LITERATURE REVIEW

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1.0 PROJECT PURPOSE AND AIM

The purpose of the literature review is to identify and understand consumer's online health behaviours. The literature review will focus on the barriers and motivators to user acceptance and rejection of eHealth innovation and digital delivery. It will also explore the emergence of self-service health technologies to identify potential future opportunities.

The aims of this projects are to:

1. Identify the motivators and barriers that influence consumers adoption or rejection of eHealth.
2. To understand the consumer factors that lead to the adoption or rejection of eHealth.
3. Identify theories/frameworks that have been applied or recommended for understanding the adoption/rejection of eHealth.
4. Identify the antecedents of trust in the eHealth context.
5. Explore future self-service health technologies.
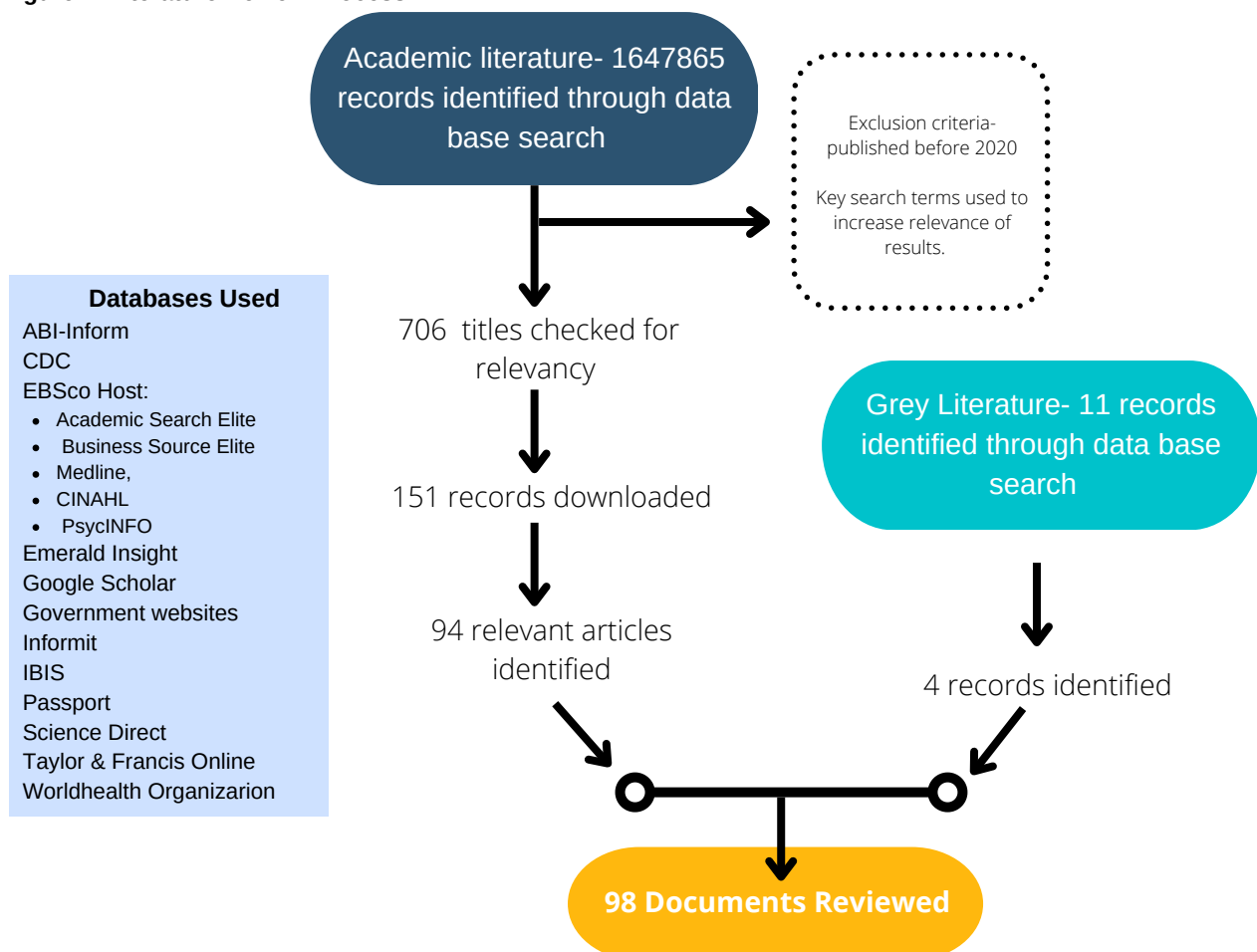
PROJECT PARTNERS

2.0 LITERATURE REVIEW PROCESS

A systematic literature review seeks to systematically search for, appraise and synthesis research evidence on a particular topic (Grant & Booth, 2009). Figure 1 outlines the literature review process undertaken for this project. The initial search identified 1 647 865 records. Through the use of exclusion criteria and key search terms this was narrowed down to 706 articles. If the abstract met the eligibility criteria or if the relevance of the study was unclear from the abstract, then a full-text review was completed. A total of 161 full-text articles and reports were reviewed, 64 of these were excluded, retaining 94 academic articles and 4 industry reports for analysis.

