

Serving Seniors: Innovation and Public Sector Service Delivery

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ABSTRACT

Public administration scholars have contributed little to the explosion of research on aging in Canada by examining the implications of population aging for public organizations in general and government service delivery in particular. Studies dealing with the impact of innovations in information technology (IT) on services to seniors are especially rare. This paper aims to help remedy this deficiency by examining government service delivery to seniors, with primary attention to the impact of current and anticipated advances in IT. Public administration scholars can learn a great deal from other academic disciplines about government service delivery to seniors. What is missing is research that sets aging within the specific theoretical, conceptual and practical concerns of the field of public administration, contributes to cross-disciplinary work in gerontology and informs the policy and program decisions of governments.

Key Words: aging, information technology, public sector, service delivery, innovation

Introduction

There is increasing recognition of the importance of technological innovation for meeting the needs of Canada's aging population. For example, AGE-WELL, a research network established in 2015 within the federal government's Networks Centres of Excellence (Canada, 2015) involves universities, in partnership with industry and the not-for-profit sector, designing and implementing technology to improve the well-being of Canada's seniors. This paper focuses on government service delivery to seniors, with primary attention to the impact of current and emerging advances in IT. It also notes the scarcity of scholarly research on aging in the field of public administration.

Since the mid-1980s, there has been a gradual shift of emphasis in Canada's public sector organizations from serving the internal needs of governments to serving the needs of citizens. This heightened emphasis citizen-centred service has been accompanied by a substantial increase in scholarly writings on government service delivery (e.g. Kernaghan, 2005, 2009; Marson and Heintzman, 2009; Dutil et al., 2010). The shift towards citizen-centred service has been enabled in large part by innovations in information technology (IT) that have fostered improvements and cost savings in the delivery of government programs.

Also since the mid-1980s, there has been "nothing short of an explosion of research in aging and gerontology in Canada and beyond" (McDaniel and Rozanova, 2011: 516). However,

the academic field of public administration in Canada has contributed little to this explosion. Few Canadian scholars in this field have examined the implications of Canada's aging population for public organizations in general or government service delivery in particular. Studies dealing with the impact of IT on *senior* citizen-centred service are especially rare.

Despite the dearth of public administration research on aging, substantial spill over learning for public administration can be gleaned from studies in other fields (e.g. economics, sociology, gerontology, health care). There is an especially large volume of literature on aging and health services in Canada. For example, Chappell and Hollander's *Aging in Canada* (2013) focuses on health and home care for the elderly, including integrated care. In respect of writings on aging and technology, Sixsmith and Gutman's *Technologies for Active Aging* (2013) examines the impact of information and communication technologies on the lives of older adults. As early as 1998, Gutman recognized the importance of new technologies to the well being of seniors with her edited volume on *Technology Innovation for an Aging Society*.

There has been much debate about the likely extent and impact of population aging in Canada and elsewhere. Popular literature and the news media frequently use such terms as "demographic time bomb" and "silver tsunami" to describe population aging's probable effects. However, most academic scholars have challenged alarmist predictions about the growth and implications of population aging (e.g., McDaniel, 1987; Northcott, 1994; Barer et al, 1995; Denton, Feaver and Spenser, 1998; Chappell and Hollander, 2013). In 2000 Gee and Gutman questioned the crisis commentary on aging demographics in their book on *The Overselling of Population Aging: Apocalyptic Demography, Intergenerational Challenges and Social Policy*.

There is, however, widespread agreement that Canada's population is aging rapidly. Statistics Canada predicts an acceleration of population aging between 2010 and 2031, followed by a slower rate of growth. By 2036 persons over 65 years of age are projected to make up 23 to 25 percent of the population compared to 14 percent in 2009. The proportion of the total population composed of working-age people is expected to fall from 69 percent in 2009 to 60 percent in 2036 (Statistics Canada, 2012). There is also widespread agreement that population aging will require increased government spending, especially in such policy fields as health care, home care and public pensions. Even in the absence of such increased spending, a strong case can be made for initiatives that improve service for senior citizens rather than, or in addition to, cutting costs.

