

Digitalisation Challenges and Opportunities for Subnational Governments

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Abstract

Digitalisation Challenges and Opportunities for Subnational Governments

The world economy and societies are going through a digital transformation that goes well beyond computerisation and use of information and telecommunications technologies. This transformation is creating opportunities and challenges for all levels of government in the areas of tax and expenditure policy and administration, service delivery and fiscal-financial management, and regulatory practices and policies. However, governments (especially subnational ones, SNGs) often also face shortages of skills, equipment and physical infrastructure, while having to address emerging challenges in cyber security risk management and data protection. The digital transformation calls for cooperation among the different layers of administration in support of effective and efficient digitalisation of SNGs. This paper reviews and discusses these opportunities and challenges.

Keywords: digitalisation, decentralisation, subnational governments

JEL classification: H11, H70, O38

Résumé

Transformation numérique : défis et opportunités pour les collectivités territoriales

Partout dans le monde, l'économie et les sociétés ont amorcé une transformation numérique qui va bien au-delà de l'informatisation et de l'utilisation des technologies de l'information et des télécommunications. Cette transformation est porteuse à la fois d'opportunités et de défis, à tous les niveaux de gouvernement, dans les domaines de la politique et de l'administration de la fiscalité et des dépenses, de la prestation de services, de la gestion budgétaire et financière, ou encore des pratiques et politiques réglementaires. Or les administrations (en particulier les collectivités territoriales) sont souvent confrontées à des pénuries de qualifications, d'équipements et d'infrastructures physiques, auxquelles viennent s'ajouter des défis nouveaux en termes de gestion du risque de cybersécurité et de protection des données. La transformation numérique requiert une coopération entre tous les niveaux de gouvernement, afin d'aider les collectivités territoriales à opérer un virage efficace et efficient vers le numérique. Cette étude examine les opportunités et les défis qui apparaissent dans ce contexte.

Mots-clés : transformation numérique, décentralisation, collectivités locales

Classement JEL : H11, H70, O38

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Digitalisation Challenges and Opportunities for Subnational Governments

By Luiz de Mello and Teresa Ter-Minassian¹

1. Introduction

1. The digital transformation – which goes well beyond computerisation and use of information and telecommunications technologies – has opened opportunities and created new challenges for governments worldwide. It includes a number of interconnected and evolving technologies, which can be characterised as a digital eco-system (Figure 1):

- *The internet of things (IOT)*: Sensors connected to physical objects collect and transmit massive data that can be utilised by governments to improve a range of public services.
- *5G networks, high-performance computing, and cloud computing*: They allow the rapid transmission, processing, and cost-efficient storage and retrieval of “big data” generated by the IOT and other sources.
- *Big data analytics*: Techniques and software tools that are used for data mining and profiling
- *Artificial intelligence (AI)*: The ability of machines and systems to acquire and apply knowledge. AI facilitates the processing of data at enormous scales and accelerates the discovery of patterns in them.
- *Blockchain technology*: A distributed ledger in which individual transactions are recorded in blocks chained to one another chronologically, using advanced cryptography. The technology creates digital records of the transactions that are visible to everyone in the blockchain network and cannot be modified.

1. An earlier version of this document was presented at the 2019 annual meeting of the OECD Network on Fiscal Relations across Levels of Government. Inputs and helpful comments from Dorothée Allain-Dupré, Piet Battiau, David Bradbury, Sean Dougherty, Peter Green, Michelle Harding, Peter Hoeller and Antti Moisi (OECD), as well as Network delegates and Jeffrey Roy (Dalhousie) are greatly appreciated. The authors nevertheless remain solely responsible for any remaining errors and omissions.

Figure 1. The digital eco-system



Source: OECD (2019a), *Going Digital*.

2. This digital eco-system is expanding rapidly and has the potential to ease many of the information constraints that affect government policies and operations, thereby allowing significant improvements in fiscal-financial management, the design of tax and expenditure policies, revenue administration and enforcement, and the delivery of public services (see the next sections for details).

3. However, there remains much potential for use of digital tools by individuals and firms to interact with government. This is all the more important at the current juncture, when the world is facing the challenges of containing the spread of Covid-19. Recent data collected by the OECD shows that less than 60% of individuals visit, or interact with, government websites, a share that is considerably lower than the 72% of individuals who use the Internet regularly for e-mail on average in OECD countries (OECD, 2019b). Moreover, the European Commission's (EC) Digital Economy and Society Index (DESI) scores a range of countries on various dimensions of digital performance, including connectivity, human capital (digital skills), use of Internet by citizens, and integration of technology and digital public services. The DESI index varies from 0 to 100 in ascending order of digital preparedness² and shows a wide variance worldwide, from around 75 in South Korea to under 40 (Brazil), with the average of the European Union countries at under 60. This is due in part to gaps in levels of education and skills required for people to thrive in a digital world, which vary substantially both across and within countries, but also

2. More information on the index is available at <https://ec.europa.eu/digital-single-market/en/news/how-digital-europe-compared-other-major-world-economies>.

unequal access among firms to digital technologies (Andrews et al, 2018), as well as a lack of focus on user needs in government digital strategies.

4. At the same time, whereas potential benefits are considerable, digitalisation poses many challenges for governments. They include the capacity to (i) design and implement appropriate strategies for the digitalisation of government operations; (ii) ensure adequate digital inclusion of the population; (iii) carry out necessary supporting institutional reforms; (iv) safeguard the quality of information and address privacy concerns; and (v) cope with some of its negative consequences, in particular the social costs of automation and the potential erosion of some traditional tax bases. There is an extensive and growing body of literature on these issues, both at individual country level and by international institutions, including the IMF, the OECD and the European Commission. Nevertheless, this literature focuses mostly on the national level of government. The purpose of this paper is to highlight the opportunities and challenges created by the digital revolution for subnational governments (SNGs).

