Patients' e-readiness to use e-health technologies for oral health

Arishdeep Kaur Jagde, B.D.S,
M.Sc. Candidate
Faculty of Dentistry
McGill University, Montreal
Oct 2019

A thesis submitted to McGill University in partial fulfillment of the requirements of the degree
of Master of Science, Dental Sciences.

DEDICATION

I would like to dedicate my thesis to my father, Baldev Singh. I would not have been able to accomplish any of this without his dreams. My love and gratitude to him goes beyond words.

TABLE OF CONTENTS

Topic   **Page number**

Chapter 1

Literature review

Chapter 2

Chapter 3

Chapter 4

Chapter 5

LIST OF TABLES

CHAPTER 1

CHAPTER 2

LIST OF FIGURES

CHAPTER 1

CHAPTER 2

LIST OF ABBREVIATIONS

WHO   World Health Organization

ICT   Information and Communication Technology

TRA   Theory of Reasoned Action

TPB   Theory of Planned Behaviour

TAM   Technology Acceptance Model

UTAUT   Unified Theory of Acceptance and Use of Technology

OITIRS   Organizational Information Technology Innovation Readiness Tool

ORC   Organizational Readiness for Change Tool

RAT   E-Readiness Assessment Tool

ABSTRACT

Introduction: Scientific evidence highlights the importance of e-readiness in the adoption and implementation of e-oral health technologies. However, to our knowledge, there is no study investigating the perspective of patients in this regard. Therefore, the objective of this study was to explore patients' e-readiness in the field of dentistry.

Methods: A qualitative study was conducted using interpretive description methodology. Purposeful sampling with maximum variation and snowball techniques were used to recruit the study participants via McGill University dental clinics and affiliated hospitals, as well as private or public dental care organizations. A total of 15 face-to-face, semi-structured, 60 to 90-minute audio-recorded interviews were conducted. Data collection and analyses were performed concurrently, and interviews were continued until saturation was reached. Activity theory was used as the conceptual framework, and thematic analysis was used to analyse data. Data analysis was conducted both manually and with the use of Atlas-ti software.

Results: Four major themes emerged from the study: Unlocking barriers, Affordability, Inquisitiveness for e-oral health technology, Enduring oral health benefits. These themes correspond with all three types of readiness (core, engagement and structural).

Conclusion: The study results suggest that dental patients consider e-oral health as a facilitator to access to care, and they are ready to learn and use e-oral health technology. There is a need to implement and support e-oral health technologies to improve patient care.

RÉSUMÉ

Introduction : Les données scientifiques soulignent l'importance de la capacité d'exploiter l'informatique dans l'adoption et la mise en œuvre des technologies de système de santé électronique. Cependant, à notre connaissance, il n'y a aucune étude examinant la perspective des patients à cet égard. Par conséquent, l'objectif de cette étude était d'explorer l'état de préparation des patients dans le domaine de la dentisterie.

Méthodes : Une étude qualitative, utilisant une méthode de description interprétative, a été conduite. Un système d'échantillonnages ciblé, produisant un maximum de variation ainsi qu'une technique de boule de neige ont été utilisés pour recruter les participants de l'étude dans les cliniques dentaires de l'Université McGill, les hôpitaux affiliés et dans des organismes privés ou publics de soins dentaires. Au total, 15 entrevues face à face, semi-structurées, de 60 à 90 minutes, enregistrées vocalement ont été réalisées. La collecte, les analyses de données ont été effectuées simultanément ; les entrevues se sont poursuivies jusqu'à ce que la saturation soit atteinte. Le cadre conceptuel a été créé en se basant sur la théorie de l'activité alors que l'analyse thématique des données a été réalisée manuellement et à l'aide du logiciel Atlas-ti.

Résultats : Quatre grands thèmes sont ressortis de l'étude : Ouverture des barrières, Accessibilité, Curiosité pour la technologie de la santé électronique, Avantages durables pour la santé buccodentaire. Ces thèmes correspondent aux trois types de préparation des patients (de base, d'engagement et structurel).

Conclusion : Les résultats de l'étude suggèrent que les patients dentaires considèrent qu'un système de santé par voie électronique facilite l'accès aux soins, et ils sont prêts à apprendre et à utiliser la technologie conduisant à la santé buccodentaire. Il est donc nécessaire de mettre en œuvre et de soutenir les technologies de l'électronique en santé buccale pour améliorer les services de soins aux patients.

ACKNOWLEDGEMENTS

CONTRIBUTION OF AUTHORS

The conceptualization of this project was through the execution of multiple meetings with my supervisor, Dr. Elham Emami, and my co supervisor Dr. Jocelyne Feine.

I recruited all the participants and interviewed them. I transcribed the interviews and coded them. Moreover, I analyzed the data and identified the emerging themes and sub-themes under the guidance of my supervisors. I performed the literature review and wrote every section of this entire thesis. It should be noted that my supervisor, Dr. Elham Emami and my co supervisor Dr. Jocelyne Feine edited all my work to make it better throughout my MSc career.

CHAPTER 1

LITERATURE REVIEW

1. INTRODUCTION

Currently people are more inclined towards using technology, not only for entertainment purposes, but also for access to information and care [1]. According to the 2015 Pew Research Center's survey, 84% of Americans have used the internet and 2/3rds of Americans owned a smartphone for education purposes [2]. Health-related technology enables people to have reliable access to health care and information, as well as helping them make better decisions when it comes to health-related issues [3, 4]. E-health technology not only improves access to information, but also it contributes to making health care more efficient and effective [5].

In the last decade, e-health has become crucial to modern healthcare systems worldwide [6].

E-health encompasses a broad range of applications, such as electronic health records, web portals, electronic medication, telemedicine and teledentistry [7]. E-health has been used in various disciplines to reduce health illiteracy, disseminate health-related information, store and exchange clinical data, increase intra-professional communication and communication between the health care provider and patients and facilitate health care management and access to health care services [8, 9] .

E-health technology is advancing faster than ever before. The growing accessibility   and   use of information technology by the general population is the main driving factor for e-health   [10, 11]. In addition, the rapid fall in cost of information technology, coupled with an enhanced digital infrastructure, has increased interest in using e-health amongst health care providers and made it possible for healthcare organisations to foresee and implement new and effective ways to provide health care [5, 12] . The e-health sector demonstrates signs of its exponential adoption. Research

studies estimate that e-health will amount to a 34-billion-dollar industry by 2020 and will be key part of modern health care systems [13].

1.1. E-HEALTH

1.1.1. DEFINITION

The word e-health has been subjected to a broad range of definitions, and several terms have been used to describe "specific types" of e-health technologies such as health informatics, telehealth, telemedicine, telecare, teledentistry, e-learning, and m-health [11].

In 1997, The World Health Organization (WHO) defined e-health as: "*The delivery of healthcare services, where distance is a critical factor, by healthcare professionals using information and communication technologies for the exchange of valid information and diagnosis, treatment and prevention of diseases and injuries, research and evaluation, and for the continuing education of healthcare providers, all in the interest of advancing health and community* [14].

In 2001, Eysenbach defined it as "*an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies*" [9]. A systematic review conducted by Hans et al. in 2005 identified 51 words to define e-health [15]. Table 1 presents these definitions:

TABLE 1: E-HEALTH DEFINITIONS

	AUTHOR (YEAR)	DEFINITION
1.	Mitchel (1999) [15] [16]	*"A new term needed to describe the combined use of electronic communication and information technology in the health sector. The use in the health sector of digital*

		data – transmitted, stored and retrieved electronically – for clinical, educational and administrative purposes, both at the local site and at a distance".
2.	Loman (1999) [15] [17]	"E-health – the application of e-commerce to healthcare and pharmaceuticals".
3.	JHITA (2000) [15] [18]	"Internet-related healthcare activities".
4.	McLendon- (2000) [15][19]	"E-health refers to all forms of electronic healthcare delivered over the Internet, ranging from informational, educational and commercial "products" to direct services offered by professionals, non-professionals, businesses or consumers themselves. E-health includes a wide variety of the clinical activities that have traditionally characterized telehealth but delivered through the Internet. Simply stated, E-health is making healthcare more efficient, while allowing patients and professionals to do the previously impossible".
5.	Medical Business Group (2000) [15] [20]	"E-Health is a convergence between the Internet and the health care industry to provide consumers with a wide variety of information relating to the health care field".
6.	GJW Government Relations (2000) [15][21]	"A wide-ranging area of social policy that uses new media technologies to deliver both new and existing health outcomes".

7.	Oracle Corporation (2000) [15][22]	*"Healthcare transactions, encounters, messaging, or care provision occurring electronically".*
8.	DeLuca,Enmark (2000) [15][23]	*"E-health is the embryonic convergence of wide-reaching technologies like the Internet, computer telephony/interactive voice response, wireless communications, and direct access to healthcare providers, care management, education, and wellness".*
9.	Pretlow (2000) [15][24]	*"E-health is the process of providing health care via electronic means, in particular over the Internet. It can include teaching, monitoring (e.g. physiologic data), and interaction with health care providers, as well as interaction with other patients afflicted with the same conditions".*
10.	Baur, Deering and Hsu (2001) [15][25]	*"The most broad term is e-health, with refers to the use of electronic technologies in health, health care and public health. The various functions of e-health are (electronic publishing, catalogues, databases); self-help/self-care (online health information, support groups, health risk assessment, personal health records), Plan/provider convenience services (online scheduling, test and lab results, benefit summaries), Consultation and referral (doctor-patient or doctor-doctor consultation via telemedicine systems, remote readings of digital image and pathology samples), E-health commerce (sales of health related product and services) Public health services (automated data collection, data warehouses, online access to population survey data and registries, advance detection and warning systems for public health threats). This chapter*

		uses the term e-health to refer to the broadest possible range of interactive technologies applied to health and health care".
11.	Orlikoff & Totten (2001) [15][26]	*"The use of the Internet and related information systems and technology in all aspects of health care".*
12.	Eysenbach (2001) [15][9]	*"e-health is an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies. In a broader sense, the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology".*
13.	Blake (2001) [15][27]	*"The combined use of electronic communication and information technology in the health sector. It is important to note that e-health is much more than business transactions. It encompasses everything from digital data transmission to purchase orders, lab reports, patient histories and insurance claims".*
14.	Strategic Health Innovations (2001) [15][28]	*"The use of information technology in the delivery of health care".*

15.	Thomas, Robert J Wood Foundation (2001) [15][29]	*"E-Health is the use of emerging information and communication technology, especially the Internet, to improve or enable health and health care".*
16.	Wysocki (2001) [15]	*"E-Health refers to all forms of electronic healthcare delivered over the Internet, ranging from informational, educational and commercial "products" to direct services offered by professionals, non-professionals, businesses or consumers themselves".*
17.	JP Morgan Partners (2001) [15] [30]	*"The health care industry's component of business over the Internet".*
18.	Ontario Hospital eHealth Council (2001) [15] [31]	*"E-health is a consumer-centered model of health care where stakeholders collaborate utilizing ICTs including Internet technologies to manage health, arrange, deliver, and account for care, and manage the health care system".*
19.	Tieman (2001) [15][32]	*"E-health is all that's digital or electronic in the healthcare industry*".
20.	DeLuca, Enmark (2001) [15] [23]	*"E-health is the electronic exchange of health-related data across organizations, although every health care constituent approaches e-health differently".*
21.	Ball – HIMSS (2001) [15] [33]	*"Internet technologies applied to the healthcare industry".*
22.	Health e-Technologies Initiative (2002) [15][34]	*"The use of emerging interactive technologies (i.e., Internet, interactive TV, interactive voice response systems, kiosks, personal digital assistants, CD-ROMs,*

		DVD-ROMs) to enable health improvement and health care services".
23.	Grantmakers in Health (2002) [15][35]	*"U*se of ICT, especially (but not only) the Internet to enable health and health care".
24.	Kirshbaum (2002) [15][36]	*There are many different definitions of eHealth* • *Electronic connectivity vehicle for improving the efficiency and effectiveness of healthcare delivery* • *Enabling consumers/patients to be better informed about their healthcare* • *Enabling providers to deliver better care in more efficient ways.*
25.	Wyatt and Liu (2002) [15][37]	*"The use of internet technology by the public, health workers, and others to access health and lifestyle information, services and support; it encompasses telemedicine, telecare, etc".*
26.	Staudenmeir - Arthur Anderson (2003) [15][38]	*"Any use of the Internet or related technology to improve: the health and wellness of the population; the quality of healthcare services and outcomes; efficiencies in healthcare services or administration".*
27.	Coach(2003) [15][39]	*"The leveraging of the information and communication technology (ICT) to connect provider and patients and governments; to educate and inform health care professionals, managers and consumers; to stimulate*

		innovation in care delivery and health system management; and, to improve our health care system".
28.	Rx- (2003) [15][40]	*"eHealth signifies a concerted effort undertaken by some leaders in healthcare and hi-tech industries to harness the benefits available through convergence of the Internet and healthcare. Access, cost, quality and portability have been concerns in the health care arena. It's evident from many recent surveys that both health consumers and healthcare professionals are frustrated with the maze of health care delivery. Some, therefore, are turning to the Internet for answers and cost-effective solutions".*
29.	Beaulieu & Beinlich - First Consulting Group (2003) [15][41]	*"eHealth. 1. The application of Internet principles, techniques and technologies to improve healthcare. 2. New way of conducting the business of healthcare enabling stronger and more effective connections among patients, doctors, hospitals, employers, brokers, payers, laboratories, pharmacies, and suppliers. 3. The "customer facing" e-revolution in healthcare".*
30.	eEurope eHealth (2003) [15][42]	*"The application of information and communication technologies (ICT) across the whole range of functions which one way or another, affect the health of citizens and patients".*
31.	Decker – Health Vision (2003) [15] [43]	*"Corporate strategy and using the power of the Internet and emerging technology to redefine the delivery of health care".*

32.	Miller - athealth.com (2003) [15][44]	*"E-health means any form of healthcare information made available over the Internet".*
33.	Telehealth Victoria (2003) [15][45]	*"Term that is used to describe most aspects of healthcare delivery or management that is enabled by information technology or communications".*
34.	Ebrunel.com (2003) [15] [46]	*"The provision of healthcare services available through the Internet - and particularly to the rash of health-related web site".*
35.	Regional Office for the Eastern Mediterranean - World Health Organization (2003) [15][47]	*"E-health is a new term used to describe the combined use of electronic communication and information technology in the health sector OR is the use, in the health sector, of digital data-transmitted, stored and retrieved electronically-for clinical, educational and administrative purposes, both at the local site and at a distance".*
36.	www.avienda.co.uk (2003) [15][48]	*"A generic field of information and communications technologies used in medicine and healthcare".*
37.	Brommey (2003) [15][49]	*"The use of electronic information and communications technologies to provide and support health care wherever the participants are located".*
38.	Southwest Medical Group (2003) [15][50]	*"e-health is an emerging field focused on medical information and health care services delivered or enhanced through advanced Internet or related technologies. In a broader sense, the term extends the scope of health care beyond its conventional boundaries.*

		Conceptually, e-health enables patients to easily obtain medical related services online from health care providers".
39.	HMS Europe (2003) [15][51]	*"The practice of leveraging the Internet to connect caregivers, healthcare systems and hospitals with consumers*".
40.	Nova Scotia Telehealth Network (2003) [15][52]	*"E-health is a broad term to describe the accessing of information, products and services on "e-health" sites".*
41.	Victoria, Strengthening Support for Women with Breast Cancer (2003) [15][53]	*"The use of information and communication technology (ICT) to enhance health care".*
42.	Vigneaul (2003) [15][54]	*"The development and evolution of technical tools to support program delivery".*
43.	Policy on ICT Security (2003) [15][55]	"*Using the Internet and other electronic channels to access and delivery health and lifestyle information and services".*
44.	Health systems group (2003) [15][56]	*"E-Health is health promotion delivered and managed over the Internet".*

45.	Marcus and Fabius (2003) [15] [57]	*"E-Health is connectivity"*.
46.	Silber(2003) [15][58]	*"E-Health is the application of information and communications technologies (ICT) across the whole range of functions that affect health"*.
47.	E- health technologies (2003) [15][59]	*"The use of emerging information and communication technology, especially the Internet, to improve or enable health and healthcare thereby enabling stronger and more effective connections among patients, doctors, hospitals, payors, laboratories, pharmacies, and suppliers*".
48.	International Telecommunication Union (2003) [15] [60]	*"Encompasses all of the information and communication technologies (ICT) necessary to make the health system work"*.
49.	Baker Modified from Gott (2003) [15][61]	*"The promotion and facilitation of health and well-being with individuals and families and the enhancement of professional practice by the use of information and communication technology"*.
50.	Sternberg (2004) [15][62]	*"New business models using technology to assist healthcare providers in caring for patients and providing services"*.
51.	Watson (2004) [15] [63]	*"The integration of the internet into health care"*.

