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Canada Revenue Agency and Tax Administration: Re-envisioning Tax and Benefit Administration in the Age of Digitalization

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Background: The Issue

Canada's tax administration system has remained fundamentally unchanged since it was established more than 100 years ago. This is despite the fact that tax policy has evolved significantly over the same period of time. In particular, when the Canadian tax system was first established in 1918, it was solely used to collect tax revenues, but in recent decades it has been increasingly used to achieve various social objectives. In other words, the tax system is not just used as a tax collection system, but it is also used to deliver a myriad of income benefits.

Two key features of the current tax system impede the delivery of income benefits: self-assessment and annual filing. Self-assessment requires individuals to proactively complete a tax return in order to be assessed for income benefit while annual filing means that income benefits are not responsive to in-year shocks. COVID-19 laid bare the marked incapability of Canada's income benefit system to respond adequately in a time of crises due to these features. The Government struggled to verify income lost in real time and there existed no super database of Canadians that could be used to quickly issue support. In one word, the tax administration system is archaic.

Objectives

The objective of this project is to obtain information regarding the tax administrative system's use of self-assessment and annual filing and consider how advances in digitization could be used to address barriers to access and responsiveness and improve the tax system. We are particularly interested in how other countries have harnessed such technological advances and how they could be used to revolutionize not only day-to-day tax and benefit administration, but also the provision of emergency income support during times of crisis.

Results

Canada's tax system is unusual throughout the world in that it is not used just to raise revenue, but it is also used to deliver an important suite of income support benefits that are designed to achieve social objectives. In addition, a further set of benefits are reliant on information assessed by the tax system. Because of this dual purpose, tax administration matters a great deal because the tax system is the only way to gain access to a suite of income benefits and it matters if the income support they receive is responsive to sudden and dramatic income shocks.

The current self-assessment approach to tax administration used in Canada means that individuals who do not initiate tax filing and submit their package for assessment are excluded

from being assessed for and receiving if eligible any benefits delivered through the tax system or benefits delivered outside the tax system that require tax filing to determine eligibility. Evidence from Canada shows that about 12 per cent of working-age Canadian do not file a tax return and this is heavily concentrated in individuals in low income. In order to be a more effective benefit administrator, the tax authority needs to ensure that everyone who is entitled to benefits receives those benefits. This can be achieved by rolling out administrative assessment, where the tax authority produces pre-filled tax forms, a process aided by digitization.

Equally the current annual filing horizon means that benefits delivered through the tax system are not responsive to sudden and large income shocks, such as what occurred in the first wave of the COVID-19 pandemic. Instead, eligibility for income benefits is assessed using the prior tax year's information and it is not reassessed until the subsequent tax year. To be more effective as a delivery vehicle for social benefits, the CRA also needs to be more responsive to real-time fluctuations in income, which can be supported through e-payroll and other digitization measures.

Key messages

Digitization has significant potential to aid with a reimagination of the existing tax administration systems for day-to-day tax and benefit administration, as well as mechanisms for supplying emergency income support in a crisis. Digitalization will provide a more transparent and reliable government that can adapt to labour market shifts, technological innovation, and unexpected events just as the one we saw at the beginning of 2020 with the COVID-19 pandemic. It provides the opportunity to create synchronicity with government and its citizens to provide better quality of services with digital technologies. Digitization of the tax system would streamline process for both tax filers and administrators, kick start reimagination of day-to-day tax and benefit administration, and provide mechanisms to supply emergency income support.

Methodology

The approach used for this Knowledge Synthesis was a literature review consisting of national and international literature. The review consisted of scholarly articles and government documents on the tax and benefit administration history as well as the present structure, functionality, and processes within the system from both Canada as well as countries within Europe that have been particularly innovative and successful in the digitization of their tax and benefit systems. This qualitative literary analysis was completed in interconnected stages to understand and highlight policy implications towards the digitalization of the Canadian tax and benefit administration system.

Canada Revenue Agency and Tax Administration: Re-envisioning Tax and Benefit Administration in the Age of Digitalization

Objectives

Canada's income tax system dates back to 1917 when personal and corporate income taxes were introduced as part of the Income War Tax Act to help finance the World War I. While it was intended to be a temporary, two-year, measure, it instead became a permanent feature of Canada's legislative framework, known since 1948 as the Income Tax Act. Since its enactment the Income Tax Act has undergone significant revision, growing from ten pages in 1917 to now more than 3,330 pages, and the tax administrator, currently known as the Canada Revenue Agency (CRA), has had their mandate expanded to also include the delivery of various income benefits. That is, the tax system is no longer just used to raise revenue; it is also an important instrument for achieving various social objectives. As a result, CRA also helps facilitate the delivery of various social and economic benefit programs provided by the tax system, acting as an intermediary between persons and government (Canada 2020). This includes such important income support programs as the Canada Child Benefit (CCB), the GST/HST credit, the Climate Action Initiative (CAI), the Canada Worker Benefit (CWB), among others.

Despite this increasing complexity in the tax system and the expansion to a dual mandate collecting taxes and delivering benefits, Canada's tax administration system has remained fundamentally unchanged since it was established in 1917. And the problems inherent in this archaic tax administration system regarding benefit administration were laid bare during the first wave of the COVID-19 pandemic. COVID-19 showed the lack of sophistication and marked incapability of income benefits delivered through the tax system to respond adequately in a time of real crisis. Since tax filing only occurs once a year, a system established more than 100 years ago based on the basis of the agrarian calendar, Canada's tax benefit system could not respond to the dramatic in-year income shocks which occurred during COVID-19, especially as the majority of first-wave shocks hit between March and June 2020. As a result, Canada was forced to instead provide pandemic support through a less-than-ideal Canada Emergency Response Benefit (CERB) system administered by Service Canada, which required recipients to self-identify to receive support. In essence, Canada's tax system proved too clunky and unresponsive to deliver emergency pandemic income support.

In order to be a more effective benefit administrator, the CRA needs to ensure that everyone who is entitled to benefits receives those benefits. As detailed in Petit et al. (2021b), the Minister of National Revenue's 2019 Mandate Letter agrees with this sentiment, stating that modernizing the CRA includes proactively contacting Canadians who are entitled to but are not receiving tax benefits (Office of the Prime Minister 2019). Regardless of this recognition, the CRA appears to

limit their service focus to those who already interact with the agency. In particular, their mandate states the following: “contribute to the economic and social-well-being of Canadians by making sure that…clients receive the benefits for which they are eligible” (Canada Revenue Agency 2020a). The term “clients” is not defined, but, from the context, it appears that “client” refers to persons and entities that file tax returns. That is, the CRA ensures persons who interact with them receive the benefits for which they apply and are eligible or for which there is automatic assessment (dependent on the benefit). However, for non-filers who do not interact with the CRA, there appears to be no such assurance.

Taking this into account there are two main features of Canada’s tax administration system that impede the CRA’s mandate to deliver income benefits. First, it relies on what is called self-assessment, which means the onus is on the individual tax filer to provide complete and accurate information to the government on the income taxes they owe. This process of self-assessment certainly has some advantages; however, as a benefit administration tool, this approach is problematic because the onus to file taxes is on the individual in order to claim or be assessed for income benefits. In Canada, there is no universal requirement to file taxes. In particular, while there are some rules governing who is required to file (Canada Revenue Agency 2004), the most important one is that only those individuals with a balance owing are legally required to file a tax form.

If the individual has no taxes owing, either because their income is at or below the basic personal exemption or because sufficient (or more than sufficient) tax was withheld by their employer and remitted to CRA, they are either not obliged to submit a tax return (if no tax is payable) or the failure to file a return would not likely give rise to any financial penalty, even if completing and submitting one would provide a refund. Individuals who do not file tax returns are excluded from being assessed for (and receiving if eligible) any CRA-delivered benefits associated with that tax year. While the CRA has some measures in place to identify and contact individuals who may lose benefits because they have not filed a return, if an individual has not been a client, i.e., has not filed a tax return either recently or ever, they are unlikely to be included in this initiative. An implication of there being no universal requirement to file taxes is that there is no super-database of all Canadians, their bank accounts, and addresses is maintained, which if it did exist could be used to issue quick payments in times of crisis, whether individual or societal.

Another feature of the self-assessment process is the additional administrative assessment that occurs once the information is provided to the tax authority. That is, once the self-assessment is provided to CRA, CRA uses third-party information reported separately to CRA and matching techniques to verify (or administratively assess) the information provided by the tax filer. Third-party reporting, or matching, is a tax policy concept according to which a third party (i.e., neither the individual nor the tax authority) provides an impartial verification of income. For example, all employers are required to report to the tax authority on a T4 information slip the wage income of

their employees. While not all income is subject to such reporting, a significant amount is. This means that the CRA knows a fair amount about much, if not all, of the income earned by a significant number of tax payers.

If CRA already has all this information available, it begs the questions as to why the onus to complete tax returns does not simply shift from the individual to the tax authority ensuring that anyone that has been issued any form a tax slip is also automatically assessed for income benefits? One reason is that in Canada not all income—notably, self-employment income—is subject to verification, meaning that such a process fails to capture a growing segment of the Canadian workforce: those employed in precarious, non-standard, and contract work. This raises concerns, not only about increased tax non-compliance, but also about a growing burden on tax filers to keep proper records and learn complex tax information. The lack of third-party reporting for self-employment income is a key reason why the government struggled to verify income lost by those with self-employment earnings, particularly those in precarious and gig work, during the COVID-19 pandemic.

The second feature of the tax administration system that impedes benefit delivery is the fact that the aforementioned self-assessment process only happens once a year, at ‘tax time’, when individuals must file a self-assessed tax return for the previous calendar year by April 30. The administrative assessment process that occurs after an individual submits their tax form is based on impartial verification of income provided by third parties, as discussed above. This third-party information is only reported once a year, as well, aligned with ‘tax time.’ For example, all employers are required to report to the tax authority on a T4 information slip the wage income of their employees, on or before the last day of February of the year following that to which the income information applies.

To be more effective as a delivery vehicle for social benefits, the tax administration system needs to be more responsive to real-time fluctuations in income. Currently, there is potentially a large time lag between when persons become eligible for (and need) benefits and when they receive the benefits through the tax system. For example, consider a person with a job in an initial year (say, 2017) with pay that is too high to qualify for the Canada Workers Benefit (CWB). If this person lost that job in February of 2018, replacing it with a lower-paid job that does qualify for the CWB, they will not receive those benefits until at least 13 months later, at their next tax filing (in the spring of 2019). This delay may drive them deeper into a financial insecurity. For example, this person may resort to other actions that provide timely cash assistance, such as taking out pay-day loans, with long-term ramifications.

Improving the tax system to address these shortcomings has the potential to both weaken the day-to-day administrative barriers Canadians face in navigating the tax system, as well as better respond to both isolated and widespread disruptions, such as those brought on by a pandemic. Canada’s tax system needs to be made more responsive to income shocks, it must address the

changing nature of work, and to be streamlined in an administrative sense, for both tax filers and tax administrators. Put simply, the tax system in Canada needs to be modernized. Within this context, digitization and the digital economy have significant potential to factor heavily in a reimagination of systems for day-to-day tax and benefit administration, as well as mechanisms for supplying emergency income support in a crisis. However, it remains an open question which technologies and approaches are optimal, and in relation to what objectives and barriers.

