Managers and Technology Adoption in Long-Term Care Homes: An Exploratory Study of Key Factors Affecting Health Information Technology Decision-Making

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Abstract

Background: Canada has an aging population. With increased life expectancy, older adults become at higher risk of developing chronic disease. Therefore, the need and demand for long-term care (LTC) is expected to continue to increase. LTC homes provide 24-hour nursing care, personal care, and assistance with activities of daily living (Government of Ontario, 2014). Health information technology (IT) presents opportunities to support staff, residents, and their families in LTC environments. This has been particularly emphasized during the latest COVID-19 pandemic in light of the challenges that have been observed in LTC homes (e.g., social isolation, limited integration of information, shortage of human resources etc.). Yet, LTC homes still lag significantly behind other areas in healthcare in relation to the adoption of health IT, and little information is available on the factors that affect the decision-making related to health IT solutions in these settings.

Objectives and Research Question: This research aims to explore and examine the most relevant and important factors that managers consider when making decisions on the adoption of health IT in LTC homes. Therefore, the research question is: "What are the factors that affect and can inform the decision-making of managers in relation to health IT adoption in LTC homes?"

Methods: This research uses an exploratory data-driven Delphi method that consists of a survey of a panel of 19 experts who are decision-makers in their respective LTC homes in Ontario. The Delphi survey is an exploratory approach that elicits the opinion of a panel of experts through iterative feedback consisting of three rounds (brainstorming, narrowing down, and ranking). In this research, the panelists were asked to identify and describe the most important and relevant factors that affect and inform their decision-making regarding health IT solutions in LTC. Then, they were asked to narrow down and rank the list, and a final coefficient of agreement was calculated based on their rankings.

Results: The panelists were mostly female, 40-49 years old, and had an average of 9.7 years of experience in their current LTC organization. In addition, participants had an average of 10.5 years of experience in making decisions related to health IT adoption. In the brainstorming round, the panelists provided a total of 102 key factors, which were consolidated into a list of 27 items that varied across 5 general categories: availability of resources, social factors,

organizational factors, regulatory requirements, and technical factors of the health IT solution. Fourteen panelists reported key factors related to the cost of technology and ease of use, which were the two key factors that were reported most often by participants. Two items were dropped from the list of key factors in the narrowing down round (i.e., *comfort and social environment* and *vendor reputation*) as only items with a rating of 5 out of 7 or greater were retained for the ranking round. In the ranking round, the consensus level was W=0.341. The top 5 factors that were identified and ranked by managers in LTC homes as important in influencing their decisions on the adoption of health IT were (in order of importance): *availability of funding, impact on workload and efficiency, value proposition, ease of use,* and *impact on residents' outcomes*.

Contributions: This Delphi survey provides an authoritative list of 25 key factors (and their description) that influence and affect managers' decisions in LTC homes in relation to the adoption of health IT. This is a first step towards understanding what is happening in the LTC context in relation to health IT decision-making. From a LTC managers' perspective, the findings provide benchmarking to understand what other LTC homes are doing and the factors that influence their decision-making on health IT solutions. Particular importance should be placed on the highly ranked factors, as they are identified as the factors that are most relevant and most important in facilitating or hindering the decision of LTC managers to adopt health IT solutions. In addition, the results of this thesis may help inform future planning and policies aimed at advancing the use of technology to support the care provided to older adults and the work of health care professionals in LTC. Future studies can use the results of this thesis to develop surveys that assess and monitor the evolution of these factors in broader and more representative samples of LTC managers.

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IT: Information Technology

LTC: Long-term care

W: Kendall's coefficient of concordance

1. Introduction

1.1 Background

Canada's population is aging, as the last census reported that over 15% of the population was over 65 years old (Canadian Medical Association, 2016). This number is expected to rise to 25% of the population by 2036, with the number of older adults living with dementia rising to 66% within the next 6 years (Canadian Medical Association, 2016). Although the life expectancy of older adults is increasing, their risk of developing chronic disease is also increasing. Currently, one-third of older adults have two or more chronic diseases (Government of Canada, 2020a). This affects activities of daily living, reduces their quality of life, and increases the risk of mortality (Government of Canada, 2020b). Our current health care system was not built to handle the challenges associated with an aging population, which is why the system continues to face challenges in properly caring for older adults (Canadian Medical Association, 2016).

Long-term care (LTC) homes refer to institutions that provide ongoing and indefinite care for those who can no longer fully care for themselves (Banerjee, 2007). In Canada, they provide continuing forms of health care (both nursing and medical care), as well as social services (e.g., supported housing, assistance with activities of daily living, and recreational programs) (Banerjee, 2007). Nursing and personal support are not covered under the Canada Health Act; therefore, funding and standards are the responsibility of the provincial government, with residents typically providing a copayment (Liu et al., 2020). Admission to LTC homes in Canada depends on which province a person lives in, as LTC homes are regulated at the provincial level. For Ontario specifically, an application process is completed for admission, with the waiting time dependent on the number of available beds in the home, the type of bed requested, and the type of room that the bed is in (Government of Ontario, 2014).

Factors that influence admission to LTC homes include cognitive impairment, the need for physical assistance, wandering, and a lack of caregiver, or a caregiver who is no longer able to provide care (Canadian Institute for Health Research, 2017). In general, residents of LTC homes are more likely to have multiple chronic diseases, making them frailer and more susceptible to infectious disease (Lai et al., 2020). Hypertension, vascular disease, dementia, arthritis, and depression are the most common co-morbid diseases of those living in LTC homes, although there is some variation with age and sex across medical conditions (Moore et al., 2014). Around 70% of residents in LTC homes in Canada have dementia, requiring assistance in daily activities and personal care (Hsu et al., 2020). For the purpose of this research, I focused on LTC homes, as they face significant challenges that could be addressed through the adoption of health-related information technology (IT) solutions (Tak et al., 2010).

As stated, older adults are more likely to have multiple chronic illnesses, which negatively impacts their quality of life (Lai et al., 2020). In general, the quality of life of older adults can be improved through technology applications, as well as improving the safety, effectiveness, and efficiency of care that they receive (Khosravi & Ghapanchi, 2016). Specifically, health IT are the electronic systems and technologies that are used by both health care providers and patients to store, share, and analyze health information (Alotaibi & Federico, 2017). They present opportunities to support both older adults and our healthcare system, by addressing problems associated with chronic illness and frailty that many older adults face (Kavandi & Jaana, 2020; Khosravi & Ghapanchi, 2016) and their purpose in LTC homes is to improve the quality of life that residents experience (Vest et al., 2019), assist with activities of daily living (Tak et al., 2010), and improve the coordination of care (Kruse et al., 2015).

1.2 Statement of problem/ rationale

Despite the benefits that health IT solutions may present in the context of the care of older adults, the extent of their use in LTC remains limited (Bezboruah et al., 2014; Tak et al., 2010). More often, technology solutions are used for older adults living in the community or acute care settings in the United States, and the research has largely been focused on these settings as well (Tak et al., 2010). As a result, LTC homes lag significantly behind other areas of health care regarding the adoption of health IT (Bezboruah et al., 2014). Most research on the adoption of health IT in LTC has been conducted in the United States, with little research found in the Canadian context (The Commonwealth Fund, 2020). The need for admission to LTC homes has been dramatically increasing as the number of older adults living with cognitive impairments and physical limitations increases (Tak et al., 2010). LTC homes in Canada and the United States have faced great challenges in providing care and assistance with activities of daily living for residents as the number of older adults that are admitted with multimorbid conditions increases (Estabrooks et al., 2020; Tak et al., 2010).

Health IT solutions present tools for addressing the challenges that LTC homes face while improving the care that residents receive (Tak et al., 2010). In recent years, we have observed an uptake of health IT to support the care of older adults, and the COVID-19 crisis has further emphasized the relevance and importance of technology in connecting older adults to their caregivers and health care professionals. In addition, as more technology is being developed and made available to LTC homes in Canada, there will be a greater need for managers to make decisions as to what health IT to adopt in their respective LTC homes. Thus, it is important to understand the factors that influence managers' decision-making when adopting health IT

solutions within their organizations to inform future strategies and policies that support health IT adoption in LTC.

1.3 Research Question and Objectives

"What are the factors that affect and can inform the decision-making of managers in relation to health IT adoption in LTC homes?"

The objective of this research is to examine the factors that affect and can inform the decision-making process of managers when adopting health IT solutions. For this purpose, I conducted a Delphi survey that is exploratory in nature; additional details are presented in the Methodology section on the relevance of this approach in the context of this research. Subsequently, an authoritative list of key factors that are important and relevant from the perspective of managers in relation to their decisions regarding health IT choices and adoption was generated.

2. Literature Review

2.1 Long-Term Care Homes in Canada

2.1.1 Overview and Characteristics

LTC homes are settings where older adults receive 24-hour nursing care, personal care, and assistance with activities of daily living (Government of Ontario, 2014). Within LTC homes, residents receive greater nursing and personal care than they would in retirement or other forms of supportive housing (Government of Ontario, 2014). The typical services that are offered to residents include shared living areas (such as dining rooms), nursing and personal care, access to health professionals, individual care plans, meals, laundry, medical supplies (such as walkers or wheelchairs), social and recreational programs, and housekeeping (Government of Ontario,

2014). Nursing and personal support is not covered under the Canada Health Act; therefore, funding and standards are the responsibility of the provincial government, with residents typically providing a copayment (Liu et al., 2020). LTC homes in Canada are regulated at the provincial level, therefore admission is dependent on the province that a person lives in. For Ontario specifically, an application process is completed for admission, with the waiting time dependent on the number of available beds in the home, the type of bed requested and the type of room that the bed is in (Government of Ontario, 2014). For example, to apply for a LTC bed in a private room, an application would need to be completed through a local Home and Community Care Support Services Organization, who would then discuss the costs associated with that specific room and provide options of homes in the area (Government of Ontario, 2014). Each person can apply to 5 homes and will have to wait to receive an offer of admission when a bed becomes available (Government of Ontario, 2014).

Canada has a total of 2,039 LTC homes, with 46% publicly owned and 54% privately owned (Canadian Institute for Health Research, 2020). Although the capacity has increased in LTC homes in the past years, demand still far outpaces this growth, which is attributed to the growing number of Canadians with forms of dementia (Estabrooks et al., 2015; Poss et al., 2017). With the rising demand for beds also comes more patients with complex care needs, where few residents have low care needs, and over 60% of residents have significant and co-morbid diseases (Estabrooks et al., 2015). Unregulated care aides provide 75% to 80% of direct care to residents of LTC homes (Estabrooks et al., 2015).

Specifically in Ontario, approximately 100,000 residents are cared for in 626 LTC homes (Wilkinson et al., 2019), and of this 360 are for-profit, 166 are not-for-profit, and 100 are municipal LTC homes (A. Joshi, personal communication, January 7th, 2022). The Ministry of

Health regulates all LTC homes through the Long-Term Care Homes Act (Banerjee, 2007). Factors that affect admission include age, limitations in the ability to perform activities of daily living, cognitive deficits, health status, and whether the person lives alone (Laporte et al., 2017). Wait times for a bed in LTC remain significant, with the average time of 89 days, however, some regions have a wait time as high as 1,907 days for nine out of ten people (Laporte et al., 2017; Waterloo Wellington LHIN, 2021).

The staffing structure of LTC homes includes some specific requirements, while other staffing decisions are made by the individual LTC home depending upon their needs (Government of Ontario, 2020). The Long-Term Care Homes Act requires that all LTC homes in Ontario have an administrator that is responsible for the overall management of the home, a director of nursing and personal care who must be a registered nurse, a medical director for evaluating medical practices who is a physician, and at least one registered nurse who is present in the organization at all times (Government of Ontario, 2020). There is no requirement for the proportion of staff to residents or the number of hours of direct care to each resident, as that decision is made by managers within each LTC home and based upon yearly staffing plans developed by each home (Government of Ontario, 2020). Management roles comprise an average of 8% of the proportion of staff employed in the LTC care sector in Ontario (Government of Ontario, 2020).

2.1.2. Challenges Faced in Long-Term Care Homes

In the past, LTC homes have faced numerous challenges including those with their workforce and the quality of life that residents have (Estabrooks et al., 2020). In general, staff levels have not been kept at adequate levels in relation to the complex care needs of residents, which has led to strain on the care providers and increased staff turnover across Canada (Estabrooks et al., 2015). Hsu et al. (2016) found that for-profit LTC homes have the lowest

staffing levels in Ontario, with only 2.63 hours of direct care, per resident per day. Registered nurses provide approximately 23.8 minutes of care per resident, per day, while health care aides provide approximately 1.66 hours of care per resident and day in Ontario (Hsu et al., 2016). In not-for-profit homes, registered nurses provide 23.4 minutes of care per resident, per day, while health care aides provide approximately 1.79 hours of care per resident and day in Ontario (Hsu et al., 2016).

Resident quality of life has remained a challenge in LTC homes in Ontario. Indicators of resident quality of life include wait times for LTC homes, residents not living with psychosis who were given antipsychotic medication, residents who fell, residents who were physically restrained, residents with pressure ulcers, residents experiencing pain and residents with worsened symptoms of depression (Wilkinson et al., 2019). Specifically in Ontario, the median wait time from the community to a LTC home is 159 days, 18.3% of residents not living with psychosis were given antipsychotic medication, 16.5% of residents fell, 3.3% of residents were physically restrained, 2.5% had pressure ulcers, 5.0% were experiencing pain and 22.4% of residents had worsened symptoms of depression (Health Quality Ontario, 2020). The provincial government provides benchmarking guidelines for LTC homes to meet and at the aggregate level, Ontario's LTC homes currently do not meet any of benchmarks based on the provincial averages previously provided (Health Quality Ontario, 2020). While the indicators have improved over the last five years, a lack of confidence in the care that older adults are receiving remains (Wilkinson et al., 2019). Improving integration and providing global metrics to improve the overall performance of LTC homes is a challenge (Wilkinson et al., 2019).

More recently, LTC homes have been struggling with the ability to address the challenges that the COVID-19 pandemic has presented. Residents living in LTC homes are far more likely

to contract COVID-19 (Liu et al., 2020). In addition to this, the residents share the same sources of air, caregivers, and medical care, which facilitates the transmission among residents (Lai et al., 2020). The COVID-19 pandemic has highlighted many areas in LTC homes that face challenges. Ensuring sufficient resources are available for care, enhancing infection prevention and control for staff, and ensuring staff with the right skills are available have all been challenges exposed by the pandemic (Government of Canada, 2020b) .

Having established the current context of LTC homes in Canada and the challenges they face, it is now possible to discuss their usage of health IT solutions.

2.2 Health IT Used to Support Older Adults

2.2.1. Types of Technologies Used for Older Adults

As previously mentioned, health IT solutions in LTC often aim to improve the quality of life that residents experience (Vest et al., 2019), assist with activities of daily living (Tak et al., 2010), and improve the coordination of care (Kruse et al., 2015). Health IT solutions are grouped into the following seven categories: assistive technology/living, information and communications technology (ICT), mobile health, telemonitoring and telemedicine, robotics, and video games (Kavandi & Jaana, 2020; Khosravi & Ghapanchi, 2016). Detailed examples of each category are presented in the following sections.

Assistive technologies are any product or system that is used to improve or maintain a person's functional abilities (Khosravi & Ghapanchi, 2016). They include technologies that enhance patient safety, increase resident freedom, and reduce staff burden (Hall et al., 2017). They range from monitoring systems to location tracking devices (Hall et al., 2017). An example of an assistive living technology is sensor technology which would alert caregivers of events

such as falling (Khosravi & Ghapanchi, 2016). Older adults have reported that they are satisfied with this type of technology as it enhances communication, provides reminders to conduct daily activities, and family caregivers with piece of mind that their loved one is safe (Reder et al., 2010). Monitoring technologies are also a type of assistive technology that is common in LTC homes as they provide the opportunity for healthcare professionals to check on the status of older adults (Czaja, 2016). In addition, monitoring technology can be used to collect data on health status. An assistive technology such as a wearable wireless vital monitors are small devices that can be used to collect health data daily without the patient having to go to a health centre to have the data collected (Suzuki et al., 2013).