5. The paper is organized as follows. Sections II and III focus respectively on the opportunities and challenges for the SNGs brought about by the digital transformation. Section IV discusses how intergovernmental cooperation can help SNGs address the challenges and exploit as much as possible the opportunities. Section V offers some brief conclusions.

2. Opportunities

6. The use of digital technologies can benefit SNGs on both the revenue and the expenditure sides of the budget. These are reviewed in turn in what follows.

2.1. On the revenue side

7. Digitalisation can enhance the level and quality of subnational revenues through a number of channels (OECD, 2019c).³ First, digitalisation can enhance national revenues that are shared with SNGs by enhancing tax administration and compliance, particularly in areas such as the personal income tax and the VAT. National tax authorities are increasingly gaining access to vast amounts of information, including information that is internally generated as well as originating from other government agencies, from online sources and from the private sector—such as data on bank transactions and income from labour and non-labour sources. This is facilitated through the increasing use of digital reporting and communication systems, standardized reporting formats, electronic interfaces as well as enhanced analytical tools including a growing use of AI and machine learning. This improved access strengthens the ability of tax administrations to enhance voluntary compliance and to better target enforcement capacity by providing more possibilities to verify the information necessary for the calculation of the tax liability (on income, consumption, and wealth) of individual taxpayers (Gupta and others, 2017).

8. Digitalisation also allows governments to track business activity more effectively and at lower cost. The Danish Taxation Authority is using machine learning to identify fraudulent firms based on VAT and corporate income tax returns. Also, the growing use of electronic invoicing, and the increased capacity of tax administrations to access and process the wealth of information and data generated by these invoices, greatly facilitate the

3. Through the Inclusive Framework on BEPS, the OECD is currently leading work to revise the international corporate tax rules to address the Tax Challenges Arising from the Digitalisation of the Economy.

enforcement of the VAT (OECD, 2019d). In Brazil, for example, the universalisation of electronic invoicing and the harmonisation of state taxpayer registries have enhanced the states' capacity to enforce the state-level VAT, thereby boosting their own revenues.

9. The availability of more granular information on the composition and distribution of the bases of the main national taxes can also help improve the design, in terms of equity and efficiency, of such taxes. Jacobs (2017) provides a fuller discussion of the potential of digitalisation to improve the design and enforcement of national taxes.

10. Second, digitalisation can also enhance subnational own revenues in a number of ways. These are briefly reviewed in what follows.

2.1.1. Taxation of consumption

11. Consumption taxes, including VAT and retail sales taxes, are sometimes regarded as an appropriate revenue source for regional governments. However, consumption taxes may be difficult to enforce in countries characterized by highly fragmented retail systems, with many small or micro-establishments. The mandatory use by retail outlets of cash registries linked to the relevant tax administration can remove an important obstacle to the adoption of consumption taxes. Box 1 in OECD (2017a) provides a number of examples of countries in which the introduction of mandatory cash registers yielded significant VAT or general sales taxes revenue gains. These countries not only include advanced economies such as Austria, Belgium, Canada, Hungary and Sweden, but also developing ones, such as Rwanda.⁴

12. The rapid diffusion of electronic payments systems – including electronic transfers of funds, credit and debit cards, and electronic wallets – has helped the enforcement of consumption taxes. Many countries now prohibit or discourage the use of cash for higher-value transactions, especially in real estate transactions and in construction services. Box 3 in OECD (2017a) and OECD (2017c) provide several examples in this area and point to estimates of significant revenue gains from the change in both advanced and emerging-market economies.

13. At the same time, digitalisation has given rise to new challenges in the taxation of consumption at both the national and the subnational levels. These pertain especially to e-commerce in goods, and particularly services (e.g. in entertainment), and to the emergence of electronic platforms for peer-to-peer (P2P) transactions, such as Uber, Airbnb, Amazon, and E-bay.⁵ Indeed, while the tax authorities have long been addressing challenges related to use of cash in the economy, which complicates the traceability of transactions and facilitates fraud and evasion, the emergence and rapid development of digital platforms pose relatively new issues. Although the digital platforms can facilitate fraud and evasion, their on-line nature also presents an opportunity to deploy technology to tackle these challenges.⁶

4. OECD (2019e) examines the significant benefits that can be realised through connecting mandatory cash registers directly to tax administration systems.

5. See Aslam and Shah (2017) and OECD (2019d) for a comprehensive discussion of the challenges of taxing the shared economy

6. The OECD is currently developing model rules for reporting by platform operators with respect to sellers in the sharing and gig economy.

14. Increasingly, national and subnational governments are requiring these digital platforms to collect and remit consumption taxes, including VAT and retail sales taxes on the transactions performed through them. The enforcement of these tax obligations could be greatly facilitated by legal requirements that the platforms provide access to the “big data” generated by transactions to the relevant tax authorities. The latter, however, need to equip themselves to analyse such data quickly and efficiently. OECD (2019) provides a number of examples of how national and a few subnational tax administrations are coping with the challenges of taxing the P2P economy.

2.1.2. Subnational taxation of incomes

15. The on-line exchange of relevant information between national and subnational tax administrations – including the use of nationwide unique taxpayer identification numbers – can facilitate the levying of subnational surcharges on the personal income tax, which is another appropriate tax handle, especially for regional governments. It can also facilitate the enforcement of a regional income tax, distinct from the national one, which some regional governments prefer to a surcharge, because of the autonomy it affords in its design. This is, for example, the case in the United States.