Some of the terms used within the e-health concept are generic, whereas some of them are field-specific, such as tele-dentistry and tele-medicine [64]. The American Telemedicine Association has regarded 'tele-medicine' and 'tele-health' to be interchangeable terms [64]. In 2018, this association updated their tele-medicine glossary and described e-health, telemedicine, m-health, tele-conferencing, tele-consultation as below [64]:

E-HEALTH:

"*Healthcare practice supported by electronic processes and communication***"** [64].

TELEMEDICINE:

"*Telemedicine is the use of medical information exchanged from one site to another via electronic communications to improve a patient's clinical health status. Telemedicine includes a growing variety of applications and services using two-way video, email, smart phones, wireless tools and other forms of telecommunications technology*" [64].

M-HEALTH:

"*Practice of medicine and public health supported by mobile communication devices, such as mobile phones, tablet computers and PDAs for health services and information*" [64].

TELECONFERENCING:

"*Interactive electronic communication between multiple users at two or more sites that facilitates voice, video, and/or data transmission systems: audio, graphics, computer and video system***"** [64].

TELECONSULTATION:

"*Consultation between a provider and specialist at distance using either store and forward telemedicine or real time videoconferencing***"** [64].

1.1.2. HISTORY

Historically, e-health can be traced back to the nineteenth century with one of the first published accounts in the early twentieth century when the Dutch researcher and inventor of the electrocardiograph, Willem Einthoven, transmitted data via telephone cables [5, 65]. Modern tele-medicine began in the 1960s and was facilitated by two different factors [5]; the first was the technological advancement of electronic communications methods in which digital techniques began to replace analog methods [5].The second factor was due to the interest by the military and space technology sectors that played an important and dominating role in the development of e-health technology [5].

Some of the first milestones in e-health included the provision of expert medical advice from the Massachusetts General Hospital to 1,000 patients who were 2.7 miles away at the Logan International Airport Medical Station [10]. In addition to these e-health studies, NASA funded various programs in the 1960s and 1970s, that resulted in a stream of progress and innovation to the field of e-health technology [66]. While NASA was attempting to solve the problem of providing care to astronauts in space, it also funded various e-health research projects across the United-State and worldwide [66]. Since then, the number of scientific studies related to e-health has steadily increased [10].

In 1980, a few radiologists in the USA began to use tele-systems to receive images for consultation. In 1987, the University of Iowa added tele-radiologist training to an established radiology training program [66] . Furthermore, President Obama signed an act of natural defense authorization in 2014, expanding e-health services to assist military members' return to civilian life [66]. In 2016, the US Health Resources and Services Administration gave over 16 million dollars for a budget to expand the use of e-health technology for patients and to improve access to care in rural areas

[67]. Thus, e-health has been expanding. According to a 2019 survey, e-health adoption by physicians increased by 340% between 2015 to 2018 [68]. More recently, Canada Health Infoway launched the ACCESS 2022 initiative to accelerate development, adoption and effective use of e-health technology [69].

1.1.3. DATA TRANSMISSION METHODS

E-health technologies enable the transmission of health-related data over long and short distances. These data could be in the form of voice, pictures or clinical information [69].Transmission can use synchronous or asynchronous methods to eliminate challenges related to distance and encourage efficient and effective access to information [69].

Typically, the synchronous method (or real time) includes audiovisual technology to allow people to interact live through a videoconference link [70]. Most applications involve video cameras, a sound system, computer displays and a reliable high-speed internet connection for information transmission [70]. Hence, real-time services depend on the accessibility of specialized equipment, that may be limited in many academic or health care organisations and institutions [70]. However, the asynchronous method (or store-and-forward) is a method of data transmission without the need for people to interact synchronously. It includes collecting digital samples at one place (e.g., electrocardiograms (EKGs), spirometry outcomes, radiological pictures) and transmitting them to a health professional in another place for evaluation [70].

In 2008, Deshpande at el. [70] found that real-time consultation could be efficient in meeting the requirements of health practitioners and patients in remote, under-served populations [70]. According to this study, real-time consultation resulted in improved access to services. When

compared with face-to-face consultations, asynchronous consultation resulted in shorter waiting times, less expensive referrals, greater satisfaction and equal diagnostic accuracy [70].

1.1.4. E- HEALTH TECHNOLOGIES: IMPLEMENTATION BARRIERS

Despite the potential benefits of e-health technology, its implementation into practice continues to be a challenge [71]. At an individual level, socio-cultural and socio-economic characteristics, e-health illiteracy, inability of an individual to access or to use technological systems and software applications, trust concerns, fear of unreliable information, privacy and lack of on-site contact with the health care professional have been highlighted as barriers in the use of such technology [72, 73]. For health care professionals, factors such as the additional work burden, uncertain payoffs, e-health illiteracy and socio-cultural characteristics could act as barriers to adoption of e-oral health technologies [72, 73].

At the organisational level, transmission of data, privacy concerns with regards to the integrity of their information, lack of standards and knowledge to establish and use e-oral health technologies and costly solutions to integrate legacy systems or invest in new infrastructure has proven to be the greatest challenges for adoption of technology [74].

1.2. E-ORAL HEALTH

1.2.1. HISTORY

In the mid 1990s, e-health was extended to the field of dentistry; it started with a coordinated e-health program that was introduced by the U.S. Army in 1994 [75]. This program included teledentistry. In this project, an intraoral camera and a secure telephone unit were used to capture high resolution colored images of patients' mouths [76]. These images were then transferred to a

dental specialist in a clinic that was located approximately 120 kilometers away [76]. The goal of this teledentistry program was to encourage dental education, patient care and communications[76]. According to this military project, the use of teledentistry can reduce total expenses and be expanded for use in remote and rural areas[75, 77].

Since e-oral health initiatives demonstrated the ability to improve health care services, US health care organizations encouraged the use of tele-dentistry in rural areas in the early 20th century [78]. In 2003, Marquette University School of Dentistry launched a pilot project on the use of e-oral health for educational purposes, and the Advanced Telecommunications Foundation funded the project [79]. This project built a network between this University and other health care organizations in distant areas where dental access was limited [79]. It used both store and forward, as well as real time technology, for consultation and educational purposes [79].

Today, e-oral health technologies are used for dental consultations, education and creating public awareness with the intention of enhancing oral health worldwide [12]. Recently, the E-Oral Health Network was created in the International Association of Dental Research to encourage and enhance research studies in this field [80]. This network also facilitates communication and collaboration between researchers in the fields of Dentistry and Information and Communication Technologies [80].

1.2.2. E-ORAL HEALTH APPLICATIONS IN DENTISTRY

Within Dentistry, e-oral health technologies are used for dental education, screening and disease diagnosis, as well as providing dental training and care in various disciplines including dental public health, preventive dentistry, orthodontics, prosthodontics, oral surgery and oral medicine [72]. The use of these technologies has also facilitated communication between general dentists and specialists for consultation, especially when dealing with difficult cases [72, 73].

Marino et al [81] conducted a systematic review in 2013 to explore e-oral health applications and its use in several dental specialties. The study results demonstrated the utility of technology for consultation within dental communities, oral disease screening and collection of epidemiologic and clinical data [81].

Pentapati et al. ([82]; 2019) conducted a systematic review and identified 214 articles on the various clinical applications of e-health in endodontics, oral medicine, oral and maxillofacial surgery and orthodontics. According to this review, e-oral health technology can be used effectively in the field of endodontics for distant diagnosis of periapical lesions [82]. In oral medicine, e-oral health is used to capture high quality photographs of patients with oral mucosal problems and to screen for oral premalignant lesions [82].In the field of oral and maxillofacial surgery, e-oral health applications are useful to general dentists for communication with specialists to discuss treatment planning [82]. In addition, they can be useful in diagnosis, monitoring, evaluation of healing, dentoalveolar fractures, impactions, abscesses and pericoronitis [82]. In the field of orthodontics, e-oral health applications have been useful for dentists to consult with a specialist via a virtual clinical examination, and it appears that treatment planning for orthodontics is as accurate as through direct clinical examinations [82]. According to this systematic review, dental practitioners were highly satisfied with the use of e-oral health technology [82].

Flores-Mir et al. [73] conducted a survey in 2016 to examine dentists' perception and attitudes towards using digital technology [73]. This survey analysed 283 responses of Canadian dentists and found that 60% of those dentists were satisfied using the e-oral health technology and believed that e-health technologies are useful in connecting general dentists to specialists, as well as improving their workplace efficiency [73] .

1.3.THEORIES IN E-HEALTH

Various theories have been purposed and used to explain e-health technologies and their adoption [83].We briefly review a few of these theories, including :

- Theory of reasoned action (1975) [84]

- Theory of Planned Behaviour (1985) [84]

- Technology Acceptance Model (1986) [85]

- Activity Theory (1987) [83]

- Unified Theory of Acceptance and Use of Technology (2003) [90]

THEORY OF REASONED ACTION (TRA)

Theory of Reasoned Action (TRA) (figure 1) was developed by Fishbein et al. in 1975 [84] . According to this theory, attitude towards acts or behaviour and subjective norms influences the behavioural intention that, in turn, leads to specific behaviors such as use of e- technology [84].
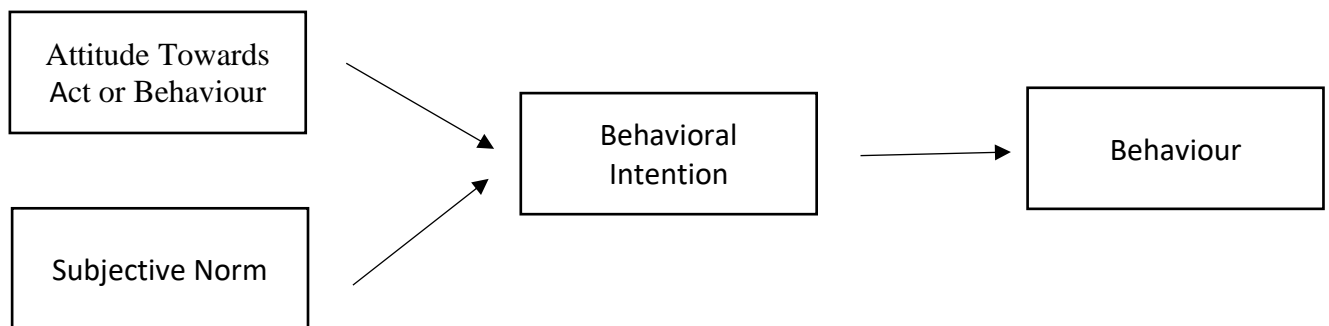
Figure 1: Theory of Reasoned Action (TRA) [84]

THEORY OF PLANNED BEHAVIOUR (TBP)

Ajzen (1985) introduced the theory of planned behavior (TPB; Figure2). This theory takes into consideration the perceived behavioral control, which relates to the perception of control over a specified behavior [84]. TPB suggests that perceptions of behavior and real behaviors are affected by sound convictions and define three kinds of physiological paradigms, each of which is influenced by a distinct sort of faith: behavioral beliefs affect attitudes, normative beliefs affect subjective norms and perceived behavioral control is influenced by control beliefs [84].