ICT are technologies that can store and receive electronic information, allowing practitioners to effectively and efficiently access information (Fitzpatrick & Fry, 2009; Reis et al., 2013). This type of technology includes computers, the internet and wearables when used to communicate with friends and family, or clinical data that can be easily accessible for other nursing staff (Fitzpatrick & Fry, 2009; Khosravi & Ghapanchi, 2016). ICT can assist with depression and social isolation as it connects older adults with friends and family (Khosravi & Ghapanchi, 2016). Regarding types of ICT, older adults are most willing to use familiar technologies such as smartphones, while they are not as willing to use unfamiliar technology such as healthcare devices (Ma et al., 2021). When looking at types of ICT that are used by clinicians in LTC homes, email is a common example as it allows clinicians to efficiently check on the progress of a patient or conduct routine guidance and education with residents (Reis et al., 2013).

Another group of technologies that are used by older adults include mobile health (mHealth). mHealth technologies can be used in partnership with health care providers and

address the challenges of satisfaction of care and high emergency room visits (Jaana & Paré, 2020). Approximately 47.4% of community-dwelling adults use smartphones and 49.8% use digital tablets, while 19.6% download mobile apps (Jaana & Paré, 2020). The majority of mobile apps that are downloaded by older adults are health related (Jaana & Paré, 2020). An example of mobile health technologies includes medication management applications that are designed to ensure that medication is administered accurately (Khosravi & Ghapanchi, 2016).

Telemedicine involves providing medical consultations at a distance and includes using telecommunication devices to diagnose and treat older adults (Khosravi & Ghapanchi, 2016). Older adults frequently use telemedicine videoconferencing more frequently than younger adults, and often rely on it for the management of chronic disease (Greenwald et al., 2018; Khosravi & Ghapanchi, 2016).

Robotics include technologies that provide services such as operating appliances and other tasks that support activities of daily living (Khosravi & Ghapanchi, 2016). Robotic technologies have been reported to help older adults improve their levels of physical activity and to reduce social isolation (Khosravi & Ghapanchi, 2016). Examples of robots that have helped to reduce social isolation include pet robots to improve poor well-being (Khosravi & Ghapanchi, 2016).

Video game technologies involve using interactive machines or equipment that can be used therapeutically or for relaxation purposes (Khosravi & Ghapanchi, 2016). Virtual reality is one example that has increased in use in recent years as studies have shown that it creates an opportunity to improve physical outcomes, such as improving gait, balance, and fall prevention (Dermody et al., 2020). It also has positive impacts on mental health of residents, such as pain management and cognition (Dermody et al., 2020). Virtual reality has been demonstrated as an

effective non-pharmacological intervention for those with behavioural and psychological symptoms of dementia in LTC homes (Sultana et al., 2020).

Surprisingly, limited information exists in Canada on the areas of application of various technologies and little is known about the current state in the context of LTC homes in Ontario. Technologies for older adults living in the community are often focused on aging in place and ensuring that the older adult can remain at home for as long as possible (Park et al., 2019). This would include communications technologies, assistive technologies, and robots, among others (Park et al., 2019). When looking specifically at LTC homes, health IT solutions have the ability to apply to a wide range of areas within LTC homes, including those that assist with activities of daily living (e.g., bathing, eating, etc.), location monitoring (e.g., to track those that wander), and those for recreational purposes (e.g., robots for companionship), among others (Tak et al., 2010). Although health IT solutions can apply to a wide range of areas within LTC homes, it is also important to note the possible impact that they have on improving the quality of life that residents have.

2.2.2 Evidence on the Impact of Technology

In general, health IT solutions can improve and transform care by reducing human error, facilitating care coordination and improve the efficiency of practice (Alotaibi & Federico, 2017). Health IT largely has a positive impact on the lives of older adults, who generally have positive attitudes towards the use of technology. Technology can be used to reduce loneliness, by creating successful relationships (Chopik, 2016). Using technology for social purposes, such as online chatting, instant messaging, and using a smartphone or online video calls is associated with better self-rated health, fewer chronic illnesses, higher subjective wellbeing and fewer depressive symptoms (Chopik, 2016). Loneliness and social isolation are predictors of poor health and

mortality, therefore using technology to reduce them is beneficial to the health of older adults (Chopik, 2016).

Specific to LTC homes, Chapman et al. (2019) found that health IT has benefits for the direct care workforce, family caregivers and various other members of the healthcare team. Many health IT solutions are designed to evaluate a patient's status and can quickly indicate health professionals or caregivers of changes in their status (Kruse et al., 2015). Additionally, health IT solutions have been proven to be able to detect falls quickly, which allows the resident to receive care faster and leads to better outcomes for the resident (Chapman et al., 2019). Health IT solutions are also able to demonstrate a clearer picture of the patient's needs by tracking significant biometric changes, which allows staff to be delegated to the residents that require more care when they need it (Chapman et al., 2019).

Despite that there is significant evidence that health IT solutions are extremely beneficial for LTC homes, there are many barriers that LTC homes face when attempting to adopt them.

2.2.3 Barriers to Health IT Adoption in Long-Term Care Homes

In the United States, concerns regarding health IT adoption were frequently explored in the literature. In a study by Wang & Biedermann (2012), a survey was mailed to all LTC organizations in Texas regarding the adoption of electronic health records. The results of this study found that lack of capital was the greatest barrier to adoption (Wang & Biedermann, 2012). Similar to the findings of Wang & Biedermann (2012), Kruse et al. (2015) found that initial costs, user perceptions and adoption problems were the most prevalent barriers to adopting health IT in LTC homes in their systematic review. Other barriers that were identified included lack of industry standards, challenges finding a system that meets organizational needs, and characteristics of specific homes that make it challenging to adopt health IT (Kruse et al., 2015).

Freedman et al. (2005) also explored the barriers to health IT adoption by conducting 16 semi-structured interviews in the United States with those that had expertise with technology use in LTC. Twelve themes were identified as to the barriers to adopting the technology; however, they also noted a need to confirm the importance of the barriers and to develop an overarching framework specifically for LTC home settings, as they are often resource limited (Freedman et al., 2005). The findings identified by Freedman et al. (2005) were consistent with other literature, which identified cost, the need for training and culture as factors that hindered the adoption of health IT solutions in LTC homes (Cherry et al., 2008).

While the barriers to adopting health IT solutions in LTC homes has been frequently researched in the United States, the pre-adoption stages are largely under-researched and there is limited information available about Canada. In an evidence brief, Gauvin et al. (2021) classified the barriers to technology adoption in LTC in Canada as those associated with governance, financial, and delivery arrangements. Regarding governance arrangements, the provincial legislation and regulatory oversight is complex, with slow regulatory approval, which can impede the uptake of health IT (Gauvin et al., 2021). With limited financial resources in the LTC sector, managers would be forced to divert money from other areas to invest in technology, such as those that contribute to critical aspects of care, which is not always possible to do (Gauvin et al., 2021). In addition, individual LTC homes decide what health IT they want to adopt, therefore there is not a group purchasing process and the available technology is not consistent across homes (Gauvin et al., 2021). Finally, the major barriers associated with health IT involve those with the delivery of care services, such as the gap between the technology that has been developed by a vendor and the needs of residents (Gauvin et al., 2021). In addition, LTC staff often lack the motivation or knowledge to utilize health IT, and have little input as to the

technology being used (Gauvin et al., 2021). Finally, the infrastructure, capacity, and needs of LTC homes are highly variable and some health IT solutions may be readily adopted by certain LTC homes, which may be unsuccessful in other homes (Gauvin et al., 2021).

Overall, the barriers to health IT adoption in Canada that have been identified are largely at the systems level, and there needs to be alignment between the governance, financial, and delivery arrangements to successfully adopt health IT (Gauvin et al., 2021). Little to no research exists at the organizational level on the barriers to health IT adoption in Canada's LTC homes.

2.3 Management and Adoption of Health IT Solutions

2.3.1 Existing Decision-making Process for Adopting Health IT

In general, senior management is responsible for making strategic decisions related to adopting IT solutions within organizations (Tamm et al., 2014). IT related decisions greatly impact organizational health and survival, however, there is often great uncertainty regarding the costs and benefits associated with the technology (Tamm et al., 2014). Tamm et al. (2014) suggests that the process behind the decision to adopt IT solutions needs to be better understood to reduce cost and make better decisions for organizations. They developed a model of the factors that affect IT decision making, including: the decision context, management team characteristics and decision-specific characteristics based upon the synthesis of current management literature (Tamm et al., 2014). The decision context, including organizational factors such as power centralization, structure, size, performance and traditions and norms within the organization were all dominant factors (Tamm et al., 2014). Within the management team characteristics, demographics, biases, individual goals and incentives, personal values and prior experiences were all important factors in the decision to adopt IT solutions (Tamm et al., 2014).

Finally, decision-specific characteristics included time pressures, motives, uncertainty and decision matter (Tamm et al., 2014).

Specific to LTC homes, a recurrent theme in the literature was the lack of evidence-based decision making used to adopt health IT. The findings of Bezboruah et al. (2014) and Liu & Castle (2009) both supported this theme, demonstrating that health IT may be underutilized and that there is little information used when making decisions to adopt health information systems in LTC homes (Bezboruah et al., 2014; M. Liu et al., 2020). Bezboruah et al. (2014) explored the attitudes of key managerial staff members towards health IT. They used semi-structured interviews and direct observation of employee behaviour at participating LTC homes (Bezboruah et al., 2014). The findings of this study included varying levels of health IT adoption, where some administrators were aware of health IT solutions and were looking to update their practices, while others demonstrated a lack of interest in adopting new health technology (Bezboruah et al., 2014). These findings suggest that adoption of health IT is not evidence-based, but it is driven by the lack of information about IT (Bezboruah et al., 2014). One limitation to this study was the small sample size of six in-depth case studies, however, they were able to demonstrate practical applications of their work such as the need for nursing home administrators to systematically plan the adoption of health IT through evidence-based practices (Bezboruah et al., 2014).

More recently, due to the lack of evidence-based decision-making used to adopt health IT in LTC homes, the literature also identified the need to develop standards, frameworks, and models to promote the integration of health technology in LTC homes (Ko et al., 2018). Ko et al. (2018) conducted a literature review of 46 papers containing information on the adoption of health IT, as well as 15 semi-structured interviews with staff. The results of this study found that

LTC homes do not employ a systematic process for adopting health IT (Ko et al., 2018). They further suggested that stakeholders in nursing home care should develop a toolkit for the nursing home workforce (Ko et al., 2018). In addition to the literature review, Ko et al. (2018) conducted semi structured interviews and small focus groups of nursing home staff with a sample size of 15 people. They found that LTC facilities lack the necessary technology support and infrastructure such as wireless connectivity to successfully adopt health IT solutions (Ko et al., 2018). They also found mixed evidence regarding the affects that health IT has on staff productivity as initial investment in the adoption and training of the workforce impacted the ability of LTC homes to realize the benefits of health IT solutions in productivity (Ko et al., 2018). The engagement of LTC staff was found to be imperative to gain the benefits from adopting health IT solutions (Ko et al., 2018). The management of LTC homes faced limitations in their own skills, time and perceptions of adopting health IT solutions (Ko et al., 2018).

2.3.2 Role of Management in Health IT Adoption

The pre-adoption stages of health IT solutions and the role that management has in the adoption process are largely under-investigated (Rodríguez & Pozzebon, 2011). Rodríguez & Pozzebon (2011) explored managerial behaviour during the pre-adoption periods in two Canadian university hospital centers. They used a case study research design and found that managers were aware of the organizational impact that adopting new health IT solutions would have, however, their decisions during the pre-adoption process were driven by financial constraints and power struggles between those involved in the process (Rodríguez & Pozzebon, 2011). Little emphasis was placed on organizational factors in the adoption process, while a large emphasis was placed on the technological aspects of the adoption (Rodríguez & Pozzebon,

2011). They emphasized a need for future research on managerial strategies in the pre-adoption phases of health IT solutions (Rodríguez & Pozzebon, 2011).

Poor leadership often causes health IT adoption to fail, and managers play various roles in the adoption of health IT (Laukka et al., 2020). More recently, Laukka et al. (2020) conducted a scoping review searching five databases: CINAHL, Business Source Complete, ProQuest, Scopus and Web of Science with articles published between 2000 and 2019. They identified seven roles for healthcare managers in health IT adoption, including: the supporter, change manager, advocate, project manager, decision-maker, facilitator, and champion (Laukka et al., 2020). The supporter role included providing sufficient resources to aid in health IT adoption and motivating healthcare professionals to use health IT solutions (Zhang et al., 2016). The change managers were responsible for taking part in resolving conflict and organising the new workflow procedures (Laukka et al., 2020). The advocate role consisted of healthcare managers who believed that health IT adoption should be of priority and convinced unwilling users the health IT would benefit patient care (Laukka et al., 2020). The project managers were responsible for the adoption process, with tasks such as planning the adoption (Laukka et al., 2020). The decision-maker role was usually held by senior management and were responsible for the decision to adopt (Laukka et al., 2020). The facilitator role was adopted by managers who aimed to ensure the cooperation of healthcare professionals in the health IT adoption (Laukka et al., 2020). Finally, the role of a champion was required for successful health IT adoption where organizations would become the first to adopt a health IT solution (Laukka et al., 2020). All of the roles impacted the degree to which health IT solution would be successfully adopted in a healthcare organization (Laukka et al., 2020). While healthcare managers played major roles in the included studies of this scoping review, they also found that managers do not make health IT

a priority as they also need to operate other health services and they are unsure who is responsible for health IT adoption (Laukka et al., 2020). Laukka et al. (2020) suggested that more research should focus on validated questionnaires that cover the factors that support the roles that healthcare managers adopt to successfully adopt health IT solutions.

Following the discussion of the existing health IT decision-making process and the role that management has, is now possible to discuss the issues that influence organizational technology adoption.

2.4 A Thematic Map of Issues Influencing Technology Adoption and Use

The following section expands on a model, which is later referred to in the discussion of the results of this research. While not specific to LTC, the model presents important issues that are factors in technology adoption at the organizational level (Saghafian et al., 2021).

2.4.1 Description of the Thematic Map from Saghafian et al. (2021)

Through a qualitative literature review and thematic analysis of the data, Saghafian et al. (2021) developed a thematic map that depicts three stages of the technology adoption process, including pre-change, change, and post-change, which are explained further in the next sections. The map is a continuous cycle, and the themes within the map can either facilitate or impair technology adoption depending on how they are managed and executed (Saghafian et al., 2021), see figure 1 below.

