THE IMPACT OF DIGITAL NUDGING ON ONLINE HEALTH INFORMATION SHARING BEHAVIORS: THE MODERATING ROLES OF SOCIAL CAPITAL AND PERSONALITY

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LIST OF ABBREVIATIONS

ANOVA	Analysis of variance
CNNIC	China Internet Network Information Center
COPD	Chronic Obstructive Pulmonary Disease
DND	Digital Nudge Design
EFA	Exploratory Factor Analysis
HISB	Health Information Sharing Behavior
HIV	Human Immunodeficiency Virus
KMO	Kaiser-Meyer-Olkin
SPSS	Statistical Package for Social Sciences
VIF	Variance Inflation Factor
WHO	World Health Organization

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KESAN PENDORONG DIGITAL KE ATAS TINGKAH LAKU PERKONGSIAN MAKLUMAT KESIHATAN DALAM TALIAN: PERANAN PENYEDERHANAAN MODAL SOSIAL DAN PERSONALITI

ABSTRAK

Perkongsian maklumat kesihatan merupakan satu tingkah laku prososial yang penting untuk menggalakkan penyebaran maklumat berkaitan kesihatan dalam masyarakat. Dengan berkongsi maklumat kesihatan dengan orang lain, ia dapat meningkatkan kesedaran dan pemahaman masyarakat terhadap isu-isu kesihatan. Ia juga membantu dalam pembinaan sokongan sosial dengan orang lain yang mengalami pengalaman serupa, di mana individu boleh berkongsi pengalaman, memberi semangat dan nasihat antara satu sama lain. Walau bagaimanapun, disebabkan oleh kapasiti kognitif terhad, manusia cenderung menggunakan strategi memudahkan atau penyederhanaan dalam pemprosesan maklumat berbanding analisis yang mendalam, yang boleh menyebabkan ketidaktepatan kognitif dalam pemprosesan maklumat kesihatan serta ketidakupayaan individu untuk membuat keputusan berkaitan perkongsian maklumat kesihatan. Untuk menangani situasi ini, reka bentuk pilihan digital adalah satu pendekatan yang berpotensi di mana digital nudging dalam pemakaian tingkah laku pengguna apabila memproses maklumat kesihatan melalui reka bentuk dan penyampaian pilihan serta maklumat dalam persekitaran digital bagi memotivasi mereka untuk lebih aktif berkongsi maklumat kesihatan. Walaupun beberapa kajian telah menyelidiki motivasi pengguna dalam berkongsi maklumat kesihatan serta faktor-faktor mengelak dari berkongsi maklumat kesihatan, serta usaha awal untuk digital nudging bagi memotivasi pemilih gaya hidup sihat, namun terdapat kekurangan dalam pemahaman bagaimana digital nudging boleh secara berkesan

mempromosikan tingkah laku perkongsian maklumat kesihatan. Untuk mengatasi kekurangan ini, kajian ini menguji kesan digital nudging terhadap tingkah laku perkongsian maklumat kesihatan pengguna menggunakan teori digital nudging. Pada masa yang sama, kajian ini meneliti pengaruh modal sosial serta ciri-ciri peribadi terhadap tingkah laku perkongsian maklumat kesihatan, serta kesan moderasinya terhadap hubungan antara digital nudging dan tingkah laku perkongsian. Kajian ini menggunakan kaedah eksperimen tinjauan, dengan langkah pertama menggunakan tinjauan awal bagi mengenal pasti motivasi dan halangan pengguna dalam berkongsi maklumat kesihatan serta memformulakan ketidaktepatan kognitif. Berdasarkan prinsip digital nudging, saliens visual, cara penyampaian mesej dan norma sosial dipilih sebagai mekanisme digital nudging bagi menangani ketidaktepatan kognitif. Digital nudging direka bentuk dan dinilai oleh panel pakar. Eksperimen tinjauan dijalankan secara atas talian pada April 2023 melibatkan 460 responden. Keputusannya menunjukkan bahawa digital nudging yang berbeza mempunyai kesan berbeza terhadap tingkah laku perkongsian maklumat kesihatan pengguna. Digital nudging cara penyampaian mesej dan keutamaan visual membantu meningkatkan perkongsian maklumat kesihatan berbanding tidak ada apa-apa penekanan sosial, manakala kesan norma sosial tidak signifikan. Justeru, digital nudging boleh menjadi berkesan dalam mempromosikan perkongsian maklumat kesihatan melalui penyampaian mesej dan saliens visual, namun perlu mengenal pasti ketidaktepatan kognitif yang sesuai dan mempertimbangkan faktor konteks, sasaran dan budaya. Selain itu, semua tiga dimensi modal sosial mempunyai kesan positif terhadap tingkah laku perkongsian maklumat kesihatan, dan bagi kesan moderasinya, modal struktural meningkatkan hubungan antara digital nudging cara penyampaian mesej dan tingkah laku perkongsian, modal hubungan meningkatkan hubungan antara saliens visual dan