2.1.3. Property taxes

16. Digitalisation is potentially of great value in the enforcement of property taxes, which are the mainstay of local taxation. The, by now ubiquitous, use of Google maps by local governments facilitates the identification of informal (unregistered) real estate properties and the updating of property cadastres. A correct valuation of properties for tax assessments is facilitated by a tax administration’s on-line access to the cadastre, and by its ability to process and analyse large datasets from real estate transactions, to spot patterns, trends and outliers. As emphasised in the literature,⁷ taxpayers’ perceptions of arbitrary and unfair valuations are a major cause of litigation and social resentment of property taxes, contributing to their under-utilisation in most countries. The analysis of large data sets on property transactions can also help local governments better capture value increments created by the development of public or private infrastructures.

2.1.4. User fees

17. The use of meters and sensors linked to the computer systems of the relevant agencies or utilities can enable increased resort to user fees, which are also a frequently underutilised source of revenues for local governments, or their enterprises. Traffic sensors can also facilitate the levying of congestion charges, as is increasingly done in large metropolitan areas, such as London and Singapore.

2.1.5. Promoting voluntary compliance

18. Finally, but importantly, the digitalisation of subnational tax administrations can promote voluntary taxpayers’ compliance in several ways. This includes increasing taxpayers’ perception of the tax authority’s ability to obtain relevant information (e.g. from banking and other records), and reducing tax compliance costs, which can be achieved

7. See for example, Bahl, Martinez Vazquez and Youngman (2010). See also Bonet, Munoz and Pineda Mannheim (2014) for examples of successful digitalisation of cadastres in Latin America.

through easier taxpayer access to tax information (e.g. through on-line portals, including detailed Q&As on tax issues) and on-line tax filing and payment facilities.

19. Regional and many large and medium-sized local governments worldwide have invested in recent years in building or refining on-line tax administration portals.⁸ In addition to providing general tax information, and access to filing and payment facilities, some of these portals allow the taxpayer to access their individual tax records and obtain the related documentation. Most tax administrations make these portals also available to smartphones users through apps, thus substantially increasing the number of potential users.

2.2. On the spending side

20. Digitalisation also creates opportunities to improve how SNGs carry out their assigned spending responsibilities. First, digital technologies can help improve the targeting and enforcement of existing spending policies, as they offer tools to monitor outcomes directly, for example through linked sensor technologies, and to lower the administrative cost of data production and dissemination, which is essential for effective targeting of social transfers. Second, they can help improve policy design and evaluation by broadening the range of instruments available to governments for policy experimentation and evaluation, and by lowering their cost. Third, they can help strengthen government-citizen interactions, by facilitating stakeholder engagement, and making data more readily available, which can enhance accountability in the public sector. Some of the specific ways in which digitalisation can help improve subnational spending are briefly reviewed in what follows.

2.2.1. Use of sensors in the delivery of public services

21. The IOT, and the capacity to process, analyse, and shape policy responses to the big data that it generates, have a vast potential to enhance the delivery of subnational public services. For example, traffic sensors can provide urban transit authorities the information necessary to change the duration of traffic lights to minimise congestion. They can also help monitor the usage and state of roads, thereby optimising the prioritisation, timing and delivery of road maintenance, repairs, and new construction.

22. Similar considerations apply to the delivery of services like mass urban transit, water and sewerage, street lighting, trash management, irrigation systems, and agricultural extension services. The use of smart meters and dynamic pricing of electricity can help alter households' and businesses' patterns of power consumption, increasing energy efficiency. The growing use of such digital technologies not only in advanced but also in developing countries attests to their potential in all the above-mentioned areas.

2.2.2. Use of digital geographic information systems (GIS)

23. Various types of digital geographic information systems (GIS) are useful tools for urban planning, the approval of construction permits, and parking controls. GIS can also be used to identify emerging weather or health-related risks, thereby helping optimise the nature, localisation, and timing of preventive or corrective measures. The use of unmanned aerial vehicles facilitates geospatial surveying, more accurate and cost-efficient air and water pollution monitoring, and early warning for floods, fires and other types of natural

8. For examples in this area see Munoz and Seco (2018).

disasters. Geospatial surveying can also help identify areas of greatest incidence of communicable diseases, helping isolate them and minimize the spreading of the diseases.

2.2.3. E-health services

24. Digitalisation is also making inroads in the provision of subnational health services. E-health services can be especially beneficial in remote or other underserved areas where doctors and other health care providers can be difficult to access. Smartphone-based health apps can be used to allow continuous monitoring of patients, interactions between patients and health professionals, and to provide real-time feedback from prevention to diagnosis, treatment and monitoring. Progress in these areas does not depend on technology alone but requires new organisational structures in the public administration and efforts to make these new ways of providing services acceptable to the population. Preparedness in this area is particularly important as the world faces the need to contain the spread of Covid-19 while minimising the economic costs associated with containment.

25. So far, finding information and making appointments online are the most widely available digital services at the local level. More advanced eHealth solutions like e-prescriptions, access to online medical records or telemedicine are less frequently offered by local governments. Digital healthcare services and solutions are more likely to be provided at the regional or national levels. The results of a survey of the use of digital information systems by local governments in various EU countries (ESPON, 2017) suggest that the level of digitalisation in health services is relatively high in larger cities in northern Europe, but rather low in other regions.

2.2.4. Digital services in education

26. Digitalised education services are primarily provided at the local level. In Europe, northern and western cities are leading the digital transition in this area. Northern cities in particular provide a very wide range of digital services with online applications for admission, online monitoring of progress, and learning materials made available on-line. PCs and interactive displays are widely used in primary education classrooms in advanced countries and many emerging-market economies, especially in cities and larger towns.