Figure 1. Literature Review Process

Academic literature- 1647865 records identified through data base search

Exclusion criteria- published before 2020

Key search terms used to increase relevance of results.

Databases Used

ABI-Inform
CDC
EBSco Host:
- Academic Search Elite
- Business Source Elite
- Medline,
- CINAHL
- PsycINFO

Emerald Insight
Google Scholar
Government websites
Informit
IBIS
Passport
Science Direct
Taylor & Francis Online
Worldhealth Organizarion

706 titles checked for relevancy

151 records downloaded

94 relevant articles identified

Grey Literature- 11 records identified through data base search

4 records identified

98 Documents Reviewed

Search Terms

Dates: 2020-2022
- e-health AND acceptance OR rejection
- e-health AND barriers OR motivation
- eHealth and trust

Exclusion Terms
- palliative care or end of life care
- intensive care unit or icu or critical care
- surgery or operation or surgical procedure
- aged care or nursing home or residential aged care facility
- agriculture or farming or crops or food or animal production
- adoption and foster care and adoptive siblings

3.0 WHAT IS eHEALTH?

The World Health Organisation (2022) defines eHealth as *"the cost-effective and secure use of information and communications technologies in support of health and health-related fields, including health-care services, health surveillance, health literature, and health education, knowledge and research."* eHelath (Figure 2) encompasses telehealth, telemedicine, telecare, mobile health (mHealth), electronic medical or health records (eMR/eHR), big data, wearables, and even artificial intelligence(AI).

Figure 2. eHealth

eHealth =

| telehealth | telemedicine | telecare | mHealth |
| eMR/eHR | big data | wearables | AI |
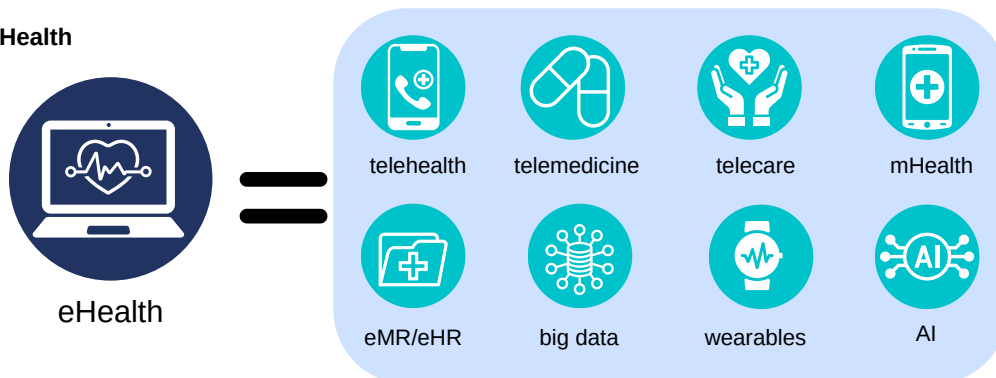
4.0 RESEARCH QUESTIONS

RQ 1. What factors lead to differences in adoption or rejection of eHealth services?

RQ 2. What are the motivators and barriers to consumer adoption/resistance of eHealth services?

RQ 3. What are the antecedents to trust in eHealth services?