The control beliefs include perceived availability of skills, resources and opportunities [84]. The perceived facilitation belief is the individual's assessment of available resources for a given set of outcomes [84].
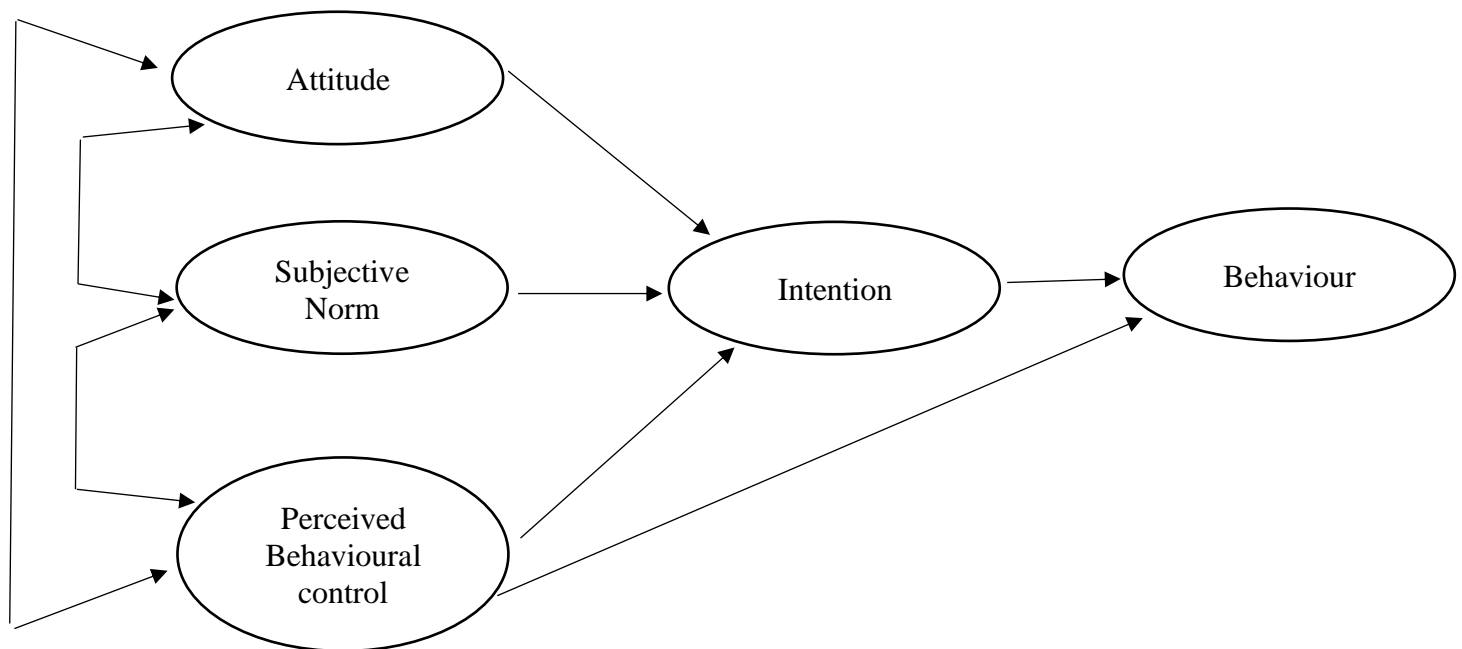
Figure 2: Theory of Planned Behaviour (TBP) [84]

TECHNOLOGY ACCEPTANCE MODEL (TAM)

In 1986, Davis et al. introduced the Technology Acceptance Model (TAM; Figure 3). The TAM provides an overview of the acceptance and use of information technology[84, 86]. TAM states that the choice people make to use technology is affected by their intention to use the technology [85]. TAM indicates that two key determinants influence the adoption of new technologies [85]. This includes perceived usefulness and perceived ease-of-use. Accordingly, perceived usefulness is defined as "*The degree to which a person believes that using a particular system would enhance his or her job performance*" [85], and perceived ease-of-use refers to "*the degree to which a person believes that using a particular system would be free from effort*" [87]. Furthermore, Davis revised his model to include some variables that were neglected [86].

This model has been implemented in numerous research studies[87] . In 2009, Park at al. [87] used the TAM to evaluate university students' intentions to use e-learning with chosen constructs such as their attitude, perceived usefulness, perceived ease of use, self-efficacy of e-learning, subjective standard and system availability [87] . One of the study's interesting findings was that subjective norm plays a significant role in affecting e-learning attitude and e-learning behavioral intent [87], and some TAM constructs had a direct and indirect effect on university students' behavioral intentions to use e-learning [87, 88].
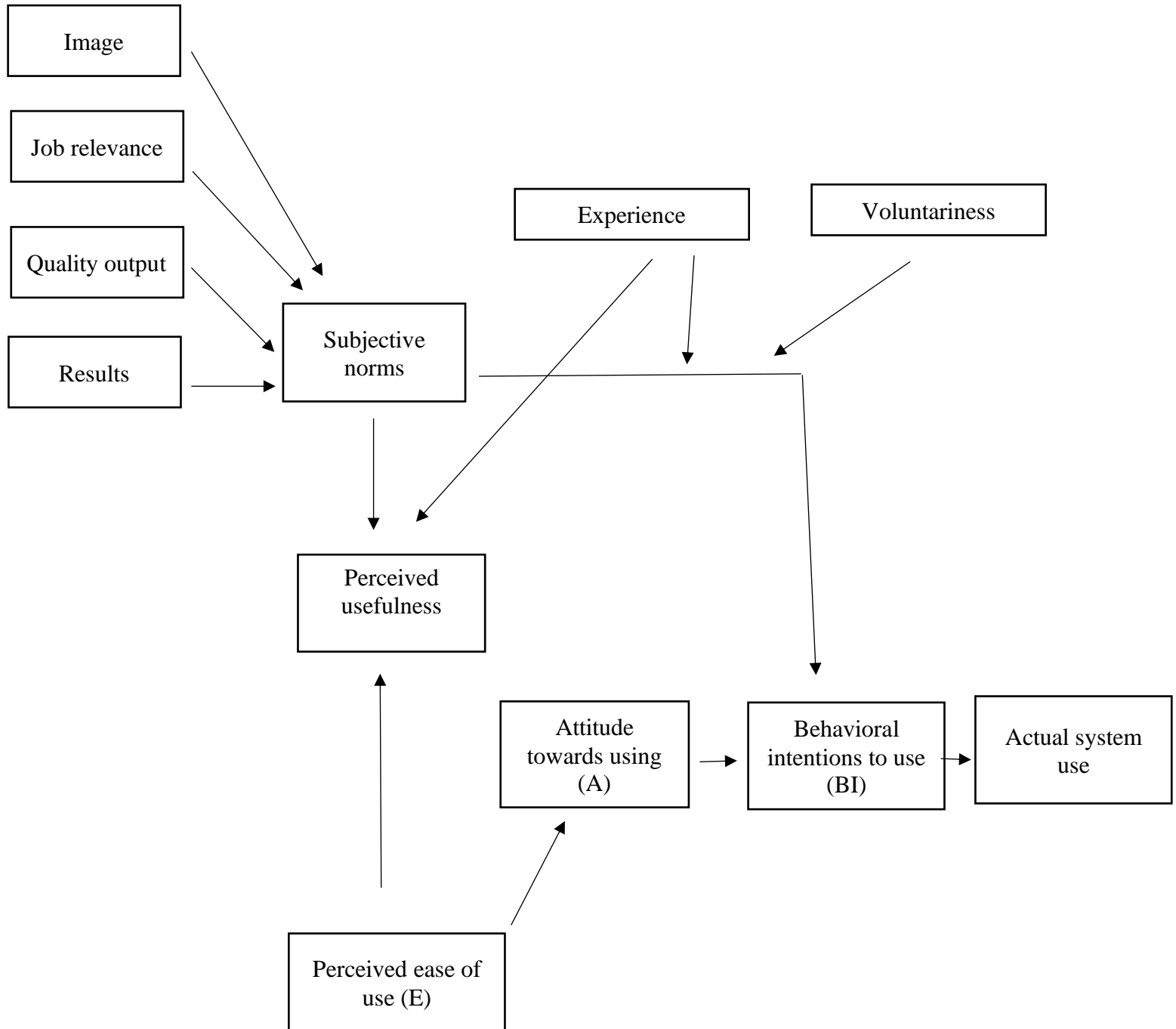
Figure 3: TAM revised model by Venkatesh & Davis, 2000

ACTIVITY THEORY

Engeström (1987) described Activity Theory in a socio-technical system through six different elements, including mediating tool, subject, object, rule, community and roles [89]. Activity Theory (Figure 4) offers a framework to analyze the complex social interactions between individuals and their environment, including social tools [83]. Activity is the basic unit of analysis in Activity Theory [83]. The subject represents the activity system as basic unit of analysis and is the person who works towards the object in the system. In turn, the object leads to the result [83]. The subject's activities are mediated via tools. Rules, community and roles support the entire system [83]. These factors influence the action, leading to the outcome, such as use of e-technology. Rules are defined as a set of conditions that determine how people can act [83]. The relationship between the individual and his/her environment is assessed through the community [83]. Rules mediate the connection between subject and society, and the connection between object and society is mediated by the individual's roles [83].
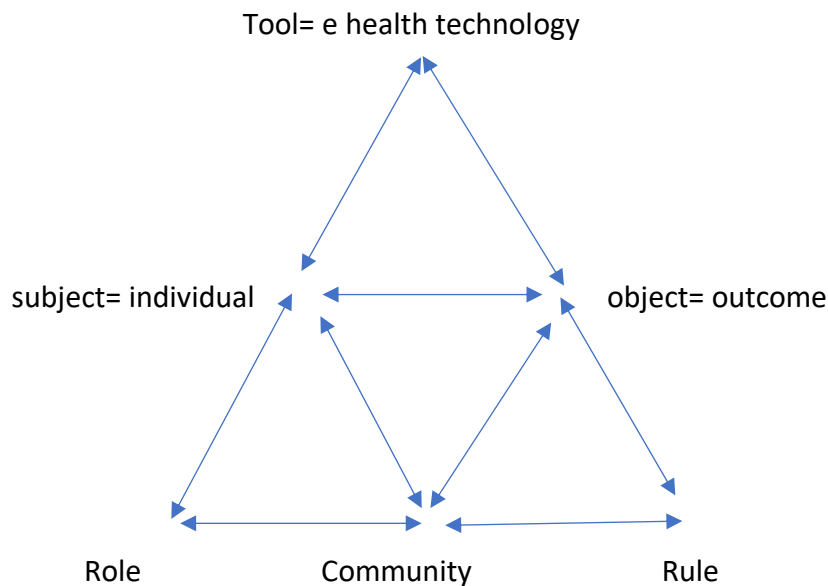
Figure 4. Activity Theory framework [83]

UNIFIED THEORY OF ACCEPTANCE AND USE OF TECHNOLOGY (UTAUT)

Venkatesh et al. (2003) created the Unified Theory of Acceptance and Use of Technology (UTAUT; Figure 5) to evaluate the probability of successful implementation of a new system or technology [90]. The UTAUT included 4 key determinants: facilitating conditions, social influence, effort expectancy and performance expectance, as well as 4 moderators of key relationships: experience, voluntariness, gender and age that will directly determine intention and usage behavior [90].

The UTAUT model places perceived usefulness into a concept of performance expectancy and perceived ease of use into effort expectancy [90]. The Social Influence is that variable which captures attitudes and influence from colleagues, leaders and company or institution cultures that forces end users to use or accept the system in question [90]. New in this model is the determinant facilitating conditions for usage behavior [90]. The variable, Facilitating Conditions, is considered to be the organizational and technological infrastructures in place for system use of e-health [90].
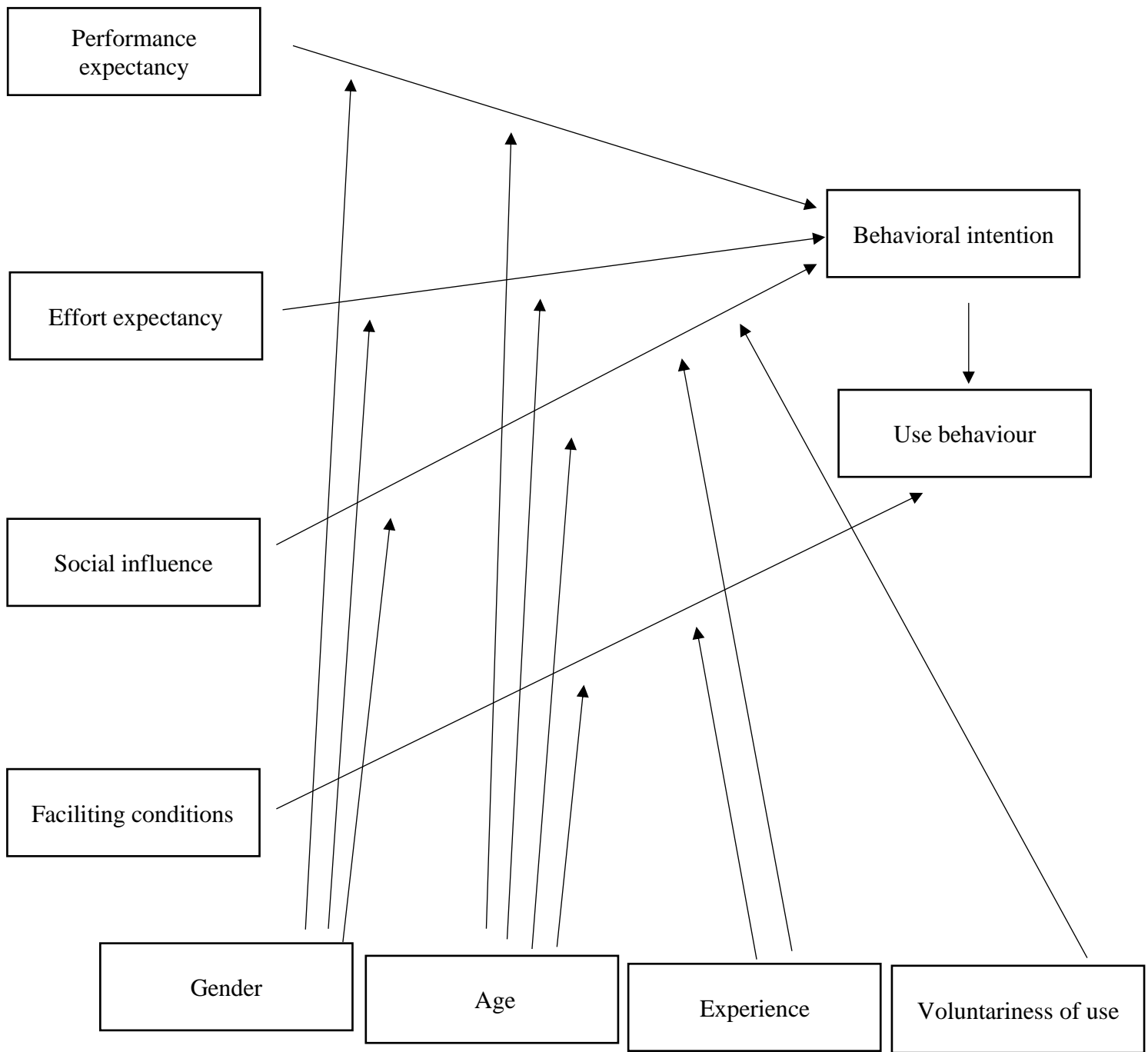
Figure 5: UTAUT model by Venkatesh et al. (2003) [90]

1.4. TECHNOLOGY ADOPTION LIFE CYCLE

According to Rogers [8], five factors can influence acceptance of a technology: relative advantage, compatibility, complexity, trialability, and observability. Rogers further classified users as 'innovators', 'early adopters', 'early majority', 'late majority' and 'laggard' [8]. 'Innovators' are the first individuals to adopt an innovation. They are prepared to take risks and are usually from higher social classes. They have excellent economic lucidity and are considered very social. Innovators also like to maintain their connections with other innovators [91]. 'Early Adopters' are considered the second fastest individuals to adopt an innovation. These people have more leadership skills than other types of adopters [91]. Early adopters are typically younger in age, having a higher social status with more financial lucidity, advanced education and are more socially forward than later adopters [91]. The adoption time for 'Early Majority' individuals is much longer than for the Innovators and Early Adopters. They tend to be slower, have above-average social status and contact with early adopters and rarely hold an opinion [91]. The 'Late Majority" approach an innovation with a high degree of skepticism. Typically, Late Majority adaptors are skeptical about innovation, have lower than average social status and very little economic lucidity (100). 'Laggards' are individuals who are the last to adopt an innovation. Unlike some of the previous categories, these people demonstrate little to no leadership quality [91]. Typically, laggards tend to focus on "traditions," likely to have the lowest social status and the lowest financial fluidity; they are the oldest of all other adopters and prefer to keep in contact only with family and close friends [91].

