

School Boards—IT Systems and Technology in the Classroom

1.0 Summary

The Ministry of Education (Ministry) funds 72 district school boards to provide elementary and secondary education to about 2 million Ontario students (as of the 2017/18 school year). School boards and individual schools determine how much funding they allocate to operate their school and classroom technology according to their own needs. They take into account many different factors when considering how to spend their budgets to support their operations and capital projects such as the boards' academic and administrative objectives and their IT system priorities.

School boards reported their total IT spending for the 2017/18 fiscal year as \$227.8 million, of which they spent \$160.6 million on IT systems and computers, including software and licences, and \$67.2 million on the boards' IT operations and administration. The Toronto District School Board, one of the four boards we visited in the course of our audit, spent an average \$33.9 million annually on IT over the last five school years.

Each school board in Ontario decides on its own level of spending on IT services. Spending across the boards ranged from 0.17% to 2.70% of total operational expenses, on average, for the last five school years. **Appendix 1** outlines average IT spending at each school board for the school years

2013/14 to 2017/18, and shows IT spending per student for 2017/18.

School boards and schools use IT in the classroom for training in math skills, programming, coding, design and other subject areas, as well as students' quick access to the Web for research. Teachers use IT to aid in designing and delivering lessons and administrative tasks such as tracking attendance and marks.

Our audit looked at how effectively school boards procure, manage and protect IT assets, whether personal information is safeguarded, whether IT support is sufficient, whether data is reported to the Ministry according to legislated requirements, and what, if any, impact the use of IT technology may have in the classroom. We visited four of the 72 school boards and staff at four schools in the province and conducted a survey with all the school boards (discussed in **Section 3**).

Overall, we found that the Ministry had no broad IT strategy for curriculum delivery, use of IT by students and administration of IT. Also, with the school boards making locally based decisions on spending, acquisition and procurement of equipment and systems, students' access to IT such as computers and software varies across the province. We also found that at different boards and schools the age of the computers and laptops in classrooms ranged from new to outdated.

Some school boards we visited informed us that they have not systematically assessed to what

extent their students are using IT in the classroom. As a result, we found that these boards have not done a full analysis of how to best use IT resources in curriculum delivery.

We noted as well that the effectiveness of measures to counter cybersecurity threats that may put student data at risk varies across the province, with different boards providing their staff with different levels of IT privacy and security training.

Our audit also found inefficiencies in the systems that the Ministry and school boards use for reporting student data, and that Ministry-provided training in student data reporting was insufficient to help resolve data validation errors.

The following are some of the specific concerns we noted in our audit:

- **Students' access to information technology and consequently students' learning experiences varied across schools.** The availability of tablets, laptops, computers and applications varied among the schools. Some school boards did not perform an assessment to evaluate whether the classrooms had adequate IT resources to help with learning, whether their IT equipment was up to date, and whether the allocation of IT resources among schools was consistent. For example, at some schools, eight students shared one computer, whereas in others each student was assigned an individual computer. Some school boards were applying no benchmark, policy or best practice to allocate classroom technology to students.
- **The age of IT equipment used in classrooms differed among schools.** We found that some schools had new, modern equipment in classrooms, while others had outdated equipment. The age of the equipment can affect students' learning experience because outdated technology is slow and incompatible with the requirements of the latest software. Older technology can also be vulnerable to hacking and other cybersecurity threats if it is no longer supported by its vendor with regular security updates.
- **School boards are not taking all reasonable steps to prevent inappropriate access to student information.** The system that administers the Ontario Education Number, which is issued to every student in the province, contains students' personal information and educational records. We found that 971, or 19%, of user accounts in this system had never been used. That indicates that many authorized users have no current need to access the system. We also found that accounts of inactive users of the Ministry's IT system are not always being cancelled after they leave their positions at the boards. These accounts are accessible on the Internet, which means that there is a risk that confidential student information may be exposed to the public. In addition, data privacy training to staff is lacking at many schools, also putting student data at risk.
- **Not all boards provide formal security awareness training or have cybersecurity policies.** Educating employees through ongoing awareness training is one of the ways to protect sensitive data, including confidential student data. However, 51 of the 69 boards that responded to our survey (74% of respondents) indicated that they do not provide formal IT security or privacy training to staff with access to technology at school boards and at schools.
- **School boards are not managing cyberbullying effectively.** Although the school boards have established policies and guidelines on bullying prevention and intervention in accordance with Ministry requirements, they do not measure the effectiveness and performance of anti-cyberbullying programs. Of the school boards that responded to our survey, 25 (36%) indicated that they did not log cyberbullying incidents and were

therefore lacking the information to study and address the root causes of such incidents.

- **School boards were inconsistent in their ability to keep track of IT assets such as laptops.** Two of the school boards we visited as part of our audit do not have enough oversight over their classroom IT assets, such as laptops and tablets, to be able to keep track of them, and in some cases board staff were unable to verify whether they had gone missing from the schools.
- **The majority of school boards do not have a formal IT business continuity and disaster recovery plan.** We found that many school boards do not have formal IT business continuity and disaster recovery plans if a natural or man-made event potentially damaged the operation of their IT systems. For example, one board we visited does not have a physical location to serve as a disaster recovery site for its IT systems. Sixty-five of the 69 school boards that responded to our survey (94%) indicated that they were not aware of their key IT risks and did not have formal disaster recovery plans or plans on how to continue business in the event of a major loss of data and IT assets.
- **The Ministry and school boards are not always obtaining value for money on their IT purchases.** The Ministry has spent more than \$18.6 million on virtual learning environment (VLE) software in the past five years, which it provides for free to the school boards; however, more than one-quarter of the school boards we surveyed reported rarely using VLE, and most boards purchase their own software. Also, one board that we visited had purchased 2,710 smartboards at a cost of about \$9.7 million but did not provide training to teachers on how to use them, so some were being used as simple projection screens. It also purchased them without a formal business case for their use.
- **There is no single common centralized student information system at the provincial level, which could potentially provide cost savings.** Each school board procures its own student information system based on local needs and preferences. It is possible that savings could be found through economies of scale if all school boards used one student information system that was managed by the Ministry. However, the Ministry and school boards have not investigated the overlaps and inefficiencies and explored the potential cost efficiency of a centralized student information system.
- **The Ministry's system that boards and schools use to submit student data to the Ministry is inefficient.** Error messages provided by the Ministry's system are not clear and often do not provide enough information to identify and resolve problems. This causes delays for school board staff while they contact Ministry staff to resolve the problems. A study conducted in 2017 by a committee of the Ontario Association of School Business Officials estimated that boards spent an average of 116 days in finalizing one of the three yearly data submissions. The Ministry has no target number of days for finalizing the submissions.

This report contains 14 recommendations, with 26 action items, to address our audit findings.

Overall Conclusion

Overall, we found that the Ministry had no broad IT strategy for curriculum delivery, use of IT by students and administration of IT. We found that students' access to classroom technology varied across the province, with student-to-computer ratios in one board ranging from 1:1 to 8:1, and that the age of equipment and software also varied in classrooms across the province. Our survey of the 72 school boards revealed that 55% of the 69 boards that responded did not have an approved

policy for effective and efficient IT asset life-cycle management, which includes inventory of IT assets and assessment of their working state.

We found that the Ministry and school boards were not always obtaining value for their IT purchases and that hardware and software were not always being used as intended or to their full potential. For example, even though the Ministry has spent more than \$18.6 million on virtual learning environment (VLE) software in the past five years, which it provides for free to the school boards, we noted that boards are purchasing their own classroom software. The boards informed us that VLE is difficult to use, is missing useful functions, and does not completely meet classroom teacher needs.

In addition, we concluded that school boards do not take sufficient measures for preventing cybersecurity threats and providing data privacy training to teachers and staff. The boards also have room for improvement in addressing cyberbullying in the schools.

We also found that the Ministry's system that school boards use to report student data to the Ministry was inefficient and lacking performance targets. Training and support on the system was insufficient to help resolve errors with data validation in a timely manner.

OVERALL MINISTRY RESPONSE

The Ministry of Education thanks the Auditor General and her team for this report. The Ministry is committed to getting education in Ontario on the right track. To accomplish this goal, efforts include restoring public confidence and financial accountability to our publicly funded education system. As such, the Ministry welcomes the opportunity to address the potential for improvements and efficiencies highlighted in the Auditor General's recommendations. These recommendations complement the robust feedback we have received from parents, students, educators and other community members as part of Ontario's consultation on education. The use of technology in schools is

an important component of these consultations and the Ministry looks forward to gathering further public input to address how our education system can best harness technology to drive student success.

The Ministry will continue to work with its education partners to deliver on its promise to ensure Ontario's education system prepares our students for the realities of today and the changing global economy. The Auditor General's recommendations will help inform the Ministry's efforts as we work to build a stronger publicly funded education system for students, parents and educators.

2.0 Background

IT systems at school boards support and enable critical business processes such as enrolment and registration of students in courses; allocating classrooms; recording test scores and marks; producing transcripts; and tracking student attendance. These systems also enable better administration of schools by facilitating bookkeeping and helping to determine the allocation of school staff. School boards are responsible for the operation and maintenance of their IT systems, as well as protecting the security and privacy of information housed in these systems.