RQ 4. What self service health technologies are on the horizon?
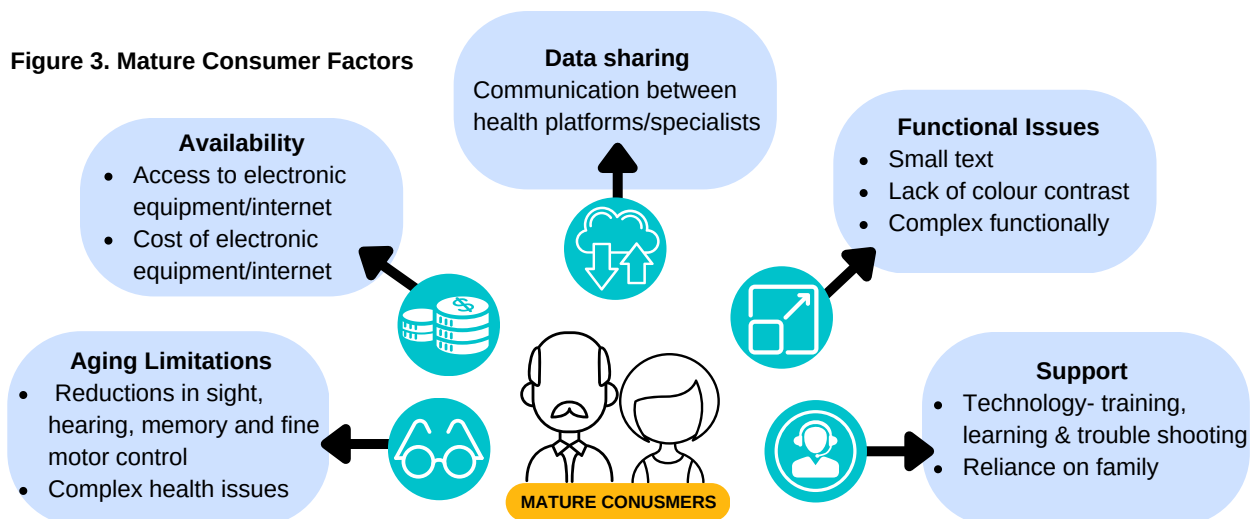
5.0 CONSUMER FACTORS

The literature identified **age** (Johnson et al., 2021; Lee et al., 2020; Wilson et al., 2021) and **eHealth literacy** (Das & Sengar, 2022; Jain et al., 2020; Khoshrounejad et al., 2021; Lee et al., 2020; Magsamen-Conrad, Wang, et al., 2020; Neter et al., 2021; Sabbir et al., 2021; Sin et al., 2020; Wilson et al., 2021; Yang et al., 2021) as the key factors that influence an individual's adoption or rejection of ehealth services. The following section will discuss the key aspects of these factors.

Age

Technology has become a necessity to everyday life and as its usage increases the technology generational divide between mature consumers and digital natives diminishes. This is reflected in the literature with new research indicating that the adoption of information and communication technology by mature consumer is increasing and is perceived to be positive and essential to their everyday lives (Wilson et al., 2021; Fristedt et al., 2021). Despite this shift individual, technological, relational, environmental and organisational barriers still remain for mature consumers and lead to differences in the adoption/rejection of eHealth services. While most of these barriers align with other age cohorts there are some factors that are specific to mature consumer markets. Figure 3 below outlines these factors.

Figure 3. Mature Consumer Factors

Availability
- Access to electronic equipment/internet
- Cost of electronic equipment/internet

Data sharing
Communication between health platforms/specialists

Functional Issues
- Small text
- Lack of colour contrast
- Complex functionally

Aging Limitations
- Reductions in sight, hearing, memory and fine motor control
- Complex health issues

Support
- Technology- training, learning & trouble shooting
- Reliance on family

MATURE CONUSMERS

5.0 CONSUMER FACTORS

eHEALTH LITERACY

The literature identified that a consumer's level of eHealth literacy was key to their adoption or rejection of eHealth services. Consumers with a high level of eHealth literacy are good at seeking, selecting, and assessing health information from many sources using additional search strategies, whereas patients with limited eHealth literacy may find the use of online health-related resources difficult (Lu & Zhang. 2021). Neter and Brainin (2012) define eHealth literacy as the ability to seek, find, understand and appraise health information from electronic sources and apply this knowledge to address or solve a health problem. Thus, engaging with an eHealth service is a complex process that requires a combination of literacy skills. eHealth literacy encompasses 6 kinds of literacies: **_functional, information, media, health, technological, and scientific_** (Neter et al., 2021; Norman & Skinner, 2006). A consumer's level of eHealth literacy is not static and evolves over time dependent upon the technology and individual contextual factors.

RELEVANT TYPES OF LITERACY

Functional Literacy: involves reading, writing, and basic communication skills that allow functioning effectively in everyday situations.

Information Literacy: the ability to find, evaluate, organize, use, and communicate information in all its various formats, most notably in situations requiring decision making, problem solving, or the acquisition of knowledge.

Media Literacy: an individuals ability to access, analyse, evaluate, create and participate with messages in a variety of forms.

Health Literacy: the degree to which individuals have the ability to find, understand, and use information and services to inform health-related decisions and actions for themselves and others.

Technology Literacy: the ability to use, comprehend, manage, and analyse technology safely, effectively, and responsibly.

Scientific Literacy: an individual's understanding of scientific concepts, phenomena and processes, and their ability to apply this knowledge to new and, at times, non-scientific situations.