27. The digital transformation can also facilitate improved provision of education services in rural areas. For example, schools in rural Finland provide elective classes through teleconferencing technologies. Lessons in one school are streamed to classrooms in other schools, where students interact remotely with the teacher. This allows the schools to offer elective classes, such as foreign language classes, which do not have a sufficiently large number of students in a single school (OECD, 2019f). Likewise, the Covid-19 crisis holds much potential to accelerate the digital transformation in the education sector, given the closing of schools and universities for more than one billion children and youths worldwide.

2.2.5. Digital portals

28. Digital portals are increasingly used by regional and local governments to facilitate residents' and tourists' access to relevant public services, such as on-line licensing, building permits, downloading of official documents, and culture and sports-related services. For example, Ireland has set up an electronic National Building Control Management System (BCMS) involving the central government, industry and the local governments to improve the efficiency and effectiveness of building control management, oversight and enforcement processes. Other country experiences are worth noting. For example, the

Spanish region of Murcia has created a platform (with tools enabling product design, price quotations, scheduling and sales to professional channels and target audiences) to make it easier for tourist companies to access services related to the regional tourism industry. In Portugal, the Citizen's Portal is the central channel to access electronic public services delivered by both central and local government, thus facilitating the relationship between citizens, business and public administration.

29. Across OECD countries, access to government services through digital portals has tripled since 2006, with around 36% of OECD citizens submitting forms via public authorities' websites in 2016 (OECD, 2017a). The ESPON survey suggest that, on average in the sample, the degree of digitalisation is larger for local services in spatial planning, construction, tourism and culture and sports, and smaller for social services (ESPON, 2017). The same survey suggests that across the EU, the digitalisation of services has somewhat or even substantially reduced operating costs for 85% of cities.

2.2.6. Electronic payments for subnational services and transfers

30. The use of electronic payment services can help reduce bureaucratic inefficiencies, fraud, and corruption in SNG's payrolls and social assistance programmes, as documented by a number of country case studies.⁹ The ability of qualifying citizens to register on-line for social assistance can reduce the social stigma attached to its use, thereby increasing its take-up. At the same time, automatic electronic exchange of information among different agencies involved in the administration of subnational social assistance programmes is essential to weed out non-qualifying recipients. Digital monitoring of workers' attendance helps the control of SNGs' payrolls by, for example, curbing absenteeism in health and education services, and the incidence of ghost workers, especially in developing countries.

2.2.7. E-procurement

31. Digitalisation can also play an important role in improving the transparency and efficiency of SNGs' procurement operations, provided that the underlying legislation and regulations are in line with good international practice, and are systematically applied.¹⁰ The latest wave of the OECD Product Market Regulation (PMR) Indicators, which covers OECD member countries and an increasing number of emerging-market economies, shows that in several countries purchasing agencies are not required to provide information and documentation on-line in a systematic manner, thereby creating information and transactions costs for potential bidders that thwart competition.

2.2.8. Digital information systems

32. The implementation of well-designed digital public financial management information systems (IFMIS) is key to allowing timely monitoring of SNG finances and appropriate policy responses to emerging risks of budgetary overruns, arrears, or significant delays in the execution of spending programmes, especially investments. Of course, as emphasized in the relevant literature,¹¹ the quality of IFMIS reflects that of the entire PFM

9. See, for example, Cangiano et al. (2017).

10. Sanchez (2013) provides a useful overview of good rules and practices in public procurement.

11. See, for example, Khan and Pessoa (2010), and Una, Allen and Botton (2019).

system: computerising inadequate budget preparation, execution, accounting and reporting processes will not generate reliable information on an SNG's finances.

2.2.9. Open government and transparency

33. Digitalisation is also a potentially powerful tool to make government more open and participative. So-called “e-Democracy” has become even more relevant in the context of Covid-19, with many countries moving to allow parliaments, as well as municipal and regional councils, to debate and vote on-line. In the context of the pandemic outbreak, the potential of on-line voting, as well as the potential security challenges, become even more relevant.¹²

34. The on-line availability of timely information on a broad range of subnational operations can also facilitate civic involvement and the accountability of local officials. A number of large cities, including Barcelona, Chicago, Paris, São Paulo and Toronto, to name but a few examples, have sought to leverage such openness into engagement through participatory budgeting initiatives, although challenges remain.

35. However, the realisation of these potential benefits depends crucially on the relevance, quality and user-friendliness of the information being generated by the digital systems and made available to the public. Therefore, early involvement of key stakeholders (CSOs and other groupings of users of public services) in the design of those systems is important for their effectiveness.

2.2.10. Use of social media

36. Both national and subnational governments worldwide are experimenting with social media, given its increasing uptake in society and as part of their e-government strategies. For example, the top executive institutions in countries such as Ecuador, the United Kingdom and Chile have a community of Twitter followers that reaches a significant proportion of the domestic population. In the United States, two thirds of counties and municipalities had an official social media presence as early as 2011. In the United Kingdom a 2012 survey reported that over 90% of local councils have a Twitter account, over 80% a Facebook account, over 50% a Flickr account to share pictures; only 3% of local councils reported having no social media presence at all.

37. However, few governments in OECD countries have a dedicated strategy for institutional use of social media and consider social media mainly as a tool to improve public communications, rather than service delivery. Uptake and choice of particular platforms depend on the national or local context. For example, in 2012 a survey of 75 larger municipalities across Europe found that only 32% had a Twitter account, 30% were on YouTube, and only 16% on Facebook. At the same time, over half of these municipalities operated a blog (Bonsón et al., 2012).