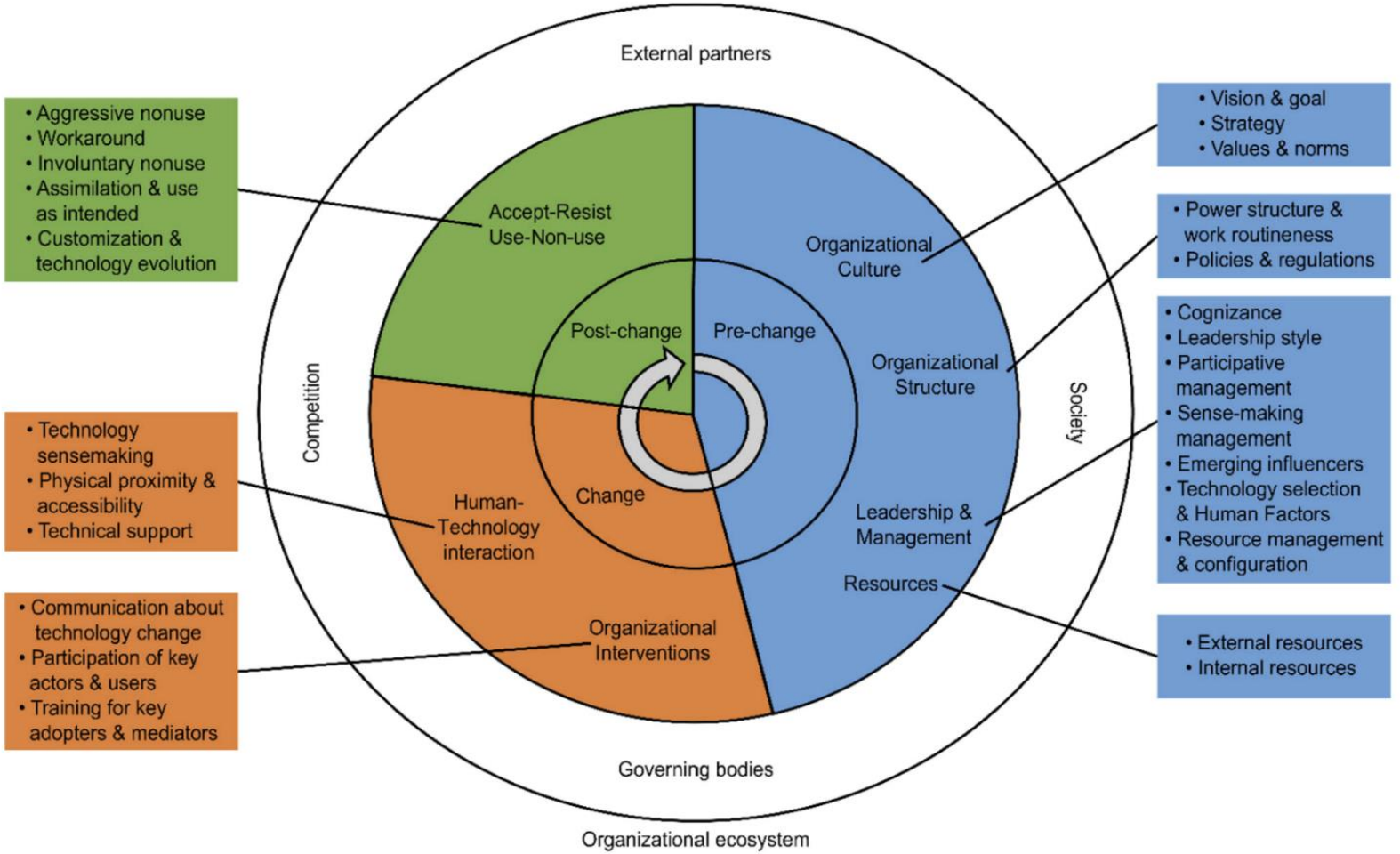

Figure 1: Reprinted from "Stagewise Overview of Issues Influencing Organizational Technology Adoption and Use", by Saghafian, M. et al., 2021, *Frontiers in Psychology*, 12.

2.4.1.1 Pre-change State

The first stage is the pre-change state, which includes themes related to the current state of an organization prior to the technology adoption (Saghafian et al., 2021). This stage includes the following dimensions of organizational culture, organizational structure, leadership and management, and resources (Saghafian et al., 2021), which are explained in more detail below.

Organizational Culture and Structure

Organizational structure is a broad theme that includes dimensions of vision and goals of the organization, and their strategy, values, and norms (Saghafian et al., 2021). Having a common and coherent vision and goal can motivate change across an organization by limiting division as to what should be done and how (Saghafian et al., 2021). Proactive organizational strategies aim to be efficient in adopting change and involve searching the external environment for opportunities (Saghafian et al., 2021). Organizational values and norms are the principles that guide people to understand what is considered acceptable or not (Saghafian et al., 2021). Knowledge transfer, collaboration among stakeholders, cultural differences, and language barriers are all considerations in adopting new technologies (Saghafian et al., 2021).

Leadership and Management

The literature review of Saghafian et al. (2021) identified the role of leadership and management as essential in the technology adoption process, and included dimensions of managerial cognizance, leadership style, participative management, sensemaking among stakeholders, resource management, technology selection, and emerging influencers (Saghafian et al., 2021). Cognizance refers to a manager's ability to adjust to changes and to be aware of what is happening within the organization (Saghafian et al., 2021). The transformational leadership style can help with technology acceptance by inspiring and motivating employees

(Saghafian et al., 2021). Regarding the dimension of participative management, support and commitment, availability, and openness to dialogue demonstrates a manager's commitment to the technology adoption, which can enhance momentum (Saghafian et al., 2021). Stakeholders may have competing goals and visions for the technology use, therefore, managers should map the involved stakeholders to adjust the dialogue they will use and address the concerns of each stakeholder (Saghafian et al., 2021). Technology selection involves choosing a technology solution that is suitable for the desired outcomes. There needs to be sufficient evaluation of the technology's useability and viability (Saghafian et al., 2021).

Resources

Saghafian et al. (2021) identified resources as the next main theme, which includes material resources (e.g., technical, infrastructure, and budget resources etc.) and immaterial resources (e.g., knowledge and skills, political resources and partnerships, time etc.) and further divides into dimensions of internal and external resources.

External Resources

External resources include those that come from outside of the organization and can include things such as sponsorships and funding bodies (Saghafian et al., 2021). External immaterial resources includes networking and knowledge sharing that can help with technology adoption (Saghafian et al., 2021).

Internal Resources

Internal resources involve those within the organization and can be separated into material and immaterial resources (Saghafian et al., 2021). Internal material resources include things such as infrastructure and budget (Saghafian et al., 2021). Internal immaterial resources

would include the human resources of an organization, such as the employees and their attitude and aptitude towards technology adoption (Saghafian et al., 2021).

2.4.1.2 Change Process Stage

The change process stage occurs next, and encompasses the ongoing change process and the interaction between the new technology and those using it (Saghafian et al., 2021). In this second stage, Saghafian et al. (2021) identified overarching themes of organizational interventions and human-technology interactions. The dimensions that were identified include communication, participation of key end-users, training, technology sensemaking, and the perceived level of organizational support (Saghafian et al., 2021), and are explained further below.

Communication

Communication refers to interventions that convey information about the technological change, in an effort to increase trust from employees and reduce anxiety about the change (Saghafian et al., 2021). Saghafian et al. (2021) recommends that communication occurs as early as the selection decision to clarify stakeholder roles and to avoid confusion early on.

Participation of key end-users

The next dimension is the participation of key end-users, which can promote engagement and commitment to use the technology (Saghafian et al., 2021). Involving the end-users often increases the likelihood that the technology will continue to be used in practice as problems with the technology can be solved earlier in the adoption process (Saghafian et al., 2021).

Training

Training must be adapted for the receivers and must help to overcome gaps in knowledge/skills to enhance self-sufficiency and improve technology adoption (Saghafian et al.,

2021). There also needs to be adequate time for employees to adjust to the change and familiarize themselves with the technology (Saghafian et al., 2021).

Technology Sensemaking

This stage includes the emotional and cognitive processes that are involved in the adoption process (Saghafian et al., 2021). The useability of the technology (e.g., if it is fast and easy to learn), the attributes that make it enticing to use, and the suitability of the technology (e.g., having a legitimate need for the technology) are all part of the theme of technology sensemaking (Saghafian et al., 2021).

Perceived Level of Organizational Support

The final dimension of the change state is the perceived level of organizational support. Commitment from management, as well as social support, can help manage challenges associated with adopting a new technology (Saghafian et al., 2021).

Overall, the change stage of adoption can enhance technology acceptance through communication and participation, and can shape the attitudes of the technology users (Saghafian et al., 2021).

2.4.1.3 Post-Change Stage

The final stage of the model is the post-change stage, which includes factors associated with the outcomes of the technology adoption process (Saghafian et al., 2021). The post-change state is impacted by the two previous stages and is highly dependent on the dynamics of the organization that adopted the new technology (Saghafian et al., 2021). The dimensions included in this stage (i.e., acceptance and resistance towards a new technology) are outlined below (Saghafian et al., 2021).

Resistance

Resistance to new technology can result from previous experiences using technology, low employee motivation, ambiguity in the adoption process, and conflict's with the values of employees (Saghafian et al., 2021). Resistance to technology can also occur indirectly, such as with workarounds, where employees believe the use of the technology slows down their work and does not provide value, therefore the employee does not use the new technology (Saghafian et al., 2021).

Acceptance

In the acceptance state, employees are convinced that the new technology adds value to their work and is needed, therefore employees assimilate the solution into their everyday tasks (Saghafian et al., 2021). In addition, when employees have accepted the technology, they may modify, customize, or tailor it, based on their specific needs (Saghafian et al., 2021).

While the thematic map Saghafian et al. (2021) identified is not specific to LTC homes, they do highlight the need to consider the nature of the task and the industry that the new technology is being used for (Saghafian et al., 2021). All stages in the thematic map are interconnected and need to be considered in a timely manner during the adoption process, along with the external environment of the organization (e.g., governmental pressures, legal bodies, market competition etc.) (Saghafian et al., 2021). Finally, the themes and dimensions that were previously outlined all have the potential to be enablers or barriers to technology adoption. For example, when a dimension is considered and acknowledged at the appropriate time, it may become a facilitator to technology adoption, otherwise, if the dimension is not considered or acknowledged, it may become a barrier to the technology adoption process (Saghafian et al., 2021).

3. Methodology

As previously mentioned, the research question is "What are the factors that affect and can inform the decision-making of managers in relation to health IT adoption in LTC homes?". The following sections will explain the methodology that was used to answer this question.

3.1 Overview of the Delphi Survey Technique

While the literature has demonstrated that health IT has the potential to improve resident quality of life in LTC homes, health IT adoption is often either delayed or is unsuccessful (Ko et al., 2018). The literature views the adoption and adoption of health IT as lacking a systemic process (Ko et al., 2018). Managers in LTC are often approached by vendors or technology firms who are marketing their products. Yet, there is no methodology or systematic benchmarking approach that managers can refer to when making decisions about new health IT solutions. In addition, it is not clear what factors influence and inform their decision-making when deciding on whether to adopt a new technology or not within their LTC home and what technology to choose and prioritize. As the aim of this study was exploratory and to develop a list of factors that are considered in the decision to adopt health IT solutions, the best source of information was experts in the field that have years of experience (Schmidt et al., 2001). Single experts would not have had the expertise needed to create a comprehensive list of factors (Schmidt et al., 2001). The Delphi technique would provide an inductive approach that is data-driven, where its rigour is best suited for exploratory studies where little empirical evidence exists (Paré et al., 2013). Therefore, using the Delphi technique, which is exploratory in nature, and elicits the opinion of experts was selected for this study.

The Delphi technique uses a panel of experts to answer multiple iterations of questionnaires and feedback from participants to obtain consensus on a particular topic (Crisp et al., 1997). This methodology is a means for consensus-building, where data can be collected by geographically dispersed participants (Paré et al., 2013). The process involves a series of rounds, and within each round participants will return a questionnaire to the researcher, who will then edit and return a statement of the panel's position (Paré et al., 2013). Specifically, a Delphi study typically involves three rounds. The first round involves the participants brainstorming as many items as possible (Paré et al., 2013). The second round is involves narrowing down the list of items (Paré et al., 2013). The final round of a Delphi study is requires the participants to rank the list of factors based on importance (Paré et al., 2013). The strengths of a Delphi study are in its flexibility for solving highly complex problems, while reducing the effect of noise, as communication within a group process can distort data (Fink-Hafner et al., 2019). Delphi studies are particularly useful when there is limited evidence on a topic and a range of opinions to generate a consensus is imperative (Iqbal & Pipon-Young, 2009). Limited evidence exists on the selection and adoption of health IT in the context of LTC and a better understanding of the factors that shape and influence managers' decision-making in relation to the adoption of health IT solutions is most beneficial at the organizational, policy, and research levels.

3.2 Selection of Participants

Decision-making, which involves considering all possible options and selecting a single one (Black et al., 2019), is often undertaken by managers or directors of LTC homes. Decision-makers are often members of the senior management team that make decisions regarding their organization (Black et al., 2019). Decisions that members of senior management teams would have to make include those that involve adopting new health IT solutions, as managers or

directors are often approached by vendors and technology firms who are looking to market their products. Participants in this study were purposefully selected based on those that can apply their knowledge and experience of adopting health IT (Akins et al., 2005). For this criterion, participants must have been approached by vendors or researchers to make decisions about adopting health IT solutions or must have been involved in the decision-making related to the adoption of health IT solutions in a LTC home. Managers that work in all sizes of LTC homes were included, as smaller LTC homes may not have adopted health IT solutions but may have been approached by vendors or researchers with health IT solutions to adopt in their LTC home.

As Ontario does not have a list of managers in LTC homes who would be making decisions about adopting health IT solutions in their LTC home, the recruitment strategy involved a convenience sample and employed a snowball approach to soliciting the participation of senior managers within Ontario. To recruit participants, the convenience sample consisted of soliciting the participation of managers in LTC homes that usually collaborate with the thesis committee members on research projects. For this purpose, the student first searched online for LTC homes in Ontario that had previously been involved with health IT adoption. This included searching through news articles and the websites of LTC homes in Ontario. Potential participants whose information was publicly available online were contacted by telephone and/or email using an invitation to participate document as a script. The invitation to participate document included information on the purpose of the study, as well as a one-minute video that that described the LTC context, the current health IT decision-making process, and the purpose and benefits of participating in this master's thesis. In addition, members of the student's thesis advisory committee reached out to members of their research network with the invitation to participate and the one-minute video. From an ethics perspective, the student was not able to reach out to

these potential participants themself as their information (e.g., name, phone number, email etc.) could not be shared without their permission. From there on, the snowball sampling approach was used with participants sharing information about the project with their peers who contacted the student researcher if they were interested in participating. I contacted the Ontario Long Term Care Association, Seniors Quality Leap Initiative, and AdvantAge Ontario and informed them about my study using the previously described invitation to participate and one-minute video. They indicated their willingness to share the information about my research with their members through a regular newsletter that they send out. Those who were interested in participating contacted the student by email or telephone and shared the invitation to participate with anyone who they believed would have been interested in the study.

Overall, 19 decision-makers who are part of management teams of LTC homes in Ontario were recruited to participate in this study. This was in line with recommendations in the literature, where panel sizes are typically between 7 to 30 participants (Akins et al., 2005; Paré et al., 2013).

3.3 Data Collection

3.3.1 Survey Rounds

As previously mentioned, the Delphi methodology uses a series of three questionnaire rounds to obtain consensus on a particular topic (Crisp et al., 1997; Paré et al., 2013). Each round of the Delphi survey was sent to participants through email. Participants were asked to complete each of the following questionnaire rounds within two weeks: brainstorming, narrowing down, and ranking. A reminder email was sent to all participants who had not sent their responses after 10 days. After three reminders, it was assumed that participants who had not responded dropped out of the study. The data collection was done between February and May 2022. Figure 2 below

outlines the steps taken in each round, which follows the recommendations outlined by Paré et al. (2013).