tingkah laku perkongsian, serta modal kognitif meningkatkan kesan kedua-dua saliens visual dan norma sosial terhadap tingkah laku perkongsian. Ini menunjukkan bahawa penggunaan modal sosial untuk menggalakkan interaksi, penyertaan dan perkongsian pengalaman kesihatan boleh memperluas kesan digital nudging. Tidak mengira jangkaan, tiga ciri peribadi iaitu kesepakatan, kebertanggugjawaban dan neurotisme mempunyai kesan positif terhadap tingkah laku perkongsian, manakala sikap terbuka dan ekstrovert tidak memberi kesan. Selain itu, hanya ekstrovert (kebertanggugjawaban) meningkatkan hubungan antara saliens visual (cara penyampaian mesej) dan tingkah laku perkongsian manakala ciri peribadi lain tidak memberi kesan moderasi. Ini menunjukkan ciri peribadi walaupun penting kepada keputusan tingkah laku, tidak memberi kesan moderasi yang ketara terhadap digital nudging. Kajian ini mempunyai implikasi meluas kepada kerajaan, pertubuhan kesihatan, platform digital serta golongan muda, dan hasilnya mengembangkan pemahaman bidang komunikasi kesihatan dan digital nudging. Kajian pada masa hadapan boleh meningkatkan sampel, jenis mekanisme digital nudging serta menjalankan kajian lintas budaya untuk memahami impak digital nudging secara lebih menyeluruh serta mereka bentuk intervensi yang sesuai dan berkesan.

THE IMPACT OF DIGITAL NUDGING ON ONLINE HEALTH INFORMATION SHARING BEHAVIORS: THE MODERATING ROLES OF SOCIAL CAPITAL AND PERSONALITY

ABSTRACT

Health information sharing is an important pro-social behavior to encourage greater dissemination of health-related information in the society. Sharing health information with others helps to increase public awareness and understanding of health issues. It also enables networking and support with people who have had similar experiences, enabling individuals to share experiences, encourage each other and obtain advice. However, due to their limited cognitive capacity, human beings tend to use heuristic or simplifying strategies when processing information rather than performing thorough analysis and evaluation, which leads to the possibility of cognitive biases in the processing of health information and hence the inability of individuals to make decisions about sharing health information. To address this situation, digital choice architecture is a potential approach where digital nudging intervenes in users' behaviors when processing health information by designing and adapting choices and information presentation in digital environments in order to motivate them to share health information more actively. Although some studies have investigated users' motivations for sharing health information and factors for avoiding health information, and explorations have begun for nudge to guide consumers to choose healthy lifestyles in digital environments, there is a dearth of knowledge on how nudge can effectively promote users' health information sharing behavior. To fill this gap, this study tested the effect of digital nudges on users' health information sharing behavior using nudge theory. At the same time, the study examined the

influence of social capital and personality traits on users' health information sharing behavior and their moderating role in the relationship between digital nudges and users' health information sharing behavior. In this study, the survey experiment was adopted, with the first step using a preliminary survey to identify users' motivations and barriers in health information sharing and to deduce possible cognitive biases. Based on the principles of digital nudging, visual salience, framing, and social norms were selected as nudging mechanisms to counteract cognitive biases. Digital nudging design was developed and completed evaluation with the advice of expert panel. The survey experiment was conducted online in April 2023 and a total of 460 participants were recruited. The results shows that different digital nudges had varied effects on users' health information sharing behavior. Framing nudge and visual salience nudge significantly promote users to share more health information compared to not being nudged, while social the impact of norms nudge is not significant. Thus, digital nudging can be effective in promoting users to share more health information by strategically framing information or making key information visually salient, but it requires identifying appropriate cognitive biases and considering the importance of specific contextual, target audience, and cultural factors. Moreover, all three dimensions of social capital can significantly promote users' sharing of health information, and as for the moderating effect, structural capital enhances the relationship between framing nudge and users' health information sharing behavior, relational capital enhances the relationship between visual salience nudge and users' health information sharing behavior, and cognitive capital had a significant positive moderating effect on both visual salience nudge and social norms nudge with respect to users' health information sharing behavior. This indicates that utilizing the function of social capital to encourage users to interact, participate in discussions and share

