governance of AI. The governance, legislative, and regulatory environments concerning technologies not only impact the technologies explicitly stated within the laws, but also have secondary effects on the adoption and use of peripheral technologies. These effects have been explored in organizational innovation adoption frameworks, such as the one proposed by Frambach and Schillewaert, and will be explored within this paper [1]. The European Union Artificial Intelligence Act is one of the first wide-reaching laws globally impacting AI use. In the coming years, other regions aim to create equivalents for their jurisdictions. As educational institutions create roadmaps for the adoption and governance of AI, it is prudent for them to be aware of these laws. Additionally, educational institutions should develop their IT and AI strategies with considerations of long-term viability and sustainability. Lastly, though of paramount importance, organizations must consider the perceptions of their communities concerning the proliferation of AI. In addition to the operational questions of how, where, and if AI use is possible, there are the overarching strategic questions relating to whether AI should be used.

2. The Impact of the Regulatory Environment on Education

2. 1 Canadian Cloud Computing Research and Implications

The considerable impact of a regulatory environment on educational technology is evident in a study of the IT infrastructure in Western Canadian K-12 school districts. This study consisted of all 75 large K-12 districts in Canada's three western-most provinces, capturing the learning environments of over 1.14 million students within a geography of 2.2 million square kilometres [2]. The study uses a data transformation mixed-methods triangulation design [3]. This study employed both quantitative and qualitative approaches, allowing for statistical correlation analysis between coded factors affecting K-

12 IT infrastructure and a corpus of interview data, providing explanations of these factors, respectively.

This study of cloud computing on Western Canadian K-12 school districts revealed the widespread adoption of cloud computing across school and superintendents' office infrastructure. The formal definition of cloud computing according to the US Department of Commerce's National Institute of Standards and Technology (NIST) is as follows: "Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. This cloud model is composed of five essential characteristics [on-demand self-service, broad network access, resource pooling, and rapid elasticity], three service models [SaaS, PaaS, and IaaS], and four deployment models [private cloud, community cloud, public cloud, and hybrid cloud]" (2011, p. 2) [4].

Though an extensive discussion of cloud computing is not possible within a paper of such length, an example of public cloud would be Google LLC/Alphabet Inc.'s suite of browser-based applications, such as Gmail or Google Docs. These applications are operated by the vendor companies directly, and are accessible through an internet browser. Private cloud, on the other hand, is run from a data centre that is operated by the school district.

The research revealed that cloud computing use was nearly ubiquitous, but differences existed between provinces regarding the type of cloud computing used. The educational leaders interviewed in the study spoke to the impact of each province's regulations, which in turn determined the type of cloud computing IT infrastructure schools used [5]. In the province of British Columbia, where the public sector was governed by some of the strictest data privacy and data residency laws in Canada between 2004 and 2021, K-12 IT infrastructure was primarily private cloud; in the provinces of Alberta and Saskatchewan, where these restrictive laws did not apply, public cloud infrastructure was more heavily used [6, 7, 8, 9].

An additional finding of this research, illuminated by the statistical correlation analysis, was that once districts made the decision to operate a data centre, they were likely to make use of that data centre. Conversely, if districts moved aspects of their IT infrastructure to the public cloud, they were more likely to continue to make this shift and decrease the use of the data centres they operated. This is a reasonable pattern, as if a school district is required to operate a data centre due to provincial laws, with electricity, security, staffing, equipment, etc., it is only a marginal increase in cost and effort to operate additional IT services there. The implication of this is that the impact of legislation not only reaches the IT systems directly or explicitly within the legislation, but also has an ecosystem/network effect on the other IT systems [2].

2. 2. The Regulatory Environment in Organization Adoption Frameworks

The impact of a regulatory environment on organizational adoption is well-established within the academic literature. Frameworks that focus on individual-level adoption of technologies are the most common within the innovation adoption literature. These include Rogers' Diffusion of Innovations (DOI) model, the Unified Theory of Acceptance and Use of Technology (UTAUT), and the Technology Acceptance Model (TAM) [10, 11, 12]. Though individual innovation adoption frameworks are more common, a framework that explicitly addresses the organizational innovation adoption is more appropriate for examining the adoption of foundational infrastructure technologies by an organization. In 2002, Frambach and Schillewaert presented a robust two-stage framework for innovation adoption: the first portion depicting the influences on organizational adoption; the second portion depicting subsequent individual-level adoption [1].