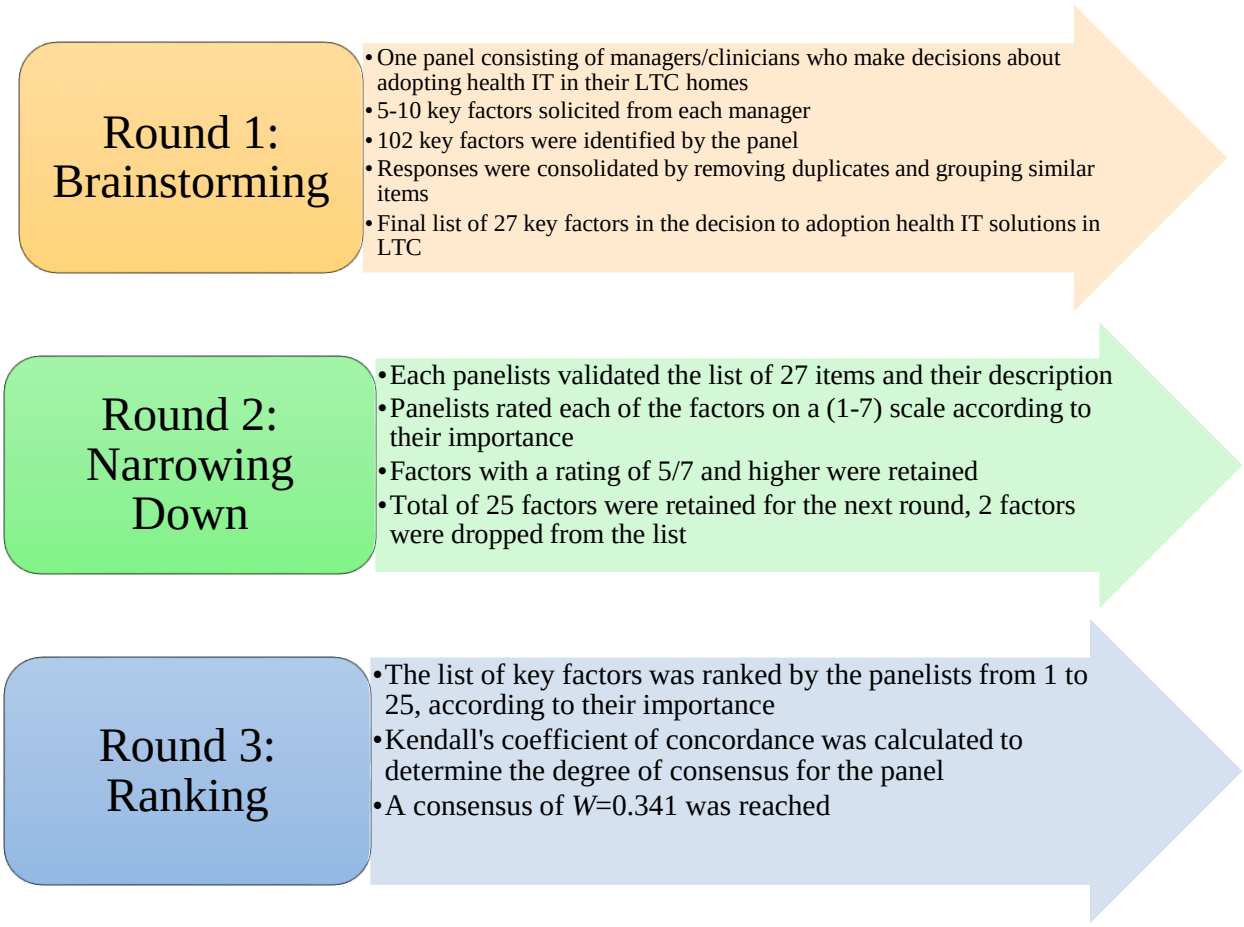

Figure 2: Delphi Survey Rounds

3.3.2 Round 1

The brainstorming round of the Delphi survey was sent to participants on February 10th, 2022, by email. Participants were asked to provide a list of 5-10 key factors that can help inform their decisions on which health IT solutions to adopt within their LTC homes. Participants were also asked to provide a brief description of each factor which was used to clarify ambiguous responses (Paré et al., 2013). A key factor was defined as a consideration or influence that contributes to the decision to adopt a health IT solution, and includes barriers, facilitators, or

conditions needed to inform the decision on health IT. Key factors were information that would be helpful or characteristics that could effectively support the manager/clinician's role when making decisions about health IT solutions to adopt in their organization.

The data collection period was longer for the brainstorming round compared to the other two rounds, as participants had required additional time to complete the survey due to the COVID-19 pandemic. To consolidate the list of key factors identified by the panelists, content analysis was used where the student and another researcher worked on coding the key factors (Hasson et al., 2000). The two coders grouped similar items together to provide a single description, keeping the wording of participants as close as possible to reflect the opinions of the participants (Hasson et al., 2000). Duplicate issues were removed and discussion with a third coder was used to resolve the 17 disagreements that the two coders had (Hasson et al., 2000).

The codes were assigned categories that reflected the themes of the key factors that were identified by participants. For example, responses of "Long-term care funding is limited resulting in few resources available to invest in new technology" and "funding is limited, and we try to make it stretch as far as possible" were both grouped under the code *Availability of Funding*. Intercoder agreement calculates the level of agreement between two or more independent coders and is based on the proportion of total issues that were assigned the same code (Allen, 2017). The intercoder agreement for the brainstorming round was 83.3%, and differences were resolved through discussion between coders. The analysis resulted in a list of 27 key factors that were identified by the 16 panelists that responded to the brainstorming questionnaire. The brainstorming questionnaire that was sent to participants is included in figure 5 in the appendix.

3.3.3 Round 2

The narrowing down questionnaire was sent to participants by email. In this round, participants were first asked to validate the list of key factors and their descriptions by providing comments, corrections, and/or additional factors to ensure that their views and opinions were accurately represented (Paré et al., 2013). The participants were then asked to rate items on a 7-point Likert scale (1=least important, 7=most important) according to their importance in the decision to adopt health IT solutions (Paré et al., 2013). To narrow down the list so that it was manageable for participants to rank in the third round, items with a rating of 5 and greater were retained (Paré et al., 2013; Schmidt et al., 2001). Twenty-five key factors were retained from this round. In addition, participants were asked to complete the questions regarding their background characteristics to provide an overview of their profiles (Paré et al., 2013). Fifteen respondents completed this survey round. The narrowing down questionnaire that was sent to participants is included in figure 6 in the appendix.

3.3.4 Round 3

The ranking questionnaire was sent to participants by email. The aim of this round was to reach a consensus in ranking the items in order of priority (Paré et al., 2013). The narrowed list from the second round was circulated to participants and they were asked to rank the remaining items based on importance, where the top-ranking factor was what they considered to be most the important and relevant in their decision to adopt health IT solutions. After the responses from the ranking round were received from the participants, Kendall's coefficient of concordance (*W*) was calculated. Kendall's coefficient of concordance, a method used for the comparison of rankings when three or more experts are involved, ranges from 0 (no agreement between raters)

to 1 (perfect agreement between all raters) (Paré et al., 2013). Equation 1 below outlines the formula used to calculate Kendall's *W*.

$$W = \frac{12S}{m^2(n^3-n)-mT}$$

Where S=sum of squares of the deviations of the rankings from the mean,

m= the number of experts,

n=number of propositions being ranked, and

T=correction factor for tied ranks

Equation 1: Kendall's Coefficient of Concordance (Graham, 2010)

Once Kendall's *W* was obtained based on the above equation, the guidance provided by Schmidt (1997) was used to interpret the value of *W*. Reporting a coefficient greater than 0.7 is considered strong, 0.5-0.7 is considered moderate agreement, and less than 0.5 is considered weak (Paré et al., 2013).

Generally, the ranking round ends after a strong consensus is reached (Schmidt, 1997). If a strong consensus is not reached after the first ranking round, another survey round can be sent to the panelists where they are provided with the items to rank and controlled feedback (Paré et al., 2013). Providing controlled feedback to participants involves including the interpretation of Kendall's W from the previous round, and any relevant comments that were made by the experts (Paré et al., 2013). For the purpose of this research, I was not able to complete a second round of ranking, which might have increased the agreement level, as it would have presented more time commitment and demand on the part of the panelists, which was a challenge given the pandemic situation and work demand on them.

4. Results

The following sections present the results of each Delphi survey round. Based on the methodology by Paré et al. (2013), the attrition rate must be reported as participants can discontinue their participation during various rounds of the Delphi survey. Nineteen managers agreed to participate in this study out of which 16 completed round 1. The attrition rate was 19%, with 15 and 13 participants completing rounds 2 and 3 respectively. This rate is in line with what is recommended by Paré et al. (2013), who suggests that the attrition rate would ideally be no higher than 30%. Given the pressures that the panelists faced with addressing the COVID-19 pandemic in LTC, the low attrition rate speaks to the importance of the study to the panelists. Figure 3 below presents the number of participants who completed each round of this Delphi survey.

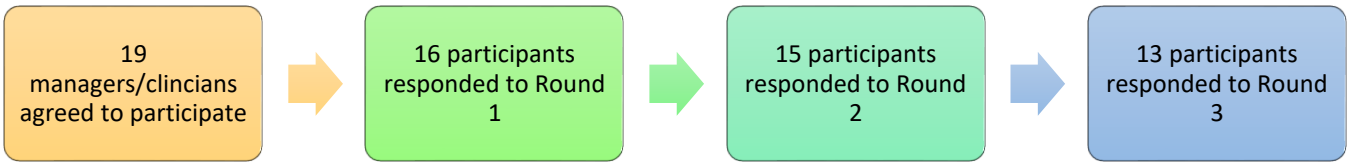

Figure 3: Number of participants throughout the data collection process

4.1 Participant Characteristics

Table 1 below presents the characteristics of the managers and clinicians who participated in this study, as well as the characteristics of the LTC home in which they work. In

general, most of the participants were female (80%), 40-49 years old (60%), and had a master's degree (60%). Participants had spent an average of 5.8 years in their current role and had 9.7 years of experience at their LTC organization. Interestingly, participants had an average of 10.5 years of experience in making decisions related to health IT adoption. Slightly more participants were in a non-clinical role (53%), compared to 47% of participants who had a clinical role. This indicates that the panelists had relevant professional experience and knowledge to contribute to this study, which is important as the Delphi methodology is dependent on the opinions and judgements of the panelists (Paré et al., 2013).

For the characteristics of the LTC home that the participants work at, the average number of beds was 211 (53-450). Regarding the ownership status, most LTC homes were not-for-profit (67%).

Table 1: Characteristics of the participants

Participant and Organizational Characteristics	N (%)
Gender	
Male	3 (20%)
Female	12 (80%)
Age	
20-29 years	0 (0%)
30-39 years	2 (13%)
40-49 years	9 (60%)
50-59 years	4 (27%)
>60 years	0 (0%)
Education	
High School	0 (%)
College	2 (13%)
Undergraduate (Bachelor)	3 (20%)
Masters Level	9 (60%)
Doctoral Level	1 (7%)
Other	0 (0%)
Job Title	
Clinician	7 (47%)

Non-Clinician	8 (53%)
	Mean [Range]
Years of experience you have in your current position	5.8 [0.5-14]
Years of experience you have in your LTC organization	9.7 [0.5-27]
Years of experience that you have in making decisions related to health IT adoption	10.5 [0.5-20]
Average number of long-term care beds	211 [53-450]
Ownership status of the LTC home For-Profit Not-For-Profit	 5 (33%) 10 (67%)

4.2 Round 1: Brainstorming

The aim of this round was to generate an exhaustive list of factors that managers consider in their decision to adopt health IT solutions. As previously mentioned, participants were asked to brainstorm a list of 5-10 key factors and their description, which resulted in a list of 102 factors total. Following the methodology of Paré et al. (2013), the list of items needed to be consolidated into a single list by removing duplicate factors and grouping the factors into categories. The student and another researcher worked to remove the duplicates and group the factors into categories. Specifically, the two coders met and used an anonymized list of factors to code and categorize the first 10 factors together. Following this, the student and researcher coded and consolidated the remaining 92 factors individually. Once finished, the student and researcher met again to discuss any disagreements. The inter-coder agreement was calculated based on the total number of responses that were grouped into the same category by both coders (85 factors), divided by the total number of factors (102 factors), and was found to be 83.3%. This indicates a fairly strong agreement between coders (Paré et al., 2013). Following the reconciliation of items that were disagreed upon, a final list of 27 key factors and their description was developed (see table 2). The nature of the key factors ranged between social factors (e.g., comfort and social

environment) and regulatory requirements (e.g., compliance with privacy standards). Some factors were related to the availability of resources (e.g., availability of funding), while others were associated with the organizational environment (e.g., top management support, impact on workload and efficiency, etc.) and the technical factors of the health IT solution (e.g., longevity of the IT solution, technology characteristics, etc.).

Table 2: Round 1 final list and descriptions of key factors affecting the decision to adopt health IT

Key Factor	Description
Alignment with Strategic Priorities	Alignment of the technology with the organization`s strategic priorities and plans, as well as with the direction of governing bodies.
Implementation Support	Active support to reduce the burden on the LTC home that is implementing a technology is a facilitator to keep the momentum of the project moving.
Limited Change and Project Management Skills	The change management and project management skills required to implement new IT solutions are in short supply in long-term care.
Availability of Funding	Long-term care funding is limited resulting in few resources available to invest in new technology, with challenges in identifying which funding envelope would cover the costs of technology. Funding in LTC do not permit transfer of funds from one envelope to another, and government funding does not meet the needs for IT training, equipment, and ongoing use. LTC homes should not have to choose between reducing care hours to pay for new/efficient technology.
Evidence of Technology Success and Effectiveness	Strong reference from similar organizations can be the best persuasion for new technologies and learning from the experience of other LTC homes that have used the technology (e.g., challenges, successes, evidence of improvements) is important.
Competing Priorities	With the COVID pandemic, there are a lot of things to do in LTC, which makes adopting new technologies another thing on the list of competing priorities, especially with the continuous changes of rules in LTC homes.
Required Time for Technology Set-up	LTC staff are often busy with other tasks and the time needed to set up new technologies can pose challenges.
Comfort and Social Environment	LTC staff have varying levels of comfort with using technology (need a reasonable learning curve for the staff or they will give up), and there may be language and cultural considerations (e.g., norms/beliefs) that need to be considered.
Compliance with Privacy Standards	The technology must be compliant with professional associations/organizations for standards of practice in relation to health information (i.e., health information must be kept private and confidential at all times).
Timing of the Implementation	Timing can impact making decisions on new technologies as there are often many other changes occurring in a LTC home (i.e., new rules and regulations).
Ease of Use	The new technology must be easy, user-friendly, logical in its application and easy to manipulate for higher chances of end-users adopting it, maintaining competency, and preventing workarounds that can lead to information and data getting lost.

Performance Improvement	The operational benefits of the technology including saving time, making information available in a timely manner, decreasing error and paper use.
End-User Buy-in	From a process owner perspective, there needs to be sufficient buy-in from the front-line staff when they are required to use the new technology.
IT Knowledge	Decision-makers' computer/IT literacy and comfort using the technology.
Top Management Support	The entire leadership team needs to be on board with supporting the technology and helping to implement it across the organization.
Value Proposition	To make technology related decisions, it is important to understand what the business, clinical, or operational problem is and how the new technology being considered will solve that problem. The technology must be the right fit for the problem and show the staff what's in it for them and for the resident.
Integration into Existing Systems/Technology	The integration with existing software and systems (e.g., Electronic medical records, clinical systems, human resource systems) is important for reporting efficiency, and avoiding overwhelming the staff with different logins and systems. Clinical-based software applications storing residents' clinical information are considered the "source of truth", so new technology should be able to integrate and pull data from them.
Alignment with Workflow	The technology should fit the demand of the process owner. Avoiding duplication (e.g., repeating the same procedures and interventions), additional tasks, and manual workarounds, as well as improving the day-to-day operations is necessary when making decisions about new technologies.
Vendor Reputation	The reputation of the provider of the solution goes a long way in the decision-making process about technology, and a vendor's longevity in the market, understanding of the LTC sector and being a leader in product offering and innovation is critical for LTC homes when making decisions on new technologies.
IT Support	Many long-term care homes do not have dedicated or have limited IT staff. Having adequate, easily accessible support in a new technology implementation, and clear information on vendor IT support model (e.g., how long and during what hours of the day, providing tips sheets or common issues solutions) is important.
Impact on Residents' Outcomes	The new technology solution must have clear, substantiated benefits that will improve the outcomes for a considerable number of LTC residents.
Cost of the Technology	Affordability of the technology is relation to its upfront cost and implementation (e.g., hardware and network requirements), and ongoing cost (e.g., maintenance), which must be reasonable and justified against using funds in a human resource driven industry. Hidden cost must be clarified upfront (e.g., necessity for increasing Internet speed or server capacity).
Technology Characteristics	Characteristics of the technology in relation to ease of maintenance and replacement, reliability, remote access to resident files, applicability to a broad group, visibility to drive communication, and equitability (i.e., issues in determining who will be able to access the new technology).