health-related experiences can effectively enlarge the role of digital nudge and promote users to share more health information. Unexpectedly, among the five personality traits, agreeableness, conscientiousness, and neuroticism had significant positive effects on users' sharing of health information, whereas extraversion and openness to experience had no significant effects. Furthermore, only extraversion (conscientiousness) enhanced the relationship between visual salience nudge (framing nudge) in relation to users' health information sharing behavior, while no moderating effect was found for the other personality traits. This suggests that although personality traits are important factors influencing users' behavioral decisions, they have no substantial moderating effect on digital nudge. This study has broad implications for governments, health organizations, online platforms, and young adults, and the findings expand the understanding of the field of health communication and digital nudging. Future research could expand the sample size, increase the types of nudge mechanisms, and conduct cross-cultural studies to gain a more comprehensive understanding of the impact of digital nudging on health information sharing, and inform the design of appropriate, accurate, and effective interventions.

CHAPTER 1

INTRODUCTION

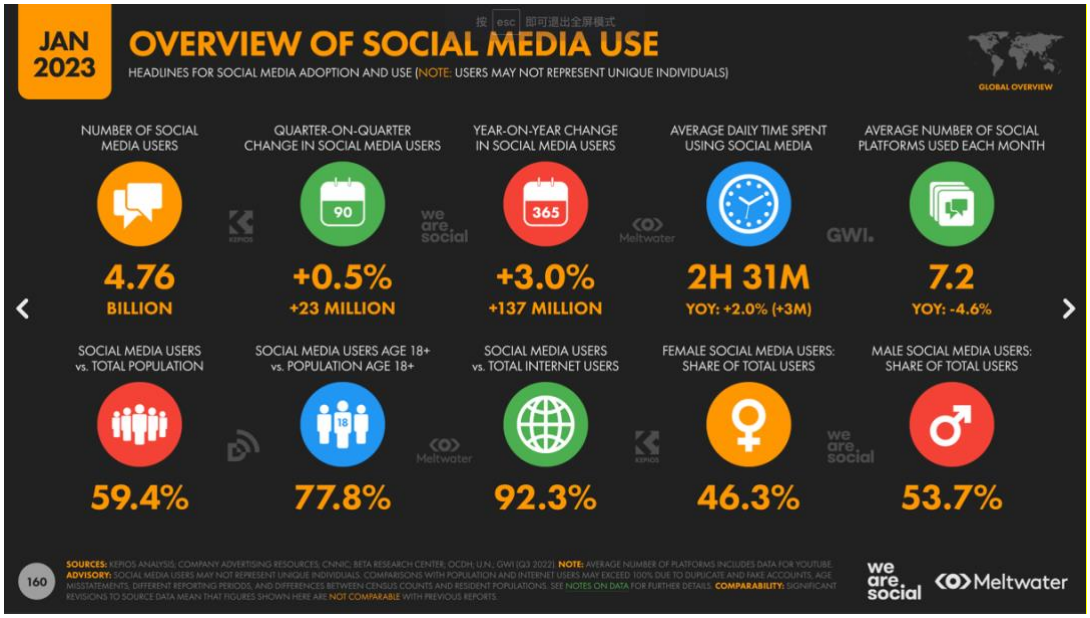
1.1 Introduction

This chapter first depicts the background of the study, including an overview of the online health information sharing behavior (HISB), cognitive bias and nudge, and digital nudging, with the intention of gradually leading to the topic of the study. This is followed by a problem statement that further describes the intended research question, highlighting the lack of China's research on digital nudging, the potential of combining user HISB and digital nudging, and the theoretical gap in current research on digital nudging to help the researcher clearly define the purpose of the study. After clarifying the research background and problem statement, the researcher outlines the purpose of the research and the research questions, before discussing on the significance of the research.

1.2 Background of the Study

People's lifestyles have already been significantly changed by the rapid development of the Internet and new media. This development is most visibly reflected in the growth in the size of mobile social media users. Without doubt, social media is an essential component of internet use. According to reports released by WeAreSocial (2023), the total number of social media users globally has increased by almost 30% since the COVID-19 pandemic, reaching 4.76 billion in January 2023, and this number is still growing (as shown in Figure 1.1). Last year, 137 million users started using social media, which equates to an average of nearly 400,000 new users per day. For example, only 5% of American people utilized at least one social media platform in 2005. By 2011, that proportion had increased to half of all Americans, and nowadays,