Methods

The approach used for this Knowledge Synthesis was a detailed review of the existing literature both nationally and internationally. In this context, literature refers to not only scholarly, peer-reviewed literature, but also government documents, and web-based material. The literature review was conducted in four phases. In the first phase, we reviewed scholarly articles and grey literature on the Canadian tax system a as well as the present structure, functionality, and processes within the system. This allowed us to determine areas that would benefit from digitalization in order to reduce the current inefficiencies of tax and benefit delivery in the Canadian tax system. Digitalization was determined a potential tool after a literary review of articles focusing on the effects of COVID-19, tax filing rates, income and benefit receipt, and the growing number of citizens engaged in non-traditional work, particularly the emerging gig economy. This evidence laid clear two key inefficiencies in the present tax system that could be rectified by employing digital technologies. These were self-assessment and annual reporting.

In phase two we completed an international literary review of countries that have been particularly innovative and successful in the digitalization of their tax system and benefit administration as well as the economy as a whole. A qualitative context analysis of work published predominately since 2000, consisting of academic articles, government documents, and conference proceedings were analyzed. Overall, we found that European countries were more likely to have incorporated digitalization into their policy systems then in any other part of the world. Aggregating case studies from Estonia, Ireland, Finland, Denmark, and the United Kingdom brought forth the concept of ‘Government as a Platform’. In opposition to the siloed structure that currently exists in Canada’s government, it was discovered that, to varying degrees, these countries employ an interoperable government system that centralizes citizens’ personal data or facilitates communication and data exchange between separate systems. This international review highlighted the timelines of key digitalization infrastructure solutions as well as services provided by the system, best practices, and made notice of past failures. The review provided a guide to digitizing a countries tax system to receive the intended benefits,

The third phase of the literature review consisted particularly of focusing on various Canadian government documents produced primarily since 2016. These included federal budgets, bills and legislation, particularly the Digital Charter Implementation Act (An Act to enact the Consumer Privacy Protection Act and the Personal Information and Data Protection Tribunal Act

and to make consequential and related amendments to other Acts 2020), internal conference proceedings, and reports to federal standing committees regarding digital technologies in the public sector. This literary review provided guidance as to where there is a previous government commitment to digitalization, financial investment, or future digitalization project plans. This phase provided a base for creating policy recommendations grounded on what the Canadian tax and benefit administration system currently needs and in what areas momentum can be leveraged.

In the fourth, and final, phase we aggregated information on past and ongoing digitalization projects within the Canadian government or in partnership with the public sector. A review was completed on municipal, provincial, and federal initiatives employing digital technologies to provide government services, or enhance the lives of its citizens. These projects were then compared to similar projects that occurred in various jurisdictions across Europe. We also developed a criterion to assess the feasibility of such projects in a Canadian context given the complexity of our government structure. As part of the jurisdictional comparison, we aggregated literature on what differentiates Canada from other countries that rank highly on various OECD world digital government rankings and indexes. We then researched what aspects of digital government need to be in place prior to a digital transformation of the tax system and future digital government transformations. It was determined that Canada will have to address two central aspects of digitalization to realize the full benefits of a digital tax and benefit administration system. These being providing a government-issued secure digital ID and reducing the digital divide.

The methodology for this knowledge synthesis was followed in the phases laid out above; however, it also involved interconnectedness between the phases. The initial literary analysis of phase one and two were initially completed consecutively. Upon completion of the two phases, it was determined that inefficiencies in the current Canadian system were closely linked with digital technologized used in European countries to improve said inefficiencies. Subsequently, phases three and four were conducted concurrently and iteratively. For example, when a federal budget identified policies towards creating a more inclusive Canada and creating strong Indigenous communities by providing connectivity to close the digital divide, we then investigated how other countries have connected their citizens to digital services and what initiatives are already in progress within Canada to close the gap. The interconnected aspects of the phases to our literature review enabled us to better understand and highlight policy implications towards the digitalization of the Canadian tax and benefit administration system. Digitalization in the public sector is a complicated transformation that needs to be made to ease the lives of Canadian citizens when interacting with government. It is important that further research be done into case studies, feasible technological solutions, citizen engagement to make digital transformation of the tax system a reality.

Results

Issues facing the Canadian Tax system

As outlined in the Background section, there are two features of the tax administration system that create barriers to tax filing and benefit administration. In this section, we examine these barriers in more detail and consider how digital innovations could make the tax system more accessible.

Self-Assessment

Self-assessment is a model that places the onus on the individual tax filer to provide complete and accurate information to the government on the income taxes payable on the income earned (Petit et al. 2021a). A taxpayer is required to provide an accurate self-assessment to that tax authority under risk of fines, penalties, and even legal action if the information provided is found to be inaccurate in a way that understates the amount of tax owing. There are several known barriers to the current self-assessment process.

While CRA does provide access to tax forms that can be completed manually, it does not have any proprietary system to allow individuals to complete their taxes online directly. Instead, those wanting to complete their tax filing online must choose from among many third-party products often for a fee. TurboTax is the number one tax software used by Canadian's in 2020, costing between $79.99 and $199.99 depending on complexity of the tax return and level of service (TurboTax 2020). In addition, while CRA does provide tax information services, it does not provide tax advice. Instead, individuals needing tax advice to complete their tax forms must seek out paid professional tax preparers. Survey data indicates that 54% of tax filers seek out professional help to complete their taxes (Marotte 2013).

Although companies providing tax software and expert tax advice provide a valuable service to individuals with limited knowledge of tax laws and regulation and to individuals with complicated returns, there are barriers to equitable access to these services. This is largely attributed to cost. Since tax software and expert preparation services are not provided free of charge, only those who can afford these services can obtain this support, making these options unavailable for many low and middle-income households. Thus, some individuals will have to complete the tax forms by hand and without outside guidance regardless of whether the taxpay has correct knowledge of the tax filling g rules and processes.

The self-assessment system, therefore, imposes compliance costs on individuals. According to Vaillancourt (2010), the average cost to individuals to comply with personal income taxes is $215. And compliance costs increase significantly with complexity. In particular, individuals with income that is not subject to third-party reporting, notably self-employment income, incur compliance costs in excess of $300. This includes those working in the gig economy who are

currently classified as self-employed workers (Hou, Lu, and Schimmele 2019). In 2017, approximately 11% of individuals that filed taxes claimed some form of such income (Canada Revenue Agency 2020b). The reason why compliance costs are higher for such individuals is because, unlike for employees, there is no employer, or other entity, to submit a slip that the individual can consult and check against their records.

Given these compliance costs, it is unsurprising that some individuals choose to not file their taxes, a necessary act in order to be assessed for eligibility for income benefits delivered through the tax system. To what degree is non-filing a policy concern? According to Robson and Schwartz (2020), 10%-12% of Canadians between the ages of 18 and 64 did not file a tax return, consequently not receiving income support or eligible benefits. They found that individuals whose income was below the poverty line were much less likely to file a tax return (19.6%) and low-income status was strongly correlated to the likelihood to non-filing. This is concerning since these are the groups of individuals most likely to be eligible for income benefits and would preparation need those benefits the most. In fact, they found that individuals lose between $193 to $4,238 in income benefits per filing season. In totality, these non-filing rates bring forth the total amount of income benefits lost from not filing amount in to $1.7 billion (Robson and Schwartz 2020). It is clear that there is a significant amount of income benefits that are being lost by those who need it most.

The largest unclaimed income benefits are in the form of child benefits, impeding the governments progress on addressing child poverty. Receiving child benefits can boost low-income households' income by up to 50% (Prosper Canada 2018). Li and Neborak (2018) reported that Indigenous families living on reserves in the North are among those struggling to gain access to child benefits because: they are unaware of the benefits, distrust in the Canadian government, or are non-eligible due to inconsistency in filing annual tax returns or filing tax returns at all (McKie 2017). It has been estimated that 40% of eligible First Nations families did not receive the Canada Child Benefit (Prosper Canada 2018). In an effort to reduce this gap CRA partnered with Aboriginal Financial Officers Association (AFOA) and Prosper Canada to develop and encourage participation in community outreach programs targeted at Indigenous Peoples to enable receipt of benefits that they should be receiving but are not (Prosper Canada 2018). Despite these efforts, a concerning gap remains.

Administrative Assessment and Pre-filled Tax Forms

The challenges imposed by compliance costs and non-filing could be alleviated by a simple change to tax administration: shifting the onus on completed tax forms from the individual to the tax authority through the use of pre-filled tax forms. Under such a system, CRA would use all the information it already has on hand to provide pre-filled tax forms on behalf of the individual (Brookes and Dery 2018). These pre-filled tax forms are then sent to the taxpayer who confirms the information or is able to make any necessary changes (Petit et al. 2021a). Pre-filled tax

returns simplify the tax filing process and creates greater accessibility for taxpayers that are susceptible to be non-filers.

A number of countries around the world have successfully shifted to administrative assessment in their tax system and employed pre-filledf tax forms. These countries include Belgium (Seitani & Westmore, 2020), Ireland (Connolly & Bannister, 2008), Sweden (OECD 2008), Denmark (Østergaard, 2014), and Estonia (Kelmm 2019). In 1988, Denmark was the first country to distribute pre-filled tax forms (OECD 2006). By 2006, Denmark distributed only pre-filled forms to its taxpayers with 99.4% in electronic format, and 72% were returned without adjustments (OECD 2008). The ability of Denmark to provide accurate pre-filled forms (Soontreeruntana et al. 2006) that require minimal corrections, display the efficiency of pre-filled tax forms. Sweden reports similar figures related to the provision of pre-filled tax forms as Denmark with a corresponding figure of 60-65% of pre-filled forms were filed with no adjustments (OECD 2008). Satisfaction among individuals with pre-filled forms is quite high and 94% indicate that they would recommend using it to other taxpayers (Erard et al. 2011).

The success of pre-filled tax forms in countries that have adopted it has been attributed to a number of pre-existing factors: a high integrity regarding taxpayer identifiers, a comprehensive system of third-party reporting, a high degree of automation among information suppliers, and a compatible legislative framework including limited non-standard deductions (Ibrahim and Pope 2011). The main reason pre-filled tax forms may not be successful is a lack of trust in the government to put the best interests of citizens first and employ the necessary security requirements with regard to personal data collection and use in the tax system.

Despite the success across European countries, in Canada there have only been unsuccessful attempts at pre-filled personal income tax forms. Quebec introduced a pre-filled income tax pilot program in 2008 for the 2007 tax year (Lindsay M Tedds 2013a) . The pre-filled tax forms were distributed to 100,000 seniors mostly above the age of 65 (80%) or to taxpayers with low income, a simplistic tax profile, and who used the paper format for the past three consecutive years (Erard et al. 2011). The pilot program was designed to ease the lives of the of older residents to accommodate the increasing average age in Quebec with the objective that by 2011 all Quebec residents would receive a pre-filled tax form (Erard et al. 2011; Lindsay M. Tedds 2013b).