Following this introduction, section two describes briefly the evolution of citizen-centred service in Canada, with particular reference to IT. Section three examines the role of the Internet and mobile devices in enabling governments to serve Canada's aging population, and section four does the same for robot technology. Section five discusses emerging technologies destined to have substantial impact on service delivery in public organizations, and the final section discusses the need for research on aging and IT in the field of public administration. Examples of innovative initiatives are drawn from several countries. For Canada, the federal government is the main focus.

The content of this paper reflects the key new developments identified by the United Nations E-Government Survey (2014), which include bridging the digital divide by providing

effective online services for the inclusion of the elderly, integrated online service delivery, increasing emphasis on multi-channel service delivery and open government data, and the expansion of mobile government.

IT and Citizen-Centred Service

The evolution of citizen-centred service, as it has been driven by advances in IT, has been examined elsewhere (Marson & Heintzman, 2009; Francoli, 2014), but several events deserve brief mention as background information.

In 1996, a federal deputy ministers' task force on Service Delivery Models advocated a citizen-centred focus on service delivery, the integration of government services, and citizen involvement in the development and delivery of these services. In 1999, the federal government created Government On-Line to promote high-quality service through the use of IT as well as the Service Improvement Initiative to pursue such objectives as setting standards for each delivery channel and improving citizen satisfaction with government services. By 2006 both programs were deemed to have achieved these objectives and were wound up. Each year from 2001 to 2005, Accenture, the international consulting firm, ranked Canada as the world leader in delivering online services to citizens.

In subsequent years the federal government made little progress in improving online service delivery, service integration or channel integration. In 2014, according to the United Nations e-government survey, Canada stood tenth in the quality of its online service delivery among high-income countries (2014: 54). This decline has been attributed to the absence of an ongoing strategic plan, an inadequate grasp of changing citizen needs, a volatile political milieu, and insufficient understanding of the uses of technology with the advent of e-government 2.0, especially social media (Francoli, 2014: 152).

From the late 1990s to the present, two bodies - The Public Sector Service Delivery Council and the Public Sector Chief Information Officers Council which are composed of representatives from all orders of Canadian government - have promoted research and action to enhance public sector service delivery. The two Councils have worked together, with secretariat support from the Institute for Citizen-Centred Service, to keep the public administration community informed of developments in such areas as self-service technologies and integrated service and channel delivery. In April 2012, the federal government announced an Open Government Action Plan that included a commitment to "new measures that address improvements to the full spectrum of citizen services through Web 2.0 technologies" (Canada, 2014a). Then, in April 2014, the government launched Digital Canada 150, a program to exploit opportunities offered by the digital age, including a commitment that Canada "will be a leader in the use of digital technologies and open data, making it even easier for Canadians to access government services online" (Canada, 2014b).

The Internet and Mobile Devices

In recent years, both scholars and practitioners of public administration have recognized that citizens' use of self-service technologies (SSTs) such as the Internet and mobile devices can bring substantial benefits in improved service delivery and cost savings. However, not all services can be effectively delivered through SSTs. For example, services that are complex or sensitive are usually best handled through face-to-face or telephone channels.

SSTs enable citizens to access government services without direct assistance from government employees. They can be classified into four categories - the Internet, mobile devices, electronic kiosks and Interactive Voice Response (IVR). The Internet and mobile devices, each of which is examined below, are the most likely SSTs to affect service delivery for older adults.

The Internet

During the years from 2000 to 2010, Internet use by seniors increased steadily but still lagged significantly behind its use by Canadians aged 16 to 44 and, to a much lesser extent, those aged 45 to 64. Those over 75 years of age were the least active Internet users (Allen, 2013). By 2010, 51 percent of those aged 65 to 74 used the Internet compared to only 27 percent of those over 75 (Statistics Canada, 2011). Between 2010 and 2012 the number of Internet users among Canadians over 65 rose from 40.2 percent to 47.5 percent while usage by all Canadians over 16 years of age grew from 80.3 percent to 83.4 percent. The 2012 usage among the younger age cohorts was 98.6 percent (16-24 years old), 95.5 percent (25-44), and 83.8 percent (45-64) (Statistics Canada, 2013a).

An especially notable statistic for this paper is that senior citizens' visits to or interaction with government websites rose from 42.6 to 44.8 percent between 2010 and 2012 compared to a slight decline for each of the other age cohorts – from 62.3 to 60.8 percent (45-64 years old), from 73.1 to 71.2 (35-44), from 60.5 to 58.7 (16-24), and from 64.6 to 62.7 for all citizens over 16 (Statistics Canada, 2013b).