The Minister of Education (Minister) is responsible for the administration of the *Education Act* (Act) and the regulations that supplement it. This includes responsibility for early years programs, child care and publicly funded education from kindergarten to Grade 12. The Minister also has authority over school boards through several mechanisms highlighted in the Act. These include the authority to make regulations regarding the duties of school boards and to request any report deemed necessary from school boards.

School boards are responsible for student achievement and well-being, for ensuring effective

stewardship of the board’s resources, and for delivering effective and appropriate education programs for their students. Other relevant responsibilities include:

- monitoring the policies of the schools and the achievement of students and, through the directors of education at the boards, holding the entire system accountable for meeting provincial and board standards; and
- developing a multi-year strategic plan that highlights how each board will meet its responsibilities. Each board is required to report this plan to the Ministry of Education (Ministry) and make it accessible to the public.

School boards have various IT and business operations support teams to support and facilitate the delivery of data reporting and IT needs at schools. IT teams typically include analysts, technical support staff, system administrators, reporting staff and a dedicated liaison to report to the Ministry. These teams are responsible for the operation of the boards’ IT systems as well as the physical IT resources and networks that they reside on. They play a key role in ensuring that the information on the boards’ systems is secure and meets the requirements surrounding privacy and protection of information, as stated in the *Municipal Freedom of Information and Protection of Privacy Act* and other documents. The teams also support the procurement of IT systems and help ensure that these systems are properly maintained and updated.

The Community Services I&IT Cluster is one of nine information and information technology (I&IT) clusters in the Ontario Public Service. (Clusters are groupings of government programs and services that have similar clients and need similar I&IT services.) This cluster has four partner ministries and a reporting relationship to corporate IT in the Ministry of Government and Consumer Services, with the Ministry of Education being the relevant one for this audit. The cluster administers and supports IT systems for the Ministry over the systems’ entire life cycle. The Ministry collects data

through cluster-supported systems for reporting and analysis.

The cluster supports its partnered ministries by:

- providing strategic advice and consultation regarding the use of I&IT;
- providing services and sustaining I&IT business solutions as well as enabling strategic use of data for its ministries’ core business and evidence-based decision-making;
- ensuring that ministries’ I&IT assets are sustainable and current; and
- supporting corporate strategic directions, policies, standards and guidelines on the value and use of information management and technology, in consultation with the Treasury Board Secretariat.

2.1 Information Technology in Classrooms

Technological resources used in classrooms as tools to help learning are known as “classroom technology.” These educational tools are of different types: desktop computers and laptops; Chromebooks, iPads, WinBooks and other kinds of tablets; interactive whiteboards; digital cameras; 3D printers; the classroom’s Internet connection; and learning software of various kinds—for training in math skills, programming, coding, design and other subject areas. Studying in Internet-connected classrooms lets students quickly gather information from the Web. Teachers can use IT tools to shorten the time they need for lesson planning and assessing students.

2.2 Procurement of Information Technology by School Boards and Schools

The Ministry licenses its virtual learning environment (VLE—see **Section 2.3.3**) and other learning software resources and provides these resources to all publicly funded Ontario school boards, Indigenous communities and facilities of education, taking

into account the advice of the Ontario Software Acquisition Program Advisory Committee (Committee). The Committee is composed of English and French educators and representatives from across the province who advise the Ministry on its software purchases.

The Ministry conducts its procurements in compliance with the Ontario Public Service Procurement Directive issued by the Management Board of Cabinet, Ontario's obligations with trade agreements and in accordance with Canadian law. It takes the Committee's advice in assessing assets and negotiating and signing its agreements with the successful vendors.

In addition to the digital resources that the Ministry licenses and provides to them, school boards and schools are entitled to procure IT equipment and software directly from eligible vendors at their own discretion. They base their decisions on local needs, and they too conduct their procurement processes in accordance with the Broader Public Service Procurement Directive.

School boards collaborate with other boards and, where applicable, other public-sector agencies, to develop co-operatives and shared services to lower the cost of their IT procurements. One such co-operative is the Ontario Educational Collaborative Marketplace (Collaborative Marketplace). The Collaborative Marketplace is a not-for-profit sourcing partner for Ontario's education sector, broader public sector, and other not-for-profit organizations. It negotiates and contracts with suppliers so that its members may have the option of a broad choice of products and save on costs. The Collaborative Marketplace also operates in compliance with Broader Public Service Procurement Directive. School boards and schools have the option to procure digital resources through Collaborative Marketplace-approved vendors when they see it will bring them cost savings and an efficient procurement process.

2.2.1 Spending on Information Technology at Selected Boards

At the four school boards we visited, IT spending varied from 0.87% (\$2.3 million) to 1.09% (\$33.9 million) of total operational expenses, on average, for the school year 2013/14 to 2017/18. In the Toronto District School Board (Toronto Board), the IT budget was an average of 1.09% of the overall budget for the last five years. This board's IT spending represented labour-related costs (salaries and benefits, 58%), and costs for major IT systems (supplies and services, 16%), maintenance/software licences (15%), network infrastructure upgrades and hardware purchases (11%). The approach the Toronto Board took to its IT budget was to maintain the current status quo in IT operations with regard to key systems and service delivery.

At the Waterloo Catholic District School Board (Waterloo Catholic Board), IT spending was consistent at 0.8% of the overall expenditures for the 2014/15 and 2015/16 school years. However, in the 2016/17 school year, this board's IT spending increased to 1.2% of overall expenditures as it invested in maintenance for major systems, replacing classroom technology and upgrading infrastructure.

At the Algoma District School Board (Algoma Board), IT spending was relatively constant at 0.9% of the overall expenditures for the 2015/16 and 2016/17 school years. The rate increased slightly to 1.0% for 2017/18 to replace classroom technology.

IT spending also remained comparatively constant, at 1.0%, at Peel District School Board (Peel Board) for the 2015/16 to 2017/18 school years. Most of the IT spending (70%) went for salaries and benefits, and the rest was allocated for IT equipment, software and support services. **Figure 1** shows IT spending over the past five years at the school boards we visited.

Figure 1: IT Spending at the Four District School Boards We Visited, 2013/14–2017/18

Prepared by the Office of the Auditor General of Ontario

	Toronto	Algoma	Peel	Waterloo Catholic
2013/14				
Total expenses (\$ million)	3,023.10	149.89	1,629.09	251.42
IT spending (\$ million)	32.36	1.12	9.71	1.47
IT spending as % of total expenses	1.07	0.75	0.60	0.59
2014/15				
Total expenses (\$ million)	3,075.03	152.92	1,674.05	254.90
IT spending (\$ million)	40.74	1.51	19.11	2.02
IT spending as % of total expenses	1.32	0.98	1.14	0.79
2015/16				
Total expenses (\$ million)	3,110.64	151.76	1,740.00	261.28
IT spending (\$ million)	32.85	1.35	17.55	2.10
IT spending as % of total expenses	1.06	0.89	1.01	0.80
2016/17				
Total expenses (\$ million)	3,159.41	154.92	1,773.01	266.13
IT spending (\$ million)	34.16	1.40	18.41	3.11
IT spending as % of total expenses	1.08	0.90	1.04	1.17
2017/18				
Total expenses (\$ million)	3,283.84	157.21	1,878.43	283.83
IT spending (\$ million)	29.63	1.58	19.01	2.82
IT spending as % of total expenses	0.90	1.01	1.01	0.99

2.3 IT Systems at School Boards and the Ministry of Education

2.3.1 The Ontario School Information System at the Ministry of Education

The Ontario School Information System (OnSIS) is a secure web-based application that collects data on school boards, schools, students and teachers, as well as courses and individual classes. The purpose of the system is to gather accurate and reliable data for analysis, policy development and evidence-based decision-making across policy areas and program areas, and ultimately improve student achievement. In **Figure 2** we have diagrammed OnSIS and the other IT systems described in **Sections 2.3.2** and **2.3.3**.