A finding from the Western Canadian K-12 cloud computing adoption research was that there was a need for an even more distinct categorization of governance, legislative, and regulatory influences on organizational adoption [2]. A limitation of the original 2002 Frambach and Schillewaert framework was that it did not sufficiently distinguish between elements within the environmental influences category. For example, participants in the aforementioned study described environmental influences, such as competitive pressures, as having a low impact on their adoption decision. These participants then discussed the strong influence of provincial legislation, also within the environmental influences category. This made presenting the study results challenging, especially when discussing the relative influence of factors, such as social network, supplier marketing efforts, adopter characteristics, etc. The lack of resolution within the original framework for the environmental influences category necessitated the creation of the Modified Frambach and Schillewaert framework, presented in Figure 1, in which there is a distinct category for the regulatory environment.
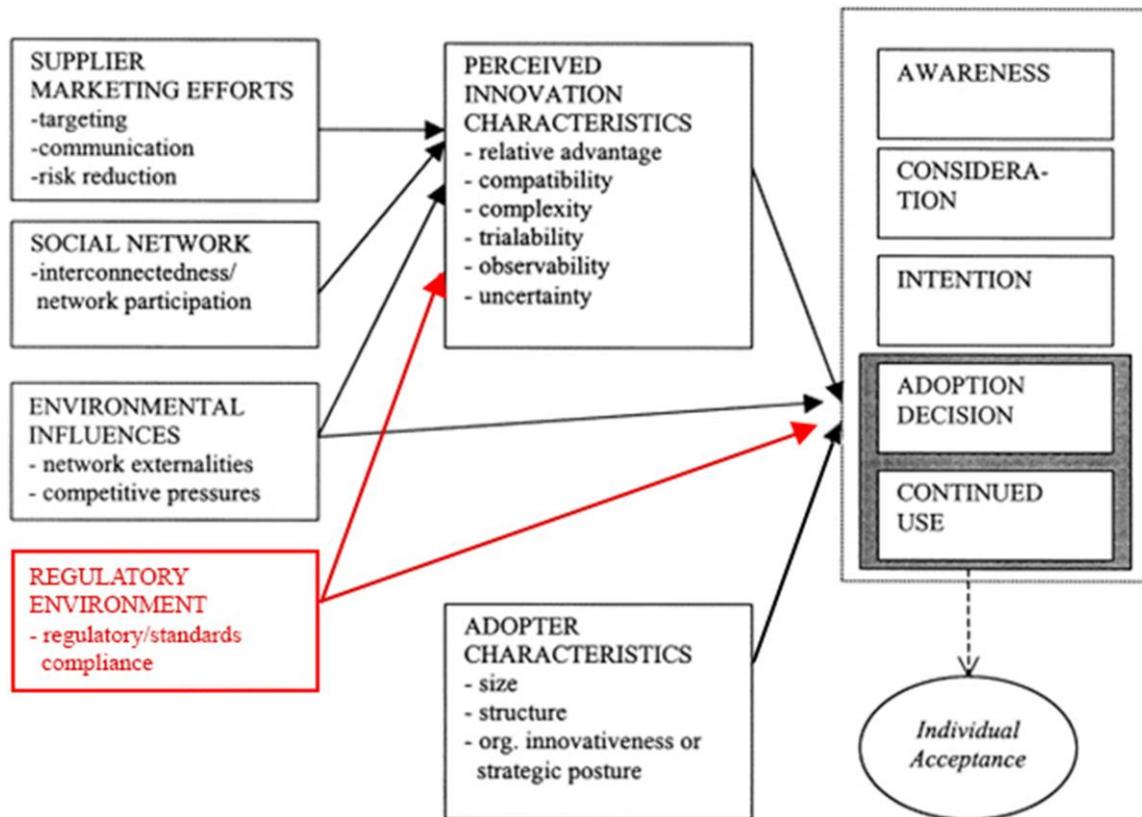
Fig. 1. The 2018 Modified Frambach and Schillewaert framework of organizational innovation adoption.

3. Emerging Global Artificial Intelligence Governance

3. 1 The European Union Artificial Intelligence Act

In April 2021, the European Commission officially proposed the European Union (EU) AI Act. It was then passed by the European Parliament and European Council in 2024, officially entering into force on August 1, 2024. The goal of the EU AI Act is to establish a risk-based classification for the use of AI. The four categories of risk are: minimal risk, limited risk, high risk, and unacceptable risk. For these categories, the obligations for organizations progress from voluntary codes of conduct, to transparency obligations, to compliance with strict legal obligations, to an outright prohibition, respectively [13, 14]. Table 1 outlines these categories, with relevant examples of each AI risk category for K-12 education [15,16].