They were provided the form in March and it was due on April 30th, the deadline for all personal income tax returns (Erard et al. 2011), arguably a short turn aground time. Of the 100,00 taxpayers in the pilot program, 93% received a prefilled tax return but only 30.9% filed said return (Erard et al. 2011), a very low response rate especially when compared to European countries. This is a significantly low filing rate. A survey was completed to understand taxpayers experience with the pre-filled forms. Of the respondents, over 46% prefer the previous form, and over 50% noted that the form arrived too late (Holen 2010). Dissatisfaction with the pre-filled

form demonstrated a loyalty to the usual manual form, the short turnaround time from receiving the tax form and the deadline for filing, and the lack of inclusion of information that allowed recipients to establish the amount they owed (Holen 2010; Erard et al. 2011). Due to the disappointing results, the Quebec pilot was discontinued.

It is clear that for a shift to administrative assessment and pre-filled tax forms to be successful, the government would need to first build trust in the system. That may pose a more significant challenge in Canada than in European countries. In Canada, there has been mistrust in the government regarding technology due to a long line of underperforming projects including but not limited to the Phoenix Pay catastrophe (Hubbard and Paquet). In addition, Indigenous, Black, and other racialized groups, along with new immigrants all have a higher likelihood of not placing trust in the Canadian government (Li and Neborak 2018). In addition, Canadians are more likely to have concerns related to the use and storage of personal information by their government. They demand that appropriate safeguards are in put in place to protect against privacy disclosures. Given that the current Canadian Privacy Protection Act (CPPA) does not cover these aspects sufficiently (Beauvais 2021) this will also pose a barrier to pre-filled forms.

Annual Tax Reporting

Under current tax administration rules in Canada, ones that have been in placed since 1918, is that the self-assessment process previously described is an annual process where, at ‘tax time’, an individuals must file an income tax form for the previous calendar year by April 30th (Petit et al. 2021a). The annual reporting period begins with third-party entities reporting information on an individual’s income to CRA, a process known as third-party reporting. Third-party reporting is a tax policy concept according to which a third party provides an impartial verification of income. Third-parties include, but are not limited to, employers, social assistance providers, or investment entities (Petit et al. 2021a). Third-parties are required to submit this information to CRA by the last day of February of the year following that to which the income applies. This must also appropriately use the various tax slips provided by CRA which depend on the income being reported (e.g., T4 for employment income, T5 for investment income, T5007 for social assistance income)

As mentioned previously, a comprehensive system of third-party reporting is a prerequisite to successful implementation of a tax administration system based on administrative assessment and pre-filled tax forms. There are two main shortcomings with the system of third-party reporting as it exists in Canada. First, while the CRA collects third-party information on a large amount of income from various sources, not all income is subject to third-party reporting which impedes the accuracy of pre-filled forms. Second, the third-part reporting regime only occurs once a year.

Real-time Third-party Reporting

To create a system more conducive of providing pre-filled forms with accurate information that is responsive to income shocks delivering income benefits in real time, third-party reporting should, instead, be completed, at minimum, on a quarterly bases and preferably on a monthly basis, to account for in-year income changes. Regular third-party reporting is also beneficial in ensuring individual information does not become obsolete between tax seasons, as people move, change their names, update their banking information, or pass away (Petit et al. 2021a). Had such a system been in place at the start of the COVID-19 pandemic the tax system would have been better able to provide emergency income support. Instead, the federal government had to roll out an emergency income benefit (CERB) where individuals were required to self-identify, therefore placing the onus on individuals in a time of chaos and confusion. The biggest challenge to increasing reporting frequency is that it increases third-party compliance costs by requiring third-parties to provide up-to date tax income information to CRA more than once a year.

The Role Digitalization Can Play in Modernizing Tax Administration

The closely intertwined nature of the Canadian tax system within benefit administration reinforces the need to modernize the tax system, providing a basis for a digital tax system and digital government. The Government of Canada is not the only one feeling the pressure of digitalization, but also the public sector and governments around the globe to transform inefficiencies in service delivery, including the ones detailed here regarding tax and benefit administration. Of course, the government is not new to digitalization. The implementation of various degrees of digital technologies and the application of data (Ubaldi, González-Zapata, and Barbieri 2020) have transitioned government process to improve efficiency, reduce costs, and provide more quality interactions with its citizens (Kalja 2002). However, it is important to remember that it is not digitalization per se that improves services delivery. Rather, it is the implementation of the c*orrect* technologies and processes that matters. To understand what the correct technologies may be in the context of tax and benefit administration, we turn to various case studies. Many countries in Europe have been digitalization pioneers, especially within government, and particularly with regarding to their tax and benefit administration. Canada can learn from the successes (and failures) of these countries. The most significant case study is that of Estonia.

Estonia

When Estonia gained independence from the Soviet Union in 1991, there was a significant need to build the public's trust as it transitioned into a democracy (Vassil 2016). It had to create its own democratic processes and build its own government and public services (Kalvet 2012). Early in this process, Estonia embraced digitalization and the combination of a strategic digital government infrastructure and innovative nature resulted in the creation of a ground-breaking interoperable digital government infrastructure that provides online government services (Kalvet

2012; Margetts and Naumann 2017). In particular, since its inception, Estonia has rolled out a number of digital government services, including: e-Tax in 2000, X-Road in 2001, mobile parking (m-parking) in 2003, i-Voting in 2005, e-health in 2010, Online Border-Crossing Queue System in 2013, e-Residency in 2014, and creation of the world's first data embassy (Smith, Bisson, and Gowen 2015; Enterprise Estonia 2020).

In total, Estonia's digital government services has created a secure and transparent ecosystem where 99% of governmental services are provided online and over 2,600 can be accessed using X-Road (Enterprise Estonia 2020). Adoption of these services continue to grow as more and more services are provided and as the comfortability of Estonian citizens to use said services expand. For instance, internet voting (i-voting) participation has increased from 5.5% in 2007 to 43.8% in 2019. The number of e-residents as increased from 7,348 in 2010 to 70,000 members in 2020 (Enterprise Estonia 2020). Estonia's e-Tax system completes personal income tax filing in approximately only one minute, leveraging a system of administrative assessment and pre-filled tax forms (Kelmm 2019). This efficiency is felt by the majority of Estonian taxpayers where E-filing rates grew exponentially from 59% in 2004 to 94% in 2011, to recent reports of that number being the entirety of the taxpayer population (Papińska-Kacperek 2006).

This expansive adoption rate of digital services in Estonia is the result of strong communication, national branding, and the use of various technological, legal and organizational resources (Bharosa, Lips, and Draheim 2020) that enable the Estonian e-government to continue to grow. Two essential features are the leadership provided through the development of its *Digital Agenda for Estonia 2020* strategy and providing citizens with an electronic identification card (eID) which simplifies access to and use of government digital services, including online tax filing (Papińska-Kacperek 2006; Kozak 2018). It is clear that Estonia provides the ideal scenario of a completely digital government for their country, but is it scalable for larger countries with a more complex tax system? Is the Estonian digital government model scalable to Canada and can it provide the necessary flexibility to be adapted to fit with the complexity of the Canadian government? To answer this question, we explain and analyze the following: the Government as a Platform (GaaP) concept, X-Road, eID, and e-Residency Program.

Government as a Platform (GaaP) Concept

The concept of Government as a Platform (GaaP) was conceived by Tim O'Reilly (2011) as a natural progression in the use of digital technology ensuring citizens have the necessary resources and technological skills to access government services wherever and whenever they need, and empower citizens to interact with the government to set forth on the road to innovation that will improve governance (Margetts and Naumann 2017). This concept to rested in the belief that government has a responsibility to treat citizen information as an asset (O'Reilly 2011) and to use that information to make everyday life easier for citizens while redistributing

some power away from government and into the hands of its citizens by being a platform. Specifically, Government as a Platform is defined as “government stripped down to the essential” without unnecessary government intervention to build essential infrastructure and create applications that engage developers to continuously enhance the platform as more applications are built (O'Reilly 2011). As more developments are made more utility is put back into the community (the citizen) thus encouraging technically savvy individuals to participate in the development of their “new” government. It is argued that Estonia paved the way for government digitalization with regard the concept of GaaP.

Estonia used the GaaP concept in its digital technologies roll out as a way to best support the resolution of issues at various levels (city, regional, and national) through shared software, data, and services to improve the efficiency and effectiveness of government (Margetts and Naumann 2017). GaaP was used specifically to develop the decentralized interoperability data exchange layer called *X-Road*, its system of digital identification and mobile identification known as eID, and a service layer accessed through various portals (Margetts and Naumann 2017). The Estonia specific GaaP concept for e-government centres around four key values: decentralized, interoperability, open platform, and open-processes (Margetts and Naumann 2017). This is a holistic approach to system communication through an information exchange layer rather than departments working in silos. showing how digitalization can have an immense impact on the way government functions improving quality of service and in turn quality of life.

X-Road

Estonia metaphorically tore down silos that existed between dispersed government databases and departments in order to streamline processes and facilitate system communication with the development of *X-Road* (Vassil 2016). X-Road is defined as a centrally managed distributed data exchange layer between information systems that provides a standardized and secure way to produce and consume goods (Solutions 2020). X-road, therefore, serves as the fundamental aspect of e-government infrastructure that facilitates the movement of information. In effect X-road has become the backbone of e-Estonia, allowing the nation’s public and private sector information systems to coordinate and operate in harmony (Enterprise Estonia 2020). The X-Road Project was launched for three reasons: the various databases in Estonia required an increasing amount of data manipulation; a standardized interface to allow for better organization of communication between users and databases; and, a standardized authentication service removing costs and confusion (Kalja 2002).

X-Road governance underwent a significant change in 2017 in which responsibility of core development was placed on the Nordic Institute for Interoperability solutions (NIIS). The NIIS is a partnership between the Estonian and Finnish government (Robles, Gamalielsson, and Lundell 2019). Since the NIIS took over governance, there are three classes of contributors to X-road. The NIIS Partners (Finland and Estonia) are in first class and are responsible for ensuring the operability of X-road at the national level (Robles, Gamalielsson, and Lundell

2019). In second class are the various NIIS partners which currently are held by Iceland and large organizations that have the capability and capacity to exchange information (Robles, Gamalielsson, and Lundell 2019). In third class are the citizens (Robles, Gamalielsson, and Lundell 2019). Although citizens are placed in the third class, they are essential to ensure a high adoption rate of the technology as well as a high satisfaction rate when interacting with Estonia's GaaP solution.

Structurally, the X-Road architecture consist of Central Services, Security Servers, Information Systems, Time-Stamping Authority (TSAs), and Certification authority (CAs) (Solutions 2020). The NIIS (2020) explains each aspect and the specific functions X-Road ecosystem. Central services store the registry of X-Road members along with their Security Servers and the security policy of X-Road including a list of; trusted certification authorities, time-stamping authorities, and configuration parameters. The Security Servers are the entry point to X-Road where they manage two types of keys: authentication keys and signing keys. Authentication keys are for establishing cryptographically secure communication channels with other Security Servers and signing keys are for signing the messages exchanged between clients. The Information system produces and/or consumes services via the X-Road as well as supports producing and consuming services from both private and public organizations. Every message sent using X-Road must go through Time-Stamping Authority(s) to verify the existence of data items at a certain point in time and then logged into the Security Server. The last structural component is Certification Authority(s) which issue certificates to Security Servers using authentication keys and X-Road member organizations using signing keys. The Security Servers then check the validity of the signing and authentication keys and issued authentication and signing certificates as proof of the transaction of message.