Digital Inclusion

The term digital inclusion refers to the capacity of groups and individuals to access and use information and communication technologies. It is often discussed as the need to overcome the digital divide between such segments of the population as the old and the young, the technologically literate and illiterate, and disabled persons and others. Overcoming digital exclusion in respect of accessing government services requires governments to ensure that such groups as older persons have adequate Internet connections (e.g. broadband) and hardware (e.g. desktops) at an affordable price as well as the technological skill to access the Internet. Another barrier to online activity is lack of motivation arising from the perceived irrelevance of online involvement to one's daily life. Christopher Baker, for the AARP Public Policy Institute (2013), identifies several benefits of seniors' use of Internet technologies, including personal fulfillment, health preservation, functional capability and activity, more effective caregiver support, and social connectedness. Cotton et al. (2014) found that Internet use by retired older adults in the United States reduced the likelihood of depression by about a third.

Citizens are more likely to seek government services online if they are assured of simple, speedy and secure Internet access. This is reflected in the Canadian government's Standard on Web Accessibility which recognizes the online channel as important to the government's "commitment to multi-channel access and service delivery" and making the channel "more effective and inclusive" (Treasury Board Secretariat of Canada, 2011).

Assurance of easy access to high-quality online services is especially important for seniors, many of whom face a variety of challenges to online activity. These include not only ensuring adequate Internet access and skills that in varying degrees face all age groups but also such functional limitations as impaired vision, hearing loss, cognition problems and motor skill decline (, 2008; Blaschke et al., 2009). For example, an international study (Nielsen, 2013) found that persons over 65 "are 43% slower at using websites than users 21-55." Canada's Standard on Web Accessibility aims to make the content of websites accessible to persons with disabilities, many of whom are seniors.

Examinations of web accessibility for seniors (e.g. Arch, 2008) note the importance of designing senior-friendly government websites that reduce access barriers, including the need for sophisticated Internet skills. Ideally, all government websites would be designed with the needs of seniors in mind. This is especially important for websites likely to attract a large number of seniors or dedicated to providing information and services specifically for them. While a detailed analysis of Canadian seniors' websites cannot be provided here, the main government website - *Seniors.gc.ca* - is a rich source of information and services for seniors on a wide variety of topics and includes a link to McMaster University's Optimal Aging Portal (<http://www.mcmasteroptimalaging.org>) containing extensive research evidence on aging. The main links on the site's home page are Information for Seniors and Information for Caregivers (both launched in 2013). The Information for Seniors page contains an interactive map for accessing federal, provincial and territorial programs and services and provides highly visible links to such sites as Benefits Finder, 211 Canada (for information about government and local community programs and services) and Service Canada. Similarly, an interactive map on the Information for Caregivers page provides links to government resources at all levels of government. Notable also for offering valuable services to seniors are the websites of Service Canada (<http://www.servicecanada.gc.ca/eng/audiences/seniors/index.shtml>) and the Public Health Agency of Canada (<http://www.phac-aspc.gc.ca/seniors-aines/index-eng.php>).

Hard data on the relative impact of the various barriers to seniors' Internet use are scarce. However, research studies are beginning to distinguish between barriers to the use of digital technologies faced by younger as opposed to older senior citizens, keeping in mind that there can be as much as a 40-year spread between them. A Pew Research study (Smith, 2014) identified two different groups of older Americans: "The first group (which leans toward younger, more highly educated, or more affluent seniors) has relatively substantial technology assets, and also has a positive view toward the benefits of online platforms. The other (which tends to be older and less affluent, often with significant challenges with health or disability) is largely disconnected from the world of digital tools and services, both physically and psychologically." Similarly, a European study (Mordini et al., 2009) found that "[a]mong younger senior citizens, say those between 65 and 80 years old, the main issues are likely to be universal access to ICT

and e-participation. Among the older senior citizens, say those more than 80 years old, the main issues are mental and physical deterioration and assistive technology.” Note, however, that a Canadian study found that seniors over age 75 “are using digital technology for everything from independent living to online shopping and more face time with friends and family using platforms like Skype” (Revera, 2012: 1). Moreover, seniors do not appear to be unduly deterred from online activity by privacy concerns. Data from 2009 (Statistics Canada, 2010) show 70.1 percent of Canadians over 65 as concerned or very concerned about online privacy compared to 78.8 percent (55-64 years of age), 76.5 percent (35-54) and 68.7 (34 and under).

