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Seniors Living with Alzheimer's Disease and Dementia: The Promise of App Technology

By

Angelica Lu

An Internship Paper
Submitted to the Faculty of Graduate Studies
through the Department of Political Science
in Partial Fulfillment of the Requirements for
the Degree of Master of Arts
at the University of Windsor

Windsor, Ontario, Canada

2017

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Seniors Living with Alzheimer's Disease and Dementia: The Promise of App Technology

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December 11, 2017

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ABSTRACT

The purpose of this paper considers the potential of seniors with Alzheimer's Disease and dementia using "apps" on Mobile Application Technology that may assist their daily issues. Based on the Ontario 2017 budget, the government's plan to improve health care services by providing additional funding will significantly impact citizens who use these services on a regular basis. Unfortunately, the number of Canadian citizens that will develop Alzheimer's and dementia are projected to double in the next decade. Because of this projection, the Dementia Strategy is meant to assist those affected by the illness as well as ensuring their quality of life is maintained. The research problem looks into alleviating the high demand for health care services through apps, and hopefully, with scientific research, apps can also convey independence and their dignity as seniors going through Alzheimer's Disease and dementia. The design of the study looks into four types of areas: cognitive training, physical training, companionship and daily task reminds. Each area reviews one app that corresponds to each category and the significance it has for seniors with Alzheimer's Disease and dementia. The future of app technology is determined by the ability of the government to conduct scientific research and experts can test app technology on seniors with Alzheimer's disease and dementia.

DEDICATION

This internship paper is dedicated to the memory of my late father who passed away in March 2015 and my late paternal grandfather who passed away in November 2015.

A special feeling of gratitude to my loving mother and sister, whose words of encouragement have helped me throughout the entire master's program.

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Thank you to all the staff at the Alzheimer's Society of Windsor and Essex County for giving me the opportunity to work and understand the relevant issues seniors face today (and future issues they will continue to face). Thank you to Sally Bennett Olczak, CEO of Alzheimer's Society of Windsor and Essex County, and to John Dominato, Director of Finance at Alzheimer's Society of Windsor and Essex County, for mentoring me at such an incredible place. Many thanks go to Larry Duffield, Chair of CARP Chapter 7, who continues to strive to make seniors issues predominant in any social and political aspect (as well as ensuring my time at Alzheimer's Society was an hectic one!)

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CHAPTER 1

INTRODUCTION

As the life expectancy for seniors increases, so does the possibility for the development of illnesses and diseases. For the first time, seniors (65 years and older) are outnumbering the younger population (14 years and younger).¹ Since the aging population continues to increase in size, so do the global demographic changes, and most importantly, the new demands for social and health services. With innovations by the government set in 2017, the new budget efficiently “makes life more affordable” for all Ontarians.² Specifically, the government initiative is to help seniors in Ontario with their financial, physical and mental matters in order to lessen the burden of their daily struggles. One breakthrough in the 2017 budget is strengthening health care by supporting people living with dementia and their caregivers through a \$100 million three-year plan.³ Not only has the government introduced this three-year plan, but most importantly, Bill C-233, an act that implements a national strategy for Alzheimer’s disease and other dementias, as a way to assist those affected by Alzheimer’s and dementia.⁴

If technology enables people to stay healthy as they age, then the demand for health services would have been reduced, since technology can sustain their quality of life. Given that the Government of Ontario anticipates investing in the development of digital skills for seniors in Canada (based on the budget set forth for 2017), the

¹ Minsky, Amy. “Canada ‘woefully unprepared’ to deal with senior population surge, Senate committee hears.” *Global News*, May 30, 2017.

² Government of Ontario, “2017 Budget in Brief: Making life more affordable.” *Ontario.ca*, September 20, 2017.

³ IBID.

⁴ Alzheimer Society, “Canada to Become 30th Country with National Dementia Strategy.” *AlzheimerSocietyBlog.ca*, June 23, 2017.

government recognizes that technology is a significant inclusion which can deliver life-changing assistance for seniors.⁵ However, the older individuals are, the more likely they will develop diseases, such as Alzheimer's Disease (named AD throughout the paper) and dementia, that technology cannot be a prevention or cure to AD and dementia. Perhaps there could be a way to treat the stages of AD through technological advances (i.e., Mobile Application Technology – later defined below) and limit the patient's use of healthcare facilities and thus, decreasing healthcare costs. Is there a possibility that the use of Mobile Technology Application can encourage clients and caregivers to live freely and independently as well as diminishing the demand for health services (i.e., Alzheimer Society services)?

In this paper, I will specifically be considering the idea of Mobile Application Technology being used by patients and their caregivers as a tool to improve those suffering or affected by AD/dementia. This paper also addresses government's role in promoting and funding technology for seniors (suffering from AD and dementia) and their caregivers. The terms "clients" and "patients" are used synonymously within this paper because these individuals are one of the same (individuals suffering from AD/dementia). As clients/patients continue to use apps on their mobile devices, these apps have also merged their use in health services (i.e., iPods as a form of music therapy at Alzheimer's Society). This paper reviews different app technology that can be useful in health services to improve the client's ability to deal with AD/dementia in addition to caregiver duties. I consider the benefit of utilizing apps on mobile smart devices that could connect to the internet and support a vast amount of software apps, as a means of

⁵ Government of Ontario, "Chapter 1 – Skills, Innovation and Middle-Class Jobs." *Budget.gc.ca*, March 22, 2017.

interaction and practicality for clients with AD, dementia, and their caregivers. This paper will be a research proposal incorporation with the 2017 budget for the Government of Ontario which demonstrates that the incorporation of Mobile Application Technology in healthcare services has monetary and social value. Basically, the idea is to look into further research and determine if apps can be beneficial or purely as a mechanism of leisure entertainment.

CHAPTER 2

HISTORY

Dementia is by far the most common symptom of AD and, unfortunately, some dementia patients are slowly but surely increasing at an alarming rate (the distinction between AD and dementia will later be defined below). Dementia is best known for its symptoms such as memory loss, struggling with completing daily tasks, and changes in reasoning, judgement, behaviours, and emotions.⁶ The most disturbing news of AD (and also dementia) is that the effects are irreversible.⁷ Dr. Alois Alzheimer first discovered the disease in 1906.⁸ He described the disease in two parts: “Plaques” and “Tangles” that affects the client’s brain and its function.⁹ “Plaques” are sums of protein termed A-beta, and when those particles amass and stick together, it will, unfortunately, create a toxic reaction that negatively affects brain cells.¹⁰ “Tangles” are fibre clumps of protein named Tau, and those molecules damage and kill brain cells by shrinking parts of the brain region.¹¹ As the brain continues to be affected by AD, the different functions of the brain that controls the variety of abilities and behaviours become impaired.¹² Once the individual loses their capabilities to think, act and behave, the client has difficulty in recovering the lost skill(s).

⁶ Alzheimer Society, *Alzheimer’s disease: What is Alzheimer’s disease?* (Windsor, ON: Alzheimer Society of Canada, [2016]).

⁷ IBID.

⁸ IBID.

⁹ IBID.

¹⁰ IBID.

¹¹ IBID.

¹² IBID.

There are four types of abilities that AD impacts: cognitive and functional abilities, emotions, behaviours and physical abilities. Out of the four effects, cognitive functions are the most traumatizing because Persons with Dementia (PWD), who are clients (later defined below) associated with Alzheimer’s Society will have great difficulty in performing simple tasks.¹³ Their ability to make those decisions will be forgotten, and over time, those clients may not be mentally able to make decisions.¹⁴ “The first cognitive changes often happen a few years before there is a diagnosis of the disease.”¹⁵ Naturally, the decline in cognitive and functional abilities transform a client’s capacity to understand, think, remember and communicate.¹⁶ When it comes to emotions, some individuals appear to lose interest in their most favourite hobbies; others may become less communicative and reserved.¹⁷ However, a client can still feel certain emotions like joy, anger, sadness, and love regardless of how much the disease progresses.¹⁸ The behavioural aspect of clients with AD or dementia will change and develop reactions that seem out of character, such as physical outbursts or repeating the same actions and words.¹⁹ Finally, the client’s physical abilities will alter into a gradual negative decline, and ultimately, the illness will affect their coordination and physical movement.²⁰ All four aspects place tremendous challenges for the PWD, their family members and caregivers because AD is altering the client’s quality of life for the worse.

¹³ IBID.

¹⁴ IBID.

¹⁵ IBID.

¹⁶ IBID.

¹⁷ IBID.

¹⁸ IBID.

¹⁹ IBID.

²⁰ IBID.

The effects of AD are fatal, but it affects each person differently by having one or a combination of symptoms/issues for instance, how clients may think, feel and act.²¹ This disease is a “progressive, degenerative disease of the brain.”²² Unfortunately, specialists in the field have trouble pinpointing “which symptoms will happen, the order in which they appear, or the speed of their progression.”²³ There are clinical trials that try to identify, prevent and treat AD through vaccines, drugs, and lifestyle factors, but, in most cases, these treatments slow down the effects AD rather than slowly eliminating the illness itself.²⁴ As of right now, there is no cure for AD, and there is no treatment that can stop its development.²⁵

²¹ IBID.

²² Alzheimer Society, *Alzheimer’s disease: Dispelling the myths* (Windsor, ON: Alzheimer Society of Canada, [2016]).

²³ Alzheimer Society, *Alzheimer’s disease: What is Alzheimer’s disease?* (Windsor, ON: Alzheimer Society of Canada, [2016]).

²⁴ IBID.

²⁵ Alzheimer Society, *Alzheimer’s disease: What is Alzheimer’s disease?* (Windsor, ON: Alzheimer Society of Canada, [2016]).

CHAPTER 3 DEFINITIONS

Within the Alzheimer's Society organization, a client is an individual who suffers from a type of AD and those individuals may go to this organization to receive help in dealing with the disease. For instance, at the Alzheimer's Society of Windsor and Essex County (ASWE), clients can choose from a variety of programs that can help stimulate the brain and take care of the client when caregivers are away (i.e., for work) or require a break from the client (see Appendix A).²⁶ ASWE has separated its programs into two sections: In-Home Respite Care Program and Volunteer Companion Program (within the clients home), and the other section is the Day Away Program (within the ASWE facility).²⁷ In the academic world, researchers consider clients as "Persons with Dementia" or "Patients with Dementia" (PWD). For the sake of this paper, PWD and clients are used interchangeably because these individuals are going through similar dilemmas and coinciding their symptoms with one another.

Most notably, many individuals use the terms Alzheimer's and dementia interchangeably. However, the two terms are not synonyms, but instead, the two terms have entirely different meanings and treatments. Basically, AD is a specific disease and dementia is a symptom. Dementia is not a specific disease, but it has a variety of different causes and a combination of symptoms including AD.²⁸ When dealing with dementia, one

²⁶ Appendix A

²⁷ Alzheimer Society Windsor and Essex County. "Care Programs for Persons with Dementia (PWD)." Alzheimer.ca. <http://www.alzheimer.ca/en/windsorsex/We-Can-Help/Care-Programs> (accessed October 16, 2017).