It is important to note that the use of keys in the Security Services are a similar key infrastructure as blockchain (Urban and Pineda 2018). In fact, both keys are written using open-source code where developers carry the majority of responsibility for integrating services into X-Road (Margetts and Naumann 2017). Although X-Road uses similar distributed ledger technology as blockchain it is not considered a blockchain. The greatest concerns with an open-source government digital key infrastructure are those surrounding privacy and security safeguards. From the structural nature of the X-Road there is a built-in protection from brute force attacks or "accidental incidents of two users generating the same private key" (Ojo and Adebayo 2017). Despite these natural hurdles for hackerism, additional protective measures need to be implemented to ensure the security and privacy of citizens' personal data. Some of these rigid security measures are authentication, multi-level authorization, high-level processing, and monitoring, encrypted and time stamped data traffic, and the immutable characteristic of DLT technology (Margetts and Naumann 2017).

Since the development of X-Road, the system has been in high demand in other countries and Estonia has been generous with providing other countries with the opportunity to experience

and learn from the technology that has placed Estonia as a forerunner in the world of digitalization. For example, Estonia has exported pieces of X-Road or essential services and components to countries of a similar Nordic descent such as Finland and Denmark (Margetts and Naumann 2017). Estonia also exports aspects of their government infrastructure to countries including Palestine, Azerbaijan, and the United Kingdom (Margetts and Naumann 2017). This exportation does not involve a “copy and paste” solution, but rather it is a “middleware layer” acting as a method of connection between existing legacy systems, digitalization, and front-end services (Margetts and Naumann 2017). Due to demand, e-Estonia created a center to guide nations through all the stages of digitalization and offers services that can be tailored to a nations particular needs (Enterprise Estonia 2020).

There are, however, many differences between Estonia and Canada that will provide barriers as to the feasibility of such a digital government in Canada. In fact, the House of Commons Standing Committee on Access to Information, Privacy and Ethics undertook a study on digital government services, focusing on lessons from Estonia. Although they ultimately rejected the Estonian model, it was not because of the benefits the Estonian model offered, but rather the fact that the Estonian model could not be copied and pasted into Canada and because Canadian institutions were simply not ready (Services 2019) . This decision refers to scalability of Estonian model in totality and not its parts.

In terms of the overall differences that made the X-Road system challenging to implement in Canada, one main consideration of differences is population size. Estonia is a Nordic European country with a relatively small geography and population size in relation to Canada. The same digital infrastructure that worked for a country with a populations size approximating 1.29 million (Vassil 2016) may not be ideal for a country with a population size around 38.0 million (S. Canada, 2021).

Another main consideration is tax history, legislative policy, and data regulations that inhibit digital transformation of the Canadian tax system. Estonia was essentially able to build their digital government from scratch after they gained independence. This meant that data was being collected in the same format making data aggregation and analysis more efficient since there is no need to rectify impartial or broken data, or deal with incompatible information systems. But in Canada, taxpayer data comes in a variety of formats due to systems being layered on top of one another to reflect additions to tax and benefit systems as the economy grew. It is important to remember that data from third-party reporting can arrive in many formats. As a result, there are different data types that CRA must be able to process. These data formats can be broadly categorized as structured and unstructured data.

There are a few key differences between structure and unstructured data that should clarified: structured data is often stored in data warehouses whereas unstructured data is not, structured data is relatively easy to search and analyze while unstructured data takes considerable effort to

process and understand, structured data exists in predefined formats in contrast to unstructured data that is found in a variety of formats (Smallcombe 2020). Analogue data is similar to unstructured data the same way digital data is similar to structured data. Consolidating all data to digital/structured data is a prerequisite for progressing to digital processes and further to complete digitalization. Digitalization can provide a more holistic and real-time view of the taxpayer's income and consumption behaviours by integrating silos of structured and unstructured data systems within government departments (Parviainen et al. 2017).

Although Canada is different from Estonia both culturally and legally speaking, Canada can learn a lot from what Estonia has accomplished. This is a small glimpse of Canadian and Estonian differences that will have an impact of the adoption of digital government services. As presented, it is not feasible to believe that the same model used in Estonia can be simply moved to Canada. It should be reconsidered as to what aspects of their digital government can be used in Canada as a step towards digital government and a simplified tax and benefit administration system. But it is clear from the above that digital identification is also an essential item for moving of digitization.

Digital Identification

When receiving government services in a face-to-face environment, a driver’s licence or a passport are among the acceptable forms of identification. But what about in the digital world? How can the government ensure that the person conducting the digital transaction is truly the person they say they are? The answer lies in the development and use of a national digital ID. The whole notion of a digital ID stems from the need to employ a system that processes the identification of an individual wishing to access a government service or complete a transaction accepted by all government levels of government and all agencies.

Digital ID is defined as a foundational set of enabling technologies that can be authenticated unambiguously through a digital channel enabling secure and verified interactions between individuals and institutions (White et al. 2019). Thus, it provides the backbone for delivering digital government services where it is equivalent to physical government-issued ID. Authentication and verification are the fundamental elements that a national digital ID program will employ to ensure secure and reliable interactions between individuals and government to reduce cyber fraud and restore accessibility issues to services. Identification is the attachment of a personal identifier to an individual which presents attributes of the individual such as name, address, age, or eye colour (Camp 2004). Authentication is the process of proving the identity of an individual through documentation such as a driver’s licence and passport or for proving a transaction was completed through a proof of payment (Camp 2004). In the digital world when accessing public services, identification occurs during the account set up when personal information is collected to identify the citizen. Authentication is then performed following identification every time an individual wishes to access a service, perform a transaction, or request information from a government entity. Authentication can occur as a two-factor authentication from a mobile device, submitting answers to security questions, or biometrics

such as fingerprints or facial recognition to authenticate the identity of the individual (Mandal 2019; Government of Canada 2021b).

Canada's lack of a national digital ID became more prevalent during the COVID-19 pandemics where Canadians had to deal with a high level of identity fraud, accessibility issues for services that were of upmost need, while abiding to the social distancing regulations (DIACC 2020a). Experts and members of the Digital ID and Authentication Council of Canada have said that although use of the pre-existing digital identity verification has helped countless Canadians receive financial aid during the pandemic. However it is not sufficient, and the momentum of increased digital services use needs to be leveraged to develop a solution for digital ID at all levels of government to elevate the lives of Canadian citizens across the country (DIACC 2020a). As more services and transaction are conducted online the likelihood of identity fraud increases because there is more opportunity and less protection. It is also easier to perform fraudulent activities from behind a computer due to the lack of in-person authentication often requiring the individual to present a government-issued ID. Therefore, it is essential that any digital ID protect them against fraud.

As Canada moves towards further iterations of digital government development, a national digital ID is clearly mandatory and should act similarly to a passport or identity card for digital transactions. Without a passport it is not possible to travel outside of Canada, similarly without a digital ID, an individual will be unable to access services because their identity cannot be verified. Passports look similar and are required for similar verification activities, but digital ID can come in many forms. A common model is a user ID and password combination to login into an online portal, such as that provided by the CRA (Government of Canada 2019a). When creating a *My Account* to access online tax filing through CRA, an individual must provide their social security number, date of birth, postal code, and the amount on their income tax and benefit return (personal identifiers) to identify the individual citizen (Government of Canada 2019a). However, CRAs My Account does not enable general access to government services across Canada. That means something else is required. A potential made-in-Canada solution is building off of the BC Services Card.

Provincial Digital ID: The BC Services Card

The Government of British Columbia (B.C.) created the BC Services Card in February of 2013 in an attempt to position the province as a leader in transformation and technology strategies (Milberry and Parsons 2013). The BC Services Card is a government-issued digital ID that is can be carried on a mobile device ( ). As of 2018, all BC residents are required to be BC Service Card holders in order to gain access to certain health and government services and the provincial government has committed to continually add services as they become available (Milberry and Parsons 2013). Although it is mandatory that all B.C. residents are in possession of a BC Services card, there is no requirement as to what version of the card. There are three versions; a stand-alone BC Services ID card, a hybrid BC Services Card with a driver's license, or a non-photo card (Milberry and Parsons 2013). The latter version is rather simplified but can

still be used for a multitude of health and government services. The lack of a photo on the card makes it less versatile, solely for accessing online services. Whereas the stand-alone card and the hybrid card contain a photo identifier and can be used as a form of valid ID in various situations.

Despite the differences in the version, there is one main commonality: a unique identifier. The unique identifier is an ID tag inside the computer chip within the digital card that provides a linking function between the cardholder's personal information and various government departments (Milberry and Parsons 2013). This unique identifier ID tag is used for identification. Upon registering for the BC Services card an individual must provide personal information such as name, address, phone number, and birthdate which will generate the unique ID tag ( ). This is known as a Personal Account Number (PAN) serving as an automatic identifier every time the card is used to access a service (Milberry and Parsons 2013).

Before being issued a BC Services Card and a PAN, an individual's identity must be authenticated. This is a one-time security check to authenticate the identity of the registering individual which does not have to be, but can be, done in person. This process can be done in approximately five minutes and provides the choice of sending a video recording or attend a short video call with a government employee to validate that the scan of the individuals paper-based ID is the individual on the other end of the call ("Use to Access Online Services "). Once the digital card is activated proceeding authentication, it uses a password-free login since the identity and authenticity of the individual has been determined during the registration phase. The government of BC has set up a process for regaining access while protecting the information attached to the card ("Security ").

The BC services card is a provincial pilot towards a federal identity system that will encompasses all government services provided municipally, provincially, and nationally to create a Canadian digital identity ecosystem to secure the development and use of digital services and products in the public sector (Milberry and Parsons 2013; DIACC 2021,). The BC Services card is being tested by the federal government with the final objective being to harmonize separate government departments through interoperable databases enabling information sharing and nationally accepted digital ID (Milberry and Parsons 2013).

Denmark's NemID

In 1996 Denmark created the world's first national digitalization strategy (Digital Denmark). This was followed by five key developments with a citizen-centric focus; digital signature, *Easy Account*, digital ID, the *Citizen.dk* portal, and digital post (Digital Denmark). All of these equally important stages in the digitalization of Denmark have been premised towards a common goal. That goal was to create a digital citizen and employing individuals with the skills and resources to use digital government services to solve their administrative problems using self-service platforms such as *Easy Account* and *Citizen.dk* (Schou and Hjelholt 2018). After developing a digital signature in 2001, equivalent to a pen-and-paper signature, Denmark created the *Easy*

Account platform that validates and promotes the use of digital signature for e-Invoicing (Digital Denmark). These two stages provide the structural pillars for deploying the digital *NemID/EasyID* in 2007 for cross-governmental identity verification and to validate all transaction between individual citizens and government (Digital Denmark ; Smith, Bisson, and Gowen 2015).