Channel Management and Migration

With the rapid growth of the Internet as a service delivery channel, governments have been moving to a multi-channel approach requiring integration of the online and traditional channels for seamless cross-channel service (Kernaghan, 2013). The challenge is, in part, to achieve the optimum mix of channels so as to reduce costs and improve service. Ideally, with respect to seniors, governments would know what services are being delivered to seniors, through what channels the services are being delivered, how seniors would like the services to be delivered, and the relative cost of delivering each service through each channel. Governments could use these data for directing seniors to the most appropriate service channel.

As noted above, governments are striving to improve digital inclusion of seniors and others through the Internet and mobile technologies. However, digital inclusion is only part of a broader notion of social inclusion that can be more fully fostered by a multi-channel system that offers a choice of channels, each of which provides the same level of service. The principle that governments frequently cite as guiding their policies on service channels is that citizens should be able to use whatever channel they want to obtain the services they need regardless of their technological, demographic, social or geographical circumstances. Yet in practice, governments are increasingly striving to save money and improve service by persuading or obliging citizens to migrate from the traditional in-person, telephone and mail channels to the much less expensive self-service online channel. The statistics on Internet use provided above indicate that seniors, especially those over 74, are the age cohort most likely to suffer if service delivery through the traditional channels is reduced.

A widely discussed channel management strategy is the UK’s “digital by default” approach, adopted in 2012 as part of a broader Digital Strategy. Digital by Default seeks to reduce costs and improve service by putting as many government services as possible online and making these services “so straightforward and convenient that all those who can use them will choose to do so whilst those who can’t are not excluded” (United Kingdom Cabinet Office, 2013). It is accompanied by the Digital Inclusion Charter that aims to reduce the number of people offline, composed disproportionately of those who are older, in poorer health, with lower income, less well educated or unemployed, and by the Assisted Digital (program) that helps citizens access government services online.

Governments often assert that the traditional channels will remain available to offline citizens, despite strong pressures to have citizens shift to self-service channels. For example, the UK’s digital by default policy contains assurances about preserving service delivery through

offline channels. However, concerns about the gradual reduction or disappearance of certain offline services have been fuelled by assertions from the Cabinet Office minister that most future public services will be available only on the Internet (Hope, 2014). Moreover, with specific reference to seniors, the minister is reported to have said that seniors would have to go on the Internet or risk losing access to key government services (Hope, 2014). Notable also is Denmark's intention to create an entirely paperless system involving the replacement of citizen-government communications via surface mail with a digital mailbox for each citizen. An innovative form of assistance to those without Internet access that is likely to be especially useful for seniors is permitting citizens to grant a digital power of attorney to relatives who can help them operate the digital mailbox, even from a distance.

Mobile Devices

The Internet is complemented by another type of SST, namely mobile devices that can be used, among other functions, to access the Internet. The movement to mobility is rapidly picking up speed and has been positioned as one of a nexus of four forces – mobile, social media, data, and the cloud – that are driving societal transformation (Gartner, 2012). The International Data Corporation (IDC) predicted that by 2015 more U.S. citizens will access the Internet through mobile devices than desktop computers and other wired devices (Hamblen, 2011). According to Canada's Citizens First 6 national survey report, “[i]t is safe to say that ‘mobile’ is already starting to be as disruptive a technology as the Internet was, only the change will happen even faster ” (Institute for Citizen-Centred Service, 2012 preface). Canadians' use of such Internet-enabled mobile devices as smartphones and tablets grew from 53 percent in 2012 to 60 percent in 2013 (Statistics Canada 2014), and Ipsos Reid reported (2012) that 47 percent of Canadians younger than 55 had mobile access in 2012 compared to 16 percent of those over 55.

Digital Inclusion

Several points noted above regarding seniors' use of the Internet, especially the importance of high-quality websites, apply also to Internet access through smartphones and tablets. However, the benefits and drawbacks of mobile devices need to be weighed with specific reference to their use by seniors. The convenience and affordability of these devices, compared to desktop and laptop computers, help to promote digital inclusion of seniors. The Citizens First 6 report cites anecdotal evidence that “many new users, especially in the youngest and oldest demographics, are skipping computers altogether and adopting tablets as their IT tool of choice” (Institute for Citizen-Centred Service, 2012, preface). In the UK, an overall increase in online usage, from 33 percent in 2012 to 42 percent in 2014, resulted in part from a doubling of smartphone use and a tripling of tablet use by those aged 65-74 (Ofcom(a), 2014).