6.0 MOTIVATORS AND BARRIERS

The literature identified a total of 17 factors (Figure 4) that either motivated or formed a barrier to consumer's adoption/rejection of eHealth services. Of the 17 factors 4 were found to only motivated, 4 only formed barriers and the remaining 9 were dual factors that could function as both a motivator or barrier dependent upon consumer perceptions and the eHealth servicescape. Four of the dual factors were also found to be constructs of the Unified Theory of Acceptance and Use of Technology (Venkatesh et.al, 2003).

6.1 MOTIVATORS

Time efficiency, discretion, peer support and hedonic motivation were all identified as being motivators to consumers adoption of eHealth services. The following section will define and discuss each of these motivators.

Time Efficiency : eHealth's ability to offer timely diagnosis and response were seen as a key motivator to the adoption of eHealth services. With increasing wating times for doctor appointments, eHealth services were found to increase access and make the process more time efficient buy reducing travel time and the overall time/cost saving.

(El Joueidi et al., 2021; Goetz et al., 2020; Islam et al., 2020; LeBlanc et al., 2020; Shah et al., 2022)

Discretion: eHealth's online self-service format enables anonymity and discretion when searching for information and treatment of health problems. Being able to engage with health professionals electronically helped overcome negative emotions such as shame, anxiety, fear and increase motivation to engage with eHealth services.

(Abdulai et al., 2022; Chen et al., 2021; Kessler & Schmidt-Weitmann, 2021; Kimball & Morgan., 2021; Verma et al., 2020)

Peer Support: eHealth platforms that enable the sharing of stigma-related experiences and facilitate emotional support/connections were found to increase consumer adoption. The most common tools used to facilitate this support were social media groups, blogs, online forums and email/phone-based communication. Virtual communities are easy to participate in since patients can remain anonymous, while still seeking assistance without the worry of being judged or discriminated against. It is also worth noting that peer support tools need to provide evidence of being regulated to ensure consumer trust.

(Abdulai et al., 2022; Chen et al., 2021; Jain et al., 2020; Johnson et al., 2021; Magsamen-Conrad, Dillon, et al., 2020)

Hedonic Motivation: is defined by the literature as perceived enjoyment, perceived fun and perceived playfulness. Examples of this in the eHealth environment include use of colour, images, shapes, photographs and interactivity. This factor also incorporates whether individual consumers find enjoyment in online information seeking.

(Alam et al., 2020; Lazard & King, 2020; Ong et al., 2022; Palas et al., 2022; Schmitz et al., 2022; Zobair et al., 2021)

6.2 BARRIERS

Misdiagnosis, patient loyalty, technology anxiety and impersonal/lack of touch, were found to form barriers to the adoption of ehealth services. The following section will define and discuss each of these barriers.

Misdiagnosis: Consumer's expressed fear of inaccurate or misdiagnosis of their health problem as a barrier to engaging with eHealth services. Consumers believe that their health issue/problem is unique and that characteristics, circumstances, and or symptoms may not be adequately addressed through ehealth. It is unclear if this is an issue with the patient's ability to communicate their issue/symptoms through the eHealth service or the lack of consultation/affirmation from the health professional.

(Chen et al., 2021; Goetz et al., 2020; Frank et al., 2021; Weißenfeld et al., 2021)

Patient loyalty: is an ongoing emotional bond between the consumer and GP/health professional that manifests itself in the customer's willingness to engage with and use the services regularly. It is often the combination of good clinical quality and a good patient experience. If a consumer is loyalty to their current GP/health professional, they are less likely to engage with eHealth services.

(Das & Sengar, 2022)

Technology Anxiety: is a negative emotional response arising from the use of (or the thought of using) technology. Consumers expressed feelings of being uncomfortable, nervousness and confusion regearing eHealth services.

(Kamal et al., 2020; Khoshrounejad et al., 2021)

Impersonal/lack of touch: eHealth services were deemed by consumers as impersonal and lacking touch. It is hard to develop relationships and loyalty through eHealth digital platforms. This is exacerbated when there is no GP/health professional photo and profile outlining specialities and interests, the consumer cannot select their preferred practitioner, or they are not provided with personalised communications. The lack of touch is also a barrier to eHealth service adoption. Appropriate levels of light touch can be incredibly reassuring and have valid therapeutic impact. Touch also build trust which is addressed by the next research question.

(Chen et al., 2021; Khoshrounejad et al., 2021; Kimball & Morgan., 2021; LeBlanc et al., 2020; Shah et al., 2022; Wilson et al., 2021)

6.3 DUAL FACTORS

Security, cost, trust, quality and eHealth literacy, performance expectancy, effort expectancy, facilitating conditions and social influence are dual factors that could either motivator or form a barrier to eHealth adoption. The following section will define and discuss each of these dual factors.