Individuals are able to convey attitudes, make decisions, implement and decide whether or not to take on innovations [8].Accordingly, innovation goes through various stages before it is

implemented. Thus, it is essential to determine whether individuals are inclined to adopt innovations because, if not, the desired benefits of technology will not occur [8].

1.5. E-READINESS

In order to prepare individuals and organizations for new innovation change, health care institutions and individuals need to become familiar with e-health technologies [8]. This process is in-depth and challenging but, by doing so, e-health solutions can be acknowledged and prioritized in a manner that maximizes the efficacy and effectiveness of e-health in health care settings [92].The scientific literature highlights the importance of e-readiness in the adoption and implementation of e-health technologies [72].

E-readiness has been defined by Eysenbach as "*the degree to which users, healthcare institutions, and the healthcare system itself, are prepared to participate and succeed with e-health implementation.*" [72]. E-readiness can facilitate the process of change and act as a foundation for the effective use of e-health technology[72] . Moreover, it will save time, money and energy by determining why individuals are unable to successfully support immediate implementation [8]. Finally, understanding e-readiness can allow productive organizational changes to improve the uptake of e-health [72, 92].

Nine types of readiness are identified in the literature [93]. Governmental, organizational and societal readiness are categorised as macro level constructs [93]. Structural, technological and health care provider readiness are dimensions of e-readiness at the meso level, whereas engagement, core and public/patient readiness are dimensions at the micro level [93]. Governmental readiness measures the degree to which the nation, its government and the political leaders endorse and sustain the awareness programs and encourage the use of e-health technologies

[93]. Organizational readiness assesses the degree to which the organisational environment and its culture promote awareness programs and the use of e-health technologies [93]. Societal readiness "gauges the degree of 'interaction' associated with a healthcare institution." This interaction can involve members within a healthcare institution, interaction between institutions and interaction between the healthcare institution and its local community [93].

Structural and technological readiness measures the accessibility and cost of Information and Communication Technology (ICT) resources that are necessary to support the proposed innovation in e-health, whereas health care provider readiness evaluates the influence of the personal experience of a health care provider, in particular his/her perception and receptivity to the use of e-health technologies [93].

Engagement readiness assesses the degree to which a community member is exposed to the concept of e-health and actively discusses its potential benefits and negative effects. It also includes assessing the ability and willingness of members of a community to accept e-health training [72]. Similarly, Core readiness assesses the degree to which members of a community are unhappy with their current health care provision, see e-health as a solution and communicate their need and readiness for e-health services [72]. Public/patient readiness assesses how much patients and members of the public are aware of e-health services and can afford and access them [72]. It also involves assessing how their personal experiences impact their perception and receptivity to the use of e-health technology [72].

1.5.1. E-READINESS ASSESSMENT TOOLS

To determine the importance of e-readiness in the implementation of e-health technologies in health care systems and other organizations, several e-readiness measurement tools were created

in areas such as e-business, e-commerce, e-learning and e-health [72]. Some of them are briefly presented here and include:

- Organizational Information Technology/Systems Innovation Readiness Scale (OITIRS) (1996) [94]

- Organizational Readiness for Change tool (ORC) (2002) [95]

- E-Readiness Assessment Tool (RAT) (2004) [95]

- E-Readiness Assessment Tools for Healthcare Institutions (2007) [97]

THE ORGANIZATIONAL INFORMATION TECHNOLOGY/SYSTEMS READINESS SCALE (OITIRS)

In 1996, a multi-phase e-health research program was implemented, focusing on innovation-related organizational change in healthcare systems [94]. In the initial phase of this research program, the Organizational Information Technology/Systems Innovation Readiness Scale (OITIRS) was developed to guide e-health project key stakeholders in evaluation, diagnosis and selection of treatments [94]. The OITIRS has eight sub-dimensions, each with ten items, namely: 1) resources, 2) end-users, 3) technology, 4) knowledge, 5) processes, 6) values and goals, 7) management structures and 8) administrative support [94]. Thus, in total, OITIRS consists of 80 items that are scored using a 7-point Likert scale [94].

Halpren et al. ([94]; 2002) conducted an evaluation pilot study to assess this instrument. The findings of their study supported the reliability and validity of OITIRS [94].

THE ORGANIZATIONAL E-READINESS FOR CHANGE TOOL (ORC)

The Organizational E-Readiness for Change tool (ORC) was introduced in 2002 [95]. There are two versions of the ORC, i.e. the staff version (ORC-S) and the director's version (ORC-D) [95] .

The ORC-S contains 129 items, while the ORC-D includes 115 items [95]. These instruments contain 4 major themes; motivation to change, institutional resources, attributes of personnel and organizational climate, using a 5-point Likert scale [95].

E-READINESS ASSESSMENT TOOL (RAT)

Jennett et al. (2004) developed an assessment tool that measures the readiness of three groups in the use of technology; these groups include practitioners, patients and organization [72, 95] . The E-Readiness Assessment Tool (RAT) questionnaire covers six major themes: general readiness, infrastructure readiness, commitment, planning, workplace readiness and technical readiness [72] [95]. This tool is the only instrument that includes scores, sub-scores and interpretation of them; however, the reliability and internal validity of the RAT is yet to be demonstrated [95].

There are 17 items with maximum scores of 85 in the Practitioner Telehealth Readiness Assessment Tool and in the Patient/Public Telehealth Readiness Assessment Tool [95]. The Organizational Telehealth Readiness Assessment Tool has four sections, with a total of 28 items [95] . The items are scored using a Likert scale of 6 points [95]. Legaré et al. (2010) [96] developed a French language version of the Readiness Assessment Tool for Practitioner and Organizational Telehealth to allow tele-health readiness in the French-Canadian context [96].

READINESS ASSESSMENT TOOLS FOR HEALTHCARE INSTITUTIONS

In 2007, the E-Health Readiness Assessment Tool for Healthcare Institutions in Developing Countries was introduced by Khoja et al. [97] . This tool has different versions for managers and health care providers, and it is comprised of 3 different sections, including core-readiness, societal readiness and policy readiness [97]. Each section includes one to four items [97]. These items

measure an institution's readiness from managers' or health care providers' perspectives [97]. A 5-point Likert scale is used to score the questionnaire items. The overall score is intended to provide an evaluation that would place an institution between prepared and unprepared to use technology[97]. These tools have excellent validity and reliability [97]. In addition, this e-health readiness evaluation instrument is expected to be more broadly applied in other developing countries [97].

CHAPTER 2

RESULTS

2.1. MANUSCRIPT

Patients' e-readiness to use e-health technologies for oral health

Arishdeep Kaur Jagde[1], Richa Shrivastava[2], Jocelyne Feine[1], Elham Emami[1]

Author affiliations:

[1] Faculty of Dentistry, McGill University, Quebec, Canada

[2] Faculty of Dentistry, Université de Montréal, Quebec, Canada

Corresponding authors:

Dr. Elham Emami

Dean and Professor, Faculty of Dentistry, McGill University

2001 Avenue McGill College #500, Montréal, QC H3A 1G1

Tel: 514-398-7222

E-mail: elham.emami@mcgill.ca

Dr. Jocelyne Feine

Professor, Faculty of Dentistry, McGill University

2001 Avenue McGill College #500, Montréal, QC H3A 1G1

Tel: 514-290-0898

E-mail: jocelyne.feine@mcgill.ca

ABSTRACT:

Introduction: Scientific evidence highlights the importance of e-readiness in the adoption and implementation of e-oral health technologies. However, to our knowledge, there is no study investigating the perspective of patients in this regard. Therefore, the objective of this study was to explore patients' e-readiness in the field of dentistry.

Methods: A qualitative study was conducted using interpretive description methodology. Purposeful sampling with maximum variation and snowball techniques were used to recruit the study participants via McGill University dental clinics and affiliated hospitals, as well as private or public dental care organizations. A total of 15 face-to-face, semi-structured, 60 to 90-minute audio-recorded interviews were conducted. Data collection and analyses were performed concurrently, and interviews were continued until saturation was reached. Activity theory was used as the conceptual framework, and thematic analysis was used to analyse data. Data analysis was conducted both manually and with the use of Atlas-ti software.

Results: Four major themes emerged from the study: Unlocking barriers, Affordability, Inquisitiveness for e-oral health technology, Enduring oral health benefits. These themes correspond with all three types of readiness (core, engagement and structural).

Conclusion: The study results suggest that dental patients consider e-oral health as a facilitator to access to care, and they are ready to learn and use e-oral health technology. There is a need to implement and support e-oral health technologies to improve patient care.

INRODUCTION:

Oral health has been recognized as a fundamental human right, yet more than 50% of the world's population is in need of suitable and affordable oral health care [1]. People with low-incomes, senior citizens, individuals with special needs, new immigrants, refugees, Indigenous peoples and those living in rural and remote areas face disparities and challenges in access to health care [2, 3]. Factors such as shortage of oral health care providers and facilities, geographical barriers to access oral health care services and associated costs result in poor oral health [4, 5]. Poor oral health can also be related to cultural and linguistic barriers, poor education and oral health illiteracy [6-8].

The use of e-health technology has been recognized as an innovative approach to address the challenges in health care systems [9]. E-health innovation has been defined by Eysenbach *et al.* as '*an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the internet and related technologies'*[10].

E-health technologies, such as online communities, electronic health records, web portals and telehealth applications, have been used in various disciplines including dentistry for disease diagnosis and screening, reducing health illiteracy, optimizing education, facilitating exchange of information and improving communication between patients and health care providers, as well as access to health services [11, 12].

Despite the substantial potential impact of e-innovations on health care, implementation of this technology still faces barriers that include e-health illiteracy, lack of awareness and readiness, unwillingness to use technology, high cost, need for training and long-term sustainability of e-health platforms [13, 14, 15].

The scientific literature highlights the importance of e-readiness in the adoption and implementation of e-health technologies [15]. E-readiness has been defined as "*the degree to which users, healthcare institutions, and the healthcare system itself, are prepared to participate and succeed with e-health implementation.*" [13]. Jennett *et al.* have introduced three e-readiness domains: (1) Core readiness refers to "*the need for telehealth services, a dissatisfaction with the status quo and an expectation of change*"; (2) Engagement readiness refers to "*understanding as well as assessing the advantages and disadvantages of telehealth*" and (3) Structural readiness is "*the development of infrastructure such as adequate human resources, technical structures as well as necessary training for telehealth implementation*" [13].

Accordingly, analysis of the e-readiness framework revealed that there is a need to develop different assessment tools for various sectors such as stakeholders, managers, health organizations and health care providers [16]. However, the area of e-health readiness assessment needs further research before attempts are made to develop a more generic framework for different disciplines [16]. To our knowledge, there is no study that specifically examines e-readiness in the discipline of dentistry from a patient's perspective. Therefore, the objective of this study was to explore the readiness of patients to use e-oral health care and services.

METHODS:

This study used a qualitative approach and "interpretive description" to gain a deep insight into the perceptions of individuals concerning e-health technology[17]. "Interpretive description" methodology, introduced by Thorne (1997), is suitable for small-scale qualitative studies and for research in the domain of clinical practice generating clinical practice-based knowledge [17]. It

goes beyond the theoretical description of the phenomenon and offers more practical forms of the interpretation [17].

Study setting, participants and data collection: The study participants were recruited from dental clinics and affiliated hospitals at McGill University, as well as other private or public health care clinics. The participants were seeking oral health care for themselves, their children or other family members. All the participants or their family members with different cultural, educational and socio-economic backgrounds were eligible to be included in the study. A semi-structured interview guide was designed based on the study framework. A purposeful sampling with maximum variation and snowball technique was used to recruit the study participants [18]. This approach allowed us to collect "information-rich" data and capture the perspectives of a wide range of people, regardless of their backgrounds[18]. Data were collected using in-depth, face-to-face, audio-recorded, 60 to 90-minute interviews. These interviews were conducted by a postgraduate student (AKJ) trained in qualitative research and at a place suited to the interviewee. Data collection and analysis were performed concurrently, and interviews were continued until saturation was reached [19].

Data Analysis: Analysis included transcription, debriefing, codification, data display, inductive-deductive thematic analysis and interpretation [20, 21]. Data were coded manually, then analyzed using ATLAS.ti to facilitate the analysis. The first coding round used the principles of text interpretation developed by Strauss and Corbin (1998). This method involved cutting the transcript into significant sections [22]. We used an initial list of codes inspired by the type of e-readiness, but throughout the coding we refined the list. Then, the codes and their respective texts

were examined and grouped into broad themes (Table 1). The preliminary interpretations were reviewed during research team meetings, and themes were elaborated collectively. Ethics approval for this study was obtained from the Institutional Review Board of McGill University's Faculty of Medicine. Signed consent forms were obtained from all study participants.

Conceptual Framework: The Activity Theory framework adopted for e-Health readiness assessment was used as the conceptual framework for this study, as shown in Figure 1 [23, 24]. The Activity Theory offers a philosophical structure for studying the developmental processes that interlink individuals and society [25]. This sophisticated tool has potential to provide a rich, systematic and more structured description of human activities in any complex and dynamic environment [26].

It provides a helpful paradigm to understanding the meaning of technology for people, including human experience, needs, environment, motivations, complexities and efficiency of emerging technologies [25]. As shown in Table 2, this framework was used in the development of the interview guide, in understanding user behaviour and associated broader contextual problems on e-health technology usability and in analysing the data [23].

RESULTS:

The profile of the study participants is shown in Table 3. Data saturation was reached after the 10th interview; however, data collection continued up to the 15th interview to ensure the saturation level. A total of four themes emerged from the analysis: Unlocking barriers, Affordability, Inquisitiveness for e-oral health technology and Enduring oral health benefits. These themes cover all three types of readiness; core, engagement and structural readiness.

1. Unlocking barriers: This theme covers core readiness, as participants expressed their needs for e-oral health services by expressing dissatisfaction with the current oral health care system.

The need for e-oral health services emerged from participants' previous experiences of oral health services and the challenges that they faced in accessing dental care. Most of the participants identified multiple barriers, such as immigration, lack of familiarity with the health care system, lack of information, language barriers, financial challenges, not having dental insurance coverage, long waiting hours to see a dentist in the public setting and lack of transportation.

"Waiting to see Dentist is always been concern in Canada, ever since I am here, I faced so many problems like speaking French".

"I think like the rest of the dearth of services around you know it would be an additional advantage to the member of the society to reach with convenience to the services they immediately need".

"I don't have a car. We need to go through the bus. Today we were supposed to take a bus. I mean, I'm living in central downtown, we check the bus. It was supposed to be in two minutes, five minutes before, we were waiting for the bus, but bus was late. we have to go out and take another bus walk and then that's why we are always late. Like around 20 minutes to come to the appointment. We were supposed to be here at 11. We don't have the 11:25. So travelling far is the problem".