Text messaging via smart phones is difficult for visually impaired seniors but can be a boon for those who are hearing impaired. Moreover, while the location disclosure function of smart phones can invade seniors' personal privacy, it can also help caregivers monitor seniors' activities. A benefit for all citizens that is especially significant for seniors is the portability (always carried, always on) feature of smart phones that is valuable in dealing with urgent needs or crises. However, a detailed UK study (Ofcom(b), 2014:17) showed an old-young divide involving 61 percent of seniors over 75 viewing landline telephone services as essential,

compared to 12 percent of those aged 16-24, and 53 percent of the latter group viewing Internet access by smartphone as essential compared to zero percent for those over 75. Some governments are taking measures to increase seniors' use of mobile devices. For example, in 2014 the Province of Nova Scotia's Community Access Program launched "Connecting our Elders: Mobile Technology for Seniors" to provide orientation, training and support in the use of mobile devices (NSCAP, 2014).

Channel Management and Migration

Seniors' participation in the rapidly rising use of mobile devices is expanding their use of the Internet, thereby fostering a higher level of digital inclusion. However, the greater attachment of seniors than other cohorts to traditional service channels strengthens the case for a multi-channel approach that helps to promote social rather than just digital inclusion. Seniors who can operate and afford mobile technology are easing the shift to digital channels that is increasingly favoured by governments, but those who cannot access government services through mobile devices or any other technology because of health or other issues need the traditional channels. Over time, as younger persons with well-developed digital skills join the seniors cohort, the need for offline services will diminish but is unlikely to disappear.

The aging of the population will also result in an increasing number of seniors who have social media experience (e.g. Facebook, Twitter, online communities and chat groups). The number of online Canadians visiting a social media site at least once a week rose to 50 percent in 2011 from 35 percent in 2010, and 40 percent of adults over 55 were using social media compared to almost two-thirds of 35-54 year olds (Faber 2011). Revera (2012: 1) reports that 53 percent of Canadian seniors over 75 years of age "are socializing via social networking sites like Facebook, and one in five uses Skype or Facetime to speak with friends and family." The more social media experience leads seniors to use mobile devices and the Internet, the more likely it is that they will migrate from traditional channels for other purposes, including government services. However, in 2012 less than one percent of Canadians in all age groups used social media, mobile applications and/or text messaging to connect with government, and support for the "idea" of doing so is only 21 percent for seniors compared to 33 percent for those under 35 years old (Institute for Citizen-Centred Service, 2012: 2, 103).

Seniors' use of social media can significantly bolster the benefits noted above that accrue from Internet and mobile usage (Leist, 2013; Johnson, 2013), including the maintenance or expansion of social interaction that helps to reduce feelings of loneliness and isolation. Online communities such as AARP, SeniorNet and SeniorSite.com are dedicated in part to social support for seniors. Seniors can also use social media to access information on the prevention and treatment of specific health problems. An innovative District of Columbia program, called Grade.DC.gov, describes as "citizen-service analytics" data gathered and analyzed from social media and from website comments. The District's Department of Aging improved the quality of food at certain facilities on the basis of complaints picked up through this program (Marshall, 2014). Barriers to seniors' use of social media include reluctance to adopt new technologies and concerns about misuse of personal information – considerations that work against digital inclusion and channel migration.

Robotics

The previous two sections of this paper dealt, respectively, with the well-established technology of the Internet and the relatively new but rapidly escalating technology of mobile devices. This section focuses on robotics, a technology that is in its infancy in terms of its impact on public organizations but has potentially huge future implications for seniors (Kernaghan, 2014).

Some electronic experts believe that this transformation may not be far off. They anticipate that within ten to twenty years robots will be as widely available as computers are today (Gates, 2007: 58; Siciliano and Khatib, 2008: 1). In many countries, a rapid growth in the number of seniors is expected to be accompanied by a falling birthrate that will result in a smaller workforce and, therefore, fewer caregivers to assist older adults. This development is well advanced in Japan, for example, which explains in large part its substantial investment in robotics research and development, especially in the sphere of home care involving the delivery of health and social services to persons living at home rather than in institutional settings.