The Ministry of Education manages OnSIS and the Community Services I&IT Cluster (explained

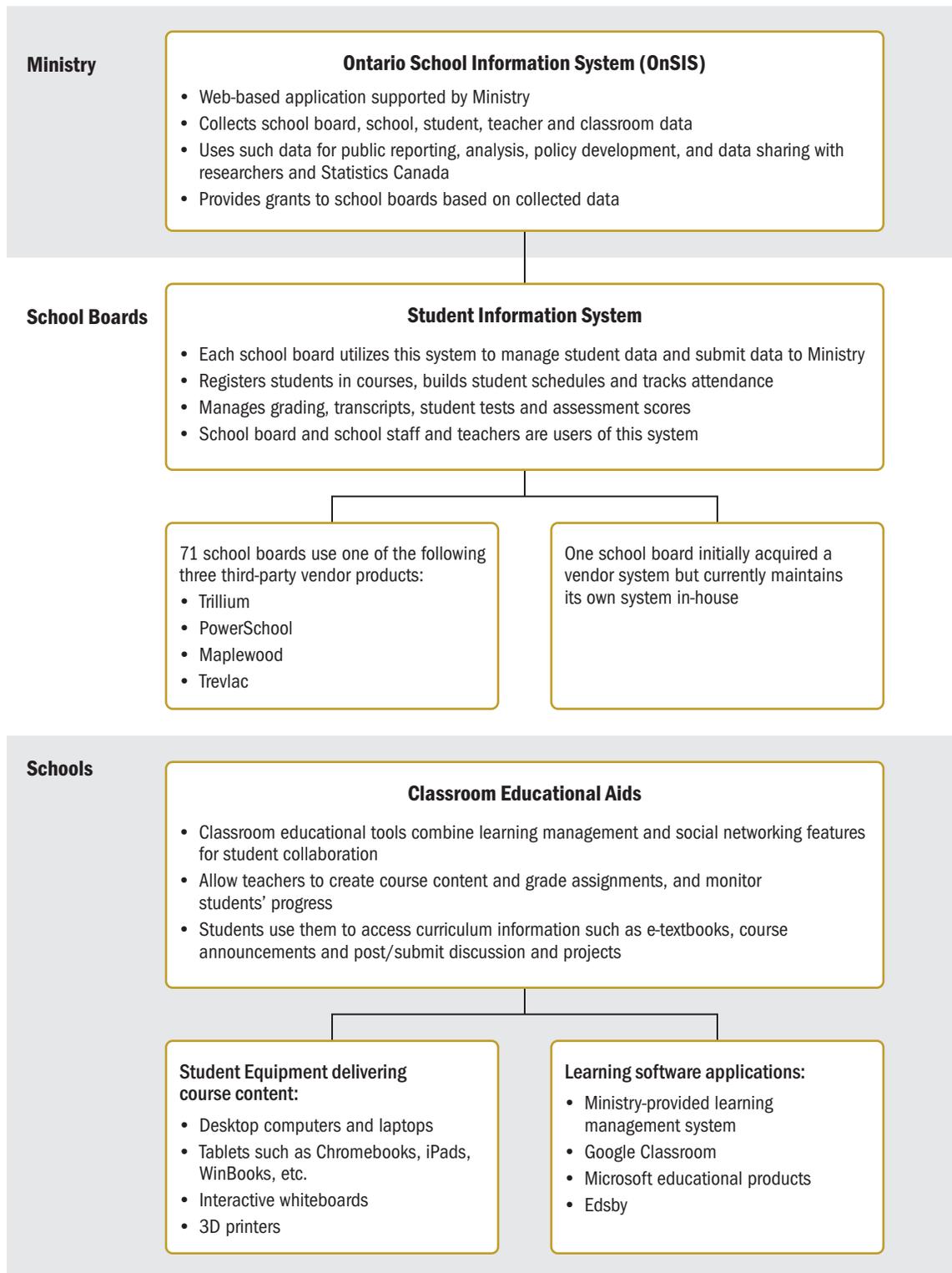
in **Section 2.0**) provides I&IT services to support the OnSIS application. Currently, over 10,000 users in schools and boards in Ontario, such as teachers, principals and administrators, use OnSIS to submit education data needed for their operations.

OnSIS collects hundreds of millions of records three times every year. This data is then validated, anonymized and transferred to the Ministry's IT system for access by Ministry staff. To track each student's progress through the school system, OnSIS requires each student in Ontario to have a unique identification number that stays with that individual student.

The Ontario Education Number serves this purpose, as a unique numeric identifier assigned to each student throughout his or her elementary and secondary education in the province. It is an essential tool for OnSIS in collecting, tracking and

Figure 2: IT Systems at the Ministry of Education (Ministry), School Boards and Schools

Prepared by the Office of the Auditor General of Ontario



processing reliable data on the movement and progress of individual students through the Ontario school system.

School boards can create and assign new Ontario Education Numbers to students and validate existing numbers. When a student transfers from a school in one board to a school in another board, board staff look up the student's existing Ontario Education Number in the application and use the information to transfer the student to the new board. This process is meant to prevent the creation of duplicate Ontario Education Numbers.

2.3.2 Student Information Systems at School Boards

School boards are responsible for the operation and maintenance of their IT systems, as well as protecting the security and privacy of information housed on these systems. A student information system is an information management system for schools to manage student data that they submit to their boards. The schools use student information systems to register students in courses; manage grading, transcripts, results of student tests and other assessment scores; build student schedules; track student attendance; and manage many other student-related data needs. The schools, boards and Ministry are the users of this data.

Each school board procures its own student information system. Three of the four boards we visited use software provided by third-party vendors. The fourth board initially acquired a student information system from a vendor but now maintains its own system in-house.

2.3.3 IT Systems in Schools

Various cloud-based software applications such as the Ministry-provided learning management system (known as the virtual learning environment, or VLE), Google Classroom, Microsoft educational products and Edsby are used to support education in classrooms. These tools combine learning man-

agement and social networking features. Teachers use these classroom technologies to create, distribute and grade assignments and monitor each student's progress. Students use them to access curriculum information, including e-textbooks.

The Ministry's licensed VLE system, which it provides free of cost to the school boards, features a variety of online tools that help with, for example, communication, assessment, student tracking, and course management.

2.4 Cybersecurity

Cyberattacks include both intentional and unintentional unauthorized access, use, manipulation, interruption or destruction of electronic information and/or the electronic and physical infrastructure used to process, communicate and/or store that information. The biggest potential consequences of cyberattacks are disruption of operations and compromise of sensitive data. In extreme circumstances, cyberattacks can lead to damage to physical property and harm to human life.

Schools, school boards and the Ministry host on their information systems a large amount of personal information about students, making the systems an attractive target for a data breach. Stolen personal data can be used for identity theft or for extortion of money by threat of the data's disclosure, or it can be sold to individuals who pose a threat to students' safety.

The primary application supporting operations at a school board is a student information system (**Section 2.3.2**). These applications host personally identifiable information on students, teachers and staff that is required to be protected under Ontario's *Municipal Freedom of Information and Protection of Privacy Act* and Canada's *Privacy Act*. The boards submit this information to the Ministry, which stores it in its own application systems. Theft and misuse of such information can lead to costly class-action lawsuits against the school boards because of the risks it poses to the safety of students and teachers, as well as the possibility of identity theft.

3.0 Audit Objective and Scope

Our audit objective was to assess whether the Ministry of Education (Ministry) and school boards have effective systems and processes in place to ensure that:

- critical information technology (IT) assets and infrastructure are economically and effectively procured, managed and protected;
- legally protected personal information is safeguarded against emerging cyber threats and privacy breaches;
- IT support and services are provided on a timely and efficient basis; and
- relevant student information is efficiently and accurately reported in compliance with legislative requirements on a timely basis.

In planning for our work, we identified the audit criteria (see **Appendix 2**) we would use to address our audit objective. These criteria were established based on a review of applicable legislation, policies and procedures, internal and external studies, and best practices. Senior management reviewed and agreed with the suitability of our objectives and associated criteria.

We conducted our audit between December 2017 and September 2018. We obtained written representation from Ministry management that, effective November 8, 2018, they had provided us with all the information they were aware of that could significantly affect the findings or the conclusion of this report.

Our audit work was conducted at four of the 72 school boards—Toronto District School Board (Toronto Board), Waterloo Catholic School Board (Waterloo Catholic Board), Algoma District School Board (Algoma Board) and Peel District School Board (Peel Board) where we interviewed senior and front-line staff, and reviewed key documents.

In addition, we met with staff at Earl Haig Secondary School in Toronto; St. John Catholic Elementary School in Kitchener (Waterloo Catholic Board); Superior Heights Collegiate & Vocational

School in Sault Ste. Marie (Algoma Board); and Mississauga Secondary School (Peel Board), to understand the use and impact of information technology in classrooms.

We reviewed the four school boards' IT systems and cybersecurity. We also reviewed key IT reporting and monitoring systems at these school boards and at the Ministry that interface with IT systems at school boards. As part of our audit, we also reviewed protection and life-cycle management of critical IT assets and supporting infrastructure, including whether a long-term strategy was being addressed for IT asset infrastructure. We also reviewed whether the Ministry had a broad IT strategy for curriculum delivery, use of IT by students and administration of IT. We did not look at school board curriculums or the possible links between classroom IT use and curriculum delivery or student learning experiences.

In addition, we conducted a survey of all 72 school boards. Sixty-nine boards responded to the survey—a 96% response rate. (References in this report to the survey results represent total respondents to the survey, or 69 school boards.) We designed the survey to capture comprehensive perspectives pertaining to IT systems and operations at school boards in specific areas such as classroom technology, asset procurement, IT budgets, student information reporting and cybersecurity. **Appendix 3** shows the results we gathered from this survey on a number of our key audit criteria.

We conducted our work and reported on the results of our examination in accordance with the applicable Canadian Standards on Assurance Engagements—Direct Engagements issued by the Auditing and Assurance Standards Board of the Chartered Professional Accountants of Canada. This included obtaining a reasonable level of assurance.

The Office of the Auditor General of Ontario applies the Canadian Standards of Quality Control and, as a result, maintains a comprehensive quality control system that includes documented policies and procedures with respect to compliance with rules of professional conduct,

professional standards and applicable legal and regulatory requirements.