Training	Extent of initial and ongoing training demands, degree of training intensiveness (e.g., number of rounds, and duration of training sessions), and accessibility of free of charge support and training to end-users given the limited time available for documentation.
Challenge Keeping up With Technology	With few administrative resources, it is difficult for long-term care decision makers to keep up with IT developments and identify new solutions.
Impact on Workload and Efficiency	The technology should not add to staff's workload but save time and drive efficiency without being onerous for users, and free up more time to dedicate to residents.
Longevity of the IT Solution	The technology solutions must be able to stand the test of time. With technology solutions advancing so quickly and evolving it is sometimes hard to stay on top of continuous updating.

4.3 Round 2: Narrowing Down

At the start of the narrowing down round, participants were asked to comment on and validate the consolidated list of 27 key factors (Paré et al., 2013). As the goal of this round was to narrow the list to a more reasonable and manageable number of key factors (Paré et al., 2013), the list was sent to the panelists in random order and they were asked to rate each item on a (1-7) scale (Paré et al., 2013). Items in the top 70% were retained (Okoli & Pawlowski, 2004; Paré et al., 2013), which included those with a rating of 5/7 or greater. This resulted in 25 items that were retained, and 2 key factors that were dropped. The highest-rated key factors and their mean ratings were *impact on workload and efficiency* (6.73), *availability of funding* (6.47), *alignment with workflow* (6.33), *ease of use* (6.20), *cost of the technology* (6.13), and *performance improvement* (6.13). These factors were related to three themes, including organizational structure and work routineness (e.g., impact on the workload and efficiency, alignment with workflow, and performance improvement), resources (e.g., the availability of funding, cost of the technology), human-technology interaction (e.g., ease of use) (Saghafian et al., 2021). In addition, they were mainly related to the internal organizational environment and can impact the operations of the LTC home. The lowest mean ratings were *comfort and social environment* (4.40) and *vendor reputation* (4.67), which were the two factors that were discarded. Table 3 presents the mean ratings of the key factors in the decision to adopt health IT.

Table 3: Round 2 mean rating of key factors in the decision to adopt health IT

Key Factor	Rating Mean [Range]
Impact on Workload and Efficiency	6.73 [5-7]
Availability of Funding	6.47 [4-7]
Alignment with Workflow	6.33 [5-7]
Ease of Use	6.20 [5-7]
Performance Improvement	6.13 [4-7]
Cost of the Technology	6.13 [4-7]
Integration into Existing Systems/Technology	6.00 [5-7]
Value Proposition	6.00 [4-7]
Impact on Residents' Outcomes	6.00 [4-7]
Implementation Support	5.93 [4-7]
Competing Priorities	5.93 [4-7]
Top Management Support	5.87 [3-7]
Timing of the Implementation	5.80 [4-7]
End-User Buy-in	5.67 [4-7]
IT Support	5.67 [4-7]
Longevity of the IT Solution	5.67 [3-7]
Training	5.60 [4-7]
Evidence of Technology Success and Effectiveness	5.53 [4-7]
Compliance with Privacy Standards	5.53 [3-7]
Technology Characteristics	5.40 [2-7]
Limited Change and Project Management Skills	5.26 [2-7]
Required Time for Technology Set-up	5.13 [3-7]
IT Knowledge	5.07 [3-7]
Challenge Keeping up With Technology	5.07 [1-7]
Vendor Reputation	4.67 [3-7]
Comfort and Social Environment	4.40 [2-7]

4.4 Round 3: Ranking

This was the final survey round, where participants were asked to rank the list of key factors from the second round from 1-25, according to their importance. Each panelist was sent a randomized list of the key factors and Kendall's *W* was calculated to determine the level of agreement between the panel (Paré et al., 2013).

As previously mentioned, only one round of ranking was completed, where the level of agreement between the panel was determined to be W=0.341 (low to fair). Given the strict timeline of this thesis project and the fact that the LTC environment has faced significant challenges and demands over the past year, it was not feasible to do a second round of ranking, which might have otherwise led to a higher level of agreement between panelists. While the agreement level between the participants in this research is not strong, it is an indication that the panelists may have had different perspectives on the importance of the factors, which will be further described in the discussion section.

The highest-ranked factors are *availability of funding, impact on workload and efficiency, value proposition, ease of use,* and *impact on residents' outcomes*. These factors reflect varying themes including those related to resources, human-technology interaction, organizational structure and work routineness, and organizational culture (Saghafian et al., 2021). Interestingly, the highest-ranked factors were not related to leadership and management or organizational interventions (Saghafian et al., 2021).

The five lowest-ranked factors are *required time for the technology set-up, IT knowledge, technology characteristics, challenge keeping up with the technology,* and *limited change and project management skills*. Of these factors, all were related to leadership and management, except for *technology characteristics,* which related to the human-technology interaction

(Saghafian et al., 2021). Interestingly, *implementation support* and *end-user buy-in* tied for the 11th rank, which are both factors related to organizational interventions (Saghafian et al., 2021). Table 4 below presents the key factors in the decision to adopt health IT solutions in LTC, ordered by their mean ranks.

Table 4: Final ranking of key factors in the decision to adopt health IT in LTC homes

Rank	Key Factor	Mean Rank	[Minimum-Maximum]
1	Availability of Funding	5.08	[1-16]
2	Impact on Workload and Efficiency	7.46	[2-15]
3	Value Proposition	8.31	[2-17]
4	Ease of Use	8.46	[1-23]
5	Impact on Residents' Outcomes	8.69	[1-24]
6	Cost of the Technology	9.08	[2-24]
7	Evidence of Technology Success and Effectiveness	9.15	[1-21]
8	Alignment with Workflow	9.92	[4-21]
9	Integration into Existing Systems/Technology	10.08	[3-22]
10	Alignment with Strategic Priorities	11.15	[3-23]
11	Implementation Support	11.69	[2-23]
11	End-User Buy-In	11.69	[3-23]
12	Top Management Support	13.15	[1-25]
13	Compliance with Privacy Standards	13.31	[1-22]
14	IT Support	13.92	[8-18]
15	Performance Improvement	14.31	[4-24]
16	Competing Priorities	14.77	[6-24]
17	Timing of the Implementation	16.00	[5-25]
18	Longevity of the IT Solution	16.08	[7-22]
19	Training	16.81	[8-24]
20	Required Time for the Technology Set-Up	18.23	[6-25]
21	IT Knowledge	18.31	[7-25]
22	Technology Characteristics	18.77	[10-25]
23	Limited Change and Project Management Skills	20.04	[6-25]

24	Challenge Keeping up With Technology	20.54	[9-25]

5. Discussion

This Delphi study was exploratory in nature and aims to examine the factors that affect and can inform the decision-making process of managers when adopting health IT. As previously stated, we have observed an uptake of health IT to support the care of older adults, and as more technology is being developed and made available to LTC homes in Canada, it is important to understand the factors that influence managers' decision-making when adopting health IT solutions within their organizations to inform future strategies and policies. Furthermore, the literature suggests that the decision-making process of health IT adoption is not well understood in the LTC environment, and that managers often make adoption decisions using little evidence, which impedes their ability to realize the benefits of health IT (Bezboruah et al., 2014; Tamm et al., 2014). Therefore, an authoritative list of key factors that are important and relevant from the perspective of managers in relation to health IT decision-making and adoption was generated through this Delphi survey.

5.1 Participants

Although Paré et al. (2013) recommends including the response rate to the initial call to participate, this was not feasible to calculate given the nature of the sampling used (e.g., it was not possible to track how many potential participants were contacted through the snowball sampling or how many participants saw the recruitment script and/or video that was sent through the various LTC organizations). While many people did indicate an interest in the study, they were unable to participate due to workload pressures that they faced, as LTC homes are

notoriously understaffed, which was further exacerbated by the COVID-19 pandemic (Estabrooks et al., 2020). Given the demands that LTC homes have faced during the COVID-19 pandemic, and the burden that may be placed on participants during the Delphi process (e.g., time consuming and iterative rounds) (Paré et al., 2013), the attrition rate for each round of the study was low, which speaks to the importance of the topic to the LTC managers in this study.

Most participants in this study were female, which is in line with the literature that suggests that most managers in LTC are middle-aged females (Madas & North, 2000; Yu et al., 2009). The participants worked in diverse roles (e.g., Senior Manager of Residential Care Technology, Chief Executive Officer, Director of Clinical Practice, Director of Infection Prevention and Control etc.), which was intended in this study in an effort to ensure diversity in the key factors elicited and to develop the most comprehensive list of factors possible (Paré et al., 2013). On average, participants had worked at their current LTC home for 9.7 years and had over 10 years of experience in making decisions related to health IT. This demonstrates the extensive experience that they have and the knowledge of the needs and challenges in this environment. It is also important to note that there was variability in the experience of the panelists, which ranged between 0.5 to 20 years of experience in making health IT adoption decisions. The list of key factors might have been ranked differently if all participants had the same years of experience, although it was surprising that 53.3% of the panel had over 10 years of experience in making health IT adoption decisions, given the high turnover and low staff retention rates that LTC homes often face across all levels of management (Zúñiga et al., 2019).

In addition, there was a mix of for-profit and not-for-profit LTC homes that participated in this study. Including both not-for-profit and for-profit homes aided in creating a more comprehensive list of key factors, as the literature has identified that there are differences in the

LTC homes based on the ownership status of the home (McGrail et al., 2007). Interestingly, the literature suggests that not-for-profit organizations are more innovative and likely to adopt health IT to address gaps in services (Hamann & Bezboruah, 2013). This might help to explain why there were more not-for-profit homes that were willing to participate in this study than for-profit homes. As well, decision-makers in not-for-profit LTC homes often make value-based decisions, which might be why key factors related to resources and culture were ranked higher than those related to leadership and management (Hamann & Bezboruah, 2013).

5.2 Delphi Survey Rounds

5.2.1 Round 1

The first survey round resulted in a list of 27 key factors that managers consider in their decision to adopt health IT solutions. It was intended that participants would have two weeks to complete the first survey, however, many participants indicated that it would not be possible for them to complete the survey in this time due to workload pressures that they were facing due to the ongoing pandemic situation. Some participants indicated other dates that would work better for them to have it completed by. In an effort to be flexible to their schedules, the completion of the survey for the first round was delayed. Following the receipt of the survey responses, additional time was taken during the analysis round to ensure that the list accurately represented and reflected the key factors that the participants had described (Paré et al., 2013).

In the first round, the panelists were provided with some context to the problem and examples of health IT solutions, such as medication reminders, virtual reality, social robots, and fall detection devices. As health IT includes a broad range of technologies, and not all types were listed in the initial brainstorming question, the panelists might have considered different types of technologies, which might have impacted their rankings. For example, the panelists who worked

in clinical roles might have based their rankings on the adoption of technologies that have a clinical focus, therefore, factors such as the impact on residents' outcomes might have been ranked higher by those panelists. Overall, given the broad range of health IT that are available to LTC homes, this study aimed to explore the pattern of decision-making, such as what is playing a critical role when those in charge of making the decisions are adopting specific technologies, and the order of the key factors and top 5 factors would likely differ if the panel was asked to identify and rank the key factors based on a specific type of technology.

5.2.2 Round 2

In this second round, the panelists were provided the list of key factors and their descriptions that had been generated based on the coding that was completed by the two coders in the previous round. In addition, participants were asked to comment, validate, and make any additions to the list of key factors and their descriptions that were provided in this narrowing down round (Paré et al., 2013). Participants used the key factors and their descriptions to make the ranking decisions, and although they were not asked if they felt some of the items were the same, when comparing the rankings of the key factors that might seem similar, they were ranked differently, which is an indication that the panelists did not perceive the key factors as the same. For example, *impact on workload and efficiency* was described as:

> *"The technology should not add to staff's workload but save time and drive efficiency without being onerous for users, and free up more time to dedicate to residents."*

Alignment with workflow was a key factor that might be interpreted as similar to *workload and efficiency,* and was described as:

> *"The technology should fit the demand of the process owner. Avoiding duplication (e.g., repeating the same procedures and interventions), additional tasks, and manual workarounds, as*

well as improving the day-to-day operations is necessary when making decisions about new technologies."

As the rankings between these two factors differed (i.e., impact on workload and efficiency was ranked 2nd and alignment with workflow was ranked 8th) this indicates that the panelists perceived each of the key factors differently.

In this narrowing down round, only 2 key factors were discarded, whereas 25 of the key factors were retained. As the majority of the key factors were rated greater than 5, the listed factors are of clear importance to LTC managers and clinicians. As Paré et al. (2013) suggests that the narrowed down list consists of approximately 20 items, and Okoli & Pawlowski (2004) suggest the list have between 20-30 items, items in the top 70% were retained (those with scores greater than 5 out of 7). The two factors that were discarded (i.e., comfort and social environment and vendor reputation) had scores that were rated on average much lower than the other factors, which indicates that they were not as important as the other factors to the managers and clinicians and could be dropped.

As previously mentioned, the highest-rated factors and their mean ratings were *impact on workload and efficiency* (6.73), *availability of funding* (6.47), *alignment with workflow* (6.33), *ease of use* (6.20), *cost of the technology* (6.13), and *performance improvement* (6.13), which was related to three themes (i.e., organizational structure and work routineness, resources, and the human-technology interaction). It was interesting that the key factor of vendor reputation had a lower mean rank and could be discarded as the literature had previously identified this as an important factor (Bezboruah & Hamann, 2018). Oftentimes vendors have important roles in health IT adoption as they partner and have close relationships with LTC homes during the adoption process, and may act as educators and information sources (Bezboruah & Hamann,

2018). The panelists did rank other related factors higher, such as IT support, which indicates that managers may look for support from sources other than the vendor, and therefore, the vendor having a reputation for providing support to the LTC (which was part of the definition provided by panelists) may not be as important.

5.2.3 Round 3

In the third round of ranking, a similar pattern was observed for some factors that received high rating in round 2 and were ranked high in round 3. For example, impact on workload and efficiency had the highest mean rating in the second round and in the third round it was ranked as the second most important factor. In addition, availability of funding had the second highest mean rating in the second round and was the top-ranked factor in the third round. As previously mentioned, the consensus level reached was W=0.341 in the third round of this Delphi study. While the consensus is not strong, this is a finding by itself as the panelists may have different perspectives on the importance of the factors included in the final list depending on their experiences in their respective LTC environment. As the LTC homes represented in this research varied between ownership status as well as size (53-450 beds), it is expected that managers may prioritize these factors differently. In addition, managers were from different backgrounds and roles in an effort to solicit a comprehensive list of factors, thus the panelists might have different management approaches to adopting health IT in their LTC homes.

The following section uses the model of technology adoption from Saghafian et al. (2021) to help conceptualize and discuss the key factors that were ranked by the panelists.