NemID took over the digital signature in 2010, requiring Danish individuals and businesses to have a *NemID* (Digital Denmark). It is a physical digital identity card that is linked to the individual's social security number (Schou and Hjelholt 2018). It consists of a user ID, password, and a 6-digit code for first time users setting up their account (Digital Denmark). Following the first login to activate the card, the 6-digit code is no longer needed and will always be used as an identifier associated with the *NemID* for future service access. An individual or business with a *NemID* will then have access to over 2000 self-services where one can access online banking, health care, tax filing, and education programs with the same login (Digital Denmark). There is no need to remember numerous user ID's and passwords but only one for universal public service access.

The success of NemID is evident in its number of satisfied users, significant cost reduction, and usage across a variety of public and private institutions. In July of 2011, *NemID* was used by 79% of the adult populations accounting for 310 million logins throughout the private and public sector combined (eGovernment 2011). Denmark's digitalization infrastructure and continuous development saves 296 million euros a year and Ministry case processing time has decreased by 30% (Digital Denmark). It is being used across all sectors and demographics. Digital applications for pension have risen 95% which is remarkable given the older demographic of this population, opening up benefit receival for all eligible (Digital Denmark). And 100% of maternity application are completed using *NemID*. As these percentages get closer to one hundred, it becomes harder to close the gap, but the government of Denmark is doing its part. In 2009, 83% of adult-aged Danish citizen had access to home internet (Ngwenyama, Henriksen, and Hardt 2021) and as of the present year 94% have home Internet access (Digital Denmark). The success of *NemID* did not arrive without complication. On March 12, 2013, the *NemID* infrastructure was blindsided by a Denial of Service (DoS) attack achieved by a group of teens which rendered the system unusable for three whole days, almost three years after its deployment (Ngwenyama, Henriksen, and Hardt 2021). This issue was quickly resolved. However, it was damaging to public confidence in the reliability of the *NemID* infrastructure.

An important factor of success for Danish digital government is the amount of trust that Danish citizens place in the hands of their government to hold and share their personal data (Smith, Bisson, and Gowen 2015). The public services provided are of high quality, likely attributed to transparency. Since promoting digitalization initiatives, transparency in Ministries and organization has increased by 96% (Digital Denmark). Public trust and transparency are casual and highly dependent on one another. Without transparency there can be no trust. It is not acceptable that government must request large amounts of personal information for digital

services yet expect their citizens to follow blindly. Thus, the reliability and effectiveness of the *NemID* infrastructure is crucial for gaining, as well as maintain public confidence (Ngwenyama, Henriksen, and Hardt 2021). There must be open communication between government in the public so that there is public trust and to ensure that the digital services receive sufficient uptake to be worth the financial, human, and digital capital investment.

The UK Digital ID Card: A Case Study in Failure

2003 was a formidable year for digital national identity in the UK. By February of 2003 the planning and design process was underway for a compulsory national identity card scheme lead by the UK Home Secretary (Norrington and Maple 2006). Then in March of 2006, the Identity Cards Act was approved commencing the roll-out of the program covering the entire 60 million population of the UK at that time (Norrington and Maple 2006). Each citizen would receive a PIN number assigned to their card for identity purpose (Beynon-Davies 2011). The PIN was linked to a small physical card containing a chip with biometric capabilities for facial recognition, iris, and fingerprint data for authentication purposes (Norrington and Maple 2006).

Unfortunately, implementation of the digital identity scheme fell far short of desired results. Fewer than 15% of all projects under the national digital identity card scheme were considered effective or necessary (Beynon-Davies 2011). By May of 2010 the compulsory digital identity cards were discontinued (Burgess 2020). Lack of success propelled a complete revisioning of what digital ID looks like in the UK and continues to be developed at the time of writing. The UK government and Her Majesty's Revenue and Customs (HMRC) worked towards budgeting for a revolutionized digital tax system for the March 2015 National Budget, followed by a published policy paper outlining a roadmap for *Making Tax Digital* based on consultations occurring the second half of 2016 (Al Karaawy 2018). The goal of *Making Tax Digital* is to provide an opportunity to all stakeholders to provide feedback regarding the transformation of the UK tax system considering it previous missteps.

Despite receiving less than desirable results from the first UK digital identity card, the country strives to redeem itself by working with Canada, Australia, Sweden, and New Zealand towards creating a trust framework for digital identity (Government of the United Kingdom 2021). This design process was not used during the first version in 2006 resulting in a lack of public trust regarding personal information. Thus, citizens were put off by the mandatory issuing of the card, lack of understanding the "why" behind the card, and privacy issues that were not addressed from the get-go. That is, a lack of transparency doomed the digital ID card.

When citizens don't know what is going on it is hard to encourage buy-in, especially when personal information and the possibility of data profiling and surveillance are involved (Boysen 2021). Another issue was that the program made a fundamental error assuming a unique PIN is ideal for a digitalized society when in reality it is better to have a model similar to Estonia which uses a unique ID, but keeps the data segmented so that citizens feel they are in control (Services 2019, 29). Recommendations from the standing committee of Access to Information,

Privacy and Ethics strongly advise against the use of a single identifier for government purposes (Services 2019).

It is anticipated that by developing the new UK digital identity scheme using the principles of a trust framework, citizens will have confidence in their government to provide a secure digital identity card to access government services (Government of the United Kingdom 2021). As forementioned in the Denmark *NemID* case study, public trust and transparency are pinnacle to the success of a digital identity card. Although past initiatives feel short of expectation, Canada can learn from the UK. Their cardinal experience with digital identity provides valuable insights considering the similar government structure of Canada.

Estonia's e-Residency Program

In 2014, Estonia deployed another facet of its e-government digitalization initiative as part of its GaaP infrastructure called e-residency. This project was completed in partnership with Bitnation, who is known as the world's first operational decentralized voluntary nation to offer public notary services to Estonian e-Residents (Alketbi, Nasir, and Talib 2018). The e-Residency program allows Estonian citizens or citizens from other nations to become a "digital resident" and gain access to a variety of services provided by Estonia's digital government (Urban and Pineda 2018). Furthermore, the program provides an opportunity for a small country like Estonia to increase their population, and thus economic activity, without opening up for mass immigration (Ølnes and Jansen 2018).

The combination of the eID and the e-Residency program forged a new facet of government interaction for Estonians. The card functionalities include the notarization of official documents such as birth certificates, marriage licenses, business licenses, land titles, and a variety of documents from around the globe (Alketbi, Nasir, and Talib 2018) . At the end of the final quarter of 2017, only three years after implementation, nearly 27,000 applications for e-residency have been received by 143 countries (Urban and Pineda 2018). As a result, 4,272 companies have been registered as Estonian entities and have generated €1.4 million in government revenues and €13 million in benefits related to socio-economic endeavours (Deloitte 2017). It is estimated that government revenues will increase to €31 million by 2021 (Deloitte 2017). As of 2021, the e-Residency program has overperformed its expected growth rate with over €1 billion in revenues produced by Estonian companies run by e-Residents (Rang 2020). As a result, Estonia has created a new way for its ground-breaking e-government model to be experienced by citizens of the world. It has become more evident as Estonia spreads its knowledge to other countries, that there is a real need for digitalization within government if Canada wants to be able to complete with innovative countries (Services 2019).

The Future of Digital ID in Canada

The Digital ID & Authentication Council of Canada (DIACC) is a non-profit council of private and public sector members assembled as a result of the federal government's Electronics Payments Systems Task Force to lead and develop a digital economy by delivering a digital identity and

interoperability framework (DIACC 2021a). This framework is called the Pan-Canadian Trust Framework (PCTF). It is a set of digital ID and authentication industry standards that will define how digital ID will roll out across Canada (DIACC 2020a). The overarching objective of the PCTF is to facilitate the migration of traditionally complex face-to-face interactions to efficient digital interactions with the understanding that the transition will still require the use of analogue processes during the transition period (DIACC 2020b). the DIACC published three white papers outlining the framework for a PCTF digital identity in Canada. A close partnership with SecureKey, a company who works alongside government, industry, and consumer-focused collaborators to create a network for self-sovereign identity (SSI) blockchain as a decentralized ledger in Canada (Boysen 2021). Initially, SecureKey developed a cloud-based identity ecosystem using decentralized ledger technology (blockchain) to eliminate a single point of trust/failure and prevent single party data profiling, while maintaining an auditable trail using cryptographic technologies or protocol (DIACC 2019a). The use of blockchain and distributed ledger technology will be addressed shortly, following explanation what digital identity could be like in Canada.

The DIACC proposed a three phased program to design and evaluate a distributed privacy enhancing digital identity ecosystem to launch Canada into participating fully in the growing digital economy. Phase one focused on developing the architecture and privacy principles ensuring privacy by design and laying the foundation that a digital identity framework can be built on (DIACC 2019a). Core principles guided the design of such a solution. The principles laid are: no centralized authority, secure and scalable infrastructure, privacy and security controls, transparency, and built on open standard-based protocols, and auditing capabilities (DIACC 2019a; "Principles "). Phase two is characterized by the implementation of key deliverables that ensure that the vision proposed in phase one can be realized to fruition. These deliverables included obtaining licenses, mobile apps, usage of biometric authentication, and Proof of Concept coding (DIACC 2019c). The model of digital ID proposed is similar to that of the BC Services Card. It is a mobile app that an individual must register for by inputting personal data and consenting to the use of biometric data to access services not only provided by the government but also by the private sector, most notably banking and housing portals (DIACC 2019c). The mobile app is called *Verified.Me* and can be used as a login to manage all an individual’s digital assets while linking their digital identity to a banking institution with the click of a button (DIACC 2019c). In a way it is like PayPal. An individual with a PayPal account can pay for an online purchase simply by logging into their PayPal account and the transaction is completed through PayPal rather than the website. It is a way to consolidate accounts reducing the friction and added cost of having to remember multiple account passwords and inevitable password reset requests.

Phase three takes the concept of the digital identity card using *Verified.Me* to the next iteration. This is commercialization and marketing. This has proven to be difficult despite analysis of potential barriers to adoption. The three main barriers are a lack of standards to build trust and safeguard Canadians, lack of public-sector investment to get digital IDs delivered across the

country, and innovation solutions inhibited by immature technology (DIACC 2021b). The *Verified.Me* service was launched on May 1st, 2019 but has yet to be backed by the federal government and is not considered a national digital ID as of summer 2021 (DIACC 2019b). However, there has been significant progress at the provincial level and national deployment could be viable soon. The province of Alberta and BC have launched their digital IDs followed by significant investment by Quebec. Additionally, Ontario, Saskatchewan, Yukon, Nova Scotia, Newfoundland, Prince Edward Island, and New Brunswick are slowing entering the digital identity space by participating in pilots and proofs of concept (DIACC 2021b). There is support for a national digital ID and Canada is moving in the right direction. There is still work to be done but the PCTF provides the principles for developing a digital ecosystem that is transparent and promotes public trust.

Blockchain and the New Internet

Blockchain is commonly used term to describe the larger umbrella concept of distributed ledger technology. Blockchain is a relatively new digital technology that is commonly linked to Bitcoin or other cryptocurrencies that have gone to market. It has unique characteristics and can perform functionalities that a centralized silo system cannot do or has sever difficulty doing so. However, not all distributed ledgers are considered blockchains. Understanding the difference between blockchain technology (BLT) and distributed ledger technology (DLT) is the first step in evaluating use for providing digital government services to Canadian citizens.