3. Challenges

38. As indicated in Section I above, governments face a number of challenges when embarking on, or expanding, digitalisation. Some of these challenges are common to all levels of government, but challenges are often greater for SNGs, given the fact that they generally face tighter human, physical, and financial resource constraints, and that the

12. A framework for e-Democracy is being developed by the Council of Europe (2019).

severity of such constraints varies significantly across the national territory. Moreover, digitalisation efforts often bring into starker relief flaws in multi-level governance and in the intergovernmental fiscal relation arrangements. This section briefly discusses the main challenges in subnational digitalisation.

3.1. Human resource constraints

39. Scarcity of relevant skills can be a major obstacle to successful digitalisation by SNGs. For instance, some 40% of respondents to the above-mentioned ESPON survey identified skill scarcity as a major constraint on digitalisation. A 2018 survey of Australian local governments revealed critical skills and capacities shortfalls, particularly among smaller and more rural authorities (Australian Local Government Association, 2018).

40. The human resource constraint can manifest itself in a number of ways. First, and possibly most importantly, a limited understanding by local leaderships of digitalisation options and their potential benefits and costs can result in a lack of strategic vision for the digitalisation process, including the definition of clear priorities, realistic timetables, and the assignment of adequate budgetary resources. A high-level leadership commitment is also crucial to ensure that the coherence of the process across the whole administration is not jeopardised by bureaucratic turf wars.

41. Second, SNGs, especially the smaller ones and those located in remote areas, are likely to be even less competitive than national administrations in recruiting and retaining workers with the appropriate IT skills, especially in countries where such skills are scarce, and are therefore able to command higher remuneration from the private sector. Of course, subnational capacities in this area are likely to be weaker in poorer regions and cities, and in rural communities.

42. IT skills requirements include not only those for the design, implementation, and maintenance of digital systems (such as software development or customisation, cybersecurity, machine-learning programming, etc.), but also for their use by non-IT government workers. Meeting the latter requirements, in particular, typically necessitates significant investments in training of subnational civil servants, and the cost of such training should be adequately factored in when designing a digitalisation strategy.

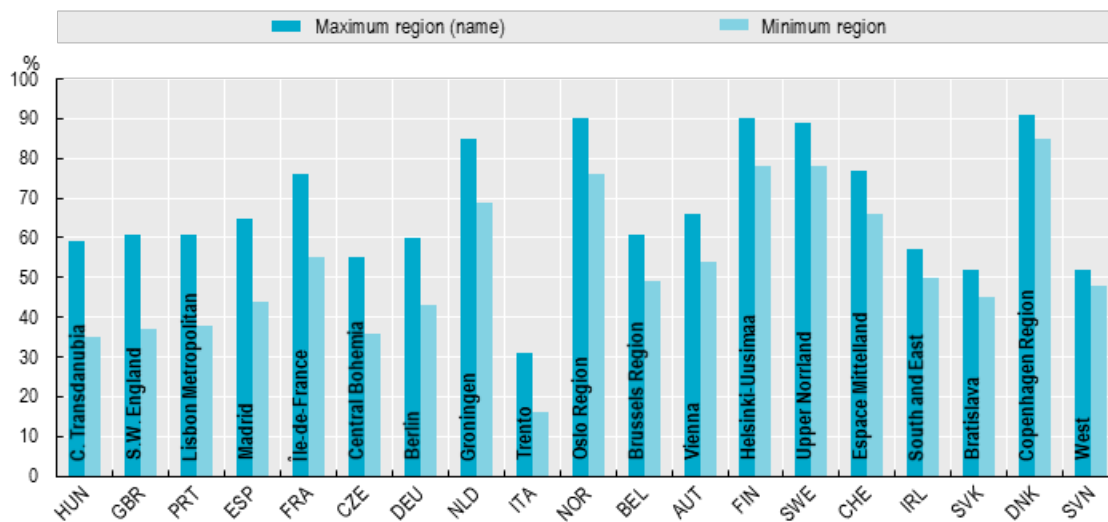
43. Finally, but no less important, SNGs need to adapt their digitalisation strategies to the degree of IT readiness in their population at large to avoid the risk of deepening existing inequalities in citizens' access to public services. For example, a shift to the payment of social security benefits and transfers exclusively through mobile phones should be contingent on evidence that a vast majority of intended recipients have access to such phones and adequate familiarity with the relevant capabilities. A shift to on-line payment of subnational taxes and user fees may have to be optional, at least until there is adequate evidence that taxpayers can avail themselves of such a facility. Similar considerations apply to other on-line services, such as licensing, official certifications, etc.

3.2. Physical constraints

44. A lack of adequate IT infrastructure (access to broadband services) can hamper digitalisation, especially in rural communities and more remote regions, where low population density results in high fixed investment and maintenance costs in digital technologies.

Figure 2. Regional variation in population using the Internet for public services