²⁸ Alzheimer Society Canada. "What is dementia?." Alzheimer.ca. http://www.alzheimer.ca/en/About-dementia/What-is-dementia?gclid=EAlaIqobChMI___juq-g1wIVFrXACH2c_giSEAAAYyAAEgLT0_D_BwE (accessed November 2, 2017).

must figure out the primary causes (that is triggering Dementia), while AD is the most common cause of dementia since AD is not the only one.²⁹ AD is “the most common form of a large group of disorders known as ‘dementia’... it is a disease of the brain that impacts our short-term, and long-term memory and our thinking ability as more brain cells become damaged and eventually die.”³⁰ In particular, AD is a disease that is irreversible and destroys brain cells “causing thinking ability and memory to deteriorate.”³¹ Dementia, on the other hand, can be caused by Parkinson disease, Lewy Body disease, vitamin deficiencies, thyroid gland problems, chronic brain infections or medication – but most of these underlying causes can be reversible with the right treatment.³² Experts studying AD have found data that shows “current treatment options and lifestyle choices can often significantly slow the progression of the disease.”³³

The stages of AD are known as early, middle, late and end of life.³⁴ The early stage is the “mild” level, the middle stage can be at a “moderate” level, and late to end of life stage is considered the most “severe” level (see Appendix B).³⁵ The disease can develop over the course of seven to ten years, but it can also take much longer in other cases.³⁶ These stages are useful for clients to speak on their symptoms and get a better

²⁹ IBID.

³⁰ Alzheimer Society, *Alzheimer’s disease: What to expect* (Windsor, ON: Alzheimer Society of Canada, [2013]).

³¹ Alzheimer Society Canada. “Alzheimer’s disease.” Alzheimer.ca. <http://www.alzheimer.ca/en/About-dementia/Alzheimer-s-disease> (accessed November 2, 2017).

³² Alzheimer Society Canada. “What is dementia?.” Alzheimer.ca. http://www.alzheimer.ca/en/About-dementia/What-is-dementia?gclid=EAlaIqobChMI___juq-g1wIVFrXACH2c_giSEAAyAAEgLT0_D_BwE (accessed November 2, 2017).

³³ Alzheimer Society, *Alzheimer’s disease: What to expect* (Windsor, ON: Alzheimer Society of Canada, [2013]).

³⁴ IBID.

³⁵ Appendix B.

³⁶ Alzheimer Society, *Alzheimer’s disease: What to expect* (Windsor, ON: Alzheimer Society of Canada, [2013]).

idea what may occur during one of the four stages, but unfortunately, the timeframe varies from each patients and the symptoms they face may overlap because the progression of each stage is usually quite subtle and unnoticeable.³⁷ A client in the early stage of AD will realize they have memory loss because they recognize day-to-day tasks become challenging.³⁸ For the most part, however, these individuals will still be able to retain their many abilities since the consequences of this illness have not fully taken effect.³⁹ In the early stage, clients can take advantage of educating themselves about the warning signs, and they can take medications that slow down the later stages of AD. By the time the client reaches the middle stage of AD, there will be a variety of abilities lost. Unfortunately, their memory and thinking abilities deteriorate and those abilities will disappear.⁴⁰ In the late stage, all the caregiver can do for the client is to guarantee that the client receives the highest quality of life, physically and mentally.⁴¹ Although the client “may not have the capacity to understand or respond as in the past, they are still likely to feel affection and benefit from reassurance.”⁴²

As the illness progresses, those with AD and dementia require a “caregiver.” A caregiver is a person, family member or friend, who assists a client with AD or a PWD. Being a caregiver is by far one of the most difficult tasks when dealing with AD since they are unable to grasp how AD can fully affect the client. Not only that, most caregivers have difficulty in managing and taking care of the client because caregivers

³⁷ IBID.

³⁸ IBID.

³⁹ IBID.

⁴⁰ IBID.

⁴¹ IBID.

⁴² IBID.

can also feel frustrated and overwhelmed when clients with Alzheimer's/dementia require 24/7 care.⁴³ Providing care for loved ones with AD takes an incredible toll on the caregivers physical and emotional health, and often caregivers do not recognize the warning signs and deny the effects that caregiver duties may have a negative impact on their health.⁴⁴ Many caregivers tend to set their own needs aside while caring for the person with AD and hope that their stress might just go away – in reality, the more those caregivers ignore the warning signs, the worse they will feel.⁴⁵ Caregivers, just like clients, also need to care for themselves to fulfil their caregiver duties positively. When the need of the caregiver is taken care of, then the person in their care will also benefit.⁴⁶ Caregivers are often that “special friend or confidante, a spouse or partner, parent or even a lifelong pal.”⁴⁷ Caregivers should provide a sense of belonging or companionship so that clients do not feel lonely or isolated – so, caregivers require space from their caregiver duties.

A Personal Support Worker (PSW) are similar to caregivers, but PSWs also provide additional care performed by health care professionals.⁴⁸ Basically, PSWs are professional health workers that are distinct from other health care providers (i.e., nurses and physiotherapists), and they act has a hybrid between health care providers and

⁴³ Alzheimer Society, *Alzheimer's disease: First steps for families* (Windsor, ON: Alzheimer Society of Canada, [2012]).

⁴⁴ Alzheimer Society Canada. “Self care for the caregiver.” Alzheimer.ca. <http://www.alzheimer.ca/en/Living-with-dementia/Caring-for-someone/Self-care-for-the-caregiver> (accessed November 2, 2017).

⁴⁵ IBID.

⁴⁶ IBID.

⁴⁷ IBID.

⁴⁸ Saari, Margaret, Erin Patterson, Tieghan Killackey, Julia Raffaghello, Alissa Rowe & Ann E Tourangeau. “Home-Based care: barriers and facilitators to expanded personal support worker roles in Ontario, Canada.” *Home Health Care Services Quarterly* (2017): 2.

caregivers. The main responsibility of all PSWs provides a supportive care system centered around clients who are unable to take care of themselves, at various levels of health and well-being within a variety of care environments (i.e., long-term care, community or hospital care settings).⁴⁹ In Ontario as of right now, home care services can be retrieved through 14 Local Health Integration Networks (LHINs).⁵⁰ At the LHIN, individuals provide some “specialized direct patient care such as case management, mental health nursing, and hospital-to-home transition support,” however, the majority of their services are direct patient care which is contracted to homecare service provider organizations.⁵¹ Then these homecare service provider organizations seek to employ PSWs to provide the specific niche patient care in specific geographic areas.⁵² Due to the increased demand to accommodate professional services and to decrease healthcare costs, a few activities traditionally done by healthcare providers are shifted to PSWs.⁵³

Mobile Application Technology are platforms (i.e., laptop, tablet, cell phone, Fitbit, apple watch) that can offer high advance capabilities that can go beyond a “normal” mobile phone, and function as a Personal Computer (PC). These platforms also can download “apps” (an abbreviation of “application”), software that can run on a web browser or offline on electronic devices.⁵⁴ Apps have three different types: desktop, mobile, and web, specifically, desktop apps are comprised of complex programs (normally for those who are tech savvy), mobile apps are simpler and easier to use, and

⁴⁹ IBID.

⁵⁰ IBID.3.

⁵¹ IBID.

⁵² IBID.

⁵³ IBID.

⁵⁴ Karch, Marziah. “A Beginner’s Guide to Apps.” Lifewire.com. <https://www.lifewire.com/what-are-apps-1616114> (accessed November 8, 2017).

web apps require internet access that can track the user's history.⁵⁵ As well, this technology would have special features that would help patients and caregivers. Some of these features should include (or a combination) of: short messaging service (SMS), multimedia messaging (MMS), personal organizer, user-friendly touch screen, keyboard, camera, video recorder, software for music, Global Positioning System (GPS) hardware/software, and ability to read and edit documents through a variety of formats. These types of features offered in Mobile Application Technology can help clients (and caregivers) to manage their whole healthcare administration, their daily tasks, and emergency situations. For instance, the device could serve as a “personal digital assistant,” which trigger constant reminders set forth by patients, caregivers or healthcare administration staff (i.e., PSWs).⁵⁶ In dire situations, authorities can track clients (assuming they have the technology on them) through the GPS feature, and locate those individuals in case that dementia clients open the front door, leave, and go missing. The objectives of this technology should provide:

- (1) relevant cues and prompts,
- (2) understandable to the client with dementia,
- (3) easily programmed by third parties (i.e., caregivers/PSWs), and
- (4) modifiable at short notice.⁵⁷

⁵⁵ IBID.

⁵⁶ Armstrong, Nicola, Chris Nugent, George Moore, and Dewar Finlay. "Using smartphones to address the needs of persons with Alzheimer's disease." *Annals of Telecommunications-Annales Des Télécommunications* 65, no. 9-10 (2010): 490.

⁵⁷ IBID.

CHAPTER 4
ALZHEIMER'S SOCIETY OF WINDSOR AND ESSEX COUNTY
PROGRAMS/SERVICES

This paper has examined some of the programs offered at ASWE as a facility which deals with seniors suffering from AD and dementia. This section demonstrates that ASWE can be a good example as one organization that can receive additional funding for incorporating app technology. With further research, non-profit organizations like ASWE, can become a stepping stone for hospitals and health clinics by incorporating apps (with the use of Mobile Application Technology) into their programs similar to those conducted in ASWE. At ASWE, PSWs are known as Client Support Staff (CSS), they are the individuals that aid clients with personal care and daily living when needed within ASWE programs. The ASWE programs have divided its services into three categories: In-Home Respite Care, Day Away and Volunteer Companion Program. The In-Home Respite Care Program provides “temporary in-home relief to the primary caregiver” because this break allows the caregiver to pursue personal activities with the reassurance that the CSS/PSW is looking after the client professionally.⁵⁸ The Day Away program, on the other hand, is held at the ASWE facility, and CSS provide their trained skills at one location with other clients in similar situations.⁵⁹ At the Day Away program, it is meant to be a ‘home away from home’ type of environment, featuring a kitchen, a living room area, garden, and even transportation (when requested). The last program offered is the Volunteer Companion Program which allows individuals (i.e., students with

⁵⁸ Alzheimer Society Windsor-Essex County. “In-Home Respite Services.” Alzheimer.ca. <http://www.alzheimer.ca/en/windsor-essex/We-Can-Help/Care-Programs/In-Home%20Respite%20Services> (accessed November 2, 2017).

⁵⁹ Alzheimer Society Windsor-Essex County. “Day Away Program.” Alzheimer.ca. <http://www.alzheimer.ca/en/windsor-essex/We-Can-Help/Care-Programs/Day%20Away%20Program> (accessed November 6, 2017).

training to become PSWs) to practice their professional skills on clients who require companionship, socialization, and supervision in the comfort of their own home.⁶⁰ ASWE provides the first initial steps for the volunteer and client to go through an orientation process and analyzes the best candidates for each client needs and interests. Without a doubt, ASWE will maintain communication with the client and volunteers, regarding police records, reference checks, and monitoring.⁶¹

With ASWE programs in place, there are a few gaps which fail to assist seniors with AD or dementia. Particularly, the issue of an increasing amount of clients seeking to participate in ASWE programs as well as a lack of having enough PSWs, CSS staff or volunteers to occupy these programs in the first place. The Mobile Application Technology can fill in the gap by addressing the demand of PSWs through government initiatives. Hopefully, as this type of technology continues to advance, any client, PSW, or health care professions can naturally incorporate and use Mobile Application Technology into their daily activities. The primary purpose of these programs is to assist clients, caregivers and the volunteers using ASWE resources to enhance their skills and knowledge in the hopes that those individuals can improve their ability to handle AD and dementia.

⁶⁰ Alzheimer Society Windsor-Essex County. "Volunteer Companion Program." Alzheimer.ca. <http://www.alzheimer.ca/en/windsor-essex/We-Can-Help/Care-Programs/VCP> (accessed November 6, 2017).

⁶¹ IBID.