Participants expressed that e-oral health technology may be a potential solution to some of these barriers. They described e-oral health technology as a facilitator to improving oral health care and access to care.

"Yeah, so it's (e-oral health) easier access. So, it would be easier, it can make your life easier. It could maybe make your life more convenient. This is what it is relatively easy and convenient".

2. Affordability: This theme covers engagement readiness as participants were exposed to the concept of e-health. Participants actively debated the perceived benefits of e-oral health, as well as its disadvantages. They consider its benefits as immediate, providing easy access to information and health care services, as well as being affordable. Participants also deem e-oral health to be cost-effective in oral health care service provision, even at organizational, governmental and policy makers' level.

"This is something new in health system. We always have health problems sometimes people are lucky sometimes people are not lucky to get information. This is something that should be applied and will benefit future generation".

"Firstly, we do not have to go from one place to another. So Secondly, the people are working, and some people are going to school or colleges. So, it will be very helpful for them to just visit a website and get information easily".

"The first and foremost it's the cost and the second thing I don't know exactly where I have to go, or which places are the best and commuting as well".

"Yes, I think is 100% affordable because if you do not have at home, you have in the library, you have on joints like Tim Horton and other eating places".

On the contrary, lack of physical interaction with the dentist, technical issues and data security/privacy issues were expressed as potential disadvantages of e-oral health care. Interestingly, most participants were aware of e-oral health and considered it to be an interesting technology.

"It's even hard for,... because you cannot feel that texture, you can't feel the edges. Cameras never going to be good enough for you to see it. Even if you're increasing ... lighting and special magnifying glasses. Oral Health is really hard to show to inside of your mouth through a camera".

"To be honest with you, I haven't heard about that before, but it seems like a good like idea".

Most of the participants demonstrated a positive attitude towards e-health and shared innovative synonyms for e-oral health such as "best friend" and "complete package".

"Well, if it will happen, I would be very satisfied. I believe it's a very good future application to be done for people even for citizens or for the newcomers to Canada, it's really helpful".

"In Canada, people use banking related applications and to get information like Metro bus service, they use application. So, I think so they will definitely use this kind of application for their health issues".

3. Inquisitiveness for e-oral health technology: This theme covers engagement and structural readiness, as participants shared their views of learning e-oral health technology and its perceived advantages. Participants were optimistic about obtaining e-oral health applications and were ready to pay for such applications because they believe that it would be cost-effective. They thought that this technology is the future of oral health care and expressed their interest, primarily in active learning.

"I mean most app-like ranges and for Apple there $1 each or whatever, $2, even if it goes up to $10, as long as it does the job, people will pay for it".

"If something like that is there which is specifically prepared for the e-dentistry, I would be happy to learn about that".

"I would be happy to learn about these kinds of innovative ideas".

4. Enduring oral health benefits: This theme covers core readiness, as participants considered e-health to be a solution to reducing health care challenges and expressed their beliefs in its long-

term benefits. Participants anticipated that this technology would be promising in reducing oral health inequalities, especially for vulnerable population including immigrants, refugees and those living in rural and remote areas. They considered it as a potential technology that can improve oral health literacy and users' satisfaction both at individual and wider societal levels.

"It would help everyone in rural remote all the people living in any areas".

"The young generation is very dependent on the technology. So, they will definitely use the technology and will teach their parents, their grandparents to use it to for their health issues and to how to get information regarding their health issues. So, it will be popular in the future".

DISCUSSION:

A better understanding of e-health is of public health importance since it could lead to the implementation of effective policies based on patients' perceptions and needs [27, 28] . Various e-health readiness frameworks have been developed to understand readiness from different stakeholders' perspectives, especially those of health care providers and organisations [13, 28-31]. Only one among those frameworks included the patients' perspective on e-health readiness [13]. Moreover, most of those frameworks lack consistent evaluation and validation [28]. To our knowledge, this study is the first to explore the patient-perspective on e-readiness in the field of oral health. Study results indicate that participants demonstrated their core, engagement and structural readiness for adoption and implementation of e-oral health technology within the Canadian health system. They considered this technology effective, not only for themselves and their families, but also for the society at large; however, they also revealed a few barriers that might need to be considered.

Various concepts have been used to elucidate e-health technology and its readiness, such as Theory of Change and Innovation Diffusion Theory [32]. Among these, the use of Activity Theory in our study was influenced by a previous study that suggested using Activity Theory as a framework for e-health readiness assessment in health care institutions [32]. Activity Theory is popular not only in health research, but also in various fields, including information system, education, culture, psychology, management and human technology interaction research [26,33]. The available literature suggests that Activity Theory is pertinent in cases of understanding and solving problems related to e-readiness and e-learning and their associated environments [26, 32]. Moreover, this theory is coherent with qualitative research methodology due to its holistic and conceptual nature of exploring human activities, such as e-oral health technology in this study [26].

Based on our data and elements of activity theory, the activity system of this research work is illustrated by Figure 2 on e-readiness with e-oral health technology. The Activity Theory allowed us to understand the patients' e-oral health readiness by exploring ongoing activities in different types of readiness at every stage of the study. As per the elements of Activity Theory, the results of this study suggest that e-oral health technology, being a central activity tool, prompted dental patients to be ready to use this technology. Their readiness was influenced by various mediating factors, such as their dissatisfaction with the oral health care system, awareness of e-oral health and motivation to use this technology.

Patient participation is imperative even earlier in order to effectively design, implement and utilize e-health technology. A deep understanding of patient needs regarding the use of e-health and e-oral health will aid in these efforts [34]. Patient perspectives on e-oral health have been measured among a wide range of patients utilizing the health services in both developed and developing nations, such as in general private and public health services, primary health care services,

rehabilitation services and services for multi-morbid chronic diseases [3, 34-38]. Our results are in line with available evidence on patient perspective for e-health technology in relation to its positive impact on access, treatment adherence, cost-effectiveness, health outcomes, satisfaction, empowerment and quality of life [34, 37-42]. Moreover, these studies on e-health also reported patients' willingness to use and learn such technology, also similar to this present study [3, 34-36, 40, 41]. Furthermore, patients' concerns regarding e-oral health were also consistent with that of e-health technology in terms of lack of human contact and personal data privacy [34, 43].

The results for this study will create a platform to develop and validate e-oral health readiness instruments for future research. The following recommendations are suggested to optimize the use of technology in oral healthcare practices:

1. Development of e-oral based application such as oral health education-based application for Children's and adults, oral health care access related applications, oral health digital service management, e-consultations;

2. Introduce visual aids to reach wider audiences and keep the application simple;

3. Creating e-oral health technology training programs for its users;

4. Dentists should recommend such technology to their patients in order to facilitate its use;

5. Simultaneously, development of detailed policies and legislations to protect patients' privacy, access and sharing of e-oral health related data.

The results of this study can be generalized only to similar settings; further research is necessary to determine whether the results identified in this study are relevant to other populations. Another possible limitation was conducting the interviews only in the English language in Montreal, which is primarily a French-speaking city. This criterion excluded the perceptions of Francophone people. Similarly, another language-based limitation was the inclusion of non-native English

speakers who may have had difficulty in expressing their views in the English language. Lastly, the lack of prior awareness of e-oral health among the participants suggests the need to introduce and create more e-oral health awareness in the public education system. This study prepares the ground for future studies aimed to understand multi-stakeholders' perspectives on e-oral health in both developed and developing nations.

CONCLUSION:

The study results suggest that dental patients consider e-oral health to be a facilitator to access to care, and they were ready to learn and use e-oral health technology. Implementation of and support for e-oral health technologies are needed to improve access to care for many populations.

TABLES AND FIGURES:

Table 1: Development of Categories

CORE CATEGORY	THEMES	OPEN CODES	QUOTATION
Core readiness *It assesses the degree to which members of a community are unhappy with their current health care provision, see e-health as a solution and communicate their need and readiness for e-health services.*	Unlocking barriers	Participants' dissatisfaction with current health care system	*One or two times I was trying to get an appointment for to get a checkup, because I used to live in Vancouver but in that time, it was like the access wasn't easy, because I have to wait for a long time, maybe six or seven months to get the appointment, then I decided to go back my home country and do it there. So, then I got it done from there.* *I'm really running short of the information where to go Where not to go collect the data where what and when it should be done* *Biggest problem I will tell you , I guess 2 years back, for my kid is having a toothache and it's you know weekend mean to say Friday night it gonna be hard for me to go to a dentist, you know so I have to wait for Monday.*
		Oral health needs	*I expect high standard of high quality of all health care and I think I would say with the most modern life technology, in terms in terms of the quality of healthcare will improve.* *You know, if the dental services are available for all the time like 24* 7, Everybody*

			would love to have those services because the health is the kind of thing, things happens. You don't know the time
			Well, if you can get faster service faster care less complicated, that would be great, save a lot of time.
			I think people should get appointment easily and it should be convenient for the people who are new to Canada and it should be cost effective it should be cost effective. So, any person can go for the dental treatment.
	Enduring oral health benefits	Preparedness and e-oral health as a solution	*I think to have more access to the E appraisal of healthcare or Cybernet will be really it will be too good stead for benefits to the society*
			In terms of efficiency, there's definitely an improvement that can be done with e health
			it's very advanced, and you can take advantage of using this type of application, it will help a lot
			this is something new and something like do you can say improvement so this is a good idea having you can access your oral health on net.
			it will be helpful for old age people too and international people also, but we cannot implement it hundred percent right now. In future this is going to be the best thing.

Engagement readiness *It assesses the degree to which a community member is exposed to the concept of e-health and actively discusses its potential benefits and negative effects. It also includes assessing the ability and willingness of members of a community to accept e-health training.*	Affordability	Understand e-oral health advantages and disadvantages	*it is same thing like a taxi, you know where you reach for taxi and do you have the number you have on the Cybernet where to reach for taxi or the or for your breakfast, first it will be same way good and I think it's additional advantage.*
	Inquisitiveness of e-oral health technology	Willingness to be trained	*you know, as a mother if you ask any mother to this (e- oral health) she will say yes, because that's the kind of very handy so I can easily access, I can talk to maybe I can I can text them this is a problem and what should be the next step*
Structural readiness *This measures the accessibility and cost of Information and Communication Technology (ICT) resources that are necessary to support the proposed innovation in e-health.*	Inquisitiveness of e-oral health technology	Adequate human resources and technical knowledge	*I think that technology is very helpful for us. And I can get any information related to health issues. So, as I said, I have laptop mobile and internet connection. So, I think it is very helpful for me* *I think personally I will say I have every access, you know, the eating program treated within and travel program readily available to me and I have even the educational system mathematics is scientifically strategy, and everything is for me, I have an access: same way this will be an additional access.*

Table 1. Development of Categories

Table 2. Elements of Activity theory adapted to e-oral health technology

Element	An example of the element
Subject	Study Participants
Object	Explore patient's readiness
Outcome	E- readiness
Tools	E- oral health technology
Rules	Change in Environment, such as immigrants moving to a new country, its culture and health system
Community	Immigrants and Canadians
Roles	Complexity of access to care

Table 3. Participants' demographic characteristics

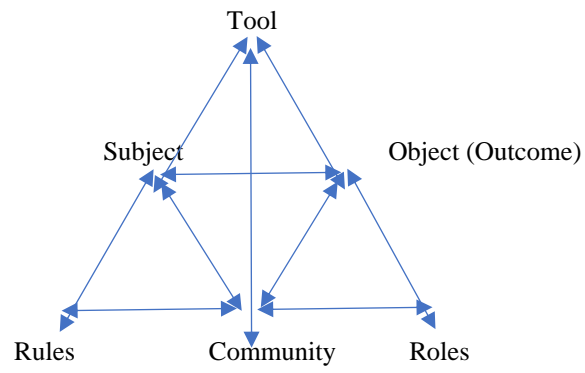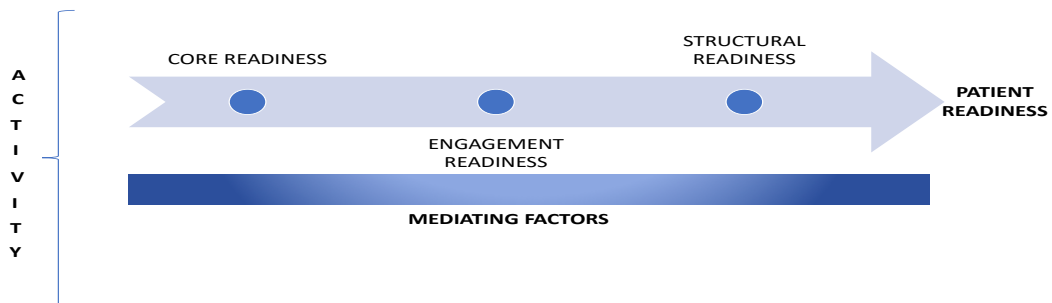| Characteristics	Number of Participants
Age	
• 20 – 40 years	11
• 40 – 60 years	2
• 60 – 80 years	2
Gender	
• Male	7
• Female	8
Residential status	
• Immigrant	10
• Born in Canada	5
Highest level of education attained	
• Elementary	2
• Secondary	1
• Higher/ University	12
Domestic Status	
• Living alone	8
• Living with partner or child	7

Figure 1: Activity Theory

Figure 2. Activity when using e-oral health technology to report the result

BIBLIOGRAPHY:

1.   World dental Fedration. FDI; figure, facts and stats. Updated May 2019 Cited July 2019. [Internet]. 2019.
2.   Clarke J. Difficulty accessing health care services in Canada. Statistics Canada Ottawa, Ontario, Canada; 2016.
3.   Wentink MM, Prieto E, de Kloet AJ, Vliet Vlieland TPM, Meesters JJL. The patient perspective on the use of information and communication technologies and e-health in rehabilitation. Disabil Rehabil Assist Technol. 2018;13(7):620-5.
4.   Hoffman C, Paradise J. Health insurance and access to health care in the United States. Ann N Y Acad Sci. 2008;1136(1):149-60.
5.   Peters DH, Garg A, Bloom G, Walker DG, Brieger WR, Hafizur Rahman M. Poverty and access to health care in developing countries. Ann N Y Acad Sci.2008;1136(1):161-71.
6.   Schneider EC, Zaslavsky AM, Epstein AM. Racial disparities in the quality of care for enrollees in Medicare managed care. Jama. 2002;287(10):1288-94.
7.   Gornick ME. The Association of Race/Socioeconomic Status and Use of Medicare Services: A Little-Known Failure in Access to Care. Ann N Y Acad Sci.1999;896(1):497-500.
8.   Janes GR, Blackman DK, Bolen JC, Kamimoto LA, Rhodes L, Caplan LS. Surveillance for use of preventive health-care services by older adults, 1995–1997. Morbidity and Mortality weekly report: cdc Surveillance Summaries, 1999 Dec: p. 51-88.
9.   Della Mea V. What is e-Health (2): The death of telemedicine?. J Med Internet Res. 2001;3(2):e22.
10.   Eysenbach G. What is e-health? J Med Internet Res. 2001;3(2):e20.
11.   Kreps GL, Neuhauser L. New directions in eHealth communication: opportunities and challenges. Patient education and counseling. 2010;78(3):329-36.
12.   Emami E, Kadoch N, Homayounfar S, Harnagea H, Dupont P, Giraudeau N. Patient satisfaction with E-Oral Health care in rural and remote settings: a systematic review protocol. Systematic reviews. 2017;6(1):174.
13.   Jennett P, Jackson A, Healy T, Ho K, Kazanjian A, Woollard R, et al. A study of a rural community's readiness for telehealth. J Telemed Telecare. 2003;9(5):259-63.
14.   Flores-Mir C, Palmer NG, Northcott HC, Khurshed F, Major PW. Perceptions and attitudes of Canadian dentists toward digital and electronic technologies. J Can Dent Assoc. .2006;72(3).
15.   Ross J, Stevenson F, Lau R, Murray E. Exploring the challenges of implementing e-health: a protocol for an update of a systematic review of reviews. BMJ open. 2015;5(4):e006773.
16.   Mauco KL, Scott RE, Mars M. Critical analysis of e-health readiness assessment frameworks: suitability for application in developing countries. J Telemed Telecare .2018;24(2):110-7.
17.   Thorne S. Interpretive description: Qualitative research for applied practice: Routledge; 2016.
18.   Sadler GR, Lee HC, Lim RSH, Fullerton J. Recruitment of hard-to-reach population subgroups via adaptations of the snowball sampling strategy. Nursing & health sciences. 2010;12(3):369-74.
19.   Posavac EJ. Program evaluation: Methods and case studies: Routledge; 2015.
20.   Elo S, Kyngäs H. The qualitative content analysis process. J Adv Nurs. 2008;62

(1):107-15.