Percent of total population, 2017

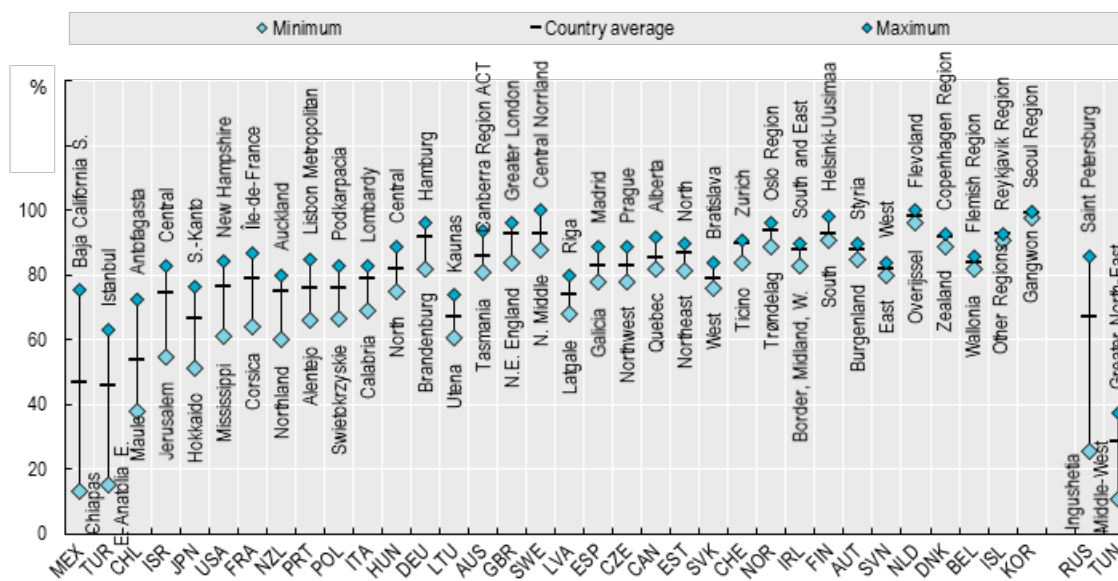


Source: OECD (2018), *Regions at a Glance*.

Indeed, access to, and use of, the internet varies significantly within countries in the OECD area (Figure 2), suggesting that digitalisation strategies at the level of individual SNGs need to be accompanied by nation-wide initiatives to tackle the digital divide within countries (Figure 3).

Figure 3. Regional variation in the share of households with a broadband connection

Percent of households, 2017



Source: OECD (2018), *Regions at a Glance*.

3.3. *Funding constraints*

45. Nevertheless, the budgetary space for funding large IT investments is severely limited for many SNGs. Regions and cities with smaller or more volatile own revenue bases, or highly dependent on discretionary or earmarked national transfers, may not be able to ensure adequate funding for digitalisation initiatives that involve relatively large, multiyear investments.

46. A recent EU-sponsored survey of local government in Europe found that, while most large and many medium-sized cities have dedicated IT budgets, funded by own and shared revenues, small cities and rural communities are largely dependent on national or EU grants to finance their digitalisation initiatives. Unsurprisingly, over 60% of survey respondents identified the lack of funding as the main constraint on their digitalisation efforts (ESPON, 2017).

47. Incidentally, in its 2014 Recommendation on Digital Government Strategies, the OECD emphasized the need to secure adequate funding for the implementation of digital strategies at all levels of government. It argued for articulating the value proposition for all projects above a certain budget threshold to identify expected economic, social, and political benefits that can justify public investments, and for involving relevant stakeholders (including other levels of government) in the design of the projects, to promote buying-in and an appropriate sharing of costs and benefits.

3.4. *Other challenges*

48. Other challenges confronting SNGs in their digitalisation efforts include:

- Identifying and enacting the legal and regulatory changes needed to support the digitalisation process. This includes, for example, the need to secure unfettered electronic access to relevant sources of data, to acquire and retain necessary skills, and to allow the use of electronic means to carry out and validate interfaces with taxpayers and users of public services. Some of these changes may require the concurrence of higher levels of government, pointing to possible needs for changes in multi-level governance.
- Identifying and tackling relevant cybersecurity risks, a challenge that appears to be inadequately met by many SNGs.¹³ Individual SNGs need to develop strategies tailored to their specific circumstances to define priorities for their cybersecurity, taking into account the severity of the impact of different threats, as well as the foreseeable respective costs of prevention and remediation. They would need a dedicated appropriately skilled team for this task and to ensure a prompt response to new emerging risks.
- Adequately addressing citizens' privacy concerns. There is an inevitable tension between the objectives of providing open access to granular government data, and of protecting the privacy of information regarding individuals and businesses.¹⁴ The case of testing, tracing and tracking through digital devices to contain the spread of

13. For instance, a 2016 survey of U.S. local governments found that more than one half of responding jurisdictions did not track cyber-incidents or know the source of such incidents when they occurred (although nearly one half of respondents estimated such cyber-attacks to be occurring at least daily).

14. For example, a study of Seattle's open data platforms and policies points to data 'spills' as a key concern of citizens in viewing open data efforts with suspicion and distrust.

Covid-19 is a case in point, where the local governments are in many cases actively involved in these efforts, and privacy/confidentiality concerns are prompting important debates among policymakers. The appropriate balance between such objectives is likely to vary across SNGs, reflecting in particular the level of citizens' trust in their governments, which is in turn influenced by social and cultural factors, and by historical heritage. This highlights the importance of adequate stakeholder involvement in the design of the digitalisation strategy.

49. This brief review of challenges in subnational digitalisation makes all the more evident the need for the efforts to be guided by a well-structured overall strategy. This strategy should begin with a stocktaking of the initial state of digitalisation, including existing legacy systems, the physical connectivity infrastructure, and the availability of skills and financial resources. Within these constraints, SNGs need to define priorities (e.g. which public services should be digitalised first), identify needs for legal and organisational supporting changes, define responsibilities for different tasks, set up realistic timetables for implementation, appropriate the necessary budgetary resources, procure any needed skills and material, and closely monitoring implementation. Early involvement of the main stakeholders in the process, and a clear communication to the public at large of its expected results, are key to securing citizens' support for the digitalisation effort.¹⁵

4. The role of inter-governmental co-operation

50. Cooperation among and within different levels of government can play a significant role in supporting effective and efficient digitalisation of SNGs. The case for support by the national government is made more compelling by the fact that, as mentioned above, different SNGs are differently equipped to meet the challenges of digitalisation. Smaller and poorer urban, and especially rural, communities are more likely to suffer from skill shortages, limited connectivity, and scarcity of budgetary resources. In other cases, policy innovation is an important area for inter-governmental co-operation in the digital sphere, with considerable potential for SNGs to launch pilot programmes that can be tested and subsequently upscaled to other same-level jurisdictions and levels of administration through gradual experimentation.