We have complied with the independence and other ethical requirements of the Code of Professional Conduct of the Canadian Professional Accountants of Ontario, which are founded on fundamental principles of integrity, objectivity, professional competence and due care, confidentiality and professional behaviour.

4.0 Detailed Audit Observations

4.1 Ontario Does Not Have an IT Strategic Plan for Its Schools

School boards and schools provide several different kinds of classroom technologies to teachers and students to encourage active learning and increase student engagement. Internet-connected laptops and tablets, digital projectors, smartboards and other equipment provide instant access to resources such as educational applications and e-textbooks, and to the latest information from across the globe.

Even though the four school boards we visited have consistently spent about 0.9–1.1% of their total operational expenses on IT (see **Section 2.2.1**), we found that the boards have not developed strategic plans specifying minimum expectations for the use of IT in the classroom. Peel District School Board (Peel Board), for example, had neither evaluated its students' needs for classroom IT nor implemented an approved policy in areas such as student-to-computer ratios, types of classroom technology to use, optimal age of the technology and its refresh cycle (replacement plan).

We found that the Ministry of Education (Ministry) has also not developed a strategic plan for IT use in classrooms across the province or provided direction to the school boards in using IT resources for curriculum delivery. The Ministry and the school boards are also lacking current data to guide their spending decisions on IT in the classroom. The

school boards we visited informed us that they have not systematically assessed to what extent their students are using IT in the classroom.

In the survey we conducted of Ontario's 72 school boards, we asked about their students' access to classroom IT. Of the 69 boards that replied, 29 boards (42% of respondents) answered that they had not assessed or were still assessing classroom technology to fully identify technology needs across their schools, and support their students' learning.

The survey also indicated that 25 school boards (36% of respondents) did not have an approved classroom technology strategy or policy for their schools. Forty-four boards indicated that they had approved strategies or policies. In the absence of formal policies and strategy documents, school boards and schools did not have a benchmark minimum number of pieces of equipment required for learning and teaching in schools, and were unable to assess the effectiveness of the use of technology in their classrooms.

RECOMMENDATION 1

In order to better understand how information technology (IT) resources may be used for curriculum delivery and to guide their allocation of resources, we recommend that the Ministry of Education together with the school boards develop a strategic plan specifying minimum expectations for the use of IT in the classroom.

RESPONSE FROM MINISTRY AND SCHOOL BOARDS

The Ministry of Education (Ministry) acknowledges the importance of supporting the school boards with broader IT strategy to help meet minimum expectations in the school board. The Ministry will continue to work with school boards to develop a strategic plan and determine the role of technology to learning and teaching. The Ministry has partnered with school boards on a broadband modernization

strategy to achieve adequate connectivity to the Internet and improved cybersecurity. School boards will work with the Ministry.

4.1.1 Ontario Students Do Not Have Equal Access to Technology Such as Tablets and Laptops

We found in our visits to the four school boards that the amount of IT equipment in classrooms varied both among school boards and among schools in the same board. The Toronto District School Board (Toronto Board), for example, did not have a policy on the ratio of students to computers. At some schools in this board, eight students shared one computer, whereas in other schools each student was assigned an individual computer.

Different student-to-computer ratios also coexisted among the nearly 260 schools in the Peel Board as well. We did not note any system to encourage and enable private-sector donations to schools of lightly used IT equipment as a way for boards to save on costs and to make student access to IT resources more equitable across the province.

4.1.2 Age of Classroom Equipment Varies across Ontario Schools

In the course of our audit, we also found that the average age and the age range of classroom equipment varied widely across schools. At the Toronto Board, the age of the IT equipment among schools ranged from less than one year to 15 years old. Students at the Algoma District School Board (Algoma Board) and Waterloo Catholic School Board (Waterloo Catholic Board) were provided with classroom devices that ranged in age from one to five years. The Peel Board was not able to identify the overall age range of the classroom equipment in its schools.

Our survey indicated that 44 of the school boards that responded (64% of respondents) provided students with equipment whose age varied from one to 15 years, while the remaining 25 school boards (36% of respondents) reported that the

overall age of their classroom equipment ranged from one to five years old.

We took note of industry best practices, which specify an age range of between one and five years for technology; however, industry best practices may differ from the requirements of the educational sector. Nevertheless, old classroom technology runs more slowly and takes longer to execute tasks than current technology, and it may not be compatible with newer software and applications required for teaching and learning in the classroom. The technological environment in the classroom is intended to facilitate increased student engagement and productivity. When classroom equipment in some schools does not perform as expected because of its age, students might not have the same learning experience across the schools.

4.1.3 Aging Classroom Equipment Not Supported by Vendors

Our audit found that about 56% of classroom equipment used in schools at the Toronto Board was no longer under vendor support due to its age. At the Algoma and Peel Boards, our audit noted that 25% of classroom equipment in their schools was no longer covered by vendor support.

Unsupported and outdated equipment is more likely to fail than newer equipment that is still supported by its vendors with maintenance, updates and repairs. Equipment failure may result in downtime, a costly and time-consuming data recovery process, or complete data loss. In addition, unsupported equipment is more vulnerable than newer equipment to cyber breaches that can disrupt operations and compromise sensitive data (see **Section 2.4**). As a result, unsupported computers require more effort by technology staff to maintain and troubleshoot them.

According to our survey, 42 school boards of the 69 that responded (61%) reported that more than half of their classroom equipment was not supported by its vendors, whereas only seven school boards (10%) indicated that 80% or more of the equipment in their schools was supported.

An appropriate technology refresh cycle, or replacement plan, ensures that classroom devices are updated on a timely basis for best performance as well as to maintain effective vendor support. We found in our survey that 13 school boards (19% of respondents), including both the Toronto and Peel Boards, did not have classroom technology replacement plans for their schools, whereas 36 school boards (52%), including the Waterloo Catholic Board and Algoma Board, replaced their classroom tablets and laptops/desktops every three to five years.

RECOMMENDATION 2

In order to achieve more equitable access to classroom information technology (IT) resources for Ontario students across schools and school boards, we recommend that the school boards:

- perform an assessment to evaluate students' needs with regard to classroom technology; and
- develop and implement a classroom IT policy outlining a computer-to-student allocation ratio, the types of technologies to use in the classroom, the optimal age of the technology systems and devices, and the refresh cycle of classroom technology.

SCHOOL BOARDS RESPONSE

An assessment was performed at two of the four school boards visited. The remaining school boards will perform an assessment to support and evaluate student classroom technology needs.

Two of the four school boards currently have the expected policy, with the other two expected to review and implement an IT policy that will incorporate the computer-to-student allocation ratio, the types of technologies to use in the classroom, the optimal age of the technology systems and devices, and the refresh cycle of classroom technology.

RECOMMENDATION 3

In order to reduce the differences in student-to-computer ratios among schools and potentially bring down the cost of acquiring information technology (IT) equipment, we recommend that the school boards assess the benefits of private-sector donations to schools of lightly used IT equipment.

SCHOOL BOARDS RESPONSE

School boards will collaborate and conduct a formal assessment for the benefits of private-sector donations to schools.

4.2 Personal Information of Students at Risk of Disclosure

4.2.1 Inactive Users with Access to Ministry's IT System Not Being Deleted

The Ontario Education Number is a unique identification number assigned to students throughout their elementary and secondary education in the province (see **Section 2.3.1**). The system that administers the Ontario Education Number collects and stores students' personal information, including name, date of birth and gender, address, and their educational records. Staff who need to work with Ontario Education Numbers are given user accounts with access to the Ontario Education Number application. However, we found Ontario Education Number accounts that exist for users who do not need such access. For example, we found 14 user accounts still assigned to former Toronto Board staff who were no longer employed by the Board, two similar cases at the Peel Board and two at the Algoma Board.

Of the total 5,229 user accounts with access to the Ontario Education Number IT system, we found 971 accounts (19%) have never been used. This indicates that many authorized users have no current need to access the system. We also found that accounts of inactive users of the Ministry's IT system are not always being cancelled after they

leave their positions at the boards. These accounts are accessible on the Internet, which means that there is a risk that confidential student information may be exposed to the public.

The Ministry does not have access to the current employment status of school board staff and therefore is not able to revoke access to the application in a timely manner when staff leave their positions at the boards. Instead, the Ministry relies on the school boards to inform it when their staff no longer require access to the application. It is evident by the large number of inactive accounts we found that some school boards have not been notifying the Ministry of personnel changes consistently and on a timely basis.

The information stored in the Ontario Education Number application is not limited to students currently enrolled in schools. It stores the records of all students who have graduated from Ontario schools since 2003, when the Ontario Education Number system became operational. As a result, there is an increased risk and potential exposure of the personal information of all these people to unauthorized users of the system.

RECOMMENDATION 4

In order to ensure that only authorized users have access to the Ontario Education Number application, we recommend that:

- Ontario's school boards periodically review their lists of users with access to the Ontario Education Number application and notify the Ministry of Education (Ministry) of any changes, so that it can revoke the access of unauthorized users; and
- the Ministry track and review unusual activity in the Ontario Education Number application.