The policy field of home care is likely to be highly affected by the rise of robotics. Researchers are assessing the value of robotics in helping seniors continue to live independently at home (that is, aging in place) and reducing the loneliness and social isolation they often suffer. The term “assistive social robots” covers two types of home care robots (Broekens et al., 2009). “Service-type” robots serve such purposes as helping elderly persons dress, bathe, eat and move from room to room, reminding them to take their medications, and monitoring their activities and reporting problems to family and caregivers. “Companion-type” robots play a therapeutic role by interacting with seniors so as to foster their emotional and physical health. A literature review on assistive social robots expressed concern about the validity of the research findings in this field but concluded that “[t]here is some qualitative evidence as well as limited quantitative evidence of the positive effects of assistive social robots with respect to the elderly” (Broekens et al., 2009: 94).

In the context of home care, robots can be considered a form of assistive technology. They are only one of many assistive technologies that include smart home tools, telehealth tools and behaviour monitoring tools (Blaschke, 2009: 644-5). Like behaviour monitoring tools, robots can perform such tasks as automatically alerting caregivers to seniors in distress, but they can also perform the service and companion tasks noted above (and illustrated below). A research project at the Netherlands Eindhoven University of Technology, named Knowledgeable Service Robots for Aging, is designing houses that link a robot with the features of a smart home (2010).

It is important to be aware of exaggerated claims about the imminent widespread adoption of robots. Many robot prototypes with great potential have been developed but few are in actual operation. Among the service-type prototypes being designed for home care are

- Care-O-bot robots that can remind users when to take medications, fetch and carry items from various parts of the home, and alert caregivers in an emergency situation and enable them to talk to the user by video telephony through the robot’s video screen, speakers and microphone

- The Home Exploring Robotic Butler (HERB) designed to help seniors with household chores like cleaning and cooking
- Riba II which takes the form of a giant teddy bear that can assist caregivers to move seniors, including picking them up from the floor

Among the companion-type robots are

- A cute baby seal robot named Paro that responds to being petted and shows emotions that is especially popular in Japan and has been shown to lower the stress levels of its users
- A robot named Babyloid resembling an infant that can move its mouth, arms and eyelids and simulate human emotions as a trigger for emotional responses from its users

The potential for effective and commercial deployment of robots can be seen in the use of HelpMate robots in many hospitals. These “courier” robots move independently from one floor and one room to another carrying such items as medications, meals and medical records. As a result, hospital staff are able to spend more time with patients and delivery costs are lowered.

The use of robots poses some of the same social, technical, economic and ethical challenges as those posed by assistive technologies in general (Oishi et al., 2010; Eccles et al., 2013). The ethical dimension of robotics is receiving especially careful attention from academic scholars (for example, Wallach and Allen, 2009; Capurro and Nagenborg, 2009; Lin, Abney and Becky, 2012), and the ethics of robotic home care is featured prominently in these writings.

A key ethical consideration is that the use of robots should not unduly diminish the human contact that is so beneficial to seniors’ emotional health – also a consideration in seniors’ use of the Internet and mobile devices. There is substantial risk that robots will become a replacement, rather than a support, for caregivers. There is also substantial concern that some seniors, especially those with dementia, may develop an unhealthy emotional attachment to companion-type robots. In addition, if robots are used to monitor the well being of seniors, care must be taken to avoid privacy violations resulting from obtrusive remote surveillance of such activities as dressing or bathing. Moreover, seniors may feel mistreated if robots are unable to move or bathe them in a sensitive fashion. These and other issues associated with what is widely described as robot ethics will become even more challenging as robots gradually take on a greater measure of ethical autonomy in their operation.

Emerging Technological Developments

In addition to the technologies discussed above, the Internet of Things (IoT) and Big Data will have significant impact on service delivery by public organizations, including those serving seniors. The IoT refers to a world “in which everyday objects such as phones, cars, household appliances, clothes and even food are wirelessly connected to the Internet through smart chips, and can collect and share data” (European Commission, 2012:1). It is envisaged as a world-wide network of machine-to-machine communications connecting anything to anyone at any time and in any place. It is conceptualized by various commentators as either similar to or broader than the concepts of pervasive computing and ubiquitous computing. The IoT “represents an unprecedented opportunity to transform the public sector in terms of how it operates and how it

provides services to constituents” (Cisco, 2014: 11). Not only various home care assistive devices but also robots with the capability to sense, think and/or act are expected to be integrated into the IoT and to fuel innovative initiatives in policy fields like home care for the elderly.