3. 2. The General Data Protection Regulation (GDPR) Precedent

General Data Protection Regulation (GDPR) is an EU law governing the handling of personal data by organizations that came into effect in 2018 [17]. This law, affecting both EU-based organizations, as well as organizations interacting with citizens of the EU, had a wide global reach, becoming the de facto international standard for the handling of personal data [18]. The penalties for non-compliance with GDPR requirements are severe. These fines range from up to €10 million, or 2% of the firm's worldwide annual turnover for less severe infringements, to a fine of up to €20 million, or 4% of the firm's worldwide annual turnover from the preceding financial year, whichever amount is higher, for the more severe infringements [17]. As the internet allows for EU citizens to easily interact with organizations around the globe, many organizations adjusted their operations to comply with GDPR, even if they were not EU-based, in order to not risk EU fines.

CLASSIFICATION	OBLIGATIONS	K-12 EDUCATION EXAMPLES
UNACCEPTABLE RISK Clear threat to fundamental rights and safety.	**PROHIBITED** Cannot be deployed or used in educational settings.	• **Cognitive Manipulation:** Educational games using psychological triggers to manipulate behavior or beliefs. • **Emotion Recognition for Discipline:** Classroom camera analyzing expressions for disciplinary reporting. • **Real-Time Biometric Identification**: Live facial recognition at entrances to identify/track individuals.
HIGH RISK SYSTEMS Permitted but subject to strict legal obligations.	**COMPLIANCE REQUIRED** Conformity assessment, rigorous risk management, high-quality data governance, human oversight, and mandatory registration.	• **Admissions and Placement Algorithms:** Screening applicants or assigning tracks based on predicted performance. • **AI Grading and Evaluation:** Auto-grading where the score is the primary factor in a final grade. • **AI Proctoring Systems:** Monitoring eye movements and screen activity during online exams.
LIMITED RISK Requires transparency to inform users they are interacting with an AI system.	**TRANSPARENCY REQUIRED** Inform users of AI interaction; clearly label artificially generated or manipulated content.	• **AI Tutors and Chatbots:** Chatbots answering FAQs; users must be informed it is a bot. • **Deepfake Educational Content:** AI-created videos of historical figures; must be labeled as artificially generated. • **Generative AI Tools:** Tools for brainstorming or generating content; output must be labeled as AI-generated.
MINIMAL RISK Common tools with minimal risk impact; existing legal frameworks apply.	**NO NEW AI ACT OBLIGATIONS.** Existing laws apply; voluntary codes of conduct are encouraged.	• **AI-Enabled Educational Games:** Simple games adjusting difficulty for engagement without high-stakes decisions. • **Inventory Management:** Tools for predicting supply needs like paper or tablets. • **Spam Filters:** AI systems keeping junk email out of inboxes. • **Spell and Grammar Checkers:** Basic tools suggesting corrections in word processors.

Table 1. EU AI Act and its implications for education.

The structure of the fines for violations of the EU AI Act closely resembles that of GDPR. For the more minor infractions, these fines range from up to 1% of total worldwide annual turnover, or up to €7.5 million, whichever is greater. For the more severe infractions, such as prohibited AI practices, the fines range from up to €35 million, or up to 7% of total worldwide annual turnover, whichever is greater [17]. Again, given the open and borderless nature of the internet, international companies can easily find themselves in violation of the EU AI Act, even if they do not have a physical presence in the EU [19,20]. Consequently, it is foreseeable that organizations around the world will begin to standardize around the policies of the EU, even if they are outside of its jurisdiction.

3. 3. Emerging Global Artificial Intelligence Regulations

In 2026, at the time of writing this paper, AI governance around the world is only emerging. The 2024 EU AI Act remains the preeminent global AI legislation. In Canada, the Artificial Intelligence and Data Act (AIDA) was drafted, but has yet to be passed into law [21]. In the United States, there is a patchwork of state and federal regulations, but no single AI regulation. Recent United States AI regulations, such as the Colorado Artificial Intelligence Act (SB24-205) and the 2026 California AI regulations, adopt many of the same principles encompassed by the EU AI Act [22,23]. In the absence of specific AI legislation, existing legal frameworks, such as those pertaining to human rights and privacy, are used. This is the approach also seen in nations such as the United Kingdom and Japan, where AI use is to implicitly comply with existing societal norms. In China, AI is similarly aimed to align with existing regional societal norms, though these have been codified in the 2023 Interim

Measures for the Management of Generative Artificial Intelligence Services (Interim GAI Measures) [24].

3. 4. The Brussels Effect

The Brussels Effect, a term brought forth in Anu Bradford's work, refers to the de facto and de jure influence EU policies have on the rest of the world [18]. The previous paragraphs have outlined the pressures companies face to avoid EU fines by standardizing their global practices to the EU standards (de facto Brussels Effect). Similarly, multinational companies can exert pressure on their regulators to develop laws that are consistent with EU requirements, again with the aims of simplicity, consistency, and efficiency (de jure Brussels Effect). A consequence of the Brussels Effect is that even if a jurisdiction's laws do not currently mediate certain uses of AI, the regional laws or services available within the region may soon evolve to mirror the laws of the EU. The AI implications outlined in Table 1, though specific to the EU, may become the standards for the rest of the world's practices with AI in an educational setting.