RESPONSE FROM MINISTRY AND SCHOOL BOARDS

The Ministry will continue to review the existing revocation protocol to monitor and limit

unnecessary access to the Ontario Education Number application.

School boards will review their lists of users with access to the Ontario Education Number application at least on an annual basis and notify the Ministry of any changes, so that it can revoke the access of unauthorized users.

4.2.2 Teachers and Staff Lack Formal Training in Protecting Students' Personal Information

All four school boards that we visited indicated that they do not generally provide formal training to teachers who have access to technology and third-party websites on IT security or privacy training. Similarly, our survey found that most boards across the province (74% of respondents) do not provide formal training.

School boards and schools collect personal information on their students, teachers and staff, including the information included in the Ontario Education Number application (for students) and social insurance numbers and employment information (for teachers and staff). Ontario's *Municipal Freedom of Information and Protection of Privacy Act* requires that the boards and schools protect this information. Disclosure of personal information can lead to risks to the safety and security of students and teachers as well as identity theft.

Without guidance from the Ministry or training by the boards on the appropriate use of approved online teaching resources, such as e-textbooks, many teachers make individual decisions to use online tools, applications and third-party websites that are not approved by the boards. Registration on these sites can record personal data. Their use without proper training therefore increases the risk of privacy breaches.

Due to the challenges with the Ministry's virtual learning environment (see **Section 4.6.1**), school boards are instead using other learning tools in their classrooms. Third-party websites, such as Edmodo, offer a platform to create homework

assignments, schedule quizzes and manage progress. In May 2017, Edmodo was hacked, leading to the exposure of 77 million user accounts around the world. Although the jurisdiction that was hacked was not revealed due to privacy reasons, we noted that schools in the Toronto Board continue to use Edmodo.

RECOMMENDATION 5

To safeguard students' personal information, we recommend that the school boards in collaboration with their schools:

- deliver ongoing privacy training to staff who have access to personal data; and
- perform risk assessments and take necessary actions associated with using non-approved websites or software.

SCHOOL BOARDS RESPONSE

School boards will conduct a formal assessment of training needs for privacy training to staff and will perform risk assessments as needed to ensure that student data are protected and that all staff are aware of safeguarding students' personal information.

4.3 School Boards On Alert For Cybersecurity Risks

4.3.1 School Boards Are Vulnerable to Cyberattacks

Cybersecurity is the protection of computer systems and data from theft of, or damage to, their hardware, software or electronic data, as well as from disruption of the services they provide. It also includes protection against the misdirection of data to the wrong servers or recipients. The threats can be both internal to the schools, posed by students seeking to alter their own marks or access and/or tamper with other students' data, or external, by professional criminals dealing in identity theft, for example.

Educating employees through ongoing security awareness training is one of the ways to protect against cyberattacks. However, we found that 74% of the boards that replied to our survey indicated that they do not provide formal information security awareness training to teachers and staff with access to technology.

As the methods and techniques used by attackers to manipulate school board staff into divulging sensitive information become increasingly sophisticated, the importance of providing updated cybersecurity awareness training continues to grow.

We also noted inconsistencies among school boards regarding their cybersecurity policies. Of the 69 school boards that responded, 41 boards (59%) indicated that they do not have a formal cybersecurity policy to safeguard sensitive data and assets at the board and its schools. We also noted that 19 school boards have not updated their cybersecurity and/or information security policy in more than one year.

4.3.2 School Boards We Visited Lacked Data Classification Policy

None of the four school boards we visited has formally documented its policy on data classification. A data classification policy defines how to categorize the information the organization has into groups—such as account data, personal data or commercially valuable data—according to the sensitivity of the data. The classifications are then used to apply protection measures to the data based on its sensitivity. When an organization lacks a formal and well-documented data classification policy that its staff know and understand, staff may not handle sensitive information with proper care.

We found that although school board staff are aware of what data is considered sensitive and they practise basic data protection principles, they may not be applying these practices consistently. Of the 69 boards that responded to our survey, 44 (64%) indicated that they do not have a data classification policy.

RECOMMENDATION 6

In order to mitigate the risks of cyberattacks, we recommend that school boards:

- develop a policy that outlines roles and responsibilities in cybersecurity at both the board and school levels; and
- provide formal information security including cybersecurity awareness training to teachers and staff who have access to information technology.

SCHOOL BOARDS RESPONSE

An awareness program is a key component of the cybersecurity and risk management framework to reduce the school boards' risks. School boards will develop or enhance a cybersecurity policy that outlines roles and responsibilities.

School boards will provide formal information security and cybersecurity awareness training to teachers and staff who have access to information technology.

4.3.3 Effectiveness of Cyberbullying Programs Unknown; Not Being Tracked

Cyberbullying is a form of bullying or harassment that involves the use of communication technologies such as the Internet, social networking sites, websites, email, text messaging and instant messaging to repeatedly intimidate or harass others. As required by the Ministry, school boards have established policies and guidelines on bullying prevention and intervention in accordance with amendments to the *Education Act* in 2012. The four boards we visited have all published cyberbullying policies and procedures to prevent and intervene in cases of bullying. However, school boards and the Ministry do not track metrics to measure the effectiveness and performance of anti-cyberbullying programs. Without appropriate logging and tracking, school boards are not able to address the root causes of such incidents and reduce the occurrence of cyberbullying at schools.

Of the 69 school boards that responded to our survey, 31 boards indicated that they do not have a cyberbullying incident reporting system, while the other 38 boards responded that they have an online tool on their website or a reporting tool to log incidents. Among these 38 boards, incidents of cyberbullying have risen 2% in the past five years.

School boards and the Ministry also have not evaluated whether their prevention strategies are effective. School boards conduct cyberbullying awareness campaigns, such as the annual prevention week, and many publish materials and surveys for staff, students and parents. Nevertheless, school-provided equipment, such as laptops, tablets and Internet connections, was reported as being misused for cyberbullying at 32 boards that responded to our survey. Twenty-five other boards did not have sufficient data to answer this question.

In 2012, the Ontario Government enacted the *Accepting Schools Act, 2012* (Act) to help address bullying and cyberbullying in schools. This Act created several amendments to the *Education Act*, including the incorporation of cyberbullying into the definition of bullying, as well as the requirement for school boards to:

- establish and provide annual professional development for teachers and other staff about bullying prevention and strategies for promoting positive school climates;
- provide programs, interventions or other supports for pupils who have been bullied;
- have a bullying awareness week; and
- have a principal investigate any matter related to bullying.

According to a 2014 Statistics Canada study, about one in five Canadians aged 15 to 20 years has experienced cyberbullying. The study also found a significant association between cyberbullying and mental health: 41% of young Internet users who experienced both cyberbullying and cyberstalking reported an emotional, psychological or mental health condition, whereas a far smaller percentage, 14%, of those who had not been cyberbullied or cyberstalked reported such a condition.

RECOMMENDATION 7

To improve the effectiveness of existing cyberbullying programs in Ontario schools, we recommend that the Ministry of Education track and measure the incidence of cyberbullying in Ontario schools.

MINISTRY RESPONSE

The Ministry of Education will enhance its existing strategies and processes surrounding cyberbullying and will monitor, track and report incidents in Ontario schools.

RECOMMENDATION 8

To improve the effectiveness of existing cyberbullying programs in Ontario schools, we recommend that school boards:

- monitor school-provided equipment to mitigate cyberbullying incidents; and
- formally track, report and review cyberbullying incidents at schools.

SCHOOL BOARDS RESPONSE

School boards will monitor school-provided equipment to mitigate cyberbullying incidents. School boards will develop procedures to formally track, report, and review cyberbullying incidents.

4.4 Not All School Boards Tracking Inventory of IT Assets

IT asset management is a process to gather and maintain a detailed set of information about assets. This process is similar to an enhanced form of inventory control that is used to manage an asset throughout its life cycle. We found inconsistencies between school boards in Ontario generally with respect to the tracking process for IT assets. At the four school boards that we visited, the Algoma Board and Waterloo Catholic Board had inventory tracking processes and up-to-date computer inven-

tory listings. However, both the Peel and Toronto Boards did not track their IT assets and maintain a current and complete inventory listing.

We tested samples of \$10.5 million (10%) of total IT purchases (\$101.4 million) for the period September 2012 to May 2018 and found that the audit sample error rate was 3.99% (or \$417,000 in dollar value). We applied the error rate to the entire population and estimated that over \$4 million worth of IT assets would not be located. In addition, 48% of procured equipment at the Toronto Board—that is, 88 out of 183 samples—lacked basic asset tracking attributes such as location and purchase date.

Our survey indicated that 38 of the 69 responding school boards (55%) did not have an approved policy for effective and efficient IT asset life-cycle management that:

- defined their IT assets in scope (that is, inventoried the relevant IT assets that they would like to keep track of);
- defined the responsibilities for managing and safeguarding the assets; and
- set up an appropriate disposal process (including data wiping of sensitive information).

Beginning with acquisition of an asset, the IT asset management process covers the asset's working state, any damage or misuse, theft, maintenance and, finally, disposal of the asset. A well-functioning IT asset management provides information essential in securing IT infrastructure, eliminating waste, making the best use of current resources and improving efficiency. For instance, it tracks the make and model of dedicated firewall/infrastructure devices in case device specific vulnerabilities are identified.