DLT is premised on each participant in the network having access to a shared ledger that is open to all, inviting trust in an unsecure environment without the need for third-party oversight to support information exchange and transactions (Ølnes, Ubacht, and Janssen 2017). BCT follows similar principles to DLT despite sight differences in definition. DLT can be a digital ledger technology with independent anonymous computers. But it can also be used in a structured environment where the owners of the DLT have more control over use of the system in comparison to an open blockchain system. BTC is also a general-purpose technology where the same information is stored on a peer-to-peer (P2P) network of nodes (computers or databases) and the data will only be added when the nodes have reached consensus, however once the information is conceded that information is immutable and a “hash” is created (!!! INVALID CITATION !!!). Using the consensus algorithm, a set of transactions are bound to a block (a hash) linking to the chain of previous block, thus the name blockchain (Alketbi, Nasir, and Talib 2018). BCT is a more defined concept closely connected with Bitcoin and DLT is a digital ledger with no central authority.

The complexities of BCT are abundant. Thus, a basic overview of the types of blockchain and consensus algorithms will be explained to provide context for further discussion. As mentioned above a consensus algorithm produces a hash function to build the blockchain. A technique called “hashing” cryptographically seals a new block onto an older block with time-stamped creating a history that cannot be tampered with (Urban and Pineda 2018). There are two models

of consensus algorithms that facilitate the hashing process: Proof of Work (PoW) and Proof of Stake (PoS) (Ølnes and Jansen 2018). PoW is a competition between various nodes that make up the network where the first node is required to guess a random number called a “nonce” given to solves a mathematical puzzle (Urban and Pineda 2018). The nonce is then used with cryptographic techniques to get a hash value to link to the pre-existing blockchain (Ølnes, Ubacht, and Janssen 2017). The block is verified when 51% of the nodes reach consensus of the transaction produced by the node that obtained the nonce (Walters 2019).What if by chance two nodes guess the nonce at the same time? This creates a fork in the blockchain and must be resolved by the network participants coming together to agree on the longest branch to continue the blockchain and the shorter end essentially disappears (Ølnes and Jansen 2018; Urban and Pineda 2018).

The PoS algorithm follows PoW with the exception that there is no nonce to be guessed and the block is created based on the wealth of the participant or node (Ølnes and Jansen 2018). One of the critical features of BCT is that it is decentralized and limits the power a single individual or entity can have. It is the distributed consensus mechanism that enables decentralized power allowing the network to decide what information is accepted or rejected for the proposed additions to the chain (Urban and Pineda 2018). Using PoS seems to be counterintuitive to this idea because the more “stake” or wealth a node has the more hashing it can do and develop the blockchain the way it sees fit. However, in the context of government use, PoS provides an entity with more resources and computing power (such as government) to be a leader in the network and thus have more control. This is what government is accustomed to in a centralized system. It makes sense that government would want to maintain some form of control. PoS does have certain advantages in that is has lower latency, requires less computation power and resources, and can provide security for small chains (Ølnes and Jansen 2018). The PoW model relies on the presumption that the cost of compromising the system must outweigh the profit from doing so creating risk in using this consensus algorithm (Ølnes and Jansen 2017). One must decide how much security is necessary.

Arguably more important to informing the decision of whether to use BLT is not is the model of consensus algorithm but rather than the type of blockchain. Blockchains are built for a variety of reasons, in different industries, with various network sizes, and works with different types of data. It is crucial to determine who will use the network, for what reasons, and the level of security required. These questions are crucial to deciding what type of blockchain to use; permissionless, permissioned, or hybrid. Permissionless blockchains (also known as public blockchains) have data that are stored in open source and are accessible to anyone who wishes to be part of the network and can operate a node with the capacity to read and write a transaction (Walters 2019).

In a permissionless blockchain the identities of the user or entity at the end of the node is pseudonymous and only data elements of that transaction that cannot be linked to an identity

are transparent (Walters 2019). Permissioned blockchain are controlled by an owner (usually an organizational entity) who determines what nodes will be allowed onto the network (Ølnes, Ubacht, and Janssen 2017). Nodes that have been granted permission to join the network will also be given rights as to what capabilities can be employed (Ølnes, Ubacht, and Janssen 2017). By granting permission the owner must trust the entity or individual controlling the node and therefore identity will be known. Some may be able to read and write, only write, or only read, providing the controlling entity to decide who can add new blocks. This model also keeps information stored on local machines rather than individually dispersed nodes (Anwar 2018). Like a PoS model, a permissioned blockchain creates a more centralized network that strays father from the initial blockchain model. Hybrid blockchains combine the characteristics of permissioned and permissionless blockchain. Hybrids are controlled by a set of administrators rather than one and agree to rules that govern the consensus model (Walters 2019). It is permissioned in that the group of owners can select who has access to the network but is permissionless in that a 51% consensus must be achieved for the data to be validated and a block added to the chain (Walters 2019).

Permissioned, permissionless, and hybrid blockchain have their advantages and disadvantages depending on use case. Permissionless provide greater transparency, pseudonymity, and in the truest sense support a completely decentralized network. Permission blockchains provide a greater sense of security and control but as more control is gained the less the system resembles the peer-to-peer open idea of blockchain. Hybrid combines the best of both worlds but creates opportunity for corruption by the group of owners. For government use in Canada, it is unrealistic to believe that a completely open permissionless blockchain would comply to PIPEDA unless security protocols that do not yet exist were developed into the system. As of the present day there has been no such development. Permissioned blockchains allow greater control to government bodies. Hybrid may be the best type to use if there is a strong desire for decentralization or the use of a BCT to provide services to customers ensuring that security protections are in place because the network is owned by various government bodies.

PIPEDA Compliance and Blockchain

PIPEDA defines the rules for how private entities and public institutions must handle personal information in Canada since the 2000's (Services 2019). Personal information is "information that on its own or combined with other pieces of data, can identify you as an individual" (Walters 2019). PIPEDA outlines ten principals for personal information and data protection. All principles will be briefly discussed, and some are grouped together since the characteristics of blockchain pose the same barrier to comply with PIPED.

1. ***Accountability*** requires that the entity collecting information is responsible for personal data under its control (Walters 2019). Accountability is difficult in a permissionless blockchain because there is no owner of the network, and it is hard to enforce accountability to the core developers seeing as the network grows it becomes increasingly decentralized.

Permissioned and hybrids have one or a cohort of owners and can thus impose accountability, successfully removing the barrier.

2. ***Consent*** must be provided by the individual for the collection, use and disclosure of personal information. ***Limiting collection*** refers to the notion that personal data should only be used for which is necessary for purposes identified by the organization. The final principle of ***limiting use, disclosure, and retention*** states that personal information shall not be used or disclosed for purposes other than those initially identified at the time of consent. For an individual to participate in a blockchain there is automatic consent by joining the network and it is not required to provide consent since participation is consent. However, if an entity is using blockchain as their underlying system and does not provide the opportunity for an individual to provide consent, that entity would be in violation of PIPEDA. If it is permissioned or hybrid, it would be expected that the user consent before entering he network. *Limiting collection, use, disclosure, and retention* is difficult to comply to. Users in a network can append additional information to a blockchain. This can be done without the original user's permission and blockchain histories can be downloaded by any user. In a permissioned blockchain appending can be monitored to ensure that personal data is not being manipulated for a purpose other than the original intent.
3. The ***safeguard*** principle states that personal information shall be protected by security safeguards appropriate to the sensitivity of the information. The strongest protection in place is pseudonymity for a permissionless blockchain. Pseudonymity is an encryption control which protects the identity of the personal information holder. Encryption is used to disguise the identity, but that encryption can be broken down. Permissioned and hybrid blockchains can add additional safeguards by limiting permission to only those trusted. This is especially important because identity can be determined by other users and is surely known by the owner. Although it is plausible to provide a level of pseudonymity in a hybrid chain if only one owner is responsible for granting access. However the Privacy Commissioner of Canada believes that that blockchain and encryption are sufficient safeguards (Services 2019).
4. Upon request, an individual shall be informed of the existence, use, and disclosure of his or her personal information and shall be given access to that information. The individual has the right to change, add or delete information. The issue with blockchain in reference to this principle is the immutable characteristic. Users can gain access to past information but will not be able to change or delete the original entry. One can only add to it. Permissioned, permissionless, and hybrid face no differences regarding individual access.
5. Like consent, an entity must identify the purpose for collecting the personal data to comply with the ***identifying purposes*** principle. The decentralized nature makes it hard to ensure that the data inputted is only used for its original purpose. Decentralization also makes challenging compliance difficult because there is no audit team for ***challenging compliance***. Both these principles could be enforced using a permissioned or hybrid model as there is a central authority. ***Accuracy*** states that personal information must be accurate, complete, and as timely as possible. This principle is less of an issue and only is concerning

when the initial data is tampered with in a blockchain. This creates a long blockchain of inaccurate data because the first block was inaccurate. Lastly, ***openness*** is a lesser issue in comparison to the above principles because blockchain is built on an open source and decentralized framework.

BCT and more generally DLT was not developed by Canadians for Canadians. Thus, it is expected that with any new technological development there will be barriers, regulations to comply with, and developments as this digital cryptographic solution diffuses across the globe. This was seen with the development of Internet. PIPEDA is a barrier for blockchain use in Canada, but recommendations are being suggested and improvements are being made to ensure the security and privacy of personal information. Discussion of the principles highlights that permissioned blockchains are malleable to PIPEDA compliance in comparison to permissionless. Maybe permissioned and hybrid blockchains will be the wave of the future. But permissionless models offer greater transparency and decentralization which is what the public wants.

Blockchain in Canada

The considerable newness and decentralized nature of BCT creates issues for government use in Canada considering PIPEDA regulations. In the past Canada has experimented with BCT running proof of concepts to investigate the usability of such a technology. The Government of Ontario and the City of Toronto explored BCT to increase the ease and efficiency of obtaining a restaurant licence but did not continue past the initial phase (Urban and Pineda 2018). The city of Toronto continues to strive towards creating a “digital city” to elevate the lives of its residents but has not employed a blockchain specific strategy (Services 2019). A federal exploration commenced in March of 2016 with Project Jasper using DLT for wholesale interbank payments settlements that have been successfully completed (McCormack et al. 2017). It follows the PoW consensus algorithm but may not be the consensus algorithm used in a final product (Chapman et al. 2017). Project Jasper involves building and testing a “CADcoin” as an interbank payment settlement instrument in partnership with the Bank of Canada and Payments Canada (Urban and Pineda 2018). Project Jasper is still currently being evaluated for its usability in the public sector. There is interest in DLT and BCT coming from different government levels in Canada, but it is not simply interest that can make implementation possible.

In June 2019 the Standing Committee on Access to Information, Privacy and Ethics presented a report to the House of Commons titled *Privacy and Digital Government Services* following studies completed by the committee. Experts in the areas of blockchain, data privacy, and e-government service delivery were asked for their input in a variety of privacy issues facing government digitalization initiatives. It is a controversial topic that some believe is advantageous and others believe is not feasible for Canada. Cybersecurity expert Chris Vickery and Chief Information Officer of the Government of Canada Alex Benay are weary of blockchain for digital government service delivery. Vickery expresses resistance due to the lack of maturity of BCT

and in his opinion databases should not communicate in the same language and should rather employ a “translator” in the middle and not have the capability to aggregate their data together (Services 2019, 35). In a BCT there many local databases, but the number is meager in comparison to the number of individual nodes all pooling together data. Exactly the opposite of what Mr. Vickory believes is the ideal digital infrastructure.