CHAPTER 5

LITERATURES ON TECHNOLOGICAL USE THUS FAR

When it comes to dementia, clients continue to be affected by their loss of memory, behaviour and cognitive abilities. Most evidently, clients slowly lose their sense of self and identity as dementia continues to deteriorate their physical and mental functionality. Not only that, the caregivers who are taking care of the clients are very likely to develop stress and burdens from their caregiving duties. So, technology can be utilized by clients, caregivers and perhaps health care officials to address cognitive issues (of dementia) and quality of life for people diagnosed with AD/dementia through technology. This technology includes any smart mobile devices (i.e., laptops, tablets, cell phones, Apple Watch, Fitbit, and so forth) that can use apps (i.e., Luminosity, Calendar app, Reminder app, companion apps, etc.) on their device. These innovative devices are subsequently easy to use, well-known, and the apps downloaded into those devices can assist dementia patients by stimulating cognitive abilities.⁶²

Smart device technology, these days, can perform several technological purposes, including connectivity with other devices (for communication), the ability to take high-resolution photographs and provide full internet access.⁶³ In theory, technology with apps will provide the necessary aspects that a caregiver or healthcare professional may not be able to monitor 24/7. To be specific, apps can provide memory aid, reminiscence,

⁶² Coppola, Jean F., Marc A. Kowtko, Christina Yamagata, and Shannon Joyce. "Applying Mobile Application Development to Help Dementia and Alzheimer Patients." *Wilson Center for Social Entrepreneurship* (2013): 1.

⁶³ Armstrong, N., C. D. Nugent, G. Moore, and D. D. Finlay. "Developing smartphone applications for people with Alzheimer's disease." *Information Technology and Applications in Biomedicine (ITAB)*, (2010): 1.

exercise diary, patient locators, medication reminders, activity monitoring, social networking, and personal organizer.⁶⁴ The literature has separated technological functions into four different aspects:

- the ability for the client to complete tasks on their own,
- provide mobile technological devices to clients and caregivers,
- have resources available in one site/content, and
- provide these Alzheimer services at a quick pace to those who require it.

Academics are hopeful that advanced technology can help minimize the ongoing demand by clients who deal with dementia/Alzheimer's (on a daily basis), but, technology has a long way to go. To this day, apps must provide a way "to help patients remember, maintain social contact, perform daily life activities and enhance their feelings of safety."⁶⁵ The idea is to help clients continue to live independently on their own without the requirement of a caregiver or PSW. Mobile Technological Devices with downloaded apps can create long-term solutions for dementia and AD (later shown below). The critical areas considered are the client's needs (i.e., companionship, memory), the ability to train clients efficiently and effectively as well as providing the necessary services to both clients and health officials.

One other factor to consider is "caregiver burden," since the next individual to deal with the client is the person closest (aside from health officials like doctors and PSWs). Caregivers provide the client "basic and instrumental activities of daily living

⁶⁴ Armstrong, Nicola, Chris Nugent, George Moore, and Dewar Finlay. "Using smartphones to address the needs of persons with Alzheimer's disease." *Annals of Telecommunications-Annales Des Télécommunications* 65, no. 9-10 (2010): 493.

⁶⁵ *IBID*, 485.

and medical support” as well as the emotional support and comfort.⁶⁶ The caregiver burden is increased when the caregiver is a spouse because they are expected to live with the client, and thus, they must take over the caregiving role.⁶⁷ Spousal caregivers also are not aware of the impact that caregiving will have on their lives, and they become more vulnerable because spouses tend to be older and associated with morbidities.⁶⁸ The literature acknowledges the need to recognize that caregivers, along with the clients they are caring for, also require some support from health care professionals in case those caregivers are unable to mentally or physically take care of the client. Technology can assist caregivers by providing them with new solutions to mediate the emotional and physical aspects of the brain of the client. For instance, the simplicity of the tablet and its touchscreen feature can be ‘user-friendly’ to even the most inexperienced and elderly users.⁶⁹

Technology can be the factor that fills in the gap between clients, caregivers, and healthcare physicians as a form of communication, improvement in the quality of life, and possibly the decrease of costs in health services. The government ought to fund developers aiming to create an app with personalized features targeting each specific dementia patient or the government of the day could provide an initial website where caregivers or clients can access the necessary resources and apps that are proven to help stimulate the brain. The hypothesis regarding the usability of mobile apps is that clients

⁶⁶ Adelman, Ronald D., Lyubov L. Tmanova, Diana Delgado, Sarah Dion, and Mark S. Lachs. "Caregiver burden: a clinical review." *Jama* 311, no. 10 (2014): 1053.

⁶⁷ IBID, 1053.

⁶⁸ IBID.

⁶⁹ Coppola, Jean F., Marc A. Kowtko, Christina Yamagata, and Shannon Joyce. "Applying Mobile Application Development to Help Dementia and Alzheimer Patients." *Wilson Center for Social Entrepreneurship* (2013): 3.

will continuously keep their brain moving (through games, puzzles, etc.) and trigger memories from music and photos from their past.⁷⁰ So long as the mobile technology device the client is using is user-friendly, they will become easily familiar with the technology, and this familiarity will decrease the chances of the client becoming irritated easily with the app and abandoning the device overall. Given that clients are properly using the technology and the app properly, their cognitive and communicational abilities should slightly improve their capacity on dealing with dementia because clients may be able to relieve the caregiver burden and remain independent within the comfort of their own home.⁷¹ The hope is to ensure that the client's unmet needs are through a developed system which the government can hopefully implement through health care services (such as Alzheimer's Society).

These pieces of literature show that apps are helpful for health services based on the effectiveness they have on clients, caregivers and possibly their health care professions through the apps' popularity (and reviews/downloads) and how much money the government could save based on statistics compiled by third parties and the Ontario Government. However, some questions must be answered within this paper when considering the future of technology and dementia/Alzheimer's. As technology continues to advance, the government ought to recognize that they are the key to providing the necessary updates and access to new and improved services offered through apps. Without their role in maintaining the appropriate and essential apps, the government has

⁷⁰ IBID, 5.

⁷¹ Armstrong, Nicola, Chris Nugent, George Moore, and Dewar Finlay. "Using smartphones to address the needs of persons with Alzheimer's disease." *Annals of Telecommunications-Annales Des Télécommunications* 65, no. 9-10 (2010): 493.

left it up to the labour market to determine what clients “need” to deal with dementia/Alzheimer’s. In other words, the government should be the central leading player in regulating the development of dementia-related apps so that clients feel prepared and aware of the possible resources that they can use, should the disease worsen.

If the labour market is left to their own devices, the apps that are endorsed, by those controlling the market, could be filled with deceptions and lies so that major corporations can gain profit from uninformed seniors suffering from AD and dementia (i.e., discussed below when dealing with the “Luminosity” app). There needs to be additional considerations and research conducted by government officials who will ensure that app technology aimed at PWD and AD patients are useful or simply designed for relaxation. Not only that, dementia and Alzheimer’s clients face the reality that the available resources offered today will be strained and the possibility of treatment may take much longer.⁷² With any luck, technology is a possible long-term solution that can provide the necessary attention for clients, affect their physical activity, and reduce any aggression and confusion clients face on a daily basis.⁷³ With this literature, I will argue that technology (with the help of the government’s role in implementing apps in health services) is a vital game-changer in treating dementia and Alzheimer’s for all clients diagnosed with the disease.

⁷² Coppola, Jean F., Marc A. Kowtko, Christina Yamagata, and Shannon Joyce. "Applying Mobile Application Development to Help Dementia and Alzheimer Patients." *Wilson Center for Social Entrepreneurship* (2013): 2.

⁷³ IBID.

CHAPTER 6

METHODOLOGY

I will use a variety of data to research the positive effects that Mobile Application Technology have on PWD, caregivers and possibly PSWs and healthcare officials. First and foremost, the academic literature above discussed the possibility of better-integrating technology into the use of health services. Not only will it assist the overall service, but it will improve the quality of life for many clients and caregivers alike. I will provide relevant data that dementia-related apps are efficient by reviewing the number of individuals who downloaded these apps on Mobile Application Technology. Based on the Android Play Store and online websites (i.e., Google Chrome sites) as a reference, I will use these resources as an example of Mobile Application Technology effectiveness (as part of my research proposal). The government should research the usefulness of app technology to determine its advantages for PWD and seniors with AD. I found that there are four types of areas that Mobile Application Technology can promote:

- (1) cognitive training,
- (2) physical training,
- (3) companionship and
- (4) daily tasks reminders.

As well, the term “training” means the use of apps for cognitive or physical abilities amongst seniors with AD and dementia. This research proposal will also reflect on the monetary and social benefits that can help decrease health care costs. Aside from considering a variety of apps within app stores, I will consider statistics which the Government of Ontario outlined in its 2017 budget, as well as background data from citizens who found these apps useful (based on news articles). Mobile Application Technology can provide a health care service in the household without the requirement of

the client leaving the comfort of their home. The way the Government of Ontario advertises Mobile Application Technology is also a significant factor that puts a positive spin on new innovative downloadable apps because clients and caregivers need to be aware that such a resource exists as well as the possibility to be trained appropriately. Caregivers benefit from the improvement of technological advances because they are often under-represented in the digital health market.⁷⁴ For instance, caregivers can see test results and other medical records for those they are caring for; “and being able to use apps that can link to reliable medical sources, allowing the caregiver to read up on different medical conditions.”⁷⁵ Thankfully, with the new 2017 budget in place, the Government of Ontario is acting in refining and improving citizens’ lives. Specifically, this budget affects health care services and how these services affect the public. Many health care services can receive additional funding so long as they can incorporate Mobile Application Technology into their programs (i.e., ASWE incorporating music on iPods with the music app). The idea is that the new budget can be used to incorporate additional funding that can improve the overall program and for their targeted audience (i.e., PWD). I will use data from the Government of Ontario websites that will demonstrate the monetary benefits and news articles that show social advantages Mobile Application Technology will have for the increasing number of Ontario seniors (within the Research Proposal).

⁷⁴ Sandle, Tim. “Seniors beginning to realize digital health benefits.” Digitaljournal.com. <http://www.digitaljournal.com/life/health/seniors-beginning-to-realize-digital-health-benefits/article/499535> (accessed November 17).

⁷⁵ IBID.

CHAPTER 7

RESEARCH PROPOSAL

Today, the Government of Ontario identifies that Ontarians need a significant change to meet the demand of increasing health care services. “The 2017 Budget will help strengthen Ontario's economy by investing in people, communities and businesses across the province.”⁷⁶ Specifically, the government is expanding funding within health care in the hopes of reducing wait times, improve access to care and enhance the experience as well as the recovery for many citizens.⁷⁷ Ontario’s achievement in a fully-funded Dementia Strategy is a great example of the Ontario government taking action once research was conducted by organizations like ASWE, and those organizations found concrete evidence on the increasing amount of seniors that will develop dementia over the next decade.⁷⁸ The strategy is meant to help patients, and their caregivers find and access the appropriate resources that will enhance their care as well as “improve training and education in dementia care for personal support workers, physicians, nurses and other front-line workers.”⁷⁹ The Ministry of Health and Long-Term Care estimates that 214,000 Ontarians live with dementia, and the number is expected to rise by 2038 with over 430,000 individuals diagnosed with dementia.⁸⁰ So, these implementation targets set in 2017 demonstrates that not only will clients and caregivers be affected by this budget, but

⁷⁶ Government of Ontario. “Province Passes Balanced Budget to Support a Stronger, Healthier Ontario.” News.ontario.ca. <https://news.ontario.ca/mof/en/2017/05/province-passes-balanced-budget-to-support-a-stronger-healthier-ontario.html> (accessed November 7, 2017).

⁷⁷ IBID.

⁷⁸ Alzheimer Society Ontario. “Ontario Dementia Strategy.” Alzheimer.ca. <http://www.alzheimer.ca/en/on/Get-involved/Advocacy/Ontario/Ontario-dementia-strategy> (accessed November 7, 2017).