5.3 Conceptualization and Synthesis of the Key Factors to Adopt Health IT Solutions

Saghafian et al. (2021) developed a model that depicts the technology adoption process in the three following stages: pre-change, change, and post-change. While not specific to the LTC

context, they explored issues that affect technology adoption at the organizational level (Saghafian et al., 2021). Figure 4 below presents the final list of key factors that were ranked by the panelists in the third survey round, with the rankings included in the brackets. The list of keys factors were categorized into the model based on the definitions and examples of each theme that were provided in the Saghafian et al. (2021) article. For example, under the theme of organizational structure, Saghafian et al. (2021) identified policies and regulations as a subtheme, where organizations must follow regulations set out by governing bodies and develop policies that address the safety, security, and protocols related to the health IT adoption. Therefore, I categorized compliance with privacy standards under the organizational structure theme (Saghafian et al., 2021).

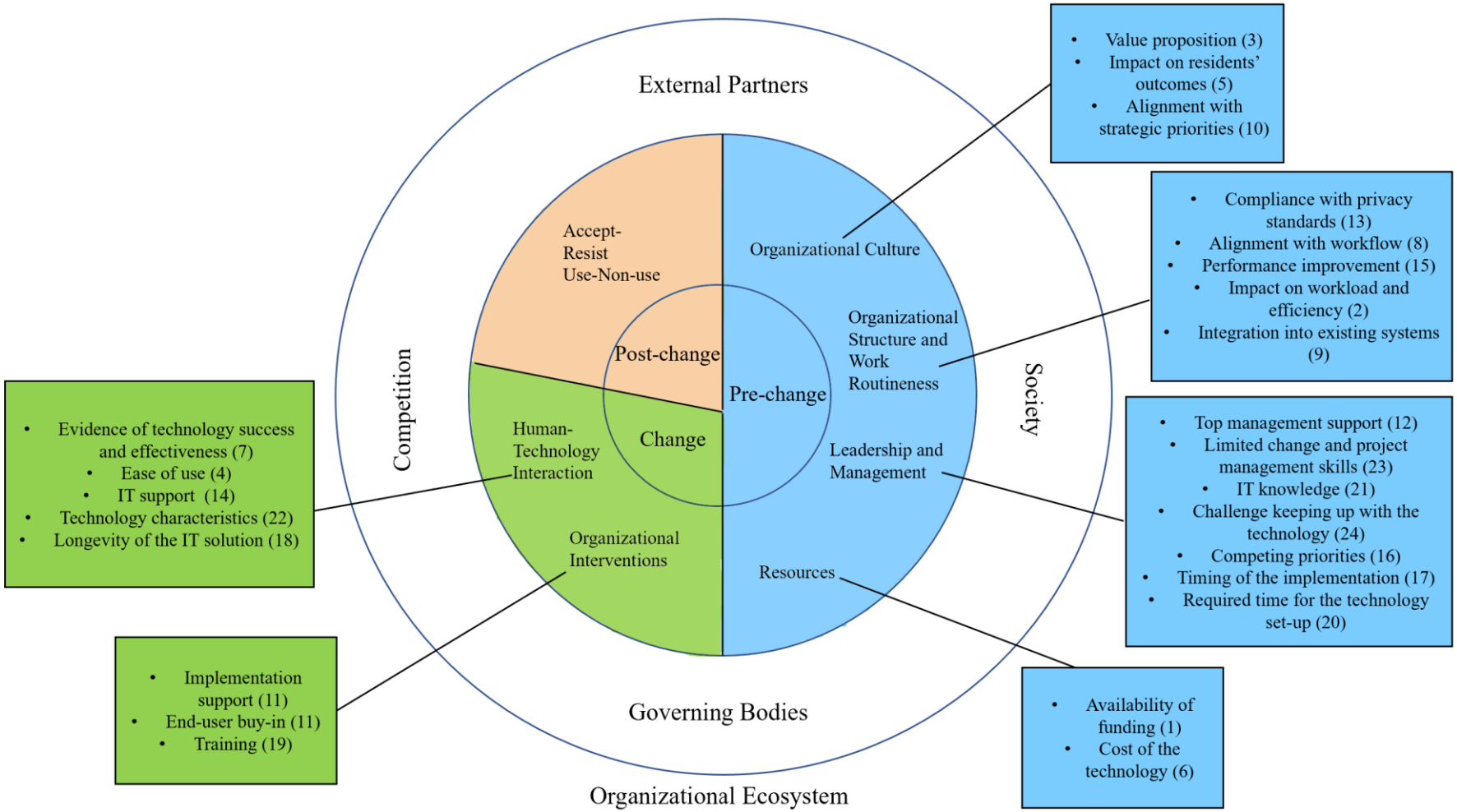

Figure 4: Categorization of Key Factors. Adapted from "Stagewise Overview of Issues Influencing Organizational Technology Adoption and Use, by Saghafian, M. et al., 2021, *Frontiers in Psychology*, 12.

5.3.1 Pre-Change State

The majority of the factors identified by the panelists were those that I categorized under the pre-change state. The following sections provide details on each key factor that was identified by the panelists and was categorized under the pre-change-state.

5.3.1.1 Resources

The highest ranked factor was *availability of funding*, which falls under the pre-change theme of resources. The primary driver of decisions made in the health IT adoption process of hospitals is financial constraints (Rodríguez & Pozzebon, 2011), which appears to be the same as the decision-making in LTC. Current literature has highlighted that LTC homes in Canada are underfunded (Estabrooks et al., 2020) and one of the participants had indicated, when referring to having funding available to adopt health IT solutions:

"*If there is no money for it then it is a non-starter*".

Rodriguez & Pozzebon (2011) also highlights the importance of funds being readily available and having a firm commitment from upper management for the available funds. While the importance of having readily available funds was clearly an important factor to the panelists in this study, it seemed that the funding commitment for health IT in LTC would come from external organizations such as the Ministry of Health and Long-Term Care. The lack of available funding has previously been described in the literature section as a barrier to health IT adoption across Canada due to the misalignments in publicly and privately funded LTC services (Gauvin et al., 2021). The participants in this study further echo the calls in the literature for more funding for LTC; one panelist indicated:

"Funding of LTC envelopes do not permit the transfer of funds from one envelope to another. Historically, the Ministry of Health and Long-Term Care funding does not meet the needed costs and burdens of IT training, equipment, and ongoing use."

In the literature, Liu (2011) had identified cost as the most important factor in the decision to adopt telecare in LTC homes, which differs slightly from the rankings that the panel of experts provided in this research. While the availability of funding was not identified as a factor in the decision to adopt telecare by Liu (2011), the panelists of this study had reported cost as a separate factor, where *availability of funding* refers to the funding envelopes that would cover the cost of the technology, and the cost being the affordability of the health IT solution. Given that the two key factors are closely related, it was unsurprising that the panel also ranked the *cost of the technology* highly (ranked 6th). The high cost of technology has frequently been cited as a barrier to health IT adoption in LTC homes (Cherry et al., 2011; Franke et al., 2021; Liu, 2011; Vest et al., 2019), which is also common in other business organizations (Shaikh et al., 2021). Interestingly, a panelist identified that:

"*Homes should not have to choose between reducing care hours to pay for new/efficient technology*".

This speaks to the importance of both *availability of funding* and the *cost of the technology*, where LTC homes already have tight budgets, and cannot afford the costs associated with health IT unless they reduce care hours. In line with what the panelists described, Rodriguez & Pozzebon (2011) also found that the concerns associated with the cost of the technology included the costs of training, equipment, and extra resources. While cost savings may occur due to the adoption of health IT, LTC managers often have limited information on this, which may lead them to make inaccurate assumptions and prevent them from adopting health IT (Bezboruah

et al., 2014). Completing a cost-benefit analysis using evidence during the adoption process might help managers to gain a better understanding of the total costs of the technology (e.g., cost of the technology itself, training, resources, etc.) (Bezboruah et al., 2014).

It was interesting that both the not-for-profit and for-profit managers identified the *cost of the technology* as a key factor in the decision to adopt health IT. The literature indicates that this would be an important factor, no matter the ownership status, although it is important for different reasons (Hamann & Bezboruah, 2013). Not-for-profit homes struggle to pay for the high initial costs of health IT, although technology may be purchased when revenues must be reinvested in the organization (Hamann & Bezboruah, 2013). This differs from for-profit homes as the cost of technology would mean that owners or shareholders would receive less returns as the money would go towards paying for the cost of the technology, and due to this, managers of for-profit homes may decide not to invest in health IT (Hamann & Bezboruah, 2013).

5.3.1.2 Organizational Culture

Several factors were grouped under the dimension of organizational culture, including *value proposition*, *impact on residents' outcomes*, and *alignment with strategic priority*. While all factors are closely related, *value proposition*, which refers to understanding how the new technology will solve the business, clinical, or operational problem while showing the staff what is in it for them, and the residents, was ranked the highest of this theme (ranked 3rd). Saghafian et al. (2021) recommends considering the purpose of a technology, and whether it aligns with the vision and goals of the organization. While the concept of value proposition and its impact on technology-related decisions has been explored in business and management literature (Nussipova, 2022) and within some healthcare organizations (Korte et al., 2020), its influence on adoption decisions in LTC is largely unexplored. The healthcare literature indicates that value

propositions should support both the business and clinical values, along with the ethical, professional, and cultural values (Buttigieg & van Hoof, 2017), otherwise they can become a barrier to health IT adoption. When the perspective of the adopters is not considered, and only the manufacturer's belief on the value of the technology is considered, the value proposition can become diminished (Korte et al., 2020). Furthermore, Nussipova (2022) indicates that the vision of the organizations can guide the value proposition.

While health IT is often not a strategic priority of organizations in LTC homes, it often complements the organizational priorities, therefore there should be alignment between technology and strategic priorities of an organization (e.g., improving quality of life) (Avgar et al., 2012). *Alignment with strategic priorities*, ranked 10th by the panelists, has also been identified in business literature, where IT solutions that are closely aligned with the vision, goals, and strategy of an organization are more likely to be successfully adopted (Saghafian et al., 2021). While the key factor of *alignment with strategic priorities* has frequently been explored in business and management literature, the impact that it has on IT adoption decision-making in LTC homes has largely been unexplored. One panelist identified that if their strategic priorities indicate that they are looking to adopt specific technology-based vendors and solutions, those that do not align with their strategic priorities will not be adopted. The notion of following the strategic priorities of the LTC governing bodies was also identified by participants, which is also acknowledged in the literature as they are often the ones who provide the funding to adopt health IT solutions (Cherry et al., 2008). Furthermore, Bezboruah et al. (2014) suggest that current management practices in LTC often result in limited use of the organization's strategic priorities when planning, therefore health IT systems are often acquired from multiple vendors based on cost, which may prevent them from realizing the benefits of technology.

In addition, the literature suggests that ownership status may influence the decision to adopt health IT as oftentimes, the strategy of the LTC home is impacted by whether it is a for-profit or not-for-profit home (Hamann & Bezboruah, 2013). The values and strategy of a not-for-profit LTC home may be service oriented and look to benefit multiple stakeholders in an effort to improve quality, whereas for-profit homes may focus on those that improve profitability (Hamann & Bezboruah, 2013).

The *impact on residents' outcomes* was another highly ranked key factor in the decision to adopt health IT solutions in LTC (ranked 5th), which referred to the new technology solution having clear, substantiated benefits that will improve the outcomes for a considerable number of LTC residents. After consolidating the panelist's responses from the first round, the student had originally grouped this factor together as "*impact on resident's health outcomes*", however, when validating the list of key factors with the panelists, many of the experts had suggested that the key factor should be "*impact on residents' outcomes*" as non-health outcomes such as quality of life can be more important than health outcomes in LTC homes. This was interesting as it speaks to the importance of health IT solutions that can improve the quality-of-life LTC residents (Vest et al., 2019). There were slight differences between the results of this study in the literature on this topic, where Bezboruah et al. (2014) found that LTC managers look for a demonstrated impact on health and clinical outcomes as the funding agencies of LTC homes in the United States often required this. In Canada, there is starting to be a shift towards the importance of quality of life outcomes over clinical outcomes, which might explain the importance that the panelists placed on changing the wording (Government of Canada, 2020a). Therefore, vendors of IT solutions should be mindful of the importance of demonstrating the impacts of their technologies.

5.3.1.3 Organizational Structure and Work Routines

Five key factors that were identified and ranked by the panelists fell under the theme of "Organizational Structure and Work Routineness". *Impact on workload and efficiency* was ranked by the panelists as the second most important factor in the decision to adopt health IT solutions in LTC homes. As the work routines of an organization refers to the typical tasks completed, the structure of these tasks, and the diversity in the tasks that need to be done (Saghafian et al., 2021), the key factor of *impact on workload and efficiency* was categorized under this dimension. It was not surprising that this factor was ranked high by the participants, as the workload pressures and demands in LTC homes are often high (Rai, 2010). The COVID-19 pandemic has added further pressures and demands in LTC homes (Estabrooks et al., 2020), therefore it would be important that the health IT solutions being adopted would help to improve the efficiency and reduce the workload of LTC staff members. It should also be noted that health IT solutions that impede the efficiency of the LTC home can cause the introduction of workarounds by staff members, which are shortcuts that are taken to solve immediate problems (Vogelsmeier et al., 2008). An example of a workaround would be ignoring alerts/warnings that a process could be dangerous (such as giving a certain medication), rather than carefully reconsidering the risks of the process (Vogelsmeier et al., 2008). The panelists in this study further echoed what was found in the literature, explaining that:

"*New technology should not add to the staff's workload but rather reduce the amount of work as well as time to complete*".

Closely related to the *impact on workload and efficiency*, were the next two key factors that were identified by the panelists: *alignment with workflow* and *integration into existing systems*, which were ranked 8th and 9th, respectively. *Alignment with workflow*, which panelists

described as the technology fitting the demand of the process owner and improving day-to-day operations has frequently been explored in the health care literature (Alexander et al., 2016; Lluch, 2011). The workflow of LTC homes is quite complex, and impacted by numerous factors such as the nature of resident care, the facility characteristics, the number of available staff members, and the number of communication channels (Cammer et al., 2013; Wei & Courtney, 2018). Importantly, the workflow across LTC homes is also diverse, where staff members may not perform the same duties and roles across all LTC homes, such as nurses who may have direct care and managerial roles in some LTC homes (Wei & Courtney, 2018). Therefore, it would be important for managers to consider the roles of the staff members who will be using the technology to ensure that the health IT solution would align well with the workflow in their individual LTC homes (Bezboruah et al., 2014). This also calls for health IT solutions that could be adapted for use with different LTC workflows, and the involvement of LTC staff members in the development of health IT solutions for LTC homes (Wei & Courtney, 2018).

Similarly, for *integration into existing systems*, one participant reported:

"The integration with existing software and systems (e.g., Electronic medical records, clinical systems, human resource systems) is important for reporting efficiency and avoiding overwhelming the staff with different logins and systems. Clinical-based software applications storing residents' clinical information are considered the "source of truth", so new technology should be able to integrate and pull data from them."

The concept of clinical-based software applications being the "source of truth" is interesting, and was also raised by other panelists, who indicated that:

"*The value proposition of the technology is diminished when it does not integrate with current systems*".

This concept has not fully been explored in the LTC literature, which might be because LTC homes lag behind other areas of healthcare in the adoption of health IT (Bezboruah et al., 2014), and therefore some LTC homes may have not adopted clinical-based software applications for other health IT solutions to integrate with. In the United States, 84% of LTC homes report using electronic health records (Vest et al., 2019), however, this information is not available for Canadian LTC homes. When compared with findings in business and management literature, the integration with existing systems is a common theme, although it is often focused towards enabling decision-makers at multiple levels of an organization to access the same information and the integration of an IT solution to help facilitate performance through collaboration and coordination (Mohamed et al., 2013). This differs in the context of LTC homes, as the panelists identified that it is most important for new health IT solutions to integrate with their existing clinical software.