21.	Thorne S, Kirkham SR, MacDonald-Emes J. Interpretive description: a noncategorical qualitative alternative for developing nursing knowledge. Research in nursing & health. 1997;20(2):169-77.

22.	Strauss A, Corbin J. Basics of qualitative research techniques: Sage publications Thousand Oaks, CA; 1998.

23.	Roos A. Activity theory as a theoretical framework in the study of information practices in molecular medicine. Information research. 2012;17(3).

24.	Engeström Y. Activity theory and individual and social transformation. Perspectives on activity theory. 1999;19(38).

25.	Coleman A, Coleman MF. Activity Theory Framework: A basis for e-health readiness assessment in health institutions. J Commun. 2013;4(2):95-100.

26.	Activity Theory: A framework for qualitative analysis [Internet]. University of Wollongong. 2007.

27.	Campbell JD, Harris KD, Hodge R. Introducing telemedicine technology to rural physicians and settings. J Fam Pract. 2001;50(5):419-.

28.	Li J, Land LPW, Chattopadhyay S, Ray P. E-Health readiness framework from Electronic Health Records perspective. GlobDev 2008. 2008:4.

29.	Demiris G, Oliver DP, Porock D, Courtney K. Home telehealth: The Missouri telehospice project: Background and next steps. Home Health Care Technology Report. 2004;1(49):55-7.

30.	Jennett P, Yeo M, Pauls M, Graham J. Organizational readiness for telemedicine: implications for success and failure. J Telemed Telecare. 2003;9(2_suppl):27-30

31.	Khoja S, Scott RE, Casebeer AL, Mohsin M, Ishaq A, Gilani S. e-Health readiness assessment tools for healthcare institutions in developing countries. Telemed J E Health. 2007;13(4):425-32.

32.	Coleman A, F. Coleman M. Activity Theory Framework: A Basis for E-Health Readiness assessment in Health Institutions. J Commun.2013;4:95-100.

33.	Kaptelinin V, Nardi B. Activity Theory as a Framework for Human-Technology Interaction Research. Mind, Culture, and Activity. 2017;25:1-3.

34.	Huygens MW. A patient perspective on eHealth in primary care: Critical reflections on the implementation and use of online care services Netherlands: Maastricht University; 2017.

35.	AlBar AM, Hoque MR. Patient Acceptance of e-Health Services in Saudi Arabia: An Integrative Perspective. Telemed J E Health. 2018.

36.	Hoque MR, Bao Y, Sorwar G. Investigating factors influencing the adoption of e-Health in developing countries: A patient's perspective. Inform Health Soc Care. 2017;42(1):1-17.

37.	Woods SS, Schwartz E, Tuepker A, Press NA, Nazi KM, Turvey CL, et al. Patient experiences with full electronic access to health records and clinical notes through the My HealtheVet Personal Health Record Pilot: qualitative study. J Med Internet Res. 2013;15(3):e65.

38.	Zsuzsanna J. From innovation to implementation: eHealth in the WHO European Region. Copenhagen, Denmark.World Health Organization, Regional office for Europe. [Internet].2016.

39.	Koch S. Improving quality of life through eHealth - the patient perspective. Stud Health Technol Inform. 2012;180:25-9.

40.	H. C. Beenkens F. Acceptance of e-Health Technology: A Patient Perspective. 2011.

41.	Bertelsen P, Tornbjerg K. Danish Citizens' Expectations to the Use of eHealth. Stud Health Technol Inform. 2015;208:78-82.

42.	Ossebaard HC, Van Gemert-Pijnen L. eHealth and quality in health care: implementation time. Int J Qual Health Care. 2016;28(3):415-9.
43.	Flynn D, Gregory P, Makki H, Gabbay M. Expectations and experiences of eHealth in primary care: a qualitative practice-based investigation. Int J Med Inform. 2009;78(9):588-604.

CHAPTER 3

3.1. DISCUSSION

E-oral health is an innovative technology capable of addressing current problems in accessing oral health care. Nonetheless, some obstacles need to be addressed before its implementation. Scientific literature highlights the importance of e-readiness in the adoption and implementation of e-oral health technologies. Previous literature lacks evidence that specifically studied patient perspectives of e-readiness in the field of oral health. Therefore, the purpose of our research was to explore patients' readiness to use e-oral health technologies. In addition to that, we studied patients' experiences related to oral health care services and their feedback on how to improve and implement e-oral health technologies. We discovered a variety of information about participant's previous dental care experiences and their perceptions about e-oral health technology, as well as some suggestions to improve e-oral health applications in the field of oral care. Study participants considered this technology effective, not only for themselves and their families, but also for society at a global level. However, they pointed out a few barriers that might need to be considered. To our knowledge, this study is the first to explore the patient's perspective on e-readiness in the field of oral health.

3.1.1. E READINESS FRAMEWORKS

Literature has identified many frameworks that describes patient readiness to use e-health [72]. Various concepts, such as the Theory of Change and Rogers' Innovation Diffusion Theory, have been used to explain e-readiness, the adoption process and barriers and facilitators for the implementation of e-health technologies [72].

3.1.2. ACTIVITY THEORY

We used Activity Theory in our research because of its interesting application of human computer interaction. Activity Theory provides a helpful paradigm for understanding human experience, needs, environment, motivations, complexities and efficiency of emerging technologies [98]. We choose activity theory for this research study based on Coleman and Coleman's previous study, in which activity theory was proposed as a context for the evaluation of e-health readiness in health institutions [83]. The available literature suggests that Activity Theory is applicable for better understanding and solving issues related to e-readiness, e-learning and their associated factors [83]. Furthermore, this theory is compatible with qualitative research methodology because of its holistic and theoretical existence to investigate human activities such as e-oral health technology [99].

Based on Activity Theory, we understood the patients' e-oral health readiness as outcomes by exploring activities in different types of readiness at every stage of the study. As per the elements of Activity theory, the results of our study suggest that e-oral health technology, being a central activity tool, prompted patients to be ready to use this technology. Patients e-readiness was influenced by various facilitating factors such as their dissatisfaction with the oral health care system, awareness of e-oral health and motivation to use this technology.

3.1.3. THEMES REFLECTING DIFFERENT TYPES OF READINESS

In general, four major themes emerged from our study results: Unlocking barriers, Affordability Inquisitiveness for e-oral health technology, Enduring oral health benefits. These themes correspond with all types of readiness. Study results show that participants demonstrated their

core, engagement and structural readiness for adoption and implementation of e-oral health technology within the Canadian health system.

UNLOCKING BARRIERS

Participants in our study communicated their dissatisfaction with the current health care system, as they face multiple barriers such as immigration hardships, language barriers, lack of dental insurance, lack of knowledge, financial challenges, transportation issues and long waiting times to see a dentist in the public setting. Core Readiness became evident through our findings of the degree to which members of a community are unhappy with their current health care provision, see e-health as a solution and communicate their need and readiness for e-health services [72]. As a result, most of the participants specified that e-oral technologies could help to decrease these problems. Our study results are in line with the Ross et al (2015)[100] systematic review regarding the barriers that influence the implementation of e-health [100]. Their findings suggested that issues regarding implementation of e-oral health are multi-level and complex [100-102]. They summarized a large body of literature on the implementation of e-health that covered a wide range of healthcare systems [100, 101, 103, 104]. Their results were comparable to another systematic review by Lau et al. [105], in which the literature on the barriers and facilitators to the implementation of complex innovations within primary care settings was summarized [105]. Our study findings also revealed a lack of familiarity with the Canadian health care system and culture. Consequently, these factors affected access to oral health care, especially for immigrants. Our results correspond to the study by Zanchetta et al (2019; [106]). A survey done by L. Corscadden et al. [107] suggested that many people, including immigrants, experience various obstacles in

accessing health care [107]. Therefore, there is broad interest in addressing these barriers for a range of vulnerable ethnic groups [108].

AFFORDABILITY

Engagement Readiness became evident from our study; this is a process in which community members are actively involved in e-healthcare, assessing its potential advantages and disadvantages in order to provide insight into factors that could promote e-healthcare adoption. Our study results showed that participants actively debated the perceived strengths and limitations of e-health. As far as the benefits of e-heath are concerned, participants perceived these as instant, easy access to information and health care services, as well as affordable. Participants believed e-health technology to be cost-effective in oral health care service provision at all levels, namely organizational, governmental and policy makers. Evidence of cost-saving and cost effectiveness have been shown in the literature as an important factor in the use of e-technologies [109]. Our study results are similar to other studies that emphasize the cost effectiveness of e-health and its implementation across all domains [100, 110-112]. Reduced costs or better resource utilization is also cited as one of the main goals of e-health technology [113-115]. These disagree with the review by Ross et al (2015), in which costs were reported as barriers to adoption of e-health technology [100, 116].

INQUISITIVENESS FOR E-ORAL HEALTH TECHNOLOGY

Participants in our study were optimistic about practicing e-oral health applications and were willing to pay because they believe that it is cost-effective. They believe that this technology is the future of oral health care and expressed their interest, particularly in active learning. This theme

covers engagement readiness and core readiness, as participants shared their perceptions about learning e-oral health technology. Our findings are consistent with the results of a Turkish study that concludes that e-health has the potential to be highly effective to enhance dental education, as well as self-education, and is a necessity for tomorrow [79, 117].

ENDURING ORAL HEALTH BENEFITS

Our findings showed that participants consider e-health as a solution to their health care challenges and consider this technology to have long-term benefits. This theme depicts core readiness. Participants predicted that this technology would be beneficial in reducing oral health disparities, especially for vulnerable populations including immigrants, refugees and rural residents. They believe that this technology can improve oral health literacy and increase users' satisfaction. These results are consistent with a systematic review ([113];2013) that showed high satisfaction ratings regarding the use of tele-dentistry from both patients' and health care practitioners' perspectives [113]. Other reviews suggested similar findings from studies reporting patient satisfaction with telemedicine [113, 118, 119].

3.1.4. PATIENT PERSPECTIVE REGARDING E-ORAL HEALTH

Patient perceptions of e-oral health have been studied among a wide range of patients utilizing health services in general, private and public health services, primary health care services, rehabilitation services and services for multi-morbid chronic diseases [120-125]. Prior to designing, implementing and utilizing e-health technology, patient participation is vital to provide information on patients' needs regarding the use of e-health and e-oral health [121]. Our results are consistent with the available evidence on patients' perspectives for e-health technology due to

its favorable impact on access, cost-effectiveness, health outcomes, patient satisfaction, patient empowerment and quality of life [121, 124-128]. Moreover, these studies on e-health also reported patients' eagerness to use and learn such technologies that are similar to our study [120, 128].

3.1.5. STUDY LIMITATIONS

The first limitation of the study lies in that most of the participants were immigrants who might not have been able to communicate their true dental care experiences if English was not their first language. This is also a possibility for the interviewer, since I may not have been able to understand the exact meanings of their described words based on the interview transcripts through which they communicated their experiences. Similarly, another language-based limitation was the inclusion of non-native English speakers who may have had difficulty in expressing their views in English. Since we looked at participants' perspectives towards e-oral health technology, it would have been more enriching to involve them from the early stages of this project's conception. These consultations would have helped us to understand whether our approach was best suited to learning about their perceptions of e-oral health care. To address this limitation, we included open-ended questions at the end of the interview to allow participants to discuss what they felt was missing and share their point of view. Lastly, lack of prior awareness of e-oral health among the participants suggests that more e-oral health awareness should be introduced in the public education system.

CHAPTER 4

4.1. CONCLUSION

The results of this study suggest that dental patients consider e-oral health as a facilitator to access to care, and they were willing to learn and use e-oral health technology. Furthermore, there is a need to implement and support e-oral health technologies to improve patients' access to care. A better understanding of e-health is of public health importance because it leads to the development of effective policies that are based on the communities' perceptions and needs. Our study can serve as a benchmark to guide future research, as well as attracting the attention of international bodies to support the process of e-health adoption.

4.2. FUTURE RECOMMENDATIONS

The following recommendations are suggested to optimize the use of technology in oral healthcare practices:

1. Development of e-oral health-based applications, such as oral health education-based applications, oral health care access related applications, oral health digital service management and e-consultations.

2. Introduction of visual aids to reach wider audiences and keep the e-health application simple.

3. Develop and conduct e-oral health technology training programs.

4. Develop detailed policies and legislation to protect patients' privacy, access and sharing of e-oral health-related data.

5. Patient satisfaction with e-health technology remains an important area for future research in teledentistry.

6. Assessment tools should be developed for e-readiness from the patient's perspective in the field of oral health, which could further identify weak areas to develop and plan for successful adoption of e-oral health technologies in the future.