RECOMMENDATION 9

In order to maintain the security of information technology (IT) assets, and to reduce financial losses due to lost or stolen IT assets at school boards and schools, we recommend that the school boards:

- develop and implement an IT asset management system defining clear roles and responsibilities of the school boards and schools for efficient IT asset life-cycle management; and
- design and implement formal IT asset tracking and reporting procedures.

SCHOOL BOARDS RESPONSE

Two of the four school boards visited currently have an IT asset management system and subsequent to the audit by the Auditor General, one school board initiated a formal IT services management project in 2018, which incorporates asset management. It is expected that through this project an effective and efficient IT asset management system will be implemented, which will include asset tracking and reporting procedures.

The remaining school board will design and implement a board-wide asset management system, including roles and responsibilities for efficient asset life cycle management, and implement IT asset tracking and reporting procedures.

4.5 School Boards Have Not Formally Identified Key IT Risks

Key IT risks that organizations should be aware of include:

- particular events or circumstances that could have harmful effects on the organization's operations;
- ineffective strategies for responding to threats (such as plans to address cybersecurity issues and data breaches, and disaster recovery plans); and
- inadequate monitoring IT processes to assess whether risk stays within an acceptable level.

We found that many school boards do not have processes in place to identify events or circumstances that may negatively affect their operations and potentially damage their IT systems. For example, among the four boards we visited:

- The Toronto Board does not have a physical location to serve as a disaster recovery site for its IT systems.
- The Toronto and Algoma Boards do not have a formal IT disaster recovery plan in place.
- The Waterloo Catholic Board has a disaster recovery plan that it has not yet fully tested.
- The Peel Board does not have a disaster recovery or business continuity plan in place.

Fifty school boards of the 69 that responded to our survey (72% of respondents) indicated that they have no approved disaster recovery plans. At these boards, responses show that no approved plans, policies, tools and procedures are present that enable the recovery or continuation of vital technology infrastructure and systems following a natural or human-induced disaster.

Thirty-eight of the school boards (55%) indicated that they do not have an approved backup policy that defines roles and responsibilities, backup schedules, retention policies, and disposal and security policies and practices.

We also found that the school boards are not clear on what mitigation measures they should use in what scenarios. Mitigation measures are put in place to foresee the kinds of damage that could potentially occur if disaster strikes and to plan for limitation of the damage and recovery. In IT, this could involve plans and exercises for recovering data when servers are physically destroyed, for example.

In our survey, we found that 67 of the 69 school boards that responded (97%) indicated that they had either no formal risk management function or only a partial formal risk management function in place to manage risks to key IT infrastructure. Similarly, 65 school boards (94%) indicated that they are not aware of their key IT risks or are still in the process of identifying key risks and challenges. Only four school boards identified their key IT risks and challenges.

By identifying and proactively addressing risks and opportunities, organizations mitigate risk and protect their stakeholders; in this case, these include school board employees, school staff, students, and the province and its population.

Sixty-four school boards of the 69 that responded to our survey (93%) indicated that they do not have an approved business continuity plan in place. In addition, 44 school boards (64%) indicated they do not have approved service-level agreements for delivery of support and service to their schools in the event of a disaster. Without recognition of threats and key IT risks, and without having proactive measures in place in the event of a disaster, school boards are unable to ensure that personnel and assets would be protected and able to function.

RECOMMENDATION 10

To manage risks to key information technology (IT) processes and infrastructure at the school boards and in the schools, we recommend that the boards develop and test effective disaster recovery plans that:

- define processes for identifying, assessing and managing risks and uncertainties resulting from internal and external events that could impede the boards' ability to achieve their strategic objectives;
- train staff in their roles and responsibilities in disaster recovery; and
- put in place effective mitigation measures.

SCHOOL BOARDS RESPONSE

One of the four school boards visited currently has a disaster recovery plan in place. The remaining three school boards will assess and develop a disaster recovery plan, train staff in their roles and responsibilities and ensure that there are mitigation measures put in place in case of a disaster.

RECOMMENDATION 11

To manage risks to key information technology (IT) processes and infrastructure at the school boards and in the schools, and to help ensure that in case of disaster, essential information technology (IT) assets continue to function

so that the boards are able to achieve their strategic objectives, we recommend that the school boards:

- develop and put in place effective business continuity plans; and
- establish backup policies, including backup schedules, retention policies, and disposal and security policies and practices.

SCHOOL BOARDS RESPONSE

One of the four school boards visited currently has a business continuity plan in place. The remaining three school boards will assess and develop a business continuity plan to put in place.

School boards will review backup policies, including backup schedules, retention policies, and disposal and security policies and practices to help ensure that in case of disaster, essential information technology assets continue to function.

4.6 Ministry and School Boards Not Always Obtaining Value for Money on IT Purchases

Based on our samples of IT procurement records at the four school boards we visited, we noted that overall IT procurement by the school boards was in accordance with the Government Procurement Directive. However, we found that the four school boards were not always obtaining value for money with their purchases of hardware and software because they were not necessarily being used as intended or to their full potential.

4.6.1 Ministry Has Invested in IT Software That May Not Meet Classroom Teaching Needs

The Ministry has spent more than \$18.6 million on virtual learning environment (VLE) software (explained in **Section 2.3.3**) in the past five years, which it provides for free to the school boards. VLE

Figure 3: Actual Student User Logins vs Forecast Student User Logins in Virtual Learning Environment (VLE) System, 2012/13–2016/17

Source of data: Ministry of Education

School Year	Actual VLE	Forecast VLE	Actual vs Forecast
	Student User Logins	Student User Logins	VLE Student User Logins (%)
2012/13	154,324	170,628	90
2013/14	278,488	313,342	89
2014/15	421,783	474,488	89
2015/16	477,233	527,587	90
2016/17	540,036	609,425	89

provides a variety of online tools that help with, for example, communication, assessment, student tracking, and course management.

Based on feedback we collected from the school boards we visited, as well as our survey results, we noted that respondents indicated that the classroom management software is difficult to use, is missing useful functions, and it does not completely meet classroom teacher needs. For example, according to board staff feedback, VLE:

- lacks the ability to perform administrative tasks such as preparing report cards and recording and analyzing attendance;
- has limited data-analysis capabilities; and
- is not user friendly.

Figure 3 shows that the Ministry’s forecast for student VLE user logins versus the actual student VLE user logins in all schools in Ontario’s school boards has been about 90% for the last five years.

However, in our survey, we asked about the frequency of VLE use in the classroom, and 18 of the school boards that responded (26% of respondents) reported that their schools rarely used VLE in their classrooms.

Staff at the school boards we visited, and at the boards we surveyed, also noted that they have received limited training from the Ministry on VLE.

4.6.2 School Boards Are Purchasing Their Own Classroom Software Instead of Using Free Ministry-Provided VLE

We found that due to the challenges with virtual learning environment (VLE) software (discussed in **Section 4.6.1**), school boards are purchasing other learning tools in their classrooms.

For example, the Algoma Board spent an additional \$57,500 over two years to purchase Edsby to use as its classroom management software instead of VLE, which it gets for free from the Ministry. Edsby provides additional features for analysis of student attendance and report cards.

Similarly, our survey indicated that in 2017/18 the York Region District School Board spent \$375,000, and the Greater Essex County District School Board spent \$180,000 in operational costs to maintain their versions of Edsby.

Based on our survey, we noted that up to 60 school boards of the 69 that responded said they are using learning management software in addition to VLE; their combined operational costs each year amounted to over \$1.5 million. The audit interviews and survey we conducted also revealed dissatisfaction with VLE.

On account of this dissatisfaction with VLE and the resulting purchases of other classroom management software, there is no standard tool or set of practices across all school boards in Ontario. School boards are using a range of products that include Google Classroom, Microsoft Office 365, Edsby, Edmodo, SeeSaw, Shobie and Moodle.

4.6.3 Toronto District School Board Did Not Track Training of Teachers to Use Classroom Technology Equipment

We found that IT software and equipment are underused at the schools in the Toronto Board. We noted that teachers in this board are not always being given sufficient training in the requirements of the classroom IT environment and that the board does not provide formal technology training to its teachers.

Smartboards purchased by the Toronto Board are one example. A smartboard is an interactive touch screen connected to a computer that allows users to project an image. Users interact with the boards similarly to tablets, by writing on the images or moving them around with their fingers. Special pens come with a smartboard for writing in different colours. Smartboards let students interact, collaborate and share their work. Anything written on the board can be saved or printed out.

On our visits to the Toronto Board we found that the Board purchased 2,710 smartboards between 2013 and 2018 at a cost of about \$9.7 million. We noted that it purchased these smartboards without a formal business case or plan for their use. The cost of a smartboard and its software can range from \$1,200 to \$4,200. Some teachers who had not been trained to use their smartboards were using them as projection screens; this could be accomplished, however, with a regular \$200 vinyl screen.

RECOMMENDATION 12

In order to ensure a good return on investment in all classroom equipment and student learning software, we recommend:

- school boards ensure that teachers and staff receive necessary training in the use of the technology already purchased and on all future purchases of technology on a timely basis; and
- the Ministry of Education and school boards perform a cost-benefit analysis of the need for and use of equipment and software

that can take the form of a business case before purchase.