Within the theme of organizational structure, the dimension of organizational policies and regulations encompasses the factor of *compliance with privacy standards* that was identified by the panelists (Saghafian et al., 2021). Saghafian et al. (2021) identifies that some organizational policies should be adjusted when adopting IT and safety, security, and project concerns must be addressed to ensure a successful adoption process. For LTC homes in Ontario, every resident has the right to privacy in their care and homes must follow the Personal Health Information Protection Act, which requires consent for the collection and disclosure of health information (Government of Ontario, 2007). Surprisingly, compliance with privacy standards was not highly rated by the panelists (ranked 13th), despite strong evidence in the literature of privacy and

security concerns with health IT solutions (Abouelmehdi et al., 2018; Harman et al., 2012; McGraw & Mandl, 2021). This might have been due to the roles of the participants, where *compliance with privacy standards* was only rated in the top 10 factors by 4 participants, all of whom were in administrative roles that address the privacy and security concerns related to health IT adoption (e.g., Manager of Informatics and Analytics) or have privacy-related duties within their clinical roles (e.g., a manager who is both the Privacy Officer and Director of Care).

Also categorized under the theme of "Organizational Structure and Work Routineness", was *performance improvement*, which referred to the operational benefits of the technology including saving time, making information available in a timely manner, decreasing error and paper use, and was ranked 15th by the panelists. While IT solutions are common in businesses to improve performance (Ksenofontov et al., 2019), within the LTC sector the focus of health IT is often to improve the quality of life of residents (Vest et al., 2019), which might explain why *performance improvement* was ranked lower than other factors, such as the *impact on residents' outcomes*. While health IT does have the potential to improve performance in LTC, the benefits are not often realized due to unsuccessful adoption processes (Bezboruah et al., 2014). For example, technologies that do not fully integrate with other existing systems will cause work to be duplicated and it may appear that performance declined with the use of health IT (Bezboruah et al., 2014). In addition, challenges associated with communicating the benefits and improvement in performance to external regulators have been identified in the literature (Bezboruah et al., 2014). As the needs of the LTC sector differ from other areas of healthcare, the criteria that external regulators use to evaluate the performance of LTC homes should be sector-specific to help realize the benefits of health IT solutions (Bezboruah et al., 2014).

5.3.1.4 Leadership and Management

Among the 25 key factors that were identified by the panelists, seven were related to leadership and management, where the role of management in technology adoption is essential and managers must be able to prioritize technology adoption (Saghafian et al., 2021). Interestingly, most factors in this category were not rated in the top 10 factors by the panelists. *Top management support* was ranked 12th and referred to the entire leadership team being on board with the technology adoption and helping to adopt it. Recent literature has highlighted the importance of healthcare leaders in health IT adoption, although many leaders are unsure of their role in health IT adoption and may display a lack of interest in health IT due to a lack of confidence and IT-related training (Laukka et al., 2020). Of the managers and clinicians who participated in this study, it appeared that they were in the roles of decision-makers and advocates (Laukka et al., 2020). Leaders who take on the role of an advocate during the adoption process are those who agree that health IT is a high priority and demonstrate commitment to adoption (Laukka et al., 2020). Panelists in this study clearly agree that health IT is a high priority and are committed to adding to the literature on this topic, based on their participation in this study. Yet, it does not seem that they perceive a priority role for managers in influencing the decision-making. In addition, those who have the role of decision-maker are responsible for the decisions related to adoption (Laukka et al., 2020), which all of the panelists are as that was one of the criteria to participate in this study. While it was not clear if participants in this study take on the role of the supporter in health IT adoption, who is responsible for motivating other healthcare leaders and staff members to use health IT, Laukka et al. (2020) highlights that this is most often the common role for healthcare leaders to take on. In the case of this research, while top management support was ranked in the top 10 by only 5 panelists, it is also important to note that support for health IT adoption also comes from other levels of

management (e.g., middle managers), and that some managers may be reluctant to or not realize the support they can provide in the adoption process as they may not be confident in their abilities to "sell" the health IT solution to their colleagues (Laukka et al., 2020).

In addition to the role that managers and leaders have in successful health IT adoption, the literature also indicates that some managers may be unable to make health IT adoption a priority, due to other services that they also run, which may help explain the following three key factors that were described by the panelists: *competing priorities* (ranked 16th), *timing of the implementation (*ranked 17th), and *required time for the technology set up* (ranked 20th). The priority in LTC homes is the residents, and to ensure their safety and care, as well as quality of life (Government of Ontario, 2007). In a study of five LTC homes in Australia, Ludlow et al. (2021) had staff members rank their priorities in order of importance. The respondents identified clinical care, activities of daily living, and providing humanistic approaches to care as the top three priorities of staff members (Ludlow et al., 2021). In addition, they highlighted that the healthcare professional's workloads are greater than the resources that their LTC homes have, which can lead to missed care (Ludlow et al., 2021). Interestingly, this was also indicated by the panelists in the research, where one person reported:

"A team member shouldn't have to choose between documentation responsibilities and resident bed side care".

A second panelist further refer to this by stating:

"There are so many priorities to address in LTC that adopting new technology if just another thing to add to the list."

Therefore, due to the workload pressures in LTC that were further exacerbated by the pandemic (Estabrooks et al., 2020), managers and leaders in LTC are not always able to make health IT adoption a priority, despite the benefits that it may have in helping to support the care for their residents.

The *challenge keeping up with the technology* was the lowest-ranked factor, which was unsurprising given that it also had the lowest mean rating (5.07 out of 7) of the factors that were retained in the second round. One panelist noted that the challenge is due to having few administrative resources, which is in line with current literature (Alexander et al., 2020). The average number of beds in the LTC homes included in this study was 211, which demonstrates that the homes were mostly of larger size and might have had more administrative resources, therefore, the challenge with keeping up with technology may be more marked in smaller LTC homes and this might be why the panelists ranked this as the lowest factor. In addition, as LTC homes lag behind other areas of healthcare in adopting health IT, this might not be as important of a factor currently given that there are other greater challenges that are faced by LTC homes (e.g., the availability of funding) (Bezbourah et al., 2014),

Another factor that was ranked low by the panelists was *limited change and project management skills* (ranked 23rd), which was only listed as a key factor by one participant in the first round, referring to:

> *"The change management and project management skills required to implement new IT solutions are in short supply in long-term care."*

While not specific to LTC homes, Keil et al. (2013) used a Delphi study to find the top-ranking project management skills needed for IT projects, including leadership team

management, verbal communication, scope management, listening, and project planning. It is unclear based on the literature if these skills are in short supply in LTC as one of the panelists suggested, although Keil et al. (2013) notes that most change and project management skills can be acquired through training. This indicates that there should be training available to LTC managers to further develop and improve their project management skills. In addition, it might be useful for LTC managers to consult the list of project management skills that are useful for IT adoption to ensure that members of their team have the skills necessary to successfully adopt health IT solutions (Keil et al., 2013).

The final factor under the theme of "leadership and management" was *IT knowledge*, which was ranked 21st by participants, and referred to decision- makers' computer/IT literacy and comfort using the technology. Oftentimes, the managers of LTC homes face limitations in their skills, time, and perceptions of adopting health IT solutions (Ko et al., 2018). Part of a manager's role is to have knowledge on IT, as well as other health services and management (Laukka et al., 2020). Bezboruah et al. (2014) identified that managers typically do not have IT knowledge and often adopt technology based on the opinions of their peers (Bezboruah et al., 2014). In addition, managers in LTC often have high turnover rates (Zúñiga et al., 2019) and may not be able to obtain IT knowledge before exiting the profession. This was not the case with this panel, as they had an average of 10.5 years of experience in making adoption decisions and based on their willingness to participate in this study, they likely would have existing knowledge on health IT, which might be why this factor was rated lower than others. Interestingly, Laukka et al. (2020) recognized that managers who take on the role of champions often have IT knowledge, skills, and a high understanding of health IT adoption. Therefore, managers in this

study might take on the role of technology champions, who are passionate about health IT adoption based on their interest in this study.

5.3.2 Change-State

The following section explains the key factors that were categorized under the change-state, which includes the 2 dimensions of organizational interventions and human-technology interaction (Saghafian et al., 2021).

5.3.2.1 Organizational Interventions

The dimension of organizational interventions includes factors that explore the initiatives that help support the adoption process and may be specific to each LTC home context and the specific technology (Saghafian et al., 2021).

Both *end-user buy-in* and *implementation support* were ranked 11th as they had the same mean rank. Within the factor of *end-user buy-in*, those that are the key users of the technology participate in the adoption process (Saghafian et al., 2021). In the literature, end-user buy-in often refers to the acceptance of the front-line staff members who use the health IT solutions when caring for the residents (Bezboruah et al., 2014), which was the same as how the participants in this study referred to end-user buy-in. To get end-user buy-in, Laukka et al. (2020) described that it is the role of the leader to convince staff members of the alignment between the technology and the values of the organization. It is also important for managers to advocate for the use of health IT and to explain the benefits that it may have on resident outcomes (Laukka et al., 2020). Initially, staff members may be reluctant to use health IT as the systems' utilities may not be well understood, given the limited and incomplete information that management has on health IT (Bezboruah et al., 2014). Bezboruah et al. (2014) suggest that staff participate in the IT decision-making process so that there is greater buy-in and understanding of

the product, otherwise staff tend to reject the new technology and find workarounds to avoid using it (Bezboruah et al., 2014).

Within the literature, support for the adoption of technology is often provided by leadership, which requires that they take on additional responsibilities (Schoville, 2017). The panelists in this Delphi study ranked *implementation support* as the 11th key factor on the list, referring to LTC homes having support to reduce the burdens that they face with the adoption. The staffing levels in LTC are quite low and staffing decisions are often made by the individual LTC homes when needed, therefore the available staff and services would vary between each LTC home (Boscart et al., 2018). This might explain why implementation support was not one of the highest-rated factors, as some LTC homes might have some support within their home that can assist with adoption support (e.g., IT support staff). Surprisingly, this factor was ranked slightly higher than *IT Support*, which demonstrates that managers are looking for support from outside of their LTC home that would help to reduce the resources burdens they face. An example of this could include state regulatory agencies, who may be able to support adoption by providing LTC homes with additional resources (Bezboruah et al., 2014).

Other literature has identified *training* as the most important factor in the decision to adopt health IT (Laukka et al., 2020). The panelists of this study ranked it 19th, referring to the extent of initial and ongoing training demands, degree of training intensiveness (e.g., number of rounds, and duration of training sessions), and accessibility of free of charge support and training to end-users given the limited time available for documentation. While the panelists did not rank this factor as high as others, Laukka et al. (2020) indicate that members of leadership might need more training themselves to be able to take on a role that advocates for and arranges training for their staff members. Interestingly, the panelists in this study mainly referred to the training of

end-users, rather than training for the senior managers. When members of the senior management team are properly trained and competent in using IT solutions, it makes it possible for them to support the end-users with adopting health IT (Laukka et al., 2020). Therefore, there is a need for policies at the organizational level to ensure that managers are able to get training on health IT solutions and proper processes for health IT adoption. In addition to the training sessions for managers, there should be training designed and tailored to those who will be using the technology so that they can use the knowledge they gained in practice (Laukka et al., 2020).

5.3.2.2 Human-Technology Interactions

Within the human-technology interactions stage, the importance of the social context is highlighted (Saghafian et al., 2021). Saghafian et al. (2021) indicates that employees will evaluate how the technology has been used in other settings and consider the useability of the technology, therefore both *evidence of technology success and effectiveness* and *ease of use* fit under this theme. It was interesting that the panelist's ranked *evidence of technology success and effectiveness* in the top 10 factors, which they referred to as having strong reference from other LTC homes that have used the technology. The literature identifies there is limited information on the results of health IT in LTC contexts, which differ from other settings (e.g., due to the characteristics of the LTC home, their funding models, and the residents) (Bezboruah et al., 2014), therefore managers may look to what has worked for other LTC homes, rather than evidence in the literature. Bezboruah et al. (2014) cautions against this though, as what might be successful in another home does not necessarily indicate that it will be successful or work well in all LTC homes. In addition, they recommend that evidence-based decisions should be made rather than looking to the success of other organizations when adopting health IT, as other homes may not have made an optimal decision, despite the perception that the solution they adopted is successful (Bezboruah et al., 2014).

It was not surprising that *ease of use* was ranked highly by the panelists as in the first survey round, 14 participants described key factors related to ease of use and one panelist reported that:

"The user interface needs to be appealing to the user and functional. The more "clicks" to get something out of the solution the less like for adoption or continued use. Workarounds get created when the solution is difficult to navigate and then information or data gets either lost or not found in the solution."

Bezbourah et al. (2014) acknowledged that due to the limited information that LTC managers have on the benefits of health IT, the technology solution may actually be easier to use in practice than it appears to be. It is also important to consider the ease of use from the perspectives of both managers and the end users of the technology, as their perceptions may differ, which could cause the costs of training to be higher than initially expected (Bezboruah et al., 2014). While a health IT solution may align with the workflow of an organization, it is likely that each specific technology will require that the staff have certain skills and abilities to use it (Avgar et al., 2012). However, when users believe a technology will be easy to use, no matter what their skills and abilities are, they are more confident in adopting the technology, as self-efficacy can positively impact managers' perceptions of the ease of use of a technology (Zhang et al., 2016).

Ease of use also ties in with *technology characteristics*, which panelists ranked 22nd and refers to the ease of maintenance and replacement, reliability, remote access to resident files, applicability to a broad group, visibility to drive communication, and equitability (i.e., issues in determining who will be able to access the new technology). The design and functional features of a health IT solution will impact how the end-user is able to interact with the technology,

therefore affecting its perceived usefulness and ease of use (Lee & Coughlin, 2015). Demonstrating the benefits and utility of a technology, as well as clearly communicating the purpose of the technology can lead to successful health IT adoption (Lee & Coughlin, 2015). An interesting aspect of this key factor, was the visibility to drive communication, which one panelist referred to:

> *"A technology that is more visible will drive communication among that person's peers and personal networks and will in turn create more positive or negative reactions."*

While social factors for health IT adoption have been explored in the LTC literature, they have mainly focused on the attitudes and behaviour of administration and staff members (Bezboruah et al., 2014). In addition, Rodriquez & Pozzebon (2011) found that the decision to adopt health IT was driven by financial concerns and power struggles, despite that social factors may impede the adoption phases of health IT. In other areas of research, the influence of social modelling on technology adoption has been explored, where individuals are more likely to adopt technology when they observe others using it (Straub, 2009).

Longevity of the IT solution (ranked 18th) was also categorized under the human-technology interaction, as the interactions between the technology and user after each update will determine if it continues to be used (Saghafian et al., 2021). One panelist reported:

> *"With technology solutions advancing so quickly and evolving it is sometime hard to stay on top of continuous updating. Sometimes updates can cause the users to have a different look or feel to the solution, so it is more like adopting a new solution rather than an upgrade."*

Little has been explored in the literature regarding the importance of longevity of health IT solutions, although given the limited resources that LTC homes have (Estabrooks et al.,

2020), it is not surprising that the panelists identified this as a key factor in their decision to adopt health IT solutions. Saghafian et al. (2021) discusses the importance of being able to modify and repurpose technologies as they evolve, which might make the users more motivated to use the technology.

The last factor categorized under the dimension of human-technology interaction was *IT support*, which was ranked 14th. The need for IT support has been identified in the LTC literature, where a lack of support can cause distress among staff members and may put residents at risk if the health IT system fails (Dugstad et al., 2019). In a longitudinal case study, Dugstad et al. (2019) found that when IT management are not involved in the adoption process, errors can occur such as a lack of compatibility between new and existing technology or those that compromise security of health information. They further indicated that there were major barriers such as the vendor believing their system is intuitive and the limited IT service workhours (e.g., usually daytime weekday hours only), and when the technology failed on a weeknight or weekend staff were left to find solutions or reorganize the resident's care (Dugstad et al., 2019). This was also indicated by the panelists, as they might have one IT support person on-site (if any), therefore they are unable to get help with the technology when needed. In addition, one panelist noted:

"Does the vendor provide support and if so, for how long and during what hours of the day?"