Security: was a common factor across the literature and encompasses the eHealth services security and data safety protocols. Security is a dual factor as it depends on the consumer's perception. If they perceive that the service safekeeps their data, then they are more likely to be motivated to adopt the service. If they perceive that the service is not safe or there is implied disclosure, then they are more likely to reject the service. Evidence of safeguards to protect the information stored within the system can include audit trails, technology and data management controls, as well as appropriate security measures to minimise the likelihood of unauthorised access to information in a patient's record.

(Abdulai et al., 2022; Baudier et al., 2020; Chen et al., 2021; Das & Sengar, 2022; Goetz et al., 2020; Kasteleyn et al., 2021; Khoshrounejad et al., 2021; Kim Magsamen-Conrad, Wang, et al., 2020; Mustafa et al., 2022; Orrange et al., 2021; Schmitz et al., 2022; Schomakers et al., 2022; Schröder et al., 2022)

Cost : Price issues were found to be critical and received particular interest from customers when they were in the process of accepting or rejecting innovations. In the context of eHealth services cost includes the monetary/price of using the service, the non-monetary costs (time, effort, stress, emotional and psychological input) and cost/pricing information. If there are unclear/lack of reimbursement processes evident, then the consumer is less likely to engage with the service.

(Ben Arfi et al., 2021; Chakraborty et al., 2021; El Joueidi et al., 2021; Khoshrounejad et al., 2021; Lintz, 2021; Orrange et al., 2021; Palas et al., 2022; Sin et al., 2020)

Trust: is critical to eHealth services due to consumers high levels of information sensitivity, the existence of uncertainty and the perceived lack of regulation. Trust is addressed in detail by RQ3, for RQ2 it is seen as a dual factor that can motivate or form a barrier to ehealth service adoption. If consumers have greater trust in the eHealth service, they will not only exhibit a higher level of perceived usefulness and perceived control for the eHealth service, but also perceive lower levels of uncertainty.

(Alam et al., 2020; Alzahrani et al., 2022; Ayuku et al., 2021; Boucher et al., 2021; Busso et al., 2022; Chang et al., 2021; Das & Sengar, 2022; Ducrot et al., 2021; Frank et al., 2021; Fristedt et al., 2021; Hasselgren et al., 2021; Hui et al., 2021; Jiang, 2020; König & Jucks, 2020; Kumari et al., 2022; Lu & Zhang, 2021; Misra et al., 2020; Orrange et al., 2021; Rajak & Shaw, 2021; Ruotsalainen et al., 2022; Sabbir et al., 2021; Sahut et al., 2022; Seçkin et al., 2021; Seitz et al., 2022; Wan et al., 2021; Wan et al., 2020; Westjohn et al., 2022; Yoo et al., 2021; Zhao & Mao, 2021)

6.3 DUAL FACTORS

Quality: in eHealth services are strongly related to consumer perceptions and trust. It is a dual factor as if the eHealth service is perceived as high quality, then the consumer is motivated to adopt it and if it is perceived as low quality then they are more likely to reject it. Research on E-service quality is still a developing field with the majority of work being in the e-commerce sector. Santos (2003) within the ecommerce context conceptualised e-service quality as incubative dimension (ease of use, appearance, content, linkage, structure and layout) and active dimensions (reliability, efficiency, support, communication, security, and incentives).

(Boucher et al., 2021; Doak et al., 2020; Kumari et al., 2022; Palas et al., 2022; Verma et al., 2020)

eHealth literacy: as discussed in RQ1 is the ability to seek, find, understand and appraise health information from electronic sources and apply this knowledge to address or solve a health problem. Consumers with high eHealth literacy are more likely to adopt eHealth services and those with low eHealth literacy are more likely to reject it.

(Das & Sengar, 2022; Jain et al., 2020; Khoshrounejad et al., 2021; Lee et al., 2020; Magsamen-Conrad, Wang, et al., 2020; Neter et al., 2021; Sabbir et al., 2021; Sin et al., 2020; Wilson et al., 2021; Yang et al., 2021)

Performance Expectancy: is the degree to which an individual believes that using the technology/system will improve the performance of the required task. Performance expectancy is also considered as a term of utility that is encountered during the use of the technology/system. In the context of eHealth this is the perceived usefulness of the eHealth service and the degree to which they believe the service will help them achieve their health goal.