51. Thus, in the absence of support from the national government, the digital revolution is likely to widen spatial and income inequalities within a national territory. Moreover, digital divides tend to be self-reinforcing. Business and skilled people tend to move to locations that have better connectivity and greater ease of access to digitalised public services. This erodes the tax base of the communities left behind, making it more difficult for them to catch up technologically.

52. Against this background, the national government can support SNGs' digitalisation efforts in a number of ways. In particular:

- By ensuring that SNGs, at the regional as well as the local levels, are assigned appropriate sources of own revenues to meet the budgetary requirements to make the most of the digital transformation, and that the incentives to use such sources are not blunted by a soft budget constraint. This will enable the more prosperous SNGs to fund all or most of their digitalisation spending.

15. An interesting example in this respect is the German proposal to create Alliances for Digitalisation, involving multiple public and private stakeholders to help shape digitalisation strategies at the regional and local levels.

- By ensuring that the overall system of intergovernmental transfers is reasonably equalising. This may be best achieved through a mix of formula-based transfers and special-purpose grants (including capital grants) that reflects the specific characteristics of territorial disparity in each country and the preparedness of different jurisdictions to meet the challenges of the digital transformation.¹⁶
- By giving adequate weight to the objective of digital inclusion across the national territory in its own infrastructure investment decisions. For example, the Canadian government announced in its 2019 budget additional funding to extend broadband infrastructure to rural and remote communities. Another example is Australia's National Broadband Network (NBN), a federal crown corporation that has made significant strides in reducing the urban-rural gap in that country through various partnership arrangements with both other government levels and private industry.
- By ensuring that subnational spending responsibilities are clear and that SNGs have adequate autonomy in carrying them out, including some flexibility in managing their payrolls. A degree of asymmetry in the devolution of spending responsibilities can also help reduce risks of digital exclusion of weaker-capacity communities.
- By defining appropriate nation-wide standards to facilitate seamless interfaces among the national and subnational digital systems. This would facilitate the exploitation of relevant big data by all levels of government, to improve tax enforcement, the administration of social benefits and other public services, and the identification of risks, including for privacy and cyber-security.
- A leading example in the adoption of an integrated digital platform for the provision of public services is Estonia. Its X-road enables secure Internet-based data exchanges among public and private information systems.¹⁷ The X-Road utilises blockchain-like technology and has now been replicated with variations by a number of advanced and developing countries. Denmark is another example of a country that has sought to foster a common digital architecture across all government levels in order to support 'digital coherence'.¹⁸
- By providing technical assistance and training to subnational officials to share lessons from their own experiences with digitalisation, and to help them design and implement successful digitalisation strategies. For example, in Brazil the federal government has provided substantial support to the modernisation and digitalisation of state tax and budget administrations through the *Profisco* programme.

53. Realising the potential for such cooperation is likely to require in many instances significant institutional and socio-cultural changes, with attendant resistance by many affected parties. Understanding by high-level national policy-makers of the potential benefits of inclusive and efficient subnational digitalisation is key to its success. It is also crucial that nation-wide digitalisation strategies be fully owned by the subnational authorities, rather than being seen as driven by the national government. This highlights

16. There is an extensive literature on fiscal equalization. See, for example, Boadway and Shah (2007) and OECD (2013).

17. See Government of Estonia (2017) for details.

18. See Government of Denmark (2017).

the usefulness of dedicated vertical cooperation forums where priorities, standards, resource requirements and other relevant issues can be debated in an open and timely manner, before decisions are crystalized.¹⁹

54. Horizontal intergovernmental cooperation has grown rapidly in recent decades, taking a number of forms ranging from limited-purpose arrangements, such as inter-municipal consortia for the delivery of local services, to the creation of inter-municipal communities and of metropolitan governance structures²⁰. Regional and local governments' associations have taken increasing roles as forums for dialogue among the respective participants on issues of common or conflictual interest, and as representative interlocutors with the national government on such issues.

55. Horizontal cooperation can also support effective and efficient subnational digitalisation. SNGs embarking on or expanding their use of digital technologies can benefit from lessons and experiences by other SNGs that have progressed further in the process. Peer support can include demonstration effects, technical assistance, and cross-training of officials. Efficient digitalisation also benefits from interfaces among subnational systems, in particular between adjacent communities, such as those in metropolitan areas that straddle local government borders, and between a regional government and its constituent localities, enabling smooth on-line sharing of information.

56. Dedicated forums for inter-regional and inter-municipal dialogue on digitalisation issues (multi-level digital boards), possibly under the umbrella of the broader horizontal cooperation forums mentioned above, can be instrumental in facilitating both the exchange of experiences and the formation of consensus on the issues.

57. A successful example of such a horizontal cooperation forum is the *Encontro Nacional de Coordenadores e Administradores Tributários Estaduais (ENCAT)*, which was instrumental in the development and adoption of the electronic VAT invoicing system in Brazil, discussed briefly in the Box below. The system is widely recognised to entail major benefits for both the state tax administrations, by reducing fraud and evasion of the state-level VAT (the *ICMS*), and for taxpayers, by reducing risks of cargo losses and theft, and by speeding up controls of inter-state trade. Moreover, information about prices of traded commodities can be used in public procurement, and also by private agents to reduce purchase costs.