4. Viability and Sustainability Considerations

As educational leaders establish their long-term visions, it is also important for them to consider the viability and sustainability of their strategies, in addition to an awareness of what is permitted by law. Though OpenAI Inc. brought ChatGPT and AI to the public consciousness in 2022, it is yet to be profitable [25]. This is linked to the computationally and energy-intensive nature of AI, which presents environmental/sustainability challenges [26]. OpenAI (OpenAI Inc. is now a collection of similarly named companies and regional subsidiaries) projects net losses of $14 billion USD in 2026, with cumulative losses expected to reach $44 billion USD by 2028 [27]. OpenAI projects becoming profitable in 2029, contingent on its revenues growing to $100 billion USD that year [28]. Conversely, Google LLC/Alphabet Inc. remains profitable due to its differentiated Google Cloud offerings, of which Gemini AI is only one component [29, 30]. In 2026, Google Cloud is expected to reach a net income of $20 billion USD [31].

The contrast in the 2026 financial positions of OpenAI versus Google LLC/Alphabet Inc. is stark, and should concern educational leaders developing an IT strategy for their K-12 schools. Currently, schools around the world are experimenting with AI-enabled tools, many of which leverage OpenAI's application programming interface (API). Should companies such as OpenAI continue to struggle financially, this will eventually have adverse downstream effects on the educational applications used by schools that rely on them. This is a strategic risk that educational leaders should be mindful of as they construct their educational technology roadmaps.

5. Stakeholder Perceptions and Cultural Shifts with Artificial Intelligence

In addition to the legal and practical considerations regarding future AI implementation within schools, educational leaders should be attuned to the perceptions of their community members concerning AI use. Though AI is a powerful tool that can complete tasks in seconds that might have otherwise taken humans many hours, this increase in efficiency is not guaranteed to be seen favourably by all stakeholders. The examples in Table 1 illustrate some of the instances where the application of AI requires transparency and caution to stay compliant with the EU AI Act. However, beyond the necessary adherence to the EU AI Act and/or other applicable laws, it is important for educators, administrators, and technologists to remain sensitive to the evolving perceptions, sensibilities, and preferences of their communities.

AI tools will continue to evolve, and their sophistication will increase [32]. This will improve AI output and make it increasingly more difficult to distinguish from high-quality human work. Simultaneously, the awareness of AI's capabilities will continue to diffuse throughout society, resulting in an audience that is more attuned to AI-generated content and AI-involved processes. Educators and school leaders must be mindful of evolving societal norms and expectations regarding AI. There is pressure for schools, especially elite university preparatory institutions, to be academically innovative. At the same time, the community members of such institutions may have a strong preference for highly personalized, bespoke, and minimally automated experiences.

Beyond the need to align with the expectations of parents, there is also the need for school community members to model appropriate uses of AI for students. If students are expected to produce authentic, human-generated work within their specific contexts, then the faculty should

similarly produce authentic, human-generated work within their specific contexts. The challenge for educators, administrators, and technologists is to continually gauge the evolving societal norms concerning when AI use is appropriate, and when it might be viewed as impersonal, insensitive, and/or low effort.

6. Conclusion

The educational experiences of students and teachers within K-12 schools are the product of the confluence of multiple factors, ranging from technical innovation, to legislation, to economic conditions, to cultural norms and expectations. These factors emerge over many years and act as an often-unseen foundation for the tangible experiences within schools [33]. As demonstrated in the cloud computing adoption research in Western Canada, the legislative environment can have profound direct and indirect influences on the IT environments available to students, teachers, and administrators. Similarly, as AI begins to permeate an increasing number of IT systems, the EU AI Act is likely to shape global technology environments, including educational technology infrastructure.

As jurisdictions around the world begin to develop their own AI-specific laws, there are opportunities for future research on the impact these changes will have on the adoption and use of AI. Similarly, with the passage of time, as AI companies and platforms mature, there will be greater clarity concerning the viability, sustainability, and business models of major AI companies such as OpenAI and Google LLC/Alphabet Inc. Moreover, there are also opportunities to explore the evolving sentiments of people concerning AI use, especially within K-12 educational settings. The governance of and strategy for AI use within K-12 education is a relatively modern phenomenon, with many opportunities for investigation in order to more fully understand what has been termed the fourth Industrial Revolution [34].

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