Mr. Benay stated that digital government services need to be secure by design and that security has been central to every major digital project within government over the past year (Services 2019). With security seemingly being the top priority, it is not surprising that he does not support putting all government information into one system or data pool but would likely to develop a system that supports interoperability across different departments and levels of government (Services 2019, 17, 36). Although the data within a permissionless blockchain system is essentially accessible by anyone, it is encrypted to the point where it is only metadata and would require expertise to consolidate various pieces of metadata through the whole system to uncover one piece of real data. As the technical know-how of blockchain systems grows, more and more people may be able to append metadata for malicious purposes and could create security risks. Although Benay did not reference blockchain directly, the security protocols were not a priority for the system, predominately relying on decentralization, encryption, and pseudonymity.

Of the experts interviewed about blockchain almost all see potential in using BCT specifically or a similar DLT. Daniel Therrien, Privacy Commissioner of Canada is in opposition to Benya and Vickory. With regard to digital government service deliver, Mr. Therrien expressed his expertise in favour of blockchain saying that the government should be legally required to apply strong technological safeguards, such as blockchain and encryption (Services 2019, 35). Anna Cavoukian, former Ontario privacy commissioner and expert in residence at the Privacy by Design Centre of Excellence at Ryerson University sees a future with blockchain in government if privacy by design is incorporated from the beginning (Services 2019, 6). Furthermore, she stated that “the more you have decentralized pots of information the greater likelihood the data will be retained for the purposes intended and not used across the board for a variety of purposes that were never contemplated” (Services 2019, 13). It seems there is great potential for blockchain despite its perceived lack of privacy and security protocols by many, bearing in mind that privacy and security should be a guiding principle in the design process. SecureKey’s extensive work with blockchain and the DIACC in the development of the PCTF for a national digital ID has led to the design of a blockchain privacy solution to hinder creation of a surveillance network which can happen easily using a single identifier for government. Andre Boysen, CIO, SecureKey Technologies explains how his company is using blockchain for its identity proofs to implement triple blinds to validate that the issuer of the data actually wrote it and that the data has not been altered (Services 2019, 29). The technicalities of such identity proofs are beyond the scope of this report but the fact that it is a solution to a privacy problem is important.

There is exciting potential towards digital government using blockchain as exemplified above, although as a revolutionary new technology it does not come without its risks. Most of these risks are privacy and security related. BCT may not be ready quite yet for deployment across government right now, but with a focus on privacy by design and introducing new security protocols it could be transformational for Canada's digital government.

Implications

Digitalization of the Canadian tax and benefit administration affects Canadian citizens in numerous ways. These include how the tax filing process is done for individuals and organizations, the role employers play, and how identity is proven using digital technologies. Online filing, pre-filled income tax forms, and real-time reporting can alleviate frustration when interacting with CRA. Real-time reporting can take away the need for employers to conduct third-party reporting. A digital ID is a gateway to reducing friction while accessing digital government services. Employing digital technologies for the tax and benefit administration system is a transformation that is needed but is not the only area of government that needs digitalization. All levels and departments of government will need to undergo digital transformation to support movement towards e-government as the digital economy and society continue to grow.

Digital Access and the Digital Divide

An e-government platform that provides a myriad of services digitally will require that all citizens have the resources to access these services. Resources include access to the Internet, access to a mobile device, financial revenue to purchase Internet and devices, and training on how to use such devices and services. Furthermore, all citizens must be able to access these services such as people with disabilities, low-income families and persons, Indigenous Peoples, seniors, and new Canadians. The issue facing Canada in providing effective digital services is that not all citizens have the resources or the ability to access the benefits provided by digital government. Canada needs to reduce the gap between the number of citizens who can access and those that cannot. Inaccessibility to digital technologies results in substantial inequalities known as the "digital divide" (Fang et al. 2019).

The extent of the digital divide was demonstrated with the onset of the COVID-19 pandemic where access to a device connected to the Internet was paramount. Canadians were expected to work from home, do schooling at home, connect with loved ones, and/or access goods and services. Canadians with no or limited access experienced further isolation and exclusion. To provide a positive digital government service, the digital divide needs to close or ideally be eliminated completely.

Indigenous Peoples and Canadians living in Rural Areas

Due to the large and unique geography of Canada the digital divide is relatively large for a country where internet and owning a mobile device is no longer a luxury. It is a necessity especially in light of COVID-19 and the growing digital society we live in. In 2020, 95% of Canadian households in the census metropolitan area or consensus agglomeration had a home Internet connection whereas only 88% of households outside these areas had access (Statistics Canada 2021). This percentage has remained relatively unchanged since 2018 despite the introduction of Canada's Connectivity Strategy published the same year (Statistics Canada 2021).

Some households have access to home Internet, but it is so slow it is almost unusable. To efficiently use the Internet, there must be capacity to download at 50Mbps and upload at 10Mbps (50/10) (Innovation Science Economic Development Canada 2019). The difference in access to 50/10 Internet speeds are vastly different when comparing urban, rural, and Indigenous households. 97% of urban households have access to the standard speed, dropping to 37% for rural household and even further to 24% of Indigenous households (Innovation Science Economic Development Canada 2019). The huge gap in home internet accessibility can be attributed to less coverage in rural places because it not worth the effort for telecommunication companies to put up towers and systematic discrimination toward Indigenous Peoples. When asked, why the respondent did not have at home Internet access, 39% reported the cost of Internet service and the cost of equipment (Statistics Canada 2021). This response is expected considering Canada is one of the most expensive countries in the G7 for both Internet and mobile wireless connection (Béïque et al. 2020).

Access to a mobile device or a computer is another inflow to the digital divide. Since 2019-2020, 88% of Canadians had a mobile device (Béïque et al. 2020). The percentage of this population with smart phones are likely living in or near a metropolitan area where cellular coverage is abundant. But what about individuals living in rural areas and especially Indigenous communities in the north? Based on the demographic data of home Internet coverage throughout Canada, it was reported that 81% of Canadians living in an urban area had a cellular data plan and 73% living in rural areas had one (Statistics Canada 2021). There was no corresponding statistic found for Indigenous Peoples. Although the 8% difference is not overly significant, it is possibly due to lack of telecommunications infrastructure in the area. The proportion of Indigenous peoples experiencing the inequalities of the digital divide is enormous as proven above. Significant effort needs to be exerted towards improving telecommunications infrastructure in the north to facilitate the use of high-speed Internet, mobile cellular access, ownership of mobile devices, and computers. The public and private sector have made commitment to closing the digital divide gap in Indigenous communities mention shortly.

Low-Income Families

Although Indigenous peoples occupy a proportionally large population of Canadians struggling with lack of accessibility, other groups of people are separated from fully participating in the digital economy as well. Low-income household, people with disabilities, seniors, and new Canadians often face barriers for accessing digital devices and services for different reasons. Persons receiving low-income often face the hard reality of not be able to afford a mobile device or home internet service. In 2019, almost half of Canadian households with an annual income of $30,000 or less do not have access to high-speed internet (Government of Canada 2019b). 53% of single mother across Canada are living in poverty (TELUS 2019). Consequently, they lack resources to find a job, receive education or workforce training opportunities, and afford internet access or a mobile device. Providing equipment with Internet access has the potential to make a difference in the lives of low-income families, single parents, and people living in poverty.

People with Disabilities

Persons living with disabilities experiences everyday barriers that can be reduced by providing adaptations for independent use of digital devices. 1 in 5 Canadians live with a disability with 80% requiring aid or assistive devices (TELUS 2021b). 20% of the Canadian population lives with some form of disability that may limit their ability to take full advantage of what digital devices can offer. Justifiable that 19.5% of Canadian aged fifteen and above living with a disability did not use the Internet in 2021 (Government of Canada 2021a). In addition 2.7 million (9.6%) Canadians aged fifteen and above have a mobility disability likely requiring some form of assistance in 2020 (Government of Canada 2020). Programs can be developed to improve interaction with the Internet and digital devices to improve independence.

Seniors

Seniors are another group of Canadians that are affected by the digital divide. Senior-aged Canadians did not grow up in the digital world and participating in it does not come naturally for the majority. The government listened to it senior population to understand what they needed to participate in the digital world to reduce the digital divide. This group indicated the need for technology-enabled solutions that do not increase social isolation, add undue burden, and over complicate processes (Béïque et al. 2020). To fully engage with the digital world seniors need supports to develop digital skills and provide accommodations such as larger print and louder ringtones.

New Canadians

Lastly, programs need to be in place to help new Canadians feel comfortable using digital devices to eventually use for government services. New Canadians will need supports to fully engage with Canada's digital economy. These supports must be tailored to barriers faced by new Canadians and should not be the same as those provided to seniors. This may involve assistance purchasing a mobile device or setting up an Internet service. In the context of government this could be accomplished by introducing many language options for digital government services. These groups most affected by the digital divide possess differences that make their experience and attitude towards digitalization different. Identifying these differences is a step towards closing the gap. The next step is how to close that gap.

Minimizing the Digital Divide

Canada's private and public sector are working to close the digital divide. There are programs and projects that aim to help all Canadians affected by the digital divide. Telus has made signification investments in programs for low-income families and persons with disabilities. It has also been collaborating with Indigenous governments, federal, and provincial governments to bring advanced connectivity to indigenous communities (TELUS 2020). The Telus Internet for Good program provides low-income families with a net income of less than or equal to $31,120 with Internet plans for $9.95/month (plus applicable taxes) for 24 months then it is regular price thereafter (TELUS 2019). The plan provides speeds up to 25Mbps and up to 300 GB data/month with no contract or cancellation fees (TELUS 2019). The Mobility for Good program supports young adults aging out of foster care system and low-income seniors with subsidized smartphone and plans (TELUS 2021a). Telus provides a free phone and plan with unlimited Canada-wide talk and text with 3GB of data per month (TELUS 2021a). The Tech for Good program supports people with disabilities who require professional assistance to independently use or control their mobile devices and provide unique assistive hardware or software technology required for persons with disabilities. (TELUS 2021b). Telus is actively collaborating with more than 30 Indigenous communities, governments and third-party organizations to support the expansion of advanced broadband networks and our wireless LTE networks in TELUS' B.C. territory (TELUS 2020). The company has invested $900 million into connecting rural and Indigenous communities across Canada 178 Indigenous communities (TELUS 2020). Telus is a leader in decreasing the digital divide across Canada.