⁷⁹ Sousa, Charles. “Chapter II: Helping You and Your Family,” in *2017 Ontario Budget: A Stronger, Healthier Ontario* (Toronto: Queen’s Printer for Ontario, 2017), 37.

⁸⁰ Ontario Ministries of Health and Long-Term Care and Education. “Developing Ontario’s Dementia Strategy: A Discussion Paper.” Government of Ontario (2016): 15.

also the incorporation of technology moving forward. For instance, the newest learning opportunity, “Ontario’s Lifelong Learning and Skills Plan,” that will assist Canadians with literacy, numeracy and digital skills vital to being able to adapt and thrive in today’s changing society.⁸¹

A survey conducted by TELUS Health has verified that Canadian seniors, out of any population group, are most likely to benefit from digital technology.⁸² TELUS Health, one of the many different sectors within the TELUS phone company, is meant to conduct studies and inform their consumers on the impact on transforming healthcare into better health results.⁸³ The survey focused on baby boomers (52 years of age and older) and the elderly (over 71 years of age), and the survey reviewed the likelihood of these age groups utilizing technology.⁸⁴ One highlight from the survey was that “78% of Canadians in the baby boomer (52+) and greatest generation (age 71+) categories reported they were the most likely to access a healthcare provider.”⁸⁵ This finding is related to using Mobile Application Technology since this result is targeted towards seniors, and hence, seniors who also suffer from AD and dementia. If this study found that seniors are accepting of new technology and they also acknowledge its positive influence on seniors as a whole, then, PWD and AD patients would also agree that Mobile Application Technology will have a positively help them deal with their illnesses. Overall, the findings show that there is a significant need for technological advances with

⁸¹ Sousa, Charles. “Chapter III: Creating Opportunities and Security,” in *2017 Ontario Budget: A Stronger, Healthier Ontario* (Toronto: Queen’s Printer for Ontario, 2017), 57.

⁸² Yetman, Jill. “Survey: Older Canadians most likely to benefit from digital health technology; least likely to adopt it.” Marketwired.com. <http://www.marketwired.com/press-release/survey-older-canadians-most-likely-benefit-from-digital-health-technology-least-likely-2227526.htm> (accessed November 17).

⁸³ IBID.

⁸⁴ IBID.

⁸⁵ IBID.

seniors, and unfortunately, this need presents challenges to technology creators because the creators want to ensure that the products they are producing are suitable and marketed appropriately.⁸⁶ Businesses are known to market their products and endorse those products (i.e., hands-on demos in clinics and shopping malls), so that those who are unaware of the technology (i.e., no internet or cable) can physically be able to understand how the technology runs.⁸⁷ Not only should citizens be educated about the impact technology has on health outcomes, but also to ensure that citizens are “maximizing the opportunity to put these digital health tools in place.”⁸⁸

So, the Ontario government can integrate Mobile Application Technology through the Learning and Skills Plan by using downloadable apps to handle AD stages.

Technology is one of the solutions that can fill in the many gaps that seniors are dealing with these days. One way is teaching caregivers (often adult learners who are close to retirement) the necessary know-how to access the best services for treating their loved ones. The main issue is whether seniors can use Mobile Application Technology properly and they can update and download the necessary apps associated with the technology. With the 2017 budget, the Ontario government can ensure that seniors have a pinpoint location that can address any technological issue (i.e., ask their caregivers, PSW or health care officials through apps). Mostly, the government continues to demonstrate strong fiscal management that an increased spending budget can (hopefully) cover for unexpected changes in economic conditions and program demands (see Appendix C).⁸⁹

⁸⁶ IBID.

⁸⁷ Sandle, Tim. “Seniors beginning to realize digital health benefits.” Digitaljournal.com. <http://www.digitaljournal.com/life/health/seniors-beginning-to-realize-digital-health-benefits/article/499535> (accessed November 17).

⁸⁸ IBID.

⁸⁹ Appendix C.

The unique factor of this new budget is the possibility of saving money the more the Ontario government is required to spend and ensure the quality of life (see Appendix D).⁹⁰ Based on the Ten-Year Review (conducted by the Government of Ontario), Ontario expenses have approximately increased by \$28 million, so, with newer and advanced technology, these expenses should reduce these costs (see Appendix F).⁹¹

Mobile Application Technology continues to adapt and improve in treating AD and dementia. These technological devices should bridge the digital divide between youths and seniors. Youths make up a significant portion of technological users since younger generations are using smartphone technology, tablets as well as accessing all types of apps and internet servers. However, seniors do not take full advantage of newer advanced technology. Most AD and dementia patients are in their senior years, and so, apps must be user-friendly to avoid frustration and difficulties from using these downloadable apps on Mobile Application Technology. There are many different downloadable apps, new apps being created and downloaded every day through Mobile Application Technology. With so many kinds of apps, the most difficult challenge (aside from adequately using these apps), is determining which app is the best downloadable app that suits the needs of PWD and AD patient. These apps are in no way a cure for AD or dementia-related illnesses, but apps aim to improve the client's performance on simple tasks. As mentioned above, I will focus on four types of areas that Mobile Application Technology can promote:

- (1) cognitive training,
- (2) physical training,
- (3) companionship and

⁹⁰ Appendix D.

⁹¹ Appendix F.

(4) daily tasks reminders.

Cognitive Training

Cognitive training is meant to enhance, rehabilitate and most importantly maintain as much of the clients' brain functions as possible.⁹² One of the best apps known to train cognitive abilities is "Lumosity". Lumosity is accessed through a downloadable app (for a specific sector of Mobile Application Technology, for instance, accessing the Android Play Store on smartphones and gaining access to the internet on tablets) as well as logging on through a computer desktop or laptop connected through Wi-Fi, Internet or data. As of right now, over 10 million Lumosity apps were downloaded by users from the Android Play Store (see Appendix L).⁹³ The number of downloads demonstrates that many users believe that the app has accomplished its goal to stimulate the mind. Lumosity is a cognitive training program with a variety of 52 games.⁹⁴ To play Lumosity, users (who downloaded and created an account) will log in the Lumosity website/app, and those individuals follow a personalized training program or sequence to play the games. Each game is a 2D visual game, designed to train cognitive skills.

The Lumosity game "involves only pointing and clicking, the games challenge players to perform speeded object or pattern recognition, attend to multiple objects simultaneously, associate and memorize visual and verbal information, and identify the hidden and changing rules in object sorting or sequencing."⁹⁵ The highlight of this app

⁹² Rabipour, Sheida, and Patrick S.R. Davidson. "Do you believe in brain training? A questionnaire about expectations of computerised cognitive training." *Behavioural Brain Research* (2015): 64.

⁹³ Appendix L.

⁹⁴ Shute, Valerie J., Matthew Ventura and Fengfeng Ke. "The power of play: The effects of Portal 2 and Lumosity on cognitive and noncognitive skills." *Computers & Education* (2015): 59.

⁹⁵ *IBID*, 60.

allows its users some insight into what areas require the most attention (i.e., speed, attention to detail and memory). The attraction and appeal of the Lumosity software is that it could easily appeal to both children and adults (with its child-like games where the programming of each category is filled with instructions on how to play, along with colourful backgrounds and characters), not to mention its free trial feature which users can test, and check if the games are easy to grasp. For many clients, when they play these app games, it helps their ability to remember and challenges themselves, along with keeping clients occupied when they feel bored or lonely.

Unfortunately, Lumosity has come under criticism because it misled consumers about its cognitive advantages of its online apps and programs.⁹⁶ The U.S. Federal Trade Commission, in 2016, ruled that the developer of Lumosity pay \$2 million to settle a deceptive advertising campaign.⁹⁷ A small study was conducted by the Federal Trade Commission, researchers found no significant improvement on tests of memory, reasoning, concentration and planning.⁹⁸ The issue was the fact that the Lumosity was marketed incorrectly (by developers of the app) and the marketing scheme prey on consumers' fears about cognitive decline, memory loss, dementia and Alzheimer's because the developers wanted to generate momentum and awareness with 'false' evidence.⁹⁹ Because of the false science that was marketed in its ads, the developers swayed the public into believing that their braining training will improve consumers everyday life. Therefore, these accusations raise questions about the value of government

⁹⁶ The Associated Press. "Lumosity to refund \$2M for unproven 'brain training' apps in U.S." CBC.ca. <http://www.cbc.ca/news/health/lumosity-ftc-1.3390544> (accessed December 9, 2017).

⁹⁷ IBID.

⁹⁸ IBID.

⁹⁹ IBID

funding of this program since the developers failed to prove they can prevent cognitive decline. If the government is involved in regulating the Lumosity app, the government would instead boost on testing their cognitive abilities and perhaps, using this app to detect the start of a patient's decline in their cognitive abilities without patients having to go to health clinics (and using via video chat to speak to their healthcare professionals). With additional research, the government can ensure that the marketing of this app will not run under false pretenses as well as finding a way where apps can possibly help improve cognitive abilities in the future.

Physical Training

Physical training affects seniors maintaining their independence. "Personal services are increasingly managed online, including tasks such as filing taxes, accessing investment statements and renewing library books and drug prescriptions."¹⁰⁰ However, many seniors face unique barriers, from the physical challenges to a lack of familiarity with technology.¹⁰¹ Many seniors are not confident in their own ability to learn about and correctly use Mobile Application Technology. For instance, an American study (conducted by Pew Research Center in 2015) found that three-quarters of American seniors are more likely to ask others to show them how to use new devices or set up the new device (see Appendix H).¹⁰² If those seniors have a disability, they should be aware

¹⁰⁰ Eligh, Blake. "Helping seniors feel safer online: new research from University of Toronto." Utoronto.ca. <https://www.utoronto.ca/news/helping-seniors-feel-safer-online-new-research-university-toronto> (accessed November 8, 2017).

¹⁰¹ Anderson, Monica and Andrew Perrin. "2. Barriers to adoption and attitudes towards technology." Pewinternet.org. <http://www.pewinternet.org/2017/05/17/barriers-to-adoption-and-attitudes-towards-technology/> (accessed November 9, 2017).

¹⁰² Appendix H.

that there is the ability to use a variety of technology.¹⁰³ Those who are 80+ and higher have a much harder time in using Mobile Application Technology compared to those who are in their 60s and 70s (see Appendix K).¹⁰⁴

Based on Statistics Canada data, at least five million Canadian users were 65 or older in 2011, and this number is expected to double by 2036.¹⁰⁵ With this number increasing, seniors can attempt to understand the use of this technology, specifically by using this technology several times a day. Most seniors would then incorporate the internet as “a standard part of their daily routine.”¹⁰⁶ Seniors using technology “are embracing computers, smartphones, tablets and other devices as they seek to manage their physical health better – or even just keep their mental wits about them.”¹⁰⁷ For instance, the creation of the Fitbit (fitness bracelet), counts the number of steps one takes and tracks sleep patterns of the person wearing the bracelet. Just this year, the Federal Government endorsed the Carrot Reward smartphone app which tracks users’ steps and offers quizzes and tips on topics of healthy living.¹⁰⁸ The amount of steps users take, the more points users will receive through the Carrot reward program of their choice (i.e.,

¹⁰³ Anderson, Monica and Andrew Perrin. “2. Barriers to adoption and attitudes towards technology.” Pewinternet.org. <http://www.pewinternet.org/2017/05/17/barriers-to-adoption-and-attitudes-towards-technology/> (accessed November 9, 2017).

¹⁰⁴ Appendix K.

¹⁰⁵ Dunn, Bryen. “Technology helps seniors take control of their health.” Theglobeandmail.com. <https://beta.theglobeandmail.com/life/technology-helps-seniors-take-control-of-their-health/article23640599/?ref=http://www.theglobeandmail.com&> (accessed November 9, 2017).