RESPONSE FROM MINISTRY AND SCHOOL BOARDS

When technology is purchased for use, the Ministry and school boards will provide the necessary training to prepare teachers and staff to utilize the equipment efficiently.

The Ministry will continue to prepare business cases prior to procurements and school boards will perform a formal cost/benefit analysis prior to all classroom equipment and student learning software purchases.

4.7 Ministry and School Boards May Not Be Obtaining Full Value for Money for Student Information Systems

4.7.1 School Boards and Ministry Have Not Explored Cost Saving Opportunities of Centralized Student Information System

We found that there is no single common centralized student information system at the provincial level. Such a centralized system could potentially bring cost savings to the boards through economies of scale if all school boards used one system managed by the Ministry. However, we noted that the Ministry and boards have not formally assessed whether there are potential overlaps, cost saving opportunities and inefficiencies in the submission of student information.

The student information system (discussed in **Section 2.3.2**) is used to register students in courses; document grading, transcripts, results of student tests and other assessment scores; build student schedules; track student attendance; and manage many other student-related data needs in a school. With the exception of a small number of small school boards and the francophone boards, almost all school boards are individually investing in resources such as system applications, licences, consultants, maintenance and equipment.

The yearly operational and maintenance costs for their student information systems at the four school boards we visited were \$710,000 (Toronto Board); \$89,910 (Algoma Board); \$98,000 (Waterloo Catholic Board); and up to \$1.5 million (Peel Board).

In our survey, 69 school boards reported spending a total of over \$13.1 million per year in operational costs to maintain their student information systems for data reporting. At the same time, the Ministry spent \$1.7 million in operational costs in the 2017/18 school year to maintain its Ontario School Information System (OnSIS) (described in **Section 2.3.1**). All 72 school boards use OnSIS to submit data to the Ministry that they have collected on their student information systems.

We also found that school boards follow different methods to report student data to the Ministry. For example, the Toronto Board has a central repository that its schools send their data to and then the Board submits the data to the Ministry's OnSIS. Smaller school boards allow each school to manage the submission process. In such cases, the school may enter the data directly into OnSIS.

In contrast, British Columbia implemented a centrally managed electronic student information system in 2005. The B.C. system has the benefits of using a single student record, even for students who transfer to another school or board and a centralized system to save on operational costs and bring efficiencies to the data reporting process. The Province and the school districts share the system's operating costs. Each board pays approximately \$10 per student per year, for a total of \$5.8 million, and the education ministry pays \$6 million (based on the monthly enrolments). A governance structure approves and prioritizes changes to the application.

RECOMMENDATION 13

To eliminate duplication, save on costs and realize potential efficiencies in collecting and submitting student data, we recommend that the Ministry of Education, in collaboration with the school boards, investigate implementing a

shared centrally managed student information system and determine whether such a system will achieve these aims.

RESPONSE FROM MINISTRY AND SCHOOL BOARDS

The Ministry welcomes this recommendation and has been working with school boards to explore options for a standardized approach to the student management system.

The Ministry will continue to engage representatives from school boards to collaborate to look for more efficiencies in technology and processes for collecting and submitting student data, including conducting and reporting on the results of adopting and shared systems.

4.7.2 Staff Report That Data Reporting Process Is Difficult and Inefficient

The effort required to submit data for one reporting period to the Ministry's Ontario School Information System (OnSIS) (described in **Section 2.3.1**) can be onerous for school boards. We noted that lack of data validation and lack of clarity in business rules (that is, controls to ensure accuracy of data) contribute to the inefficiencies in the reporting process.

Submissions fall under three reporting periods ending October 31, March 31 and June 30 every year. A study on the student information work flow process conducted in 2017 by a committee of the Ontario Association of School Business Officials estimated that school boards spent an average of 116 days in finalizing the October 31 data submission.

Student information systems at school boards and schools (discussed in **Section 4.7.1**) are supported by three main vendors: Trillium, PowerSchool and Maplewood. These vendors are responsible for incorporating new or revised business rules provided by the Ministry into the student information systems. The school boards are responsible for ensuring that the business rules are updated in a timely manner. However, we found

that school boards and schools are often not aware of these changes to business rules until after they have submitted their data to the Ministry.

In the Ministry's OnSIS, business rules that ensure accuracy of data are enforced at two designated points in time:

- Upon entry of data, rules relating to the immediate area of the data entry are enforced, preventing further entry until errors are corrected (for example, date format, required fields).
- At sign-off, rules relating to the entire submission are enforced, possibly preventing completion of the data submission.

School board staff who are involved in submitting data to the Ministry indicated to us that error messages provided by the Ministry's OnSIS system are not clear and often do not provide enough information to identify and resolve the problems. As a result, board staff contact the Ministry multiple times to fix the errors before making their final data submission.

This results in inefficiencies, as much time and effort are needed to understand what is expected by the Ministry's system and to investigate the errors. Time and effort are also needed to understand what kind of data the individual board student information systems expect. The submission process therefore requires repeated communication between school staff, board staff, the system vendor and Ministry staff to clarify system expectations and understand how to resolve problems.

We interviewed staff at the four school boards we visited regarding the main challenges they face in the data reporting process. These boards and the rest of the 69 school boards that responded to our survey made the following comments on OnSIS data reporting:

- During peak times, OnSIS response is often delayed due to technical difficulties.
- Communication from the OnSIS help desk regarding technical difficulties is often delayed or non-existent.

- New data requirements do not have enough lead time.
- Error information is limited, so that resolving problems takes a long time.
- The OnSIS system has a slow response time.
- The process has a complex interface; it is overly complicated and manually intensive.
- There is a lack of formal training materials.

Fifty-five of the 69 school boards that responded to our survey (80%) mentioned that the training provided by the Ministry on OnSIS data submission and reporting is not sufficient.

RECOMMENDATION 14

To improve the data reporting process for student information, we recommend that the Ministry of Education, in collaboration with the school boards:

- improve the student information workflow with a focus on streamlining processes and providing clear information regarding errors and how to resolve them;
- establish key performance indicators and monitor the time required for boards to sign off on OnSIS submissions and the quality of signed-off data; and
- improve the training provided on OnSIS submission and reporting.

MINISTRY RESPONSE

The Ministry will continue to engage with representatives from school boards to look for efficiencies for data workflow and provide clear information regarding system error and how to troubleshoot them.

The Ministry will establish key performance indicators and monitor the time required for boards to sign off on OnSIS submissions and the quality of signed-off data.

The Ministry is making ongoing enhancement to its quality assurance process and will update existing training and user guides.

Appendix 1: IT Spending vs Total Spending in Ontario School Boards, 2013/14–2017/18 and IT Spending per Student for 2017/18

Prepared by the Office of the Auditor General of Ontario

School Board	IT Spending vs Total Spending in Ontario School Boards						IT Spending Per Student (2017/18)			
	Year (%)						5-Year Avg. (\$ million)	IT Spending (\$ million)	# of Students	IT Spending/Student (\$)
	2013/14	2014/15	2015/16	2016/17	2017/18	2017/18				
Northeastern Catholic District School Board	2.49	3.05	2.79	2.66	2.50	2.70	1.08	1.05	2,268	464
Conseil scolaire district catholique des Aurores boréales	2.13	2.63	1.77	2.38	2.85	2.35	0.51	0.66	810	810
Trillium Lakelands District School Board	1.51	1.64	1.71	1.91	1.70	1.69	3.57	3.72	16,845	221
Keewatin-Patricia District School Board	1.47	1.70	1.77	1.53	1.59	1.61	1.42	1.48	4,865	304
Conseil scolaire catholique MonAvenir	1.43	1.73	1.44	1.72	0.99	1.46	3.54	2.66	16,746	159
Superior-Greenstone District School Board	0.96	1.65	1.67	1.87	1.04	1.44	0.57	0.43	1,477	291
Conseil scolaire district du Nord-Est de l'Ontario	1.37	1.52	1.05	1.50	1.59	1.41	0.68	0.85	2,154	394
St. Clair Catholic District School Board	0.98	1.85	1.53	1.29	1.30	1.39	1.51	1.48	8,765	169
Renfrew County District School Board	0.88	1.34	1.22	1.34	2.05	1.36	1.74	2.75	9,197	299
Conseil scolaire catholique Providence	0.80	1.22	1.31	1.14	2.03	1.30	1.85	3.18	9,988	318
London District Catholic School	0.75	1.41	1.40	1.46	1.47	1.30	3.09	3.71	19,942	186
Sudbury Catholic District School Board	0.69	1.38	1.26	1.46	1.55	1.27	1.10	1.43	5,976	240
Wellington Catholic District School Board	1.03	1.21	1.28	1.24	1.44	1.24	1.22	1.49	7,933	188
Conseil scolaire Viamonde	0.96	1.47	1.25	1.07	1.44	1.24	2.32	3.05	11,976	255
Brant Haldimand Norfolk Catholic District School Board	0.67	1.24	1.22	1.47	1.57	1.24	1.51	2.04	10,064	203
Renfrew County Catholic District School Board	1.22	1.23	1.03	1.19	1.21	1.18	0.78	0.86	4,787	179
York Region District School Board	1.03	1.54	1.19	1.08	0.97	1.16	16.27	14.54	124,707	117
Conseil scolaire district catholique du Nouvel-Ontario	0.88	0.78	1.11	1.26	1.46	1.10	1.33	1.82	6,652	274
Toronto District School Board	1.07	1.32	1.06	1.08	0.90	1.09	33.95	29.63	246,381	120
Grand Erie District School Board	0.54	0.92	1.15	1.25	1.48	1.07	3.35	4.77	26,549	180
Huron-Superior Catholic District School Board	0.50	0.48	1.05	1.47	1.64	1.03	0.80	1.33	4,768	279
Upper Canada District School Board	0.87	1.07	1.00	1.02	1.17	1.03	3.62	4.26	27,045	157
Simcoe Muskoka Catholic District School Board	0.49	0.93	1.16	1.24	1.31	1.03	2.62	3.50	21,341	164