CHAPTER 5

BIBLIOGRAPHY

1.   Lundblad JP. A review and critique of Rogers' diffusion of innovation theory as it applies to organizations. Organization Development Journal. 2003;21(4):50.
2.   Perrin A. Social media usage: 2005-2015.
3.   Della Mea V. What is e-Health (2): The death of telemedicine? J Med Internet Res. 2001;3(2):e22.
4.   Emami E, Kadoch N, Homayounfar S, Harnagea H, Dupont P, Giraudeau N. Patient satisfaction with E-Oral Health care in rural and remote settings: a systematic review protocol. Systematic reviews. 2017;6(1):174.
5.   Craig J, Petterson V. Introduction to the practice of telemedicine. J Telemed Telecare. 2005;11(1):3-9.
6.   Bhaskar D, Agali CR, Gupta V, Jain A, Garg Y. Teledentistry: an overview. Journal of Advanced Medical and Dental Sciences Research. 2015;3(2):88.
7.   Alvarez RC. The promise of e-Health–a Canadian perspective. Ehealth international. 2002;1(1):4.
8.   Rogers EM, Medina UE, Rivera MA, Wiley CJ. Complex adaptive systems and the diffusion of innovations. The Innovation Journal: The Public Sector Innovation Journal. 2005 Jun;10(3):1-26.
9.   Eysenbach G. What is e-health? Journal of medical Internet research. 2001;3(2):e20.
10.   Murphy Jr R, Bird KT. Telediagnosis: a new community health resource. Observations on the feasibility of telediagnosis based on 1000 patient transactions. Am J Public Health. 1974;64(2):113-9.
11.   Benschoter RA, Eaton MT, Smith P. Use of videotape to provide individual instruction in techniques of psychotherapy. Academic Medicine. 1965;40(12):1159-61.
12.   Bauer JC, Brown WT. The digital transformation of oral health care: Teledentistry and electronic commerce. J Am Dent Assoc. 2001;132(2):204-9.
13.   https://blog.evisit.com/history-telemedicine-infographic. [Internet]. 2019.
14.   Pagliari C, Sloan D, Gregor P, Sullivan F, Detmer D, Kahan JP, Oortwijn W, MacGillivray S. What is eHealth (4): a scoping exercise to map the field. J Med Internet Res. 2005;7(1):9.
15.   Oh H RC, Enkin M, Jadad A. What is eHealth (3): a systematic review of published definitions. Med Internet Res. 2005;7(1):e1.
16.   Khoja S, Scott RE, Casebeer AL, Mohsin M, Ishaq A, Gilani S. e-Health readiness assessment tools for healthcare institutions in developing countries. Telemedicine and e-Health. 2007;13(4):425-32.
17.   Loman P. E-Health: Putting health on the Net. An FCG White Paper URL: http://www fcg com/webfiles/whitepaper/white_paper_files/wpEhealth asp [accessed June 24]. 1999.
18.   Joint Healthcare Information Technology Alliance. e-health. [Internet]. 2000.
19.   McLendon K. E-commerce and HIM: Ready or not, here it comes. Journal of AHIMA. 2000;71(1):22-3.
20.   What is e-Health? Medical Business Group. [Internet]. 2000.
21.   GJW. Government Relations Ltd Health Affairs. Memorandum. [Internet].2000.

22.   Oracle Corporation. CEO Perspective: Health Care Information Technology. [Internet]. 2000.
23.   Deluca JM, Enmark R. E-health: the changing model of healthcare. Frontiers of health services management. 2000;17(1):3.
24.   Pretlow R. eHealth International: A cutting edge company for a new age in health care. URL: http://www ehealthnurse com/ehealthi html [accessed June 24]. [Internet].2000.
25.   Baur C, Deering M, Hsu L. Ehealth: federal issues and approaches. The Internet and health communication: Experiences and expectations. 2001:355-84.
26.   Orlikoff JE, Totten MK. E-health and the board: The brave new world of governance, part 1. Trustee. 2000;53(7):1.
27.   Blake G. Accelerating the E-health Connectivity Imperative: Implementing Short-term Value against Long-term Goals when Building Private-sector Relationships. Electronic Healthcare. 2001;1:56-9.
28.   Strategic Health Innovations. FAQs. [Internet].2001.
29.   Eng TR. The eHealth landscape: a terrain map of emerging information and communication technologies in health and health care. 2001.
30.   Partners JM. The Rise & Fall and??? Of e-Health. 2001.
31.   Health GI. Grantmakers In Health, Washington, D.C, USA. Examining e-health. Issue brief (Grantmakers Health). 2002 Nov (14):1-28.
32.   J. T. On the trail of a computer cure-all ... eHealth Initiative. Mod Healthc. 2001 Jun 18;31(25):36-37.
33.   MJ B. E-Health: Empowering clinicians and consumers. 2001.
34.   Health e-Technologies Initiative. Call for Proposals. 2002
35.   Grantmakers In Health,Washington, D.C, USA. Examining e-health Issue brief (Grantmakers Health). 2002 Nov (14):1-28.
36.   D. K. eHealth: Past, present & future. 2002.
37.   Wyatt JC LJ. Basic concepts in medical informatics. J Epidemiol Community Health. 2002 Nov;56(11):808-812.
38.   S. S. Introduction to eHealth. 2003.
39.   Coach. What is eHealth? Canada's Health Informatics Association. 2003.
40.   Rx2000 Institute. eHealth FAQ. [Internet]. 2003.
41.   Beaulieu D BJ. Current promises and challenges. 2003.
42.   eEurope. What is eHealth. 2003.
43.   Decker S. What is e-Health?. 2003.
44.   Miller JL. The Internet as Therapist and Teacher. 2003.
45.   Telehealth Victoria. Telehealth Victoria FAQs. [Internet]. 2003.
46.   ebrunel.com. eHealth. [Internet]. 2003.
47.   World Health Organization - Regional Office for the Eastern Mediterranean. E-Health in the Eastern Mediterranean. 2003.
48.   Telehealth & Ehealth. 2003.
49.   Brommey M. Challenges in e-health service delivery. 2nd annual online summit. 2003.
50.   Southwest Medical Group. 2003.
51.   Europe HMS. What is eHealth?. 2003.
52.   Nova Scotia Telehealth Network. E-health. 2003.
53.   Victoria. B. Strengthening Support for Women with Breast Cancer. E-health Information Package. 2003.

54.   R. V. First Nations and Inuit Health Information Systems. 2003.
55.   Policy on ICT Security. 2003.
56.   Group. HS. eHealth -Wellness in the 21st Century. 2003.
57.   Marcus E, Fabius R. What is E-health?. 2003.
58.   Silber D. The case for eHealth. 2003.
59.   E-health technologies. What is eHealth?. 2003.
60.   International Telecommunication Union. Standardization in e-health. 2003.
61.   Baker B. Nursing in an e-healthy world? A vision of e-health as core to caring. 2003.
62.   Sternberg DJ. The new e-health. As technology matures, more sensible approaches to online healthcare are emerging. Mark Health Serv. 2004;24(1):46-48.
63.   Watson R. EU wants every member to develop a "roadmap" for e-health. BMJ. 2004 May 15;328(7449):1155
64.   American Journal of Public Health. J Am Dent Assoc. 2018.
65.   Strehle EM, Shabde N. One hundred years of telemedicine: does this new technology have a place in paediatrics?. Archives of disease in childhood. 2006 Dec 1;91(12):956-9.
66.   Zundel KM. Telemedicine: history, applications, and impact on librarianship. Bulletin of the Medical Library Association. 1996 Jan;84(1):71.
67.   Field MJ, editor. Telemedicine: A guide to assessing telecommunications for health care. National Academies Press; Nov 1996.
68.   https://www.healthleadersmedia.com/innovation/physician-telehealth-usage-wallops-early-ehr-adoption-rates. 2019.
69.   https://www.dialogue.co/en/ultimateguide-telemedicine. Ultimate Guide To Telemedicine. 2019.
70.   Deshpande A, McKibbon A, Jadad AR. Overview of assessments of real-time (synchronous) and asynchronous telehealth [Technology overview number 38]. Ottawa: Canadian Agency for Drugs and Technologies in Health. 2008.
71.   Ignatius E, Makela K. Use of videoconferencing for consultation in dental prosthetics and oral rehabilitation. J Telemed Telecare. 2010;16(8):467-470.
72.   Jennett P, Jackson A, Healy T, Ho K, Kazanjian A, Woollard R, et al. A study of a rural community's readiness for telehealth. J Telemed Telecare. 2003;9(5):259-63.
73.   Flores-Mir C, Palmer NG, Northcott HC, Khurshed F, Major PW. Perceptions and attitudes of Canadian dentists toward digital and electronic technologies. J Can Dent Assoc. 2006;72(3).
74.   Easterbrook. Barriers to adoption of information technology in healthcare. 2017.
75.   Daniel SJ, Kumar S. Teledentistry: a key component in access to care. J Evid Based Dent Pract.2014. 14: p. 201-208.
76.   Sanchez E, Lefebvre C, Abeyta K. Teledentistry in the United States: a new horizon of dental care. Int J Dent Hyg. 2004 Nov;2(4):161-4.
77.   Rocca MA, Kudryk VL, Pajak JC, Morris T. The evolution of a teledentistry system within the Department of Defense. American Medical Informatics Association. In Proceedings of the AMIA Symposium. 1999 (p. 921).
78.   Abbey LM, Zimmerman JL, editors. Dental informatics: integrating technology into the dental environment. Springer Science & Business Media. Dec 2012.
79.   Chen JW, Hobdell MH, Dunn K, Johnson KA, Zhang J. Teledentistry and its use in dental education. J Am Dent Assoc. 2003 Mar 1;134(3):342-6.
80.   https://www.e-oralhealth.org/. [Internet].

81.   Mariño R, Ghanim A. Teledentistry: a systematic review of the literature. J Telemed Telecare. 2013 Jun;19(4):179-83.

82.   Pentapati KC. Clinical applications of intraoral camera to increase patient compliance - current perspectives. 2019.

83.   Coleman A, Coleman MF. Activity Theory Framework: A basis for e-health readiness assessment in health institutions. J Commun. 2013;4(2):95-100.

84.   Yousafzai SY, Foxall GR, Pallister JG. Explaining internet banking behavior: theory of reasoned action, theory of planned behavior, or technology acceptance model?. J Appl Soc Psychol. 2010 May;40(5):1172-202.

85.   Mathieson K. Predicting user intentions: comparing the TAM with the theory of planned behavior. Information Systems Research. 1991, 173- 91.

86.   Davis FD, Bagozzi, R. P., & Warshaw, P. R. User Acceptance of Computer Technology: A Comparison of Two Theoretical Models," Management Science. 35, 982-1003. 1989.

87.   An Analysis of the Technology Acceptance Model in Understanding. University Students Behavioral Intention to Use e-Learning. 2009.

88.   Venkatesh V, Morris, M.G, Davis, G.B, & Davis, F.D. User acceptance of information technology: Toward a unified view. MIS Quartely. (3): 425-78. 2003.

89.   https://en.wikipedia.org/wiki/Activity_theory.

90.   Venkatesh V, Morris, M.G, Davis, G.B, & Davis, F.D. User acceptance of information technology: Toward a unified view. MIS Quartely. (3): 425-78. 2003.

91.   https://ondigitalmarketing.com/learn/odm/foundations/5-customer-segments-technology-adoption/.

92.   Wittenberg-Lyles E, Shaunfield S, Oliver DP, Demiris G, Schneider G. Assessing the readiness of hospice volunteers to utilize technology. American Journal of Hospice and Palliative Medicine®. 2012 Sep;29(6):476-82.

93.   Mauco KL, Scott RE, Mars M. Critical analysis of e-health readiness assessment frameworks: suitability for application in developing countries. J Telemed Telecare. 2018;24(2):110-7.

94.   Rita Snyder-Halpern. Development and Pilot Testing of an Organizational Information Technology/Systems Innovation Readiness Scale (OITIRS) 2002.

95.   Légaré É, Vincent C, Lehoux P, Anderson D, Kairy D, Gagnon MP, Jennett P. Telehealth readiness assessment tools. J Telemed Telecare.2010 Apr;16(3):107-9.

96.   Légaré É, Vincent C, Lehoux P, Anderson D, Kairy D, Gagnon MP, Jennett P. Developing and validating the French-Canadian version of the practitioner and organizational telehealth readiness assessment tools. J Telemed Telecare. 2010 Apr;16(3):140-6.

97.   Khoja S, Scott RE, Casebeer AL, Mohsin M, Ishaq AF, Gilani S. e-Health readiness assessment tools for healthcare institutions in developing countries. Telemedicine and e-Health. 2007 Aug 1;13(4):425-32.

98.   Kaptelinin V, Nardi B. Activity theory as a framework for human-technology interaction research. 2017. 25: p. 1-3.

99.   Hashim NH, Jones ML. Activity theory: A framework for qualitative analysis. 2007.

100.   Ross J, Stevenson F, Lau R, Murray E. Exploring the challenges of implementing e-health: a protocol for an update of a systematic review of reviews. BMJ open. 2015 Apr 1;5(4): e006773.

101.   Broens TH, Huis Veld RM, Vollenbroek-Hutten MM, Hermens HJ, van Halteren AT, Nieuwenhuis LJ. Determinants of successful telemedicine implementations: a literature study. J Telemed Telecare. 2007 Sep 1;13(6):303-9.

102.   Castillo VH, Martínez-García AI, Pulido JR. A knowledge-based taxonomy of critical factors for adopting electronic health record systems by physicians: a systematic literature review. BMC medical informatics and decision making. 2010 Dec;10(1):60

103.   McGinn CA, Grenier S, Duplantie J, Shaw N, Sicotte C, Mathieu L, Leduc Y, Légaré F, Gagnon MP. Comparison of user groups' perspectives of barriers and facilitators to implementing electronic health records: a systematic review. BMC medicine. 2011 Dec;9(1):46.

104.   Orwat C, Graefe A, Faulwasser T. Towards pervasive computing in health care–A literature review. BMC medical informatics and decision making. 2008 Dec;8(1):26.

105.   Lau R, Stevenson F, Ong BN, Dziedzic K, Treweek S, Eldridge S, Everitt H, Kennedy A, Qureshi N, Rogers A, Peacock R. Achieving change in primary care—causes of the evidence to practice gap: systematic reviews of reviews. Implementation Science. 2015 Dec 1;11(1):40.

106.   Zanchetta MS. Health Literacy Within the Reality of Immigrants' Culture and Language. 2019.

107.   Corscadden L, Levesque JF, Lewis V, Strumpf E, Breton M, Russell G. Factors associated with multiple barriers to access to primary care: an international analysis. Int J Equity Health. 2018 Dec;17(1):28.

108.   El-Yousfi S, Jones K, White S, Marshman Z. A rapid review of barriers to oral healthcare for vulnerable people. Br Dent J.2019 Jul;227(2):143.

109.   Ludwick DA DJ. Adopting electronic medical records in primary care: lessons learned from health information systems implementation experience in seven countries. Int J Med Inform. 2009;78(1):22–31.

110.   Benavides-Vaello SA, Sheeran BC. Using technology in the delivery of mental health and substance abuse treatment in rural communities: a review. J Behav Health Serv Res. 2013;40(1):111–20.