The Canadian 2020 Digital Charter also established programs to help in similar ways. These include the Computer for Schools programs, Connecting Families initiative, Accessible Technologies Program, and Digital Literacy Exchange (Béïque et al. 2020). The largest project outlined in the Digital Charter requiring the most capital is Connect to Innovate program launched in 2016 (Innovation Science Economic Development Canada 2019). The program will be investing $500M in 900 rural and remote communities, including 190 Indigenous communities. (Béïque et al. 2020). Connect to Innovate has exceeded expectations by

connecting 300 additional communities (Innovation Science Economic Development Canada 2019). Although the program was a success there is still a lot of work to be done. Thus, Budget 2019 announced and investment to mobilize up to $6 billion toward universal connectivity (Innovation Science Economic Development Canada 2019). This investment was used to develop Canada's Connectivity Strategy. The objective is to deliver 50/10 connectivity to 90% of Canadians by 2021, 95% of Canadians by 2026, and the hardest-to-reach Canadians by 2030 in addition to enhanced mobile connectivity on highways and major roads (Innovation Science Economic Development Canada 2019). To develop infrastructure along highways and major roads $1.7 billion in funding will be used to provide broadband access across the country (Koch 2020). Connecting all Canadians, especially those living in the north and in Indigenous communities will require weighty capital and collaboration between the public and private sector and across government levels. The Government of Yukon has committed to Canada's Connectivity strategy with the Dempster Fibre Project. It is a 800-Kilometre fibre optic line that follows the Dempster Highways from Dawson City, Yukon, to Inuvik, Northwest Territories that will connect to a fibre optic line in the Mackenzie Valley where Alberta, BC, Yukon, Saskatchewan, and Northwest Territories meet (Government of Yukon 2021). With the combination of the projects and programs above and ones not mentioned that the digital divide will decrease until it in nonresistant.

Economic Implications

There will also be expected resistance with new technology that can highlight human misbehaviours "allowing greater visibility of individual transactions and accounting records" (Correspondent 2019). Resistance may also come in the form of budgetary concerns and job loss in the accounting and auditing industry. The accounting and related industries may be concerned that their job will become redundant once digitalized, but in actuality is more likely to witness a job role change rather than the job becoming obsolete (Schmitz and Leoni 2019). The initial design and setup cost will be expensive but once implemented and operational, the marginal cost for maintenance are minimal compared to the revenue losses experienced using an archaic tax system (Townsend et al. 2018).

Digitalization can provide incremental economic growth and reduce unemployment, thus improving quality of life and boosting citizen accessibility to government services provided by greater government efficiency and transparency (Parviainen et al. 2017; Sabbagh et al. 2012). In terms of quantitative evidence, Sabbagh et al. (2012) determined that digitalization can increase economic benefits by 20% in countries categorized as being in the advanced stages of digitalization as compared to those in the initial stages. More specifically, it was concluded upon analysis of 150 different countries that a 10% increase in digitalization prompts a 0.50 to 0.62% gain in per capita GDP and reduces the unemployment rate by 0.85 (Sabbagh et al. 2012). Improvements in these macroeconomic factors that gauge the health of the economy show that digitalization can truly improve quality of life.

Conclusion

The Canadian tax and benefit administration system is in need of digital transformation to reduce inefficiencies and enhance the tax filing process for citizens. The tax system has remined fundamentally unchanged in the last 100 years despite the growing national and global digital economy. As a result, it is not currently adaptive to changes in the nature of the work force and is unable to effectively react to drastic changes in income as exemplified with the onset of COVID-19 in first quarter of 2020.

There are two key structural barriers within the Canadian tax and benefit administration system: self-assessment and annual reporting. Self-assessment places the onus of tax filing on the individual citizen to fill out a personal income tax form which is then subject to matching and verification by the tax authority. The self-assessment model has become problematic in a tax system that has become increasingly complex and where filing is required to assess eligibility for income benefits. Barriers to tax filing can be overcome by shifting to administrative assessment which entails the tax authority producing and issuing pre-filled tax forms. Under such a system, individuals only need to confirm that the income on the tax return is in fact correct instead of filling it in themselves. When paired with deemed filing, a system where if no response is received the tax filing is assumed to be accurate and processed accordingly, it eases the tax filing process for citizens and ensures everyone is assessed for benefits delivered through the tax system.

COVID-19 exemplified the tax systems inability to react to changes in income in real-time due to the annual reporting regime in place. Tax filers are required to report income to the tax authority on an annual basis and before April 30th for the previous year. The pandemic brought drastic changes in income from one month to another as various health measures, such a physical distancing and business closures, meant unprecedented layoffs, furloughs, and firings. Those affected were unable to receive benefits in real time, not only because the Employment Insurance system was overwhelmed, but also because many other important benefits are linked directly to the filing of an income return. This resulted in needing to roll out new emergency income support programs. If the tax and benefit administration system employed real-time reporting, there would have been no need for such emergency benefits because income supports could be adjusted in real-time as needed. Such a move to real-time reporting is based on a digitalization of payroll, known colloquially as e-payroll. E-payroll simply requires employers reporting employees pay information on a more frequent basis than annually.

Digitalization of the tax system encompasses a larger movement towards digital government or e-government. Digital transformation of government services would provide greater support for digitalization of the tax and benefit administration system. Digital governments are gaining in

popularity and Canada is relatively behind in this area compared to countries across the world, especially in Europe. A digital government transformation requires all levels of government and within various departments have the ability to communicate and exchange information. Presently, the government infrastructure is siloed and often requires citizens to give the same personal information to multiple agencies. Embracing the concept of 'Government as a Platform' entails facilitating communication and data exchange between separate government databases and that personal data is not replicated. Estonia particularly has been working to digitally transform its government for the past two decades and has gained global recognition for its digital government infrastructure. Estonia's system infrastructure known as X-road, is the backbone for its 'Government as a Platform' model. Canada has much to learn from the successes and failures of Estonian projects under the 'Government as a Platform' model as it embraces and accelerates a move towards a more digital government.

To ensure usability of the 'Government as a Platform' model, there needs to be a mechanism in place to identify and validate an individual's identity when accessing government services. Such an identify is known as a digital ID. A digital ID acts the same as a government issued ID such as a passport or driver's license. It allows citizens to access digital government services and ensure that their information is private and secure. The Digital Identification and Authentication Council of Canada is working towards creating a national digital ID following the success of the Government of British Columbia's BC Services Card. With a national digital ID in place, all individuals accessing government services would be provided with a digital ID that allows them access to all government services once the card has been activated. The use of digital IDs has been widespread throughout Europe, allowing citizens access to a myriad of government services: Denmark, Finland, and Estonia specifically provide impressive case studies for successful implementation of a digital identification system. Each of these countries possess slight variations as to what their digital ID looks like, but all perform the same fundamental aspects of identification and authentication. Equally, the failed UK digital card roll out provides crucial lesson for things to avoid, especially concerning government capabilities and level of citizen trust in government.

The information from these case studies points to the fact that successfully providing digital government services, especially those related to the tax system, requires the digital divide to be addressed. Canada is a large country varying in geography, where not all regions of Canada have the same level of telecommunications infrastructure, especially with regard to access to broadband. This is especially true for rural and remote communities. This creates accessibility issues related to digital services. If individuals do not have access to a high quality and reliable internet connection, a device to access the connection, or have the digital literacy to use the services, a sizeable portion of the population will be prevented from accessing these services. This means that telecommunication infrastructure needs to be built up in Canada. Given existing gaps in such infrastructure, special consideration will need to be paid to Indigenous communities that lack access to affordable, accessible, and high-quality broadband.

This infrastructure though needs to extend beyond just broadband services. Mobile devices and computers are also inaccessible for some. While there are various government entities, non-profit community organizations, and private companies that do donate devices and help low-income and new Canadians gain access to such devices, there are still large gaps in getting such technology into the hands of those that need it. This includes seniors, people living with disabilities, and refugees. Price friendly internet services and lower-priced mobile devices allow such individuals to use services that will enable them to receive the appropriate benefits and income supplements. Furthermore, training should be provided to seniors and newcomers to Canada to improve digital literacy. Lastly, modified devices that are accessible to people with disabilities will allow this group to participate in the digital economy.

Knowledge Mobilization Activities

This knowledge mobilization project began just as the third wave of the COVID-19 pandemic hit jurisdictions across Canada and two of the three authors of this report were living in the Alberta, the jurisdiction that was hardest hit by the third wave. Two of the three authors on this report are also parents to young children, varying in age from 0 to 8 years of age. The impact of the third wave was such that K-12 schools and childcare centres were episodically closed to face-to-face learning either due to provincial wide closure mandates or isolated outbreaks within classes and schools that occurred throughout the period of January-June 2021. The disruption that these closures had on parents' lives cannot be understated and did affect planned knowledge mobilization activities associated with this project. That said, as became common place throughout the pandemic, the research team pivoted activities away from face-to-face activities and flexible online engagement in various ways.

Peer-reviewed Journal Articles

As planned, the team on this project, along with two additional authors with expertise in tax policy and benefit administration, published preliminary findings in an open access peer reviewed journal article as follows: Gillian Petit, Lindsay M. Tedds, David Green, and Jonathan Rhys Kesselman. 2021. Re-envisaging the Canada Revenue Agency—From Tax Collector to Benefit Delivery Agent. *Canadian Tax Journal* 69(1), 99-114. https://www.ctf.ca/CTFWEB/Documents/CTJ%202021/Issue%201/99_2021CTJ1-PF-3-Petit-etal.pdf

The team also plans to submit shortened version of the knowledge mobilization (KM) report to the open access peer reviewed journal *The School of Public Policy Publication Research Papers Series* in Fall 2021.

Media and Social Media

The principal investigator on this project, Lindsay Tedds, has been actively sharing the findings and recommendations of the work as it progressed on her Twitter account, which has nearly 14,000 followers. Many politicians, bureaucrats, academics, emerging scholars, and community-based organizations actively follow Dr. Tedds and her messages have led to productive engagement on the policy issues related to our work. It has also led to a number of interviews for print media, including in the Unites States given the links of our work to the implementation of the Child Tax Credit in that country. We also plan several op-eds promoting our work in Fall 2021 upon completion and publication of this KM report. To help with this public engagement, we plan to develop an infographic that outlines the results of this work.

Engagement with Policymakers

In order actually effect policy change, it is important that key policy makers be informed of our work in this area. We have had the pleasure of having several meetings not only with various ministerial staff and bureaucrats in several governments and government ministries across Canada, but also individuals in a number of community-based organizations as well as academic and emerging scholars to discuss our findings and recommendations.

Engagement with Expert Panels, Reports, Working Groups

We have also been able to bring our work to the attention of various expert panels that are working in areas that are relevant to the topic of our report. The BC Basic Income panel included several of our recommendations from our preliminary work in their final report. Our work is also being incorporated into reports for the Government of Nunavut on the design and delivery of a basic income in Nunavut. Material from this report will be included in the recommendations related to the report of the Royal Society of Canada's COVID-19 Working Group on Women and the Economy. Finally, the findings and recommendations outlined in this knowledge mobilization report have been articulated to the federal government's Task Force on Women and the Economy.

Student Involvement

Two student assistants received high quality training and mentorship through this project and are included as authors on this report. Ms. Marina Flaim participated in this project as part of her undergraduate cooperative education requirements at the University of Ottawa. Marina conducted the primary literature searches, synthesis, and critical analysis and led the writing of the KM report. Ms. Gillian Petit, a Ph.D. candidate at the University of Calgary, established the methodology along with the key jurisdictions identified for case studies, and provided day-to-day supervision of Ms. Flaim. Ms. Flaim also present the results of our preliminary and final work at the organized KM sessions.

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