5.3.3 Post-Change State

As the post-change state of IT adoption encompasses the outcomes of the process (Saghafian et al., 2021), the key factors that were identified by the panelists in the previous two stages may become barriers of facilitators that can lead to the acceptance or resistance of the IT solution. Interestingly, no key factors were categorized under the post-change state, therefore,

there is a risk that LTC managers might either be paying less attention to this state or be in the early stages of health IT adoption and not considered this later stage yet. This demonstrates a need for ongoing monitoring and evaluation of the outcomes of the health IT adoption process, including the degree of acceptance and resistance of the technology (Saghafian et al., 2021),

5.4. Implications of the Findings

The literature identifies that there are movements that look to transform LTC from institutional care to person-centered care that incorporates the overall quality of life and well-being of residents (Chisholm et al., 2018; Shier et al., 2014). With limited financial and staffing resources, it is difficult to transition LTC to person-centered care (Chisholm et al., 2018). Health IT has a role in this culture shift, as they help to support the delivery of care to LTC residents (Chapman et al., 2019). We have been observing some shift with more LTC homes considering and implementing technologies that support the work of health care professionals and the care provided to older adults. This is a reflection of some current culture change, which warrants considering ways to evaluate the new technologies being adopted.

Furthermore, the literature has identified a need to better understand the decision-making process when adopting IT, which would lead to reduced costs and better technology outcomes for organizations (Tamm et al., 2014). Specifically in LTC homes, there is limited understanding as to the factors that managers consider in their health IT decision-making (Bezboruah et al., 2014). This study aims to contribute to this by providing an authoritative list of 25 key factors that influence and affect managers' decisions to adopt health IT in LTC homes. This is a first step towards understanding what is happening in the LTC context in relation to health IT decision-making. The list of key factors was generated from the opinions of managers who had a variety of managerial roles in LTC, which aided in the comprehensiveness of the list. The results

can also be used to inform future studies that can develop surveys that assess and monitor the evolution of these factors in broader and more representative samples of LTC managers. At the practical level, Ko et al. (2018) recommended that a toolkit should be developed by stakeholders of LTC homes for their workforce as they do not employ a systematic approach to adopting health IT solutions. The list of key factors could contribute to the development of the toolkit for the LTC workforce as the list of key factors provides a benchmark tool that can be used to help LTC managers understand what other LTC homes are doing and the factors that influence their decision-making on health IT solutions. The list can also be used as a starting point to develop a tool that can be used by managers to evaluate the rating of these factors when making a decision on adopting a new technology. Managers could use this list when they are approached by vendors and researchers who are looking to test or have their solution adopted in a LTC home. For example, when the vendor or researcher presents the technology to the senior management team at a LTC home, the managers and clinicians could use the list to help guide the discussion on the proposed technology. This might encourage LTC homes to make more evidence-based adoption decisions, which could help lead to the realization of the benefits of technology. The participants of this study have indicated that they would like access to the results of this study.

Of the list of key factors that were identified by the panel, those that were related to technology were often ranked lower, and the factors related to leadership were not prioritized. Managers may be reluctant to adopt health IT due to a lack of confidence, support, and training that is available to them (Laukka et al., 2020), which highlights a need for interventions and knowledge mobilization strategies to make managers more aware of the role they can play in the adoption of health IT. Given that LTC homes lag behind others areas of healthcare in the adoption of health IT (Bezboruah et al., 2014), and over time as LTC homes catch up to the other

areas in healthcare, the rankings might change or new key factors may emerge, therefore, it is important for future research to continue to explore this topic. In addition to this, the current challenges that managers face in the adoption of health IT were mainly focused on key factors that were categorized under the pre-change state, specifically with 7 factors related to leadership and management, therefore, interventions that target leaders and management are important, in an effort to make them more aware of the important role they play in the adoption of health IT (Laukka et al., 2020).

At the policy level, the results of this thesis may be used by LTC governing bodies to support the use of health IT to care for older adults and the work of health care professionals in LTC homes. In addition, the Ministry of Health could use this list of factors to provide training and workshop opportunities to the senior managers of LTC homes, which would also help to ensure that their decision-making aligns with the strategies and policies that they have set out. As the ranking of key factors may differ between LTC homes, it may be beneficial for the Ministry of Health and Long-Term Care to aid in connecting the managers through training opportunities to help develop solutions to the barriers and challenges that are faced at the organizational level. Finally, given that most of the key factors were categorized in the pre-change state and especially under the theme of leadership and management, there is a need for policies and interventions that can make managers more aware of the health IT solutions that are available to help support the healthcare professionals and residents in their LTC homes.

5.5 Strengths and Limitations of the Study

This study used a systematic approach to identifying an authoritative list of key factors that are important and relevant from the perspective of managers in relation to their decisions regarding health IT choices and adoption. As the Delphi technique is dependent on the

knowledge and judgement of the panelists, participants were selected based on those that can apply their knowledge and experience of adopting health IT and must have been involved in the decision-making related to the adoption of health IT solutions in a LTC home. While the convenience and snowball sampling approaches that were used to recruit participants could be viewed as a limitation of this study, the panelists had an average of 10.5 years of experience in making health IT adoption decisions and had worked in their current LTC home for an average of 9.5 years which clearly demonstrates that the panelists had expertise and knowledge in the area of health IT adoption in LTC homes and further ensures the validity of the study results (Paré et al., 2013). In addition, participant anonymity was maintained throughout all Delphi rounds, which encouraged free expression of each panelists opinions (Paré et al., 2013). While the panel was of smaller size, the sample size is in line with previous Delphi studies that had been conducted (Paré et al., 2013). In addition, the experts who contributed to this research study represented a breadth of perspectives, which helped to minimize distortion in the data (Paré et al., 2013).

Furthermore, one limitation of the Delphi methodology is related to it's reliability, where additional panels may not reach the same list of key factors (Paré et al., 2013). While it may be noted that the results of this study are not generalizable given the reliability of the methodology, the small sample size, and types of sampling used, it is important to note that this was not the intention of the study. This study presented was exploratory in nature and solicited the opinion of experts who have experience in the LTC environment and context (Frey, 2018). Future research should use more representative samples and verify the findings of this research (Frey, 2018).

Regarding the rigour of the survey rounds, this study followed the methodology outlined by Paré et al. (2013). In the brainstorming round, clear instructions were sent to participants

asking them to provide a list of 5-10 key factors that are relevant and important to inform their decision to adopt health IT solutions in LTC homes, along with a brief description, which was used to help clarify the meaning of obscure responses (Paré et al., 2013). Two researchers consolidated the items into a single list, with a high inter-rater reliability, which was then circulated to panelists for validation and comments (Paré et al., 2013). A randomly ordered list was circulated to participants for the narrowing down round (Paré et al., 2013). In the third and final round, participants were provided with the list of key factors in a random order, and given specific instructions to rank the items 25 items (Paré et al., 2013). Experts were not asked to justify their rankings, as that would have overburdened participants who were already extremely busy (e.g., addressing the impacts of the COVID-19 pandemic).

In addition, a limitation of this study was that the final consensus reached by the panelists was weak (W=0.341). While an additional round of ranking might have increased the final consensus of the panel, it would have overburdened the participants given the time commitment required and the work demands on them due to the pandemic situation. Furthermore, the pandemic context might have affected the list of key factors that emerged in this research. For example, the importance of resident quality of life and well-being has been highlighted throughout the pandemic (Estabrooks et al., 2020), therefore, factors such as impact on residents' outcomes might not have been rated as highly or mentioned. In addition, other factors might have emerged if this research was not completed during the pandemic, therefore, it will be important for future research to validate and explore the list of key factors as LTC homes recover from the pandemic. In the case of this research, there might have been a larger panel of experts who were willing to participate in this research if the data was not collected during one of the COVID-19 waves, as many managers had indicated their interest in participating, however, they

were unable to do so due to work pressures and demands associated with the pandemic. Interestingly, one of the smaller LTC homes that agreed to participate in this study only started adopting health IT solutions because of the pandemic (e.g., communication devices for social isolation purposes), therefore, future research should validate the list of key factors with other smaller LTC homes who are starting to make health IT adoption decisions.

Overall, this Delphi survey combined the expert opinions of managers from who were scattered geographically across Ontario (Paré et al., 2013). Participants were able to complete the surveys at a time that worked best for their schedules (Toronto, 2017), which was particularly important for LTC managers given their work demands. The panelists remained anonymous throughout all survey rounds, which allowed them to freely express their opinions without the influence of other panelists (Paré et al., 2013). Efforts were made to reduce bias in this study, by randomly ordering the list of key factors in both the second and third rounds and not disclosing the rankings to any of the participants so that they were not influenced by others' responses (Paré et al., 2013). Finally, the list of key factors that were developed represent the viewpoint of the managers that were included in this study. Future research should capture the residents' and families' perspectives, which should come into play when making health IT related adoption decisions, as well as the opinions of the frontline workers.

6. Conclusions and Future Research

The results of this study provide a list of 25 key factors that LTC managers and clinicians consider to inform and affect their health IT adoption decision-making. It followed a rigorous approach and solicited the factors from senior managers with experience in making IT adoption decisions across Ontario.

Future research should build on these findings and employ other methodologies with more representative samples, including those across Canada to better understand the decision-making of managers. Larger scale surveys could be used to compare the key factors with the existing literature in other countries. In addition, it would be important for future research to explain why the key factors were ranked in this particular order as this would be useful for managers when using the list of key factors as a benchmarking guideline. It may also be helpful for future research to use focus groups with LTC managers as some of the panelists indicated that they do not make IT adoption decisions alone.

The type of health IT might also influence the order of the rankings, therefore future research should explore health IT adoption decisions based on different types of technologies. This is particularly important as LTC homes are shifting towards caring for residents that have more cognitive impairments (Estabrooks et al., 2020), therefore different types of health IT solutions may show more promise in supporting the work of healthcare professionals and caring for these residents. Examples of such technologies includes sensor-based technologies (e.g., bed sensors and location tracking), wearables (e.g., those that can provide information on sleep patterns), and social robots (e.g., robots that are made to look like pets and can serve therapeutic and companionship purposes) (Shu & Woo, 2021).

While LTC homes have lagged behind other areas of healthcare in adopting health IT (Bezboruah et al., 2014), this study contributes to the understanding of key factors that are relevant and can inform managers' decision-making in LTC, which may aid in increasing the uptake of health IT to support the care of older adults. Vendor's strategies may be informed by this list of key factors to ensure that the technologies they develop align with the priorities identified by the managers in this research. As a long-standing issue in the LTC sector, the

availability of funding should be addressed to mobilize the efforts in LTC in order to facilitate the adoption and uptake of technology (Estabrooks et al., 2020). Policy changes can be informed through this research to help better allocate resources that are in line with the priorities identified. Finally, this master's thesis may aid in creating a toolbox for LTC managers and clinicians, which could be used to inform their decisions on health IT adoption (Ko et al., 2018). This may help to increase the uptake of health IT solutions and allow LTC homes to better reap the benefits of technology (Ko et al., 2018).

7. Protection of Human Rights

Ethics approval was received from the University of Ottawa Research Ethics Board on January 12th, 2022. No threats to confidentiality or anonymity were raised during this study.

8. Conflict of Interest

This research was completed to fulfil the requirements of the Master of Science in Health Systems program at the University of Ottawa. Funding was received from the Social Sciences and Humanities Research Council of Canada to support this project.

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10. Appendix

TELFER
BUSINESS FOR A BETTER CANADA

Delphi Study (Key Factors in IT Decision-making):
"Brainstorming" -Question #1

Question

With the increasing number of health information technologies (IT) available to support the care for older adults, managers, and clinicians in long-term care (LTC) homes are faced with decisions about the adoption of new technologies in these environments. Examples include medication reminders, virtual reality, social robots, fall detection, among others.

The decision to adopt these technologies in a LTC home, choose and prioritize among them, and select between different vendors can be challenging. Therefore, it is important to understand what factors play a role and influence the decision-making process in relation to adopting health IT solutions in order to support decision-makers in this environment.

Please generate a list of 5-10 key factors that, in your opinion, are relevant and important to facilitate and inform your decision-making about the adoption among health IT in your LTC home.

A key factor is a consideration or influence that contributes to your decision to adopt a health IT solution in the senior care organization where you work. It may be a barrier, a facilitator, or a condition that is needed to inform the decision on health IT. A key factor may be related to information that would be helpful to you, or a characteristic/variable that can effectively support your role as a manager or clinician when making decisions about health IT solutions to implement in your organization.

Instructions

- Use this document to generate your list.
- The list may include **5-10 key factors** in total.
- **Provide a brief description/explanation** for each factor presented.
- Return your list by e-mail to [redacted]**@uottawa.ca**

Below are examples of key factors that may influence the decision to adopt health IT in LTC homes:

1. *Having more information about how the technology works*
2. *Cost of the technology*
3. *Evidence of prior experiences with success using the technology*
4. *Time pressures*
5. *Etc.*

Present below and briefly describe your list of key factors that you consider as important and relevant to inform your decision-making on the adoption of health IT solutions in your organization:

Figure 5: Questionnaire for the Brainstorming Round of the Delphi Process

Delphi Study (Key Factors in IT Decision-making):
"Narrowing Down" -Question #2

Question

Following the « brainstorming » stage, which was conducted during the past month, we combined the responses of the 16 long-term care (LTC) managers/directors participating in this study. During the analysis of the responses, we grouped some items together in order to simplify the comprehension of the most critical factors that play a role in the decision-making related to health information technology (IT) solutions in LTC homes. The results and brief description of the issues are presented in random order in the table below.

In this second stage of the Delphi survey, we ask you to perform the following two tasks:

1) First, read carefully and **validate each of the key factors in the decision to implement HIT solutions and their respective description**. If you do not agree with the label and/or description of an issue, please provide your suggestions in the « track change» mode or in the comments box below the table.
2) Second, and based on your personal experience, check the **« Degree of importance of each factor»** in the table below. In order to identify the importance of each issue, we ask you to use a **(1-7) scale**: **1="least important"** and **7="most important".**

Please remember that there is no right or wrong answer. Your individual opinion is the one that matters. Once you completed the table below, please save the document and return it by e-mail to Danielle Cruise (_____@uottawa.ca) by **April 19th.** Thank you for your collaboration on this important research project.

Figure 6: Questionnaire for the Narrowing Down Round of the Delphi Process

Delphi Study (Key Factors in IT Decision-making):
"Ranking" -Question #3

Following the second stage of this Delphi survey, we combined the responses of all long-term care (LTC) managers / directors participating in this study. The resulting list of the most critical factors in the decision to adopt health information technology (IT) solutions is presented below **in random order** (a more detailed description is also provided at the end for your reference).

In this third and last stage of the Delphi survey, we ask you to **rank from 1 to 25** the listed factors according to their importance. In order to simplify this task, please complete the questionnaire as follows:

1) As a first step, identify the 5 most important factors among the list of factors below (from A to Y). Then, rank these five factors in order of importance (1=most important to 5=least important). You may indicate the letter corresponding for each factor in the boxes under Group I.

2) Repeat this exercise with the remaining key factors on the list and indicate the letter corresponding to boxes 6 to 10 under Group II (6= most important, 10= least important).

3) Repeat the exercise until all the critical factors that were identified by the panellists in this list are ranked.

Please remember that there is no right or wrong answer. Your individual opinion is the one that matters. Once you have completed the table below, please save the document and return it by e-mail to Danielle Cruise .@uottawa.ca) by **May 25th, 2022**. Thank you for your collaboration on this important research project.

Figure 7: Questionnaire for the Ranking Round of the Delphi Process