(Johnson et al., 2021; Kamal et al., 2020; Kumari et al., 2022; Nezamdoust et al., 2022)

Effort expectancy: is the degree of ease associated with use of the technology/system. In the context of eHealth this factor includes the perceived ease of use and complexity of the eHealth platform. When a consumer feels that e-service is easy to use and does not require much effort, they have a higher chance of adopting it. The flip side of this is that if a consumer is inconvenienced or it requires more effort than they expected then they are likely to reject it.

(Boucher et al., 2021; Busso et al., 2022; Doak et al., 2020; Dogra et al., 2022; El Joueidi et al., 2021; Flaherty et al., 2021 Islam et al., 2020; Jain et al., 2020; Kamal et al., 2020; Kumari et al., 2022; Leonardsen et al., 2020; Nezamdoust et al., 2022; Palas et al., 2022; Schröder et al., 2022; Verma et al., 2020)

6.3 DUAL FACTORS

Social Influence: is the extent of social pressure exerted on individual to adopt new technology/system. Social pressure was originally defined as the change in an individual's thoughts, feelings, attitudes, or behaviours that results from interaction with another individual or a group that is perceived to be similar, desirable, or an expert. In the context of eHealth services social influence can include groups, social and cultural behaviours that motive or form barriers to adopting eHealth services.

(Kamal et al., 2020; Mustafa et al., 2022; Palas et al., 2022; Rajak & Shaw, 2021; Srivastava & Raina, 2021)

Facilitating Conditions: is the degree to which an individual believes that an organisational and technical infrastructure exists to support use of the technology/system. If the consumer bevies that the eHealth service is accessible, available & compatible with their current technology, lifestyle, goal they are more likely to adopt the service.

(Alam et al., 2020; Baudier et al., 2020; Islam et al., 2020; Kamal et al., 2020; Mustafa et al., 2022; Schmitz et al., 2022; Srivastava & Raina, 2021; Zobair et al., 2021)

THE UNIFIED THEORY OF ACCEPTANCE AND USE OF TECHNOLOGY

The last four factors (performance expectancy, effort expectancy, facilitating conditions and social influence) are all constructs from the Unified Theory of Acceptance and Use of Technology (Figure 5) (Venkatesh et.al, 2003). The theory was developed in 2003 by Venkatesh and his research group after reviewing prior theories of technology acceptance from social psychology and the IT field: Theory of Reasoned Action (Fishbein, 1979), Model of PC Utilization (Triandis 1979), Innovation Diffusion Theory (Rogers, 1983), Motivational Model (Deci & Ryan, 1985), Social Cognitive Theory (Bandura, 1986), Technology Acceptance Model (Davis, 1989), Theory of Planned Behaviour (Ajzen, 1991), the combination form of TAM and TPB (Taylor &Todd, 1995) and the Technology Acceptance Model 2 (Venkatesh & Davis, 2000). The Unified Theory of Acceptance and Use of Technology is one of the most intensive models to test technology adoption and acceptance and takes into consideration both voluntary and forced behaviour (Momani, 2020). It has been used to study internet banking, social media adoption and AI. Further research in the eHealth service context is needed.

Figure 5. Unified Theory of Acceptance and Use of Technology
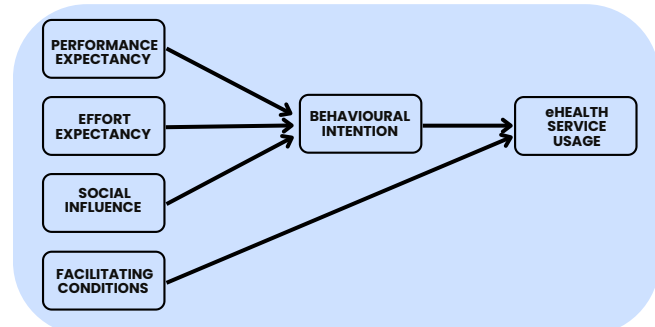
(adapted from Venkatesh et.al, 2003)

7.0 TRUST

**RQ 3. What are the antecedents to trust in eHealth services?**

Trust is a multidisciplinary construct that has been viewed form the lens of philosophy, psychology, social sciences, information science, and economics (Ruotsalainen et al., 2022). Thus, it is no surprise that the literature review identified trust as a key mechanism that shifts a consumer's adoption of eHealth services (Jiang, 2020; Yoo et al., 2020; Wan et al., 2020). The first step in understanding the antecedents to trust in eHealth service context is to define it. For the purpose of this study trust is defined as;

> *"the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party"*
>
> (Mayer, Davis & Schoorman, 1995, p712)

This definition takes into consideration the intangibility and high levels of credence within eHealth services. From reviewing the literature, a conceptual model of trust (Figure 6) was created that took into consideration the main actors in co-creating trust; patient (consumer), practitioner (GP/health professional) and platform (midnight health). The following sections of the report will then discuss each of these actors and the factors that play a role in moderating trust.