19. See Ter-Minassian and de Mello (2016) for examples of vertical cooperation forums.

20. See OECD (2019b) and Ter-Minassian and de Mello (2016) for details and examples.

Box 1. Brazil's experience with the electronic invoices and other systems to track goods in transit

Many countries around the world have moved to electronic invoices particularly to facilitate and enhance VAT compliance. Since typically the VAT is a national-level tax, the national tax administrations have put in place and maintain the related IT system. Brazil offers a distinctive example of use of the electronic invoice system at the subnational level. The creation and maintenance of the system constitute a good example of intergovernmental cooperation in a country that, in other respects, is sorely in need of strengthening cooperation to reform its complex and highly distortive consumption taxes system.

The electronic invoice system was developed in Brazil under the auspices of *ENCAT*, a horizontal cooperation forum among state-level tax administrators, which acts as technical secretariat for the *CONFAZ*, a council of state-level finance secretaries, and promotes dialogue and dissemination of best practices among its members. The development of the system began in 2006 and posed major technical challenges, given the territorial extension of the country and the number of transactions subject to the *ICMS*. By mid-2017, the system had processed more than 17 billion invoices, emitted by more than 1.4 million taxpayers.

The system links in a network available 24 hours per day, 7 days a week, the IT systems of the 26 states and the Federal District. The seller of a good subject to ICMS inserts into the system of his state of origin the electronic invoice for the transaction in a standardized format, which includes the specification of the buyer and his/her state. The system of the originating state, following appropriate validity checks, authorizes the transaction and transmits the relevant information to the state of destination. The electronic invoice accompanies the merchandise throughout its journey to destination. A complementary system, using transponders and more recently imbedded electronic chips, tracks cargo movements throughout the country.

5. Conclusions

58. The rapidly expanding eco-system of advanced digital technologies (high-speed computing, big data, AI, IOT, blockchains, etc.) creates significant opportunities for all levels of government to raise more and better revenues, and to improve the delivery of public goods and services. This paper has focused in particular on such opportunities for SNGs, which, given ongoing worldwide trends in decentralisation, are increasingly responsible for substantial shares of government spending.

59. Digitalisation can help improve both shared and own subnational revenues. Especially promising are possibilities to (i) strengthen the enforcement of, consumption taxes, subnational personal income taxes or surcharges on national ones; (ii) make more efficient and equitable the administration of local property taxes; and (iii) better utilise user fees for local services.

60. Advanced digital technologies can also help improve the quality and efficiency of subnational spending. Of particular interest are the use of (i) sensors to control traffic, the maintenance of regional or local infrastructures, the use of water and sanitation, etc.; (ii) geographic information systems (GIS) to pinpoint potential environmental and health risks; (iii) digital portals to facilitate SNGs' communication with their population and the delivery of certain public services; and (iv) well-designed IFMIS to strengthen all aspects of subnational PFM and facilitate subnational transparency and accountability.

61. Digitalisation also poses significant challenges for SNGs, whose capacities to deal with such challenges can be expected to vary widely both across and within countries. The

most important constraint in many SNGs is likely to be the scarcity of requisite skills, not only in the government leadership and bureaucracy, but also in the population at large. Lack of skills breeds, in turn, distrust and resistance to digitalisation. Other significant constraints can be posed by inadequate physical infrastructure and funding to improve it. Tackling cyber security risks, and adequately addressing citizen's privacy concerns constitute further significant challenges.

62. Less recognised, but also important, are legal or regulatory constraints, especially in federal or decentralised settings, where the risk of domestic regulatory fragmentation is highest. The coexistence of multiple regulatory regimes raises the scope for arbitrage and may create regulatory barriers to trade, investment and innovation, undermining the effectiveness of regulatory action. Indeed, regulatory inconsistencies, along with tax barriers, are an important culprit for fragmentation in internal markets. Canada is a case in point, where different regulations across the provinces hinder labour mobility, limit choice for consumers and prevent firms from reaping the benefits of scale of production, which are important in the digital area (Alvarez et al., 2019). Regulatory cooperation is therefore needed, both vertically and horizontally, to avoid arbitrage, protect consumer rights effectively, and promote interoperability across regulatory frameworks and enforcement.

63. At the same time, there is much scope for using digital technologies to improve regulatory practices at all levels of government. For example, artificial intelligence and machine learning can reduce the cost of data collection and increase the range of data sources. Language processing techniques can assist with automating procedures to review public comments on proposed rules and potentially even improve the drafting of regulations. Moreover, big data can improve ex post evaluations, since it enables analysts to view market participants' behaviour and improve evidence base for policy decisions. Digital technologies can also be leveraged to simplify policy experimentation, better target inspection activities, such as through real time and continuous monitoring of compliance, and strengthen regulatory enforcement. These challenges in subnational digitalisation highlight the need for a well-structured overall strategy, as discussed in Section III above.

64. Cooperation among and within the different levels of government can play a significant role in supporting effective and efficient digitalisation of SNGs. The case for support by the national government is made more compelling by the fact that, as mentioned above, different SNGs are differently equipped to meet the challenges of digitalisation. Smaller and poorer urban, and especially rural, communities are more likely to suffer from skill shortages, limited connectivity, and scarcity of budgetary resources.

65. The national government can support subnational digitalisation efforts in several ways. They include appropriate reforms (discussed in Section IV above) in the intergovernmental fiscal relation system to (i) give adequate weight to regional digital inclusion in its public investment choices, (ii) set appropriate nation-wide standards to facilitate seamless interfaces among the national and subnational digital systems, and (iii) provide technical assistance and training of subnational officials.

66. There is also significant scope for horizontal cooperation among SNGs in the digitalisation area. Peer support can include demonstration effects, technical assistance, and cross-training of officials, as well as effective interfaces among subnational digital systems in areas of common interest. Dedicated forums for interregional and inter-municipal dialogue on digitalisation issues, possibly under the umbrella of broader horizontal cooperation forums, can be instrumental in facilitating both the exchange of experiences and the formation of consensus on common digitalisation issues.

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