¹⁰⁶ Anderson, Monica and Andrew Perrin. “2. Barriers to adoption and attitudes towards technology.” Pewinternet.org. <http://www.pewinternet.org/2017/05/17/barriers-to-adoption-and-attitudes-towards-technology/> (accessed November 9, 2017).

¹⁰⁷ Dunn, Bryen. “Technology helps seniors take control of their health.” Theglobeandmail.com. <https://beta.theglobeandmail.com/life/technology-helps-seniors-take-control-of-their-health/article23640599/?ref=http://www.theglobeandmail.com&> (accessed November 9, 2017).

¹⁰⁸ Cross, Jessica Smith. “Ontario government spending \$1.5M on Carrot Rewards wellness app.” Globalnews.ca. <https://globalnews.ca/news/3579480/ontario-government-spending-1-5m-on-carrot-rewards-wellness-app/> (accessed November 15, 2017).

Aeroplan, Petro-Points, Cineplex's Scene Points).¹⁰⁹ With over 100,000 apps being downloaded by a variety of users, this app verifies that citizens are using the Carrot Rewards app to make healthy choices (see Appendix M).¹¹⁰ The trend of engaging seniors with the use of technology will create a butterfly effect because of its ease of use. The assistance provided by technology can improve senior mobility because they could become increasingly fit and healthy.

Compared to the Lumosity app, the Carrot rewards app is endorsed by the federal government and came to light when it was first released in British Columbia in March 2016 with more than 4,000 users in its first week.¹¹¹ Aside from tracking steps, the Carrot rewards app would give users information and suggestions on small daily habits that they can adapt and change over time.¹¹² The federal government recognizes that it should start using incentives to motivate (positive) behaviours proves to be much cheaper than using advertising because users are actively choosing to stay active and earn points unlike Lumosity that used its marketing tactic that instilled fear amongst its users. Since the Carrot rewards app can connect with other Mobile Application Technology, Carrot participants walked more often so that they could receive bonus points on their loyalty programs (i.e., 8% of citizens in B.C. increased their daily step count to stay healthy and receive points for it).¹¹³ In Ontario alone, over 325,000 users downloaded the app in February because of its high success and popularity amongst tech savvy consumers; hence, seniors with AD and dementia could benefit with its monetary incentives by

¹⁰⁹ IBID.

¹¹⁰ Appendix M.

¹¹¹ The Globe and Mail. "Carrot Rewards nudge users toward healthy, wealthy habits

¹¹² IBID.

¹¹³ IBID.

simply reaching their daily step count goal (which is set up through the Carrot rewards app).

Companionship

Apps related to companionship have significant effects on social isolation amongst seniors with AD and dementia. The best known social media that seniors use is Facebook. With over 1 billion users downloading Facebook on their Mobile Application Technology, social media serves as a ‘virtual’ companion for seniors especially when seniors speak with loved ones via online (see Appendix N).¹¹⁴ Based on the Statistics Canada data from 2014, Canadian seniors are using social networking sites to connect with friends, family, and acquaintances.¹¹⁵ In America alone, 34% ages 65 and up use social media sites (see Appendix G).¹¹⁶ At least 36% of Facebook users are about 65+ years old, and this number is increasing.¹¹⁷

Seniors use social media to stay connected with loved ones without leaving their home as well as contacting them with the tip of their fingers. Therefore, seniors could use social media (linked to apps on their Mobile Application Technology) to express themselves through specialized features like using status updates or photos. Once online, many seniors engage significantly with online activities and content.¹¹⁸ Most profoundly, older adults use the internet because seniors no longer have other commitments (i.e.,

¹¹⁴ Appendix N.

¹¹⁵ Qureshi, Usman. “StatCan: Seniors Canadians Getting More Tech Savvy to Stay Connected.” iPhoneincanada.ca. <http://www.iphoneincanada.ca/news/seniors-canadians-getting-tech-savvy/> (accessed November 8, 2017).

¹¹⁶ Appendix G.

¹¹⁷ Qureshi, Usman. “StatCan: Seniors Canadians Getting More Tech Savvy to Stay Connected.” iPhoneincanada.ca. <http://www.iphoneincanada.ca/news/seniors-canadians-getting-tech-savvy/> (accessed November 8, 2017).

¹¹⁸ Anderson, Monica and Andrew Perrin. “2. Barriers to adoption and attitudes towards technology.” Pewinternet.org. <http://www.pewinternet.org/2017/05/17/barriers-to-adoption-and-attitudes-towards-technology/> (accessed November 9, 2017).

school or work) that take up most of their time (see Appendix I).¹¹⁹ With most of their free time available, civic engagement amongst seniors is rising, especially when suffering from illnesses like AD and dementia, because they find like minded individuals through social media apps and they connect their experiences with other seniors online.¹²⁰ Elderly users are then actively seeking to promote their ideologies because they take what they see online to actively pursue a political or social change in person (i.e. Coffee Break at ASWE website, where seniors with AD or dementia as well as their caregivers where participates go to a coffee shop that sponsors the Coffee Break event, and they express their experienes).¹²¹ Therefore, seniors engaging through social media apps can help relieve caregiver's burden by seeking companionship through online friends.

Daily Task Reminders

Mobile Application Technology with daily task reminders influences seniors with AD and dementia with the ability to live without the supervision of PSWs or caregivers. Overall, one of the reasons that seniors are reluctant to participate in online activities is because of the fear that their online safety will be exposed. There is a concern for seniors (especially the older they are) to be victimized and mistreated because it takes seniors longer to grasp the knowledge to use technology. However, families adapting to technology can access different types of tools that can be used by seniors themselves or by the caregivers. For instance, there are health tracking tools, reminder apps and online

¹¹⁹ Appendix I.

¹²⁰ Chan, Emily. "10 StatsCan findings that show how civic engagement is changing in Canada." Ctvnews.ca. <http://www.ctvnews.ca/politics/10-statscan-findings-that-show-how-civic-engagement-is-changing-in-canada-1.2562499> (accessed November 9, 2017).

¹²¹ IBID.

databases that assists senior care.¹²² Mobile Application Technology can hold an extensive amount of helpful information to take better care of clients.¹²³ Seniors can even improve their ability to communicate because they have the option of booking appointments through apps.¹²⁴ A huge improvement is the integration of “wireless home monitoring can now detect emergencies, report unusual behaviours and even track vital signs from the comfort of home, while GPS technology and personal emergency response systems (PERS) can call for assistance at the push of a button.”¹²⁵ These technological smart devices can be an extension of daily attention to detail, which can include (but not limited to), smart inhalers that assists with chronic disease management, monitor asthma remotely, transmit data to health care professionals and save time for seniors by reducing the number of medical visits they require.¹²⁶

Basically, “smart technology can alert both the patient and caregivers via text and email when the medication needs to be refilled -- the digital health device also helps to remind people when the pills need to be taken.”¹²⁷ Seniors and caregivers are using technology even to communicate to “their health-care providers for daily assessment and

¹²² Dunn, Bryen. “Technology helps seniors take control of their health.” Theglobeandmail.com. <https://beta.theglobeandmail.com/life/technology-helps-seniors-take-control-of-their-health/article23640599/?ref=http://www.theglobeandmail.com&> (accessed November 9, 2017).

¹²³ CBC News. “Harnessing the potential of mobile health apps.” Cbc.ca. <http://www.cbc.ca/news/health/m-health-1.3654795> (accessed November 9, 2017).

¹²⁴ Sandle, Tim. “Seniors beginning to realize digital health benefits.” Digitaljournal.com. <http://www.digitaljournal.com/life/health/seniors-beginning-to-realize-digital-health-benefits/article/499535> (accessed November 17).

¹²⁵ Dunn, Bryen. “Technology helps seniors take control of their health.” Theglobeandmail.com. <https://beta.theglobeandmail.com/life/technology-helps-seniors-take-control-of-their-health/article23640599/?ref=http://www.theglobeandmail.com&> (accessed November 9, 2017).

¹²⁶ Sandle, Tim. “Seniors beginning to realize digital health benefits.” Digitaljournal.com. <http://www.digitaljournal.com/life/health/seniors-beginning-to-realize-digital-health-benefits/article/499535> (accessed November 17).

¹²⁷ IBID.

advice, and seem to have a healthier lifestyle.”¹²⁸ Seniors often cite mobility challenges as a reason to cancel medical appointments, so, the use of technology can be used to connect to those health care officials without having to go to the doctor's office (i.e., FaceTime, Skype). Skype alone has over 1 billion downloads, and users are aware of its technological benefits (see Appendix O).¹²⁹ Evidently, this app can message, call, and video chat with individuals all over the world (so long as the recipient downloaded the same app together with Wi-Fi). Daily Tasks Reminder apps demonstrate that seniors can achieve a healthy life once they have the proper tools. Those apps placed in Mobile Application Technology can change the way seniors live their lives, and it can make their lives much simpler and more comfortable.

¹²⁸ Dunn, Bryen. “Technology helps seniors take control of their health.” Theglobeandmail.com. <https://beta.theglobeandmail.com/life/technology-helps-seniors-take-control-of-their-health/article23640599/?ref=http://www.theglobeandmail.com&> (accessed November 9, 2017).

¹²⁹ Appendix O.

CHAPTER 8

CONCLUSION

Technological use amongst seniors is increasing, but seniors still have a long way to go before most feel confident enough to use Mobile Application Technology on their own. These days, Canadians (of all ages) must accept a cultural shift of adapting to technology because the use of technological advances can help maintain a good quality of life by staying connected and informed by family, friends and medical professionals. Overall, Mobile Application Technology with downloaded apps continues to increase at a rapid pace. In November 2014 for example, iOS apps (apps downloaded from the Apple store app) reached 8.1 million downloads in America.¹³⁰ “Because those downloads were considered “organic” – meaning users were downloading apps on their own, not because of advertisements or other marketing campaigns – the costs associated with those marketing efforts decreased.”¹³¹ In other words, users are downloading significantly more apps without being told by the market (big corporations) because these apps are fulfilling the purpose of its creation (i.e., Carrot rewards app tracking steps) and those apps continue to be downloaded through Mobile Application Technology. If the government can conduct research on the benefits of apps and determine if organizations (like ASWE) can receive additional funding with proof that apps (on Mobile Application Technology) works, then, the government may be able to find a way to regulate the use of apps. For instance, the government can ensure that privacy amongst users is held to the highest standards and the app technology is user friendly. Thus far, the government was able to

¹³⁰ Qureshi, Usman. “App Store Downloads Reach a Record High in November.” iPhoneincanada.ca. <http://www.iphoneincanada.ca/news/app-store-downloads-record-november-2014/> (accessed November 8, 2017).

¹³¹ IBID.

fund and determine the usefulness of the Carrot rewards app because of the apps ability to keep its users active and the app's capability of providing health tips (i.e., how to stay healthy, what to eat). Subsequently, the government can create a similar app (i.e., Lumosity, Facebook and Skype), or fund current apps similar to the Carrot rewards app.

The more users download apps, the more likely users are aware of how to use apps because those apps have an essential value (i.e., friendship and cognitive training). As well, Canadian seniors may correctly use these apps if they choose to learn and download these apps on their own/free will. Not only that, seniors say that technology has a positive effect on society, despite the challenges of incorporating technology into their daily lives (see Appendix J).¹³² With the help of youths and caregivers (i.e., loved ones of PWD and AD patients), seniors can access apps which address their cognitive, emotional, behavioural and physical attributes when they feel like they do not have an outlet for their disgruntlement. Not only that, the use of Mobile Application Technology can be used as a tool for accountability when others wrongly mistreat PWD or AD patients. Mobile Application Technology can give PWD and AD patients the ability to believe that they are independent, and this fundamental belief can encourage these seniors to actively continue to use technology designed for cognitive training, lead a healthy lifestyle, a form of communication and quick reminders (through apps). Caregivers are the individuals that bridge seniors and Mobile Application Technology because caregivers would be the seniors first contact before looking for other solutions. In other words, caregivers can assist PWD/AD patients when those seniors cannot comprehend the technology.