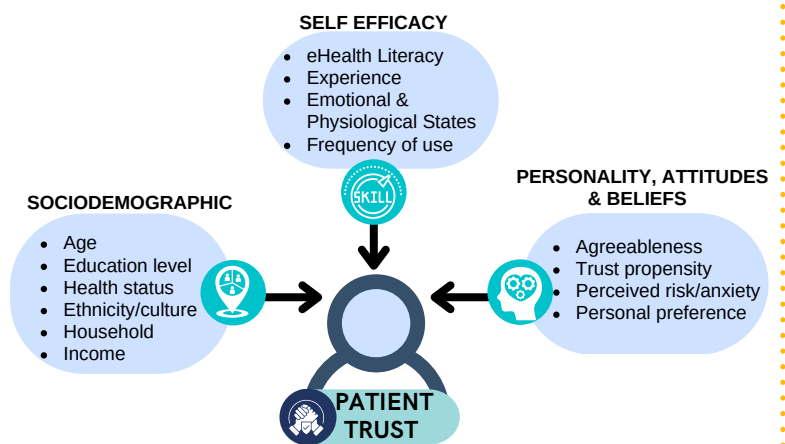**Figure 6. Conceptual Model of Trust**
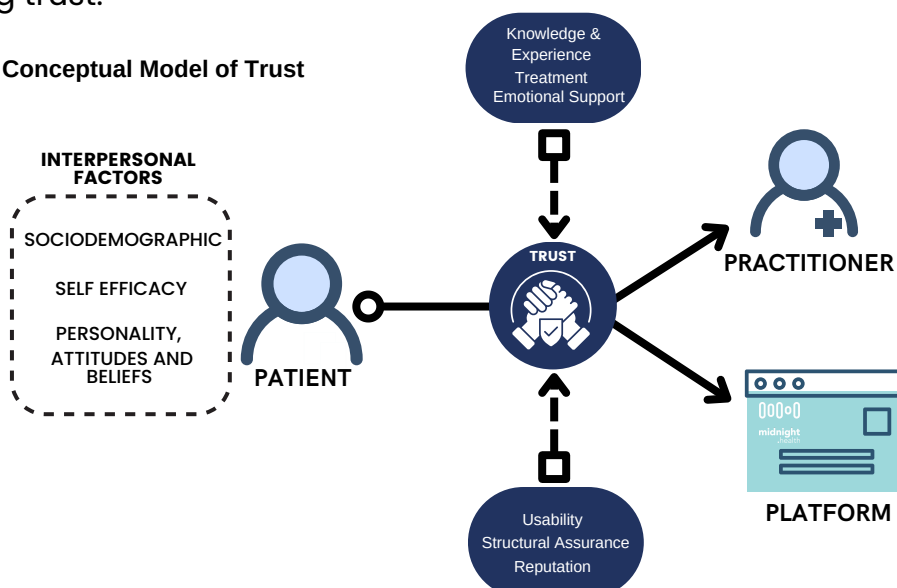
7.1 PATIENT FACTORS
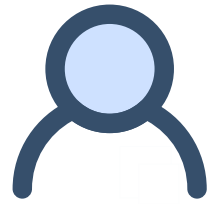
Patient trust is one's perception that the doctor (and by extension ehealth service) will behave in their best interest (Baker, Mainous, Gray, & Love, 2003). From synthesising the literature sociodemographic, self efficacy, personality, attitudes and beliefs were identified as interpersonal factors that impact a patient's level of trust (Figure 7). While you cannot control interpersonal factors you can take into consideration their impact on the consumers' ability to trust. Strategies can then be developed to address or minimise those factors which form barriers to trust and foster the ones which help build trust.

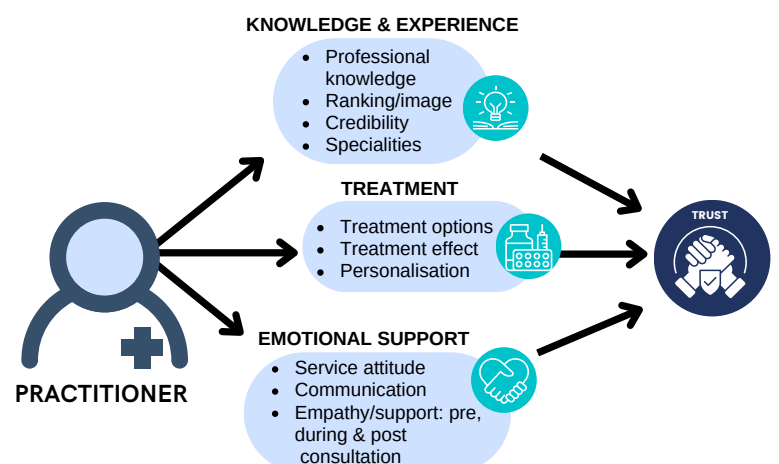Figure 7. Interpersonal Consumer Factors That Moderate Trust