The IoT will be a major driver of the Big Data movement by generating a huge amount of data from many sources. The term Big Data refers to data sets so substantial in their volume, velocity and/or variety that they cannot be effectively collected and analyzed with conventional database software tools. The data are - and increasingly will be - collected through Internet and mobile technologies as well as through a large number of other technologies utilizing sensors, actuators and embeddable chips. The collected data are analyzed through such techniques as machine learning and social network analysis.

Both the IoT and Big Data are tightly tied to cloud computing which can provide storage and reduce the cost of processing and analyzing the data deluge flowing from the IoT. Home care for the elderly is a frequent focus of Big Data discussions, including, for example, the use of wearable sensors to monitor older persons continuously, contact caregivers in the event of abnormal behaviour and feed relevant information to the cloud for analysis. Big Data can also benefit seniors in other areas. The Seoul Metropolitan Government in South Korea is examining the use of leisure and welfare facilities for older adults by analyzing data on “1) commuting population by hour and day analyzed through over ten billion communications statistics; 2) resident population, 3) estimated income, 4) facilities for the elderly, 5) sidewalk and street networks, and 6) working population” (Seoul 2014). Google has announced the creation of a life science startup called Calico to utilize Big Data to generate new ideas to battle aging and its related diseases (Wheatly, 2014).

The IoT and Big Data are also closely connected to the Open Data movement that has prompted governments to make large amounts of data available to the public online in the hope that these data will be exploited to improve the substance and delivery of public policies and programs. The large amount of data generated by these developments offers the prospect, for example, of gaining information and insights on the advisability and costs of migrating seniors to the online channel. These data would inform efforts to personalize services to the needs of individual seniors as well as segmentation efforts, such as those of Service Canada, to tailor services and service channels to the needs of seniors as a population group.

Conclusion

Public administration scholars can learn a great deal from other academic disciplines about government service delivery to seniors. What is missing, however, is research that sets aging within the specific theoretical, conceptual and practical concerns of the field of public administration. For example, one major focus in the field is organization theory and practice which is concerned with government institutions, structures, processes and systems. Since the early 1990s, much attention has been paid to alternative service delivery (ASD), that is, whether government programs should be delivered by government departments, corporations or agencies or by non-governmental entities and, more recently, whether these programs should be delivered through traditional service channels or online.

A major recent emphasis in ASD is collaborative arrangements within and between government departments, between governments, and between the public, private and non-profit sectors. A key objective of these arrangements is to foster service and channel integration and, thereby, cost savings and service quality. To examine the desirability of such integration in the aging sphere, scholars need to know what organizations in what governments are delivering what programs affecting seniors, through what channels the programs are being delivered, and what role is being played by such non-governmental entities as the National Seniors Council and the Canadian Association of Retired Persons. In the federal sphere alone, more than 22 departments and agencies collaborated in developing the *Government of Canada: Action for Seniors* report providing information on programs and services for seniors (Employment and Social Development Canada, 2014).

An account of the many actors - and their relationships - involved in serving seniors would be valuable information for other disciplines conducting research on aging, including, for example, those concerned with health services integration. Yet there has been no Canadian study on the organizational dimension of aging since 1983 (Kernaghan and Kuper). Moreover, the case study methodology has not produced best practice cases on aging as learning tools for either students or public service practitioners. Note also that the discipline of Political Science, which is closely related to public administration, has conducted little research on the political environment in which aging policy is developed and delivered, including the roles of political parties and pressure groups. In 1980, Victor Marshall observed that "one of the greatest lacks in Canadian research on aging is in the general area of political science" (5). This deficiency persists.

In Canada, there is a pressing need for substantially increased research by public administration scholars on the impact of IT on service delivery to seniors. Moreover, the accelerating pace of technological change requires cutting edge rather than "catch-up" research if these scholars are to contribute significantly to cross-disciplinary work in gerontology and inform the policy and program decisions of governments.

About the Author

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