¹³² Appendix J.

Unfortunately, future research must be conducted to determine whether these apps have scientific impact on citizens. As of right now, those who are knowledgeable with Mobile Application Technology have already adapted and incorporated these devices daily. “Although older adults are less inclined than other age groups to say they like trying new technology, some seniors do show a strong preference for early tech adoption.”¹³³ This trend will continue to adopt amongst seniors, and with the 2017 budget, the trend will leave a positive impact. Some factors to consider when using Mobile Application Technology:

1. The time it takes the user to learn and understand how these technologies function,
2. Can this help caregivers and health care officials without physically being there to help the PWD or AD patient,
3. regarding confidentiality, the government should ensure that seniors are not being targeted (for fraud),
4. At what age should seniors start using Mobile Application Technology, and
5. Whether there is a possibility for the government (based on the 2017 Budget) to incorporate a centre with a variety of technologies where individuals can go and learn to use the technology correctly.

¹³³ Anderson, Monica and Andrew Perrin. “2. Barriers to adoption and attitudes towards technology.” Pewinternet.org. <http://www.pewinternet.org/2017/05/17/barriers-to-adoption-and-attitudes-towards-technology/> (accessed November 9, 2017).

CHAPTER 9

LIMITS OF THE RESEARCH PROPOSAL

Since the creation of the 2017 budget, the data (relating to the 2017 budget) may seem purely speculative because the Ontario government has yet to act and set forth a definite plan, so, there could be proof of the useful (or uselessness) of app technology. Another factor that limits this paper is that most of the downloadable apps may vary from user to user, as some may find the app difficult to use, while others find it user-friendly. I have limited my research based on a timeframe of roughly a decade, but I have looked at previous information related to technology to compare with data from 2010-2016. Based on the number of apps downloaded, I have based my reasoning that users who download the apps I have mentioned are using those apps correctly and they are most likely using the apps on a regular basis.

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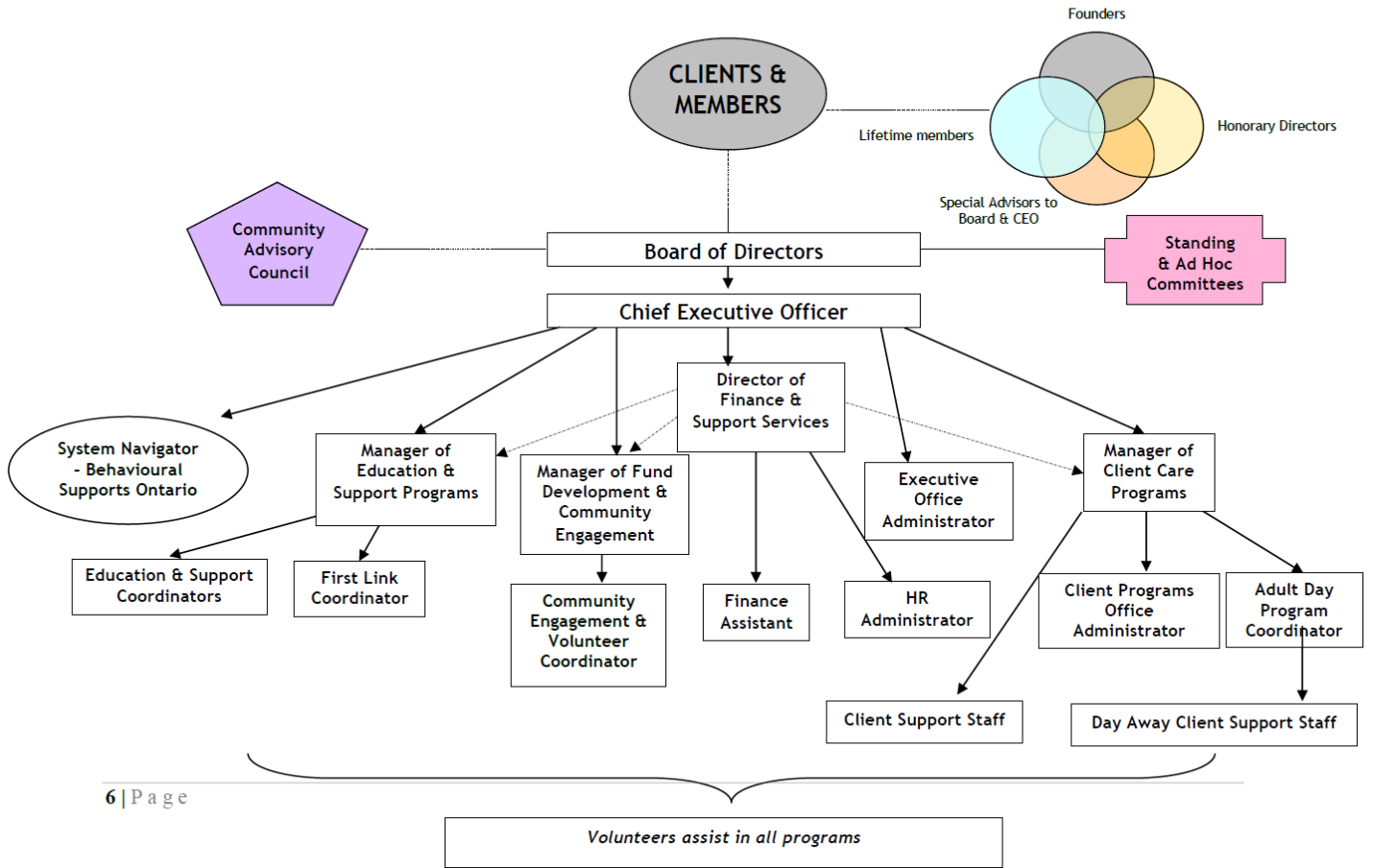
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APPENDICES

Appendix A

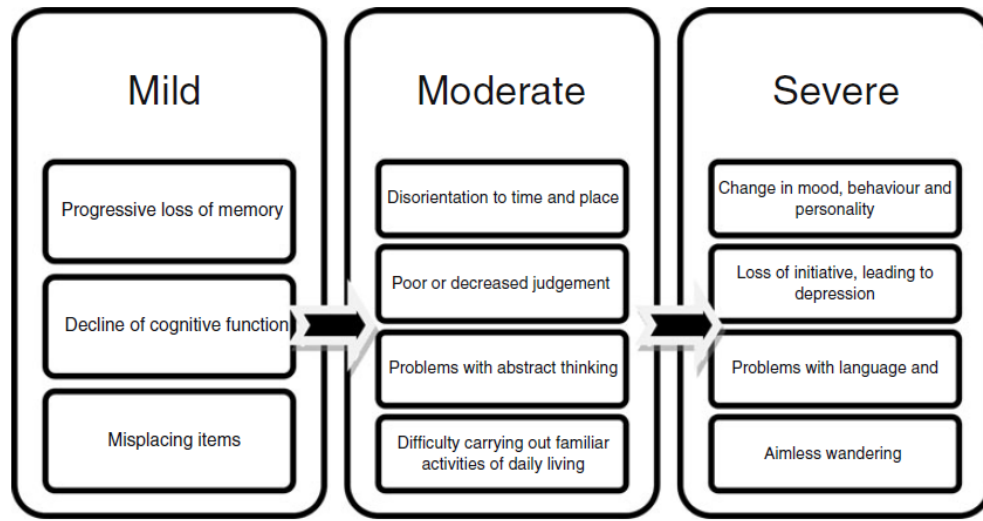


6 | Page

This graph demonstrates the hierarchy at the Alzheimer Society Windsor and Essex County.

Appendix B

Fig. 1 Symptoms of Alzheimer's disease throughout each stage of the disease



Armstrong, Nicola, Chris Nugent, George Moore, and Dewar Finlay. "Using smartphones to address the needs of persons with Alzheimer's disease." *Annals of Telecommunications-Annales Des Télécommunications* 65, no. 9-10 (2010): 486.

Appendix C

TABLE 6.13 Selected Expense Sensitivities

Program/Sector	2017–18 Assumption	2017–18 Sensitivity
Health Sector	Average annual growth of 3.3 per cent	One per cent change in health spending: \$538 million
Hospitals Sector Expense	Annual growth of 3.1 per cent	One per cent change in hospitals sector expense: \$237 million
Drug Programs	Annual growth of 8.4 per cent	One per cent change in program expenditure of drug programs: \$42 million
Long-Term Care Homes	78,229 long-term care home beds. Average Provincial annual operating cost per bed in a long-term care home: \$52,861	One per cent change in number of beds: approximately \$41 million
Home Care	Approximately 29 million hours of personal support services Approximately 8.7 million nursing and therapy visits and 2.1 million nursing shifts	One per cent change in hours of personal support services: approximately \$9.7 million One per cent change in all nursing and therapy visits: approximately \$8.4 million
Elementary and Secondary Schools	Approximately 1,969,000 average daily pupil enrolment	One per cent enrolment change: approximately \$165 million
Ontario Works	248,877 average annual caseload	One per cent caseload change: \$27 million
Ontario Disability Support Program	358,079 average annual caseload	One per cent caseload change: \$51 million
Interest on Debt	Average cost of 10-year borrowing in 2017–18 forecast to be approximately 3.0 per cent	The impact of a 100 basis-point change in borrowing rates is forecast to be approximately \$300 million

Government of Ontario. 2017. "2017 Ontario Budget: A Stronger, Healthier Ontario." In 2017 Ontario Budget: A Stronger, Healthier Ontario, by Charles Sousa, 19-56. Toronto: Queen's Printer for Ontario.

Appendix D

TABLE 6.15 Total Expense (continued)
(\$ Millions)

Ministry Expense	2014-15	Actual 2015-16	Interim 2016-17	Plan 2017-18
Francophone Affairs, Office of (Total)	5	8	5.1	5.3
Government and Consumer Services (Total)	567	602	613.6	593.3
Health and Long-Term Care (Base)	49,983	51,011	52,201.1	53,762.8
Time-Limited Investments in Affordable and Supportive Housing	-	-	4.7	-
Health and Long-Term Care (Total)	49,983	51,011	52,205.8	53,762.8
Indigenous Relations and Reconciliation (Base)	67	75	82.6	85.8
Green Investment Fund Initiatives	-	-	5.0	-
One-Time Investments including Settlements	3	5	11.3	5.0
Indigenous Relations and Reconciliation (Total)	71	79	98.9	90.8
Infrastructure (Base)	229	213	193.3	173.0
Federal-Provincial Infrastructure Programs	-	-	131.6	689.4
Infrastructure (Total)	229	213	324.9	862.4
International Trade (Total)	17	21	31.0	61.6
Labour (Total)	305	305	310.3	311.8
Municipal Affairs / Housing (Base)	889	923	898.0	955.0
Green Investment Fund Initiatives	-	-	92.0	-
Time-Limited Investments	7	1	7.0	10.0
Time-Limited Investments in Municipal, Social and Affordable Housing	153	165	543.6	297.0
Municipal Affairs / Housing (Total)	1,050	1,088	1,540.7	1,262.0
Natural Resources and Forestry (Base)	713	723	753.2	754.6
Emergency Forest Firefighting	78	95	108.6	69.8
Natural Resources and Forestry (Total)	791	818	861.8	824.4
Northern Development and Mines (Total)	804	701	837.4	767.1
Seniors Affairs (Total)	17	20	20.1	35.3
Status of Women (Total)	20	26	22.8	25.8
Tourism, Culture and Sport (Base)	1,246	1,431	1,454.9	1,390.5
Time-Limited Investments to Support 2015 Pan/Parapan American Games	405	839	82.3	-
Tourism, Culture and Sport (Total)	1,650	2,270	1,537.2	1,390.5
Transportation (Base)	2,941	3,284	3,667.8	4,213.7
Green Investment Fund Initiatives	-	-	20.0	-
Time-Limited Investments in Infrastructure	-	-	-	1,112.6
Transportation (Total)	2,941	3,284	3,687.8	5,326.2
Treasury Board Secretariat (Base)	237	221	239.8	336.8
Employee and Pensioner Benefits	1,186	987	1,163.0	1,208.0
Operating Contingency Fund	-	-	30.0	515.0
Capital Contingency Fund	-	-	-	100.0
Treasury Board Secretariat (Total)	1,423	1,208	1,432.8	2,159.8
Interest on Debt ³	10,635	10,967	11,250.0	11,581.3
Year-End Savings ⁴	-	-	-	(1,200.0)
Total Expense	128,861	131,891	134,751.8	141,050.0

¹ The 2014-15 amount includes expenses for the 2014 general election.