SELF EFFICACY
- eHealth Literacy
- Experience
- Emotional & Physiological States
- Frequency of use

SOCIODEMOGRAPHIC
- Age
- Education level
- Health status
- Ethnicity/culture
- Household
- Income

PERSONALITY, ATTITUDES & BELIEFS
- Agreeableness
- Trust propensity
- Perceived risk/anxiety
- Personal preference

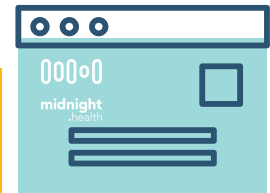**PATIENT TRUST**

7.2 PRACTITIONER FACTORS

The patient-practitioner relationship in crucial to the development of trust in eHealth services (Jiang, 2020; Wan et al., 2021; Yan et al., 2020). There is already an implicit level of trust in the practitioner (GP, nurse or health professional) due to their medical training. Hower this trust can be moderated through the practitioner's demonstration (or lack thereof) knowledge & experience, treatment and level of emotional support (Figure 8).

Figure 8. Practitioner Factors That Moderate Trust

KNOWLEDGE & EXPERIENCE
- Professional knowledge
- Ranking/image
- Credibility
- Specialities

TREATMENT
- Treatment options
- Treatment effect
- Personalisation

EMOTIONAL SUPPORT
- Service attitude
- Communication
- Empathy/support: pre, during & post consultation
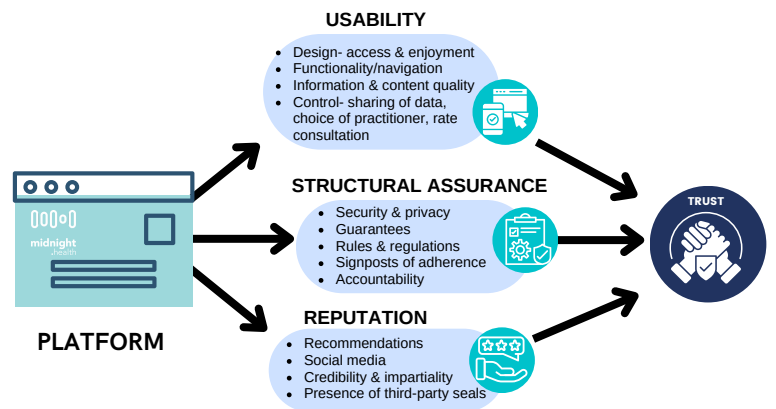
PRACTITIONER

TRUST

7.3 PLATFORM FACTORS

Patients' trust of eHealth services is dependant on the usability, structural assurance and reputation of the platform (Figure 9). Higher levels of usability are more trustworthy since they provide valuable and needed information easily and securely (Yoo et al., 2021). Features that facilitate the search for health information, physician selection, health consultation, ratings, and post consultation actions were all associated with higher usability and trust. On the contrary platforms with complex interfaces, long consultation processes, non-relevant or outdated information see a decrease in patient trust.

Figure 9. Platform Factors That Moderate Trust

USABILITY
- Design- access & enjoyment
- Functionality/navigation
- Information & content quality
- Control- sharing of data, choice of practitioner, rate consultation

STRUCTURAL ASSURANCE
- Security & privacy
- Guarantees
- Rules & regulations
- Signposts of adherence
- Accountability

REPUTATION
- Recommendations
- Social media
- Credibility & impartiality
- Presence of third-party seals

PLATFORM

TRUST

8.0 FUTURE SELF-SERVICE HEALTH TECHNOLOGY

RQ 4. What self-service health technologies are on the horizon?

The internet of things (IoT) is where the future of self-service health technology is headed. IoT is a relatively new paradigm and is where real-world objects connect to the internet, allowing these objects to collect, process and communicate data without human intervention (Arfi et al., 2021). The Internet of Health things (IoHT) is a developing field that includes all IoT-based devices with the potential for remote monitoring and to medical device integration.

Future Health Tech

Monitor- Smart wearable technology that integrates with IoT

Diagnose- Virtual primary care and AI systems

Treatment- Personalised medicine

(Arfi et al., 2021; Euromonitor Future of Personalised Healthcare 2022; Euromonitor Mega Trends, 2022; Goetz et al., 2020)

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