111.   Boonstra A. Barriers to the acceptance of electronic medical records by physicians from systematic review to taxonomy and interventions. BMC Health Serv Res. 2010;10:231.

112.   Botsis T HG. Current status and future perspectives in telecare for elderly people suffering from chronic diseases. Telemed Telecare. 2008; 14(4):195–203.

113.   Susan Daniel J, Wu L, Kumar S. Teledentistry: A Systematic Review of Clinical Outcomes, Utilization and Costs. American Dental Hygienists' Association. 2013 Dec 1;87(6):345-52

114.   Scuffham PA, Steed M. An economic evaluation of the Highlands and Islands teledentistry project. J Telemed Telecare. 2002 Jun;8(3):165-77.

115.   Ignatius E, Happonen RP, Perala S. Teledentistry in dental specialist education in Finland. J Telemed Telecare. 2006;12:46-49.

116.   Police R, Foster T, Wong K. Adoption and use of health information technology in physician practice organisations: systematic review. Journal of Innovation in Health Informatics. 2010;18(4):245-58.

117.   Ata SO, Ozkan S. Information technology in oral health care: attitudes of dental professionals on the use of teledentistry in turkey. In European and Mediterranean Conference on Information Systems 2009 (pp. 13-14).

118.   Mair F WP. Systematic review of studies of patient satisfaction with telemediciene. 2000.

119.   Williams TL, May CR, Esmail A. Limitations of patient satisfaction studies in telehealthcare: a systematic review of the literature. J Telemed Telecare T. 2001 Dec 1;7(4):293-316.

120.   Wentink MM, Prieto E, De Kloet AJ, Vliet Vlieland TP, Meesters JJ. The patient perspective on the use of information and communication technologies and e-health in rehabilitation. Disability and Rehabilitation: Assistive Technology. 2018 Oct 3;13(7):620-5

121.   Huygens MW. A patient perspective on eHealth in primary care: Critical reflections on the implementation and use of online care services. Maastricht University; 2017.

122.   AlBar AM, Hoque MR. Patient acceptance of e-health services in Saudi Arabia: An integrative perspective. Telemedicine and e-Health. Nov 2018.

123.   Hoque MR, Bao Y, and Sorwar G. Investigating factors influencing the adoption of e-Health in developing countries: A patient's perspective. Inform Health Soc Care, 2017. 42(1): p. 1-17.

124.   Woods SS, Schwartz E, Tuepker A, Press NA, Nazi KM, Turvey CL, Nichol WP. Patient experiences with full electronic access to health records and clinical notes through the My HeatheVet Personal Health Record Pilot: qualitative study. J Med Internet Res. 2013;15(3): e65

125.   Europe WH. From innovation to implementation. eHealth in the WHO European Region. Regional office for Europe: Copenhagen, Denmark.2016.

126.   Koch S. Improving quality of life through eHealth - the patient perspective. Stud Health Technol Inform, 2012. 180: p. 25-9.

127.   Beenkens FH. Acceptance of e-Health Technology: a patient perspective. 2011.

128.   Ossebaard HC, Van Gemert-Pijnen L. eHealth and quality in health care: implementation time. Int J Qual Health Care. 2016 Jun 1;28(3):415-9.

APPENDICES

APPENDIX A: ETHICAL APPROVAL

30 November 2018

Dr. Elham Emami
Faculty of Dentistry
Division of Oral Health and Society
2001 McGill College – Room 524
Montreal QC H3A 1G1

RE: IRB Study Number A11-B63-18B
        Patients' e-readiness to use e-health technologies for oral health

Dear Dr. Emami,

Thank you for submitting the above study for IRB review. This study was reviewed on behalf of your Masters Student, Dr. Arishdeep Kaur Jagde.

As this study involves no more than minimal risk, and in accordance with Articles 2.9 and 6.12 of the 2nd Edition of the Canadian Tri-Council Policy Statement of Ethical Conduct for Research Involving Humans (TCPS 2) and U.S. Title 45 CFR 46, Section 110 (b), paragraph (1), we are pleased to inform you that approval for the study (Protocol and Consent Form, IRB dated November 2018) is granted under the expedited/delegated review process on 30 November 2018. The ethics authorization is valid until November 2019. The study proposal will be presented for corroborative approval at the next meeting of the Committee and a certification document will be issued to you at that time.

A review of all research involving human subjects is required on an annual basis in accord with the date of initial approval. The annual review should be submitted at least one month before November 2019. Please inform the IRB promptly of any modifications that may occur to the study over the next twelve months.

Sincerely,

Roberta Palmour, PhD
Chair
Institutional Review Board

cc: Arishdeep Kaur Jagde
        A11-B63-18B

APPENDIX B: CONSENT FORM

Faculty of Dentistry
McGill University,
2001 Ave McGill College,
Montreal, QC H3A 1G1

Title of Research Project:
Patient e-readiness to use e-health technology for oral health.

Investigators:

Principal Investigator:
Dr. Elham Emami
Faculty of Dentistry
McGill University
Email: elham.emami@mcgill.ca

Professor Jocelyne Feine
Faculty of Dentistry
McGill University
Email: Jocelyne.feine@mcgill.ca

Student Investigator:
Dr. Arishdeep Kaur Jagde
Faculty of Dentistry
McGill University
Email: Arishdeep.jagde@mail.mcgill.ca
Tel: (514) 839-6053

INFORMATION AND CONSENT FORM

Introduction: About this study
We invite you to be part of our research. Before you accept to participate to this study, please read this consent form completely and carefully, and consider the following information before signing it.
This consent form describes the purpose of this study, as well as the benefits, risks, the nature of your participation and your rights. If you have any additional questions, please discuss them with one of our researchers. The contact information of the people involved in this research project will be listed, in case you would need to contact them.
Your participation in this study is completely voluntary: you can refuse to participate or withdraw at any time without any consequences.
Before you agree to take part in this study, it is important that you read the information in this consent form. You should ask as many questions as you wish in order to understand what you will be asked to do. Your participation is voluntary. You can take time to give your approval and return the signed form to us if you accept to participate in this study.

Study description:
We want to better understand to what extent patients in need of oral health care are prepared to adopt *e*-technology to improve their oral health and health care. Overall, we expect to conduct between 15 and 20 interviews with different people.
Nature of your participation and length of your study:
Your participation is voluntary. If you agree, we will ask you to take part in a face-to-face, semi-structured interview with Arishdeep. You may choose the time and place of the interview according to your own convenience.
The interviewer, Arishdeep, will ask simple questions about your views regarding your access to dental care services. The interview will be conducted in English. It will last approximately one hour and a half. If you find that this period is too long, we would suggest a shorter interview, followed by another short interview, on another day that is convenient to you.
With your permission, the interview will be audiotaped because it is impossible to note everything during the interview.
During the interview, if you feel the need to stop the discussion, please feel free to inform the interviewer. You can take a break at any point during the interview.
Conditions to participate:
You can participate to this study if:
- You are at least 18 years old
- You live in Montreal
- You can speak and understand English

You cannot participate to this study if:
- You are not capable of giving written informed consent
- You are not able to communicate in the research interviews

Possible risks:
There are no known risks to study participation. We guarantee you the strictest confidentiality. You will also have all rights to discontinue the interview and withdraw from the study without any consequences. If certain questions put you ill at ease, you will also have the right not to answer it. In every case, you will undergo no damage.

Possible benefits:
There is no direct benefit to you for taking part in this study. However, our aim is that this study will help both dental patients and professionals in the near future to better understand and use e-health technology. The goal of the study is to promote access to oral health care.
Voluntary participation and possibilities to withdraw:
Your participation to this study is absolutely voluntary. You are, therefore, free to refuse to participate. You can also withdraw from this study at any time without giving us a reason. You can simply notify the research director or one of the research team members.

Confidentiality:

The information that you will provide will remain confidential. All identifiable data will be stored on McGill University's OneDrive network (developed by Microsoft), which is password-secured and accessible only by Arishdeep; access will be granted to supervisor and co-supervisor, Drs. Elham Emami and Jocelyne Feine. The data will be transferred to Dr. Elham Emami's OneDrive account after Arishdeep's graduation and, eventually, will be destroyed after seven years, as per University policy. Any documents, such as consent forms, transcripts etc., will be stored in a locked filing cabinet in a secure central location accessible only to the principal investigator. All names will be removed, and any information that would allow readers to determine a participant's identity will be removed.

You have the right to consult your research file to verify the information, and request corrections, if necessary, as long as the principal researcher or the institution holds this information. However, in order to maintain the scientific integrity of this study, your access to certain information may not be available until your participation is finished.
A representative of the McGill Institutional Review Board, or a person designated by this Board, may access the study data to verify the ethical conduct of this study.
The results of this study could be published in scientific journals, but it will not be possible to identify you.

Compensation:
You will not receive no compensation for taking part in the study.

Communication of results:
You will be able to communicate with the research team in order to obtain information on the progress of the procedures or results of the study. The study progress or results will be available to you at the end of this study.

Contact Information for questions about rights of research participants:
If you have any questions or concerns regarding your rights as a participant in this study, you can contact:
Dr. Arishdeep Kaur Jagde at Arishdeep.jagde@mail.mcgill.ca
Dr. Elham Emami at elham.emami@mcgill.ca
Dr. Jocelyne Feine at Jocelyne.feine@mcgill.ca

For any question concerning the ethical aspect of your participation to this study, you can share your concern with Ms. Ilde Lepore: Ethics officer for the McGill Institutional Review Board, McGill University, Faculty of Medicine, McIntyre Building, # 633-3655 Promenade Sir William Osler, Montreal, QC H3G1Y6. Tel:(514)398-8302 . Email: idle.lepore@mcgill.ca.

CONSENT:

Please tick your choice of yes or no next to the question.
I agree to be audio-recorded during the interview   □ YES _____   □ NO ____

By signing this form, I agree that; I have read the information provided in this consent form and that I am volunteering for this project. I understand that I can stop the interview at any time or take a break in between. I understand that the transcribed interview may be used as described above and that I don't expect to receive any benefit or payment for my participation. I am aware that I can ask any questions I might have during the interview, and that I am free to contact the researcher with any questions I may have in the future. I understand that I am free to withdraw from this study at any time. I have been informed that my name will not be mentioned in any publications that are in association with this study. I do not give up any of my legal rights by agreeing to take part in this study. A dated and signed copy of this information and consent form will be given to me.

Name of the participant: ……………………………………..   Date: ………………………

Signature of the participant: …………………………………

Researcher's engagement and signature:
I certify that we have explained to the participant the terms of this information and consent form, that we have answered his/her questions concerning it, and that we have clearly indicated that he/she is free to withdraw from the study and this, without any negative consequence.
I engage myself along with the research team to respect what has been agreed upon the information and consent form and to give him/her a signed copy.

Printed name of person who obtaining consent: ………………………   Date: …………

Signature of person obtaining consent: ……………………………………

APPENDIX C: INTERVIEW GUIDE

Date:
Time and Place:
Number of Interview:

A) INTERVIEW OPENING

➢ Greet and welcome the interviewee; introduce yourself (interviewer/position) and make the applicant feel comfortable

➢ Explain the purpose of the interview and inform the candidate about the duration of the interview; allow interviewee to read the consent

➢ Invite the interviewee to clarify any doubts regarding the interview and sign 2 copies of the consent form.

➢ Describe the interview process.

➢ Before starting, mention confidentiality to participant

Mention that:

- Your anonymity will be respected
- Your name will not be revealed or published in any document.
- You can withdraw at any time (if you feel uncomfortable)
- Install the tape recorder (carry out a test recording)

B) CONDUCTING THE INTERVIEW

➢ Verify that the tape recorder is functioning correctly

➢ Begin with an unstructured, open questions to encourage spontaneity.

➢ Give a brief description at the end of each section to make sure that the participant understood well and to give him/her the opportunity to complete or modify their statements (reformulation).

SECTION 1: CORE READINESS

(*Gauges the extents to which members of a community are dissatisfied with the current status of their healthcare service provision, see e-health as a solution, and express their need and preparedness for e-health services.*)

1. How satisfied are you with your access to the oral healthcare system?
2. What are, in your opinion, the problems that you face in access to oral health care?
3. What are your expectations from the oral health care system?
4. How can access to oral health care be improved?
5. What came into your mind when you first heard about e-health technology?
6. Were you aware about e health technology?
7. Do you see e-health technologies (using the internet) as solution to these problems? Describe your point of view.
8. Have you tried using the internet to access health care? If yes, could you explain briefly? If no, what was the reason for your hesitation?
9. Can you describe your needs in order for you to use e-oral health technologies?
10. How can the use of e-health technologies be improved?

SECTION 2: ENGAGEMENT READINESS

(Engagement readiness refers to "*Willingness to be trained, awareness and debating advantages and disadvantages*"

1. Are you willing to be trained to use e-oral health technology?
2. What factors would influence you in making the decision to use e-oral health technology?
3. What do you think about the advantages of e-oral health technology?
4. What do you think about the disadvantages of e-oral health technology?
5. What do you think would be the impact of e-oral technology on your oral-health?
6. How would you and society benefit from these technologies in access to e-oral health care?
7. In your opinion, how would e-oral technology change the way you access oral health care?
8. How would e-oral health technologies help in improving oral health care?

SECTION 3: STRUCTURAL READINESS

(Structural readiness is defined "*as the development of infrastructure such as adequate human resources, technical structures as well as necessary training for telehealth implementation*")

1. What sources of technical knowledge, like internet connectivity, are available to you?
2. What facilities will motivate you to use e-oral health technology?
3. How can e-oral health implementation be made more convenient and better?
4. What norms, guidelines can make it more feasible?
5. What would be the impact of awareness programs, training and education on e-oral health technologies?
6. What barriers do you have regarding the use of these technologies?

SECTION 4: NON-READINESS

1. Are you prepared to participate in e-oral health technologies when it comes to access to oral health?
2. What, according to you, are the reasons for not being willing to use it?
3. Is there anything else that you would like to add?

SECTION 5: PUBLIC READINESS

(*Gauges the extent to which members of the public and patients are aware of, and can afford and access, e-health services*)

1. Within your financial capacity, is e-oral health affordable to you?
2. How convenient is it for you to access e-oral health?
3. How would you encourage a person from your community to use e-oral health technology?

SECTION 6: SOCIO- DEMOGRAPHIC INFORMATION

1. Tell me about yourself and your family?
2. How old are you?

3. Are you working presently?

4. What are your job responsibilities?

5. What is your marital status? Are you living alone?

6. Are you satisfied with your annual income?

7. Are you member or part of any social organisation or group?

8. Is there anything else that you want to add?

C) CLOSING THE INTERVIEW

1. Is there anything else that seems to you important and that you would like to talk about? any comment?

2. Thank the interviewee for his/her time and contribution

3. Ask if the participant can be contacted later, if necessary.

D) AFTER THE INTERVIEW

1. Write down any observations made during the interview.