² Numbers reflect the pension expense/recovery that was calculated in accordance with Public Sector Accounting Board standards.

³ Interest on debt is net of interest capitalized during construction of tangible capital assets of \$202 million in 2014-15, \$165 million in 2015-16, \$121 million in 2016-17 and \$292 million in 2017-18.

⁴ As in past years, the Year-End Savings provision reflects efficiencies through in-year expenditure management and underspending due to factors such as program management, and changes in project startups and implementation plans.

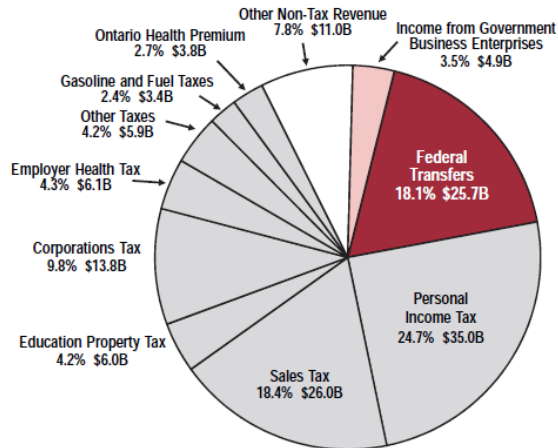
Note: Numbers may not add due to rounding.

Government of Ontario. 2017. "2017 Ontario Budget: A Stronger, Healthier Ontario." In 2017 Ontario Budget: A Stronger, Healthier Ontario, by Charles Sousa, 19-56. Toronto: Queen's Printer for Ontario.

Appendix E

CHART 6.2 Composition of Revenue, 2017–18

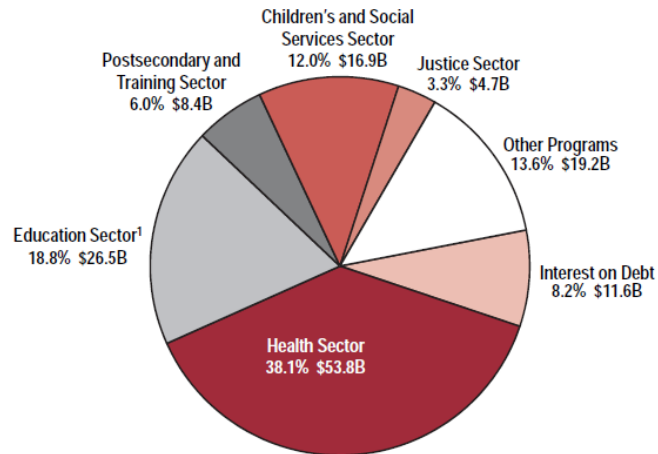
2017–18 Total Revenue: \$141.7 Billion



Note: Numbers may not add due to rounding.

CHART 6.3 Composition of Total Expense, 2017–18

2017–18 Total Expense: \$141.1 Billion



¹ Excludes Teachers' Pension Plan. Teachers' Pension Plan expense is included in Other Programs.

Note: Numbers may not add due to rounding.

Government of Ontario. 2017. "2017 Ontario Budget: A Stronger, Healthier Ontario." In 2017 Ontario Budget: A Stronger, Healthier Ontario, by Charles Sousa, 19-56. Toronto: Queen's Printer for Ontario.

Appendix F

TABLE 6.17 Ten-Year Review of Selected Financial and Economic Statistics¹
(\$ Millions)

	2008-09	2009-10 ²	2010-11	2011-12	2012-13	2013-14	2014-15	Actual 2015-16 ⁵	Interim 2016-17	Plan 2017-18
Revenue	97,532	96,313	107,175	109,773	113,389	115,911	118,546	128,377	133,228	141,650
Expense										
Programs	95,375	106,856	111,706	112,660	112,248	115,792	118,225	120,925	123,502	129,469
Interest on Debt ³	8,566	8,719	9,480	10,082	10,341	10,572	10,635	10,967	11,250	11,581
Total Expense	103,941	115,575	121,186	122,742	122,589	126,364	128,861	131,891	134,752	141,050
Reserve	-	-	-	-	-	-	-	-	-	600
Surplus/(Deficit)	(6,409)	(19,262)	(14,011)	(12,969)	(9,220)	(10,453)	(10,314)	(3,514)	(1,524)	0
Net Debt ⁴	169,585	193,589	214,511	235,582	252,088	267,190	284,576	294,564	301,916	311,921
Accumulated Deficit	113,238	130,957	144,573	158,410	167,132	176,634	187,511	192,028	193,544	193,544
Gross Domestic Product (GDP) at Market Prices	608,446	597,882	630,989	659,743	680,084	695,349	727,962	763,276	798,218	832,652
Primary Household Income	414,724	412,847	424,251	444,076	459,111	472,921	490,023	511,781	532,941	555,587
Population — July (000s)	12,883	12,998	13,135	13,264	13,414	13,556	13,685	13,797	13,983	14,130
Net Debt per Capita (dollars)	13,164	14,894	16,331	17,762	18,793	19,710	20,795	21,350	21,592	22,075
Household Income per Capita (dollars)	32,193	31,763	32,299	33,481	34,226	34,886	35,807	37,094	38,114	39,177
Interest on Debt as a Per Cent of Revenue	8.8	9.1	8.8	9.2	9.1	9.1	9.0	8.5	8.4	8.2
Net Debt as a Per Cent of GDP	27.9	32.4	34.0	35.7	37.1	38.4	39.1	38.6	37.8	37.5
Accumulated Deficit as a Per Cent of GDP	18.6	21.9	22.9	24.0	24.6	25.4	25.8	25.2	24.2	23.2

¹ Revenue and expense have been restated to reflect a fiscally neutral accounting change for the revised presentation of education property taxes, as described in the 2010 Ontario Budget; a fiscally neutral accounting change related to the reclassification of government agencies and organizations, as described in the 2017 Ontario Economic Outlook and Fiscal Review; and a fiscally neutral reclassification of a number of tax measures that are transfers or grants, as described in the 2012 Ontario Budget.

² Starting in 2009-10, investments in motor tangible capital assets, owned by the Province were capitalized and amortized to expense. All capital assets owned by consolidated organizations are being accounted for in a similar manner.

³ Interest on debt is net of interest capitalized during construction of tangible capital assets of \$134 million in 2013-14, \$202 million in 2014-15, \$165 million in 2015-16, \$171 million in 2016-17, and \$292 million in 2017-18.

⁴ Starting in 2009-10, Net Debt includes the net debt of hospitals, school boards and colleges, consistent with Public Sector Accounting Board standards. For comparable purposes, Net Debt has been restated in 2008-09 to conform with this revised presentation.

⁵ The 2015-16 actuals have been restated to reflect recognizing jointly sponsored net pension assets for the Ontario Public Service Employees' Union Pension Plan and the Ontario Teachers' Pension Plan on the Province's financial statements, consistent with the 2016 Budget and as described in the 2016-17 Third Quarter Finances.

Note: Numbers may not add due to rounding.

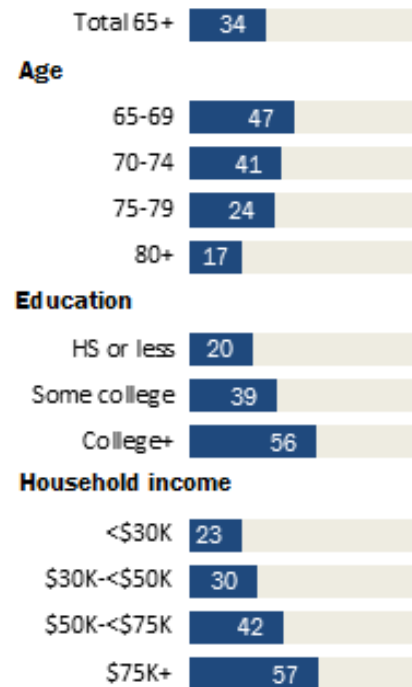
Sources: Statistics Canada and Ontario Ministry of Finance.

Government of Ontario. 2017. "2017 Ontario Budget: A Stronger, Healthier Ontario." In 2017 Ontario Budget: A Stronger, Healthier Ontario, by Charles Sousa, 19-56. Toronto: Queen's Printer for Ontario.

Appendix G

Around a third of seniors report using social media

% of U.S. adults ages 65 and older who say they ever use social networking sites



Source: Survey conducted Sept. 29-Nov. 6, 2016.
"Tech Adoption Climbs Among Older Adults"

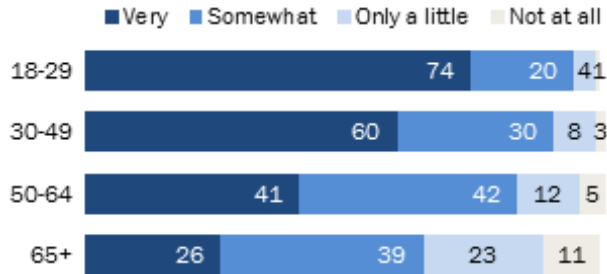
PEW RESEARCH CENTER

Anderson, Monica and Andrew Perrin. "2. Barriers to adoption and attitudes towards technology." Pewinternet.org. <http://www.pewinternet.org/2017/05/17/barriers-to-adoption-and-attitudes-towards-technology/>

Appendix H

Seniors are less confident when using electronic devices

% of U.S. internet users who say they feel ___ confident when using computers, smartphones or other electronics to do the things they need to do online, by age

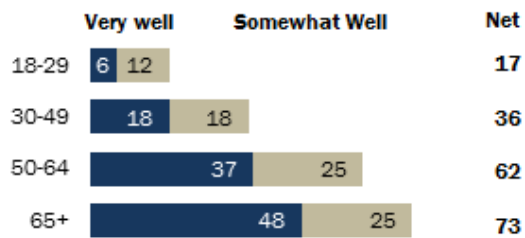


Source: Survey conducted Oct. 13- Nov. 15, 2015.
"Tech Adoption Climbs Among Older Adults"

PEW RESEARCH CENTER

Most seniors say they need help using new electronic devices

% of U.S. adults who say the statement, 'When I get a new electronic device, I usually need someone else to set it up or show me how to use it,' describes them very or somewhat well, by age



Note: NET category calculated prior to rounding.
Source: Survey conducted Oct. 13- Nov. 15, 2015.
"Tech Adoption Climbs Among Older Adults"

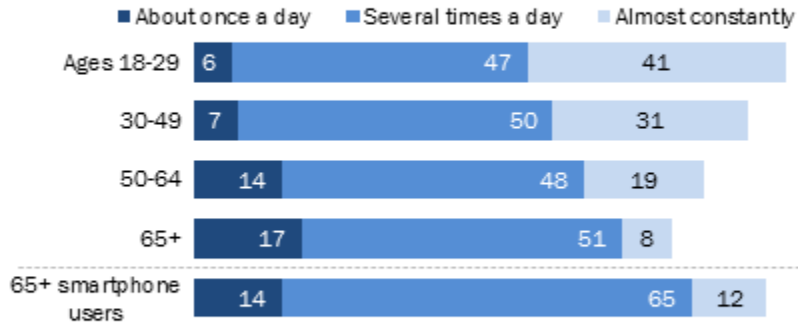
PEW RESEARCH CENTER

Anderson, Monica and Andrew Perrin. "2. Barriers to adoption and attitudes towards technology." Pewinternet.org. <http://www.pewinternet.org/2017/05/17/barriers-to-adoption-and-attitudes-towards-technology/>

Appendix I

Roughly three-quarters of internet users ages 65 and up say they go online daily

% of U.S. internet users who say they use the internet ...