School Board	IT Spending vs Total Spending in Ontario School Boards					IT Spending Per Student (2017/18)	
	Year (%)					IT Spending (\$ million)	# of Students
	2013/14	2014/15	2015/16	2016/17	2017/18	5-Year Avg. (\$ million)	IT Spending/Student (\$)
Near North District School Board	0.79	1.10	0.99	1.03	1.06	1.47	161
Rainbow District School Board	0.36	1.14	1.06	1.13	1.22	1.85	184
District School Board of Niagara	0.76	1.11	1.18	1.02	0.81	4.26	101
Limestone District School Board	0.70	0.75	1.11	1.15	1.15	2.53	159
Hamilton-Wentworth District School Board	1.03	1.06	1.04	0.84	0.90	5.69	110
Algonquin and Lakeshore Catholic District School Board	0.45	0.96	1.02	0.88	1.55	1.46	207
Conseil scolaire district catholique Franco-Nord	0.58	1.02	1.05	1.15	1.03	0.58	235
Superior North Catholic District School Board	0.28	1.46	1.37	0.94	0.77	0.18	223
Peel District School Board	0.60	1.14	1.01	1.04	1.01	16.76	122
Bluewater District School Board	0.77	0.81	1.00	0.80	1.26	1.91	163
Nipissing-Parry Sound Catholic District School Board	0.67	1.12	0.78	0.88	1.10	0.43	200
Algoma District School Board	0.75	0.98	0.89	0.90	1.01	1.39	164
Waterloo Catholic District School Board	0.59	0.79	0.80	1.17	0.99	2.30	126
Dufferin-Peel Catholic District School Board	0.33	1.23	0.81	1.17	0.64	8.08	79
Hastings and Prince Edward District School Board	0.77	0.96	0.85	0.85	0.73	1.63	98
Durham Catholic District School Board	0.53	0.99	0.86	0.81	0.94	2.27	125
Northwest Catholic District School Board	0.38	0.64	0.52	0.62	1.80	0.19	353
Ottawa-Carleton District School Board	0.78	0.95	0.78	0.61	0.83	7.06	109
Catholic District School Board of Eastern Ontario	0.53	0.90	0.73	0.87	0.79	1.34	114
Halton Catholic District School Board	0.78	0.71	0.77	0.85	0.70	2.81	81
Simcoe County District School Board	0.56	0.83	1.04	0.86	0.52	4.52	63
Lambton Kent District School Board	0.27	1.17	0.80	0.84	0.67	2.01	85
Conseil des écoles publiques de l'Est de l'Ontario	0.52	0.76	0.85	0.72	0.88	1.66	147
Conseil scolaire district catholique de l'Est ontarien	0.49	0.75	0.71	0.81	0.95	1.23	163

School Board	IT Spending vs Total Spending in Ontario School Boards						IT Spending Per Student (2017/18)			
	Year (%)						5-Year Avg. (\$ million)	IT Spending (\$ million)	# of Students	IT Spending/Student (\$)
	2013/14	2014/15	2015/16	2016/17	2017/18	2017/18				
Peterborough VNC Catholic District School Board	0.59	0.74	0.69	1.03	0.63	1.32	1.16	15,064	77	
Conseil scolaire district catholique Centre-Est de l'Ontario	1.40	0.67	0.67	0.64	0.28	2.28	1.00	23,764	42	
Conseil scolaire district du Grand Nord de l'Ontario	0.79	0.69	0.94	0.62	0.58	0.42	0.37	2,473	151	
Huron-Perth Catholic District School Board	0.43	0.57	0.57	0.84	1.21	0.72	0.81	4,524	178	
Halton District School Board	0.40	0.81	0.90	0.76	0.66	0.71	4.92	64,517	76	
Thames Valley District School Board	0.46	0.85	0.71	0.80	0.62	0.69	5.81	77,573	75	
Avon Maitland District School Board	0.68	0.71	0.72	0.54	0.78	0.69	1.64	15,793	104	
Ottawa Catholic District School Board	0.72	0.86	0.62	0.66	0.54	0.68	2.93	42,077	70	
York Catholic District School Board	0.62	0.88	0.54	0.73	0.55	0.67	3.75	53,728	70	
Thunder Bay Catholic District School Board	0.69	0.64	0.65	0.62	0.67	0.65	0.75	7,739	97	
Windsor-Essex Catholic District School Board	0.49	0.62	0.55	0.62	0.92	0.64	2.38	20,414	117	
Niagara Catholic District School Board	0.50	0.72	0.71	0.66	0.58	0.63	1.55	21,429	73	
Bruce-Grey Catholic District School Board	0.70	0.42	0.51	0.56	0.95	0.63	0.58	4,423	130	
Kenora Catholic District School Board	0.16	0.42	0.16	0.72	1.53	0.60	0.44	1,419	308	
Rainy River District School Board	0.65	0.57	0.38	0.45	0.70	0.55	0.40	2,707	148	
Toronto Catholic District School Board	0.25	0.48	0.37	0.51	1.09	0.54	12.81	91,183	140	
Waterloo Region District School Board	0.28	0.65	0.56	0.53	0.59	0.52	4.38	64,004	68	
Upper Grand District School Board	0.36	0.54	0.54	0.55	0.54	0.51	2.27	34,877	65	
Hamilton-Wentworth Catholic District School Board	0.34	0.78	0.49	0.48	0.43	0.50	1.55	29,463	53	
Durham District School Board	0.18	0.43	0.36	0.74	0.72	0.49	6.03	70,201	86	
Lakehead District School Board	0.00	0.36	0.42	0.90	0.54	0.44	0.70	8,807	79	
District School Board Ontario North East	0.50	0.48	0.39	0.31	0.51	0.44	0.65	6,660	98	
Greater Essex County District School Board	0.02	0.33	0.29	0.31	0.28	0.25	1.26	36,332	35	
Conseil scolaire district catholique des Grandes Rivières	0.15	0.21	0.18	0.49	0.16	0.24	0.20	5,861	34	
Kawartha Pine Ridge District School Board	0.09	0.11	0.29	0.31	0.06	0.17	0.24	32,323	8	

Appendix 2: Audit Criteria

Prepared by the Office of the Auditor General of Ontario

1. IT governance and accountability structures should be in place to help school boards and schools plan for economical delivery of IT functions, in accordance with legislative, contractual and program requirements.
2. The delivery of IT services is timely and effective. Performance measures and targets should be established and monitored for IT services against actual results, to ensure the intended outcomes are achieved and corrective actions are taken on a timely basis when issues are identified.
3. Appropriate procedures, controls and processes are in place to prevent and detect security attacks, threats, weaknesses and vulnerabilities, and assess their impact on schools and school board security.
4. Confidential information is managed in accordance with privacy legislation and principles.
5. IT systems allow student information, and financial and human resource data to be reported accurately and on a timely basis.

Appendix 3: IT Survey Aggregate Results on Key Audit Criteria

Prepared by the Office of the Auditor General of Ontario

Key Audit Criteria	Yes	No	In Progress
An assessment has been performed to evaluate students' need for classroom technology	40	13	16
An approved IT asset management policy exists	44	10	15
An approved cybersecurity/information security policy exists	28	41	n/a
School boards perform cybersecurity risk assessments on a regular basis	31	38	n/a
School board provide formal IT security awareness and data privacy training to all staff who use technology at board level and in schools	18	51	n/a
School boards formally keep a record of cybersecurity incidents that occurred at the school board and in schools	25	44	n/a
Cyberbullying incidents are being recorded in an incident reporting system	38	31	n/a
An enterprise risk management function exists	2	37	30
Approved data classification policy or guidelines exist	25	44	n/a
School boards have an approved business continuity plan (BCP)	5	31	33
School boards have an approved disaster recovery (DR) plan	19	18	32
School boards have an approved data backup policy	35	19	15
School boards have an approved service level agreement (SLA) and/or key performance indicators (KPIs) for support and service delivery to schools	25	44	n/a
School boards frequently use VLE (virtual learning environment) in classrooms	51	18	n/a

Note: All results in this figure are out of 69. We surveyed all 72 school boards in Ontario; 69 school boards responded to the survey.