Source: Survey conducted Mar. 7-April 4, 2016.
"Tech Adoption Climbs Among Older Adults"

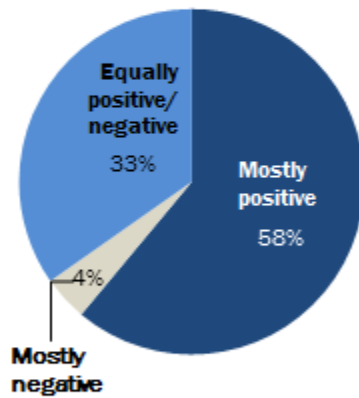
PEW RESEARCH CENTER

Anderson, Monica and Andrew Perrin. "2. Barriers to adoption and attitudes towards technology." Pewinternet.org. <http://www.pewinternet.org/2017/05/17/barriers-to-adoption-and-attitudes-towards-technology/>

Appendix J

Most seniors say technology has had a mostly positive effect on society

% of U.S. adults ages 65 and up who say technology has had a ___ impact on society



Note: Respondents who did not give an answer are not shown.
Source: Survey of U.S. adults conducted March 2-28, 2016.
"Tech Adoption Climbs Among Older Adults"

PEW RESEARCH CENTER

Anderson, Monica and Andrew Perrin. "2. Barriers to adoption and attitudes towards technology." Pewinternet.org. <http://www.pewinternet.org/2017/05/17/barriers-to-adoption-and-attitudes-towards-technology/>

Appendix K

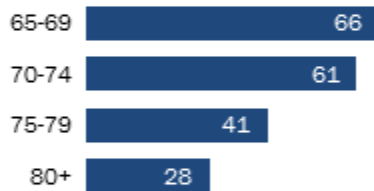
Tech use is especially limited among those ages 75 and up

% of U.S. adults in each age group who say they ...

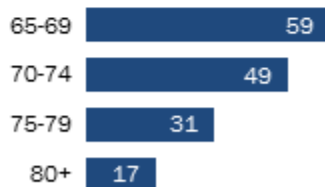
Use the internet



Subscribe to home broadband services



Own a smartphone



Source: Survey conducted Sept. 29-Nov. 6, 2016.
"Tech Adoption Climbs Among Older Adults"

PEW RESEARCH CENTER

Anderson, Monica and Andrew Perrin. "2. Barriers to adoption and attitudes towards technology." Pewinternet.org. <http://www.pewinternet.org/2017/05/17/barriers-to-adoption-and-attitudes-towards-technology/>

Appendix L



Lumosity - Brain Training

Lumos Labs, Inc.

E Everyone

UNINSTALL

OPEN

In-app purchases

You Might Also Like

MORE



Memrise:
Learn a new

4.7 ★

FREE



Vocabulary
Builder

4.3 ★

FREE



Elevate
- Brain

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FREE



TED

4.6 ★



Downloads



199,245



Education



Editors' Choice



Si

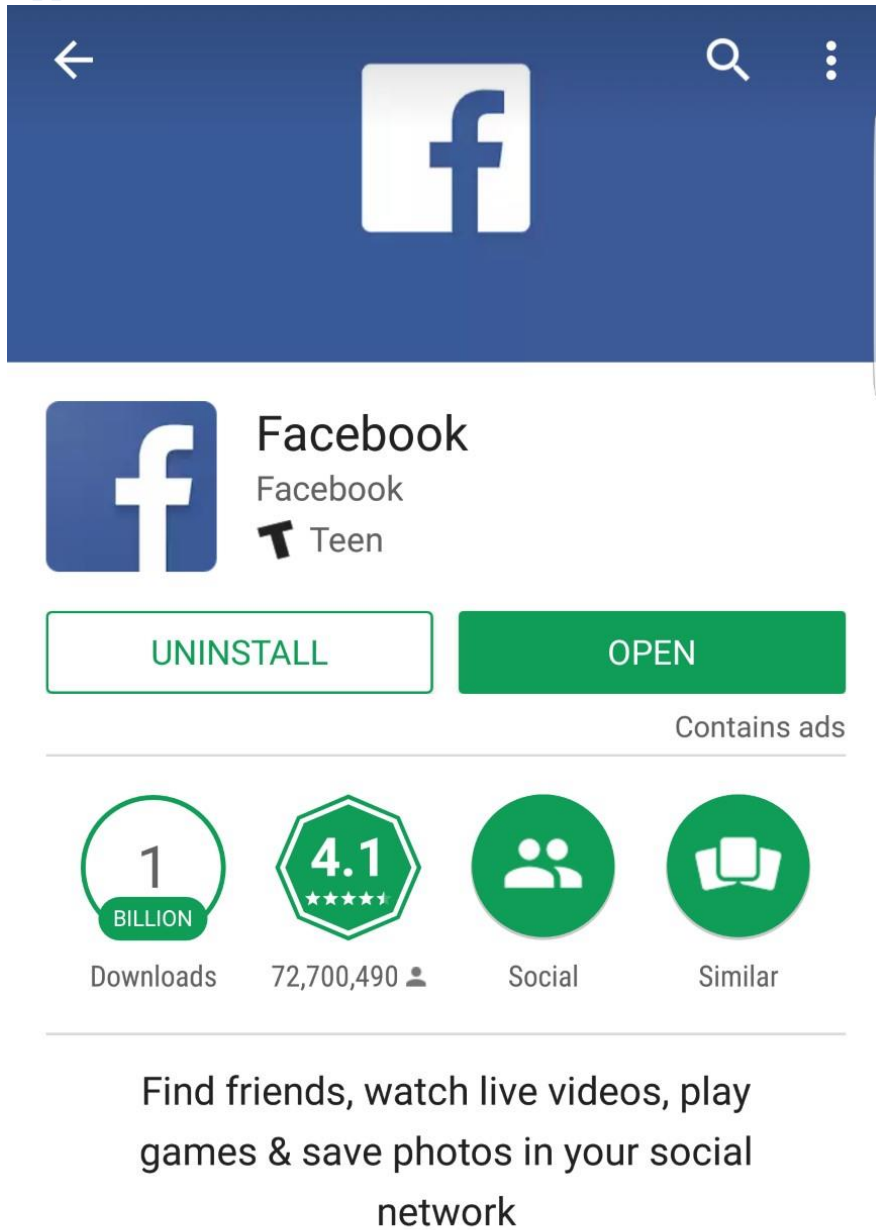
Based on the Android Play Store

Appendix M

The screenshot shows the app listing for 'Carrot Rewards' on the Android Play Store. At the top, there is a dark blue header with a back arrow, a search icon, and a menu icon. The app's logo, 'carrot rewards' and 'carotte points santé', is displayed in the center. Below the header, the app's icon (a carrot) is shown next to the title 'Carrot Rewards' and the developer 'CARROT Insights Inc.'. The age rating is 'E Everyone'. There are two buttons: 'UNINSTALL' and 'OPEN'. Below these are four circular icons representing app statistics: '100 THOUSAND Downloads', '3.4 stars (1,247 reviews)', 'Health & Fitness', and 'Similar'. A promotional text block reads: 'Earn points from your favourite loyalty programs by completing healthy offers'. At the bottom, a light green box titled 'WHAT'S NEW' contains the text: 'A couple fixes for our Fitbit users here, a few style tweaks there, add a dash of performance'.

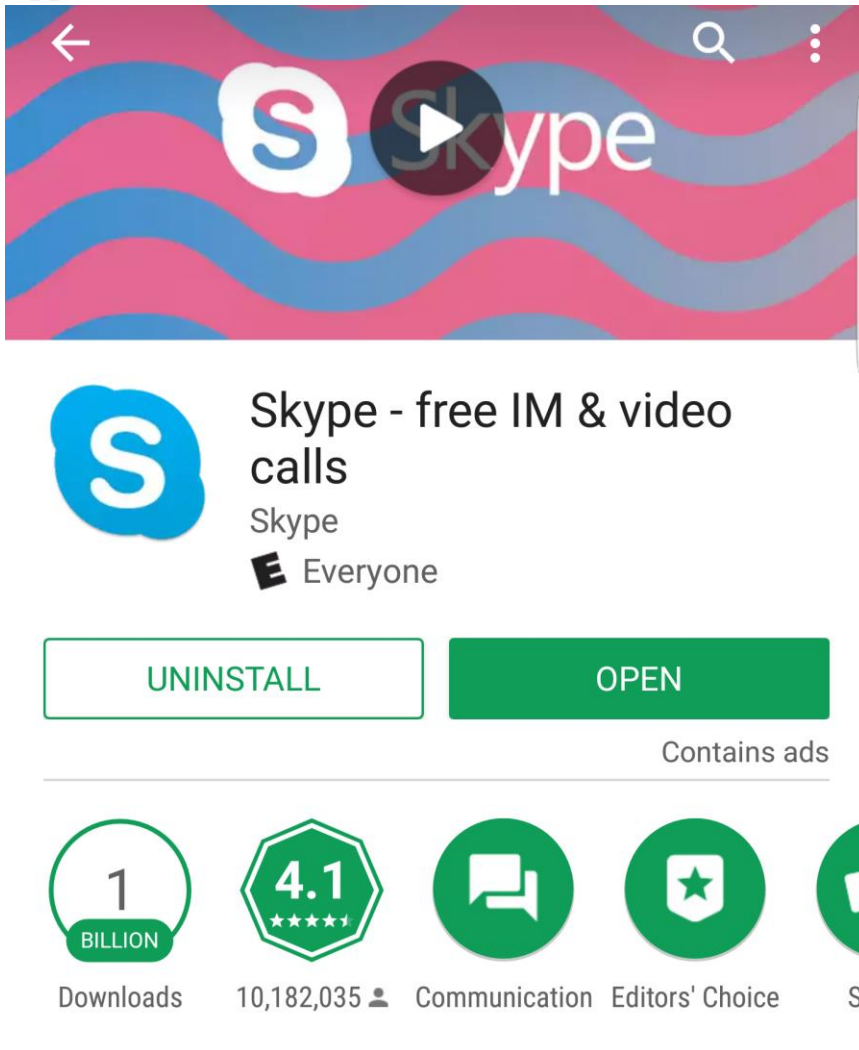
Based on the Android Play Store

Appendix N



Based on the Android Play Store

Appendix O



Skype video and voice calls, instant messaging and cheap international calls.

Based on the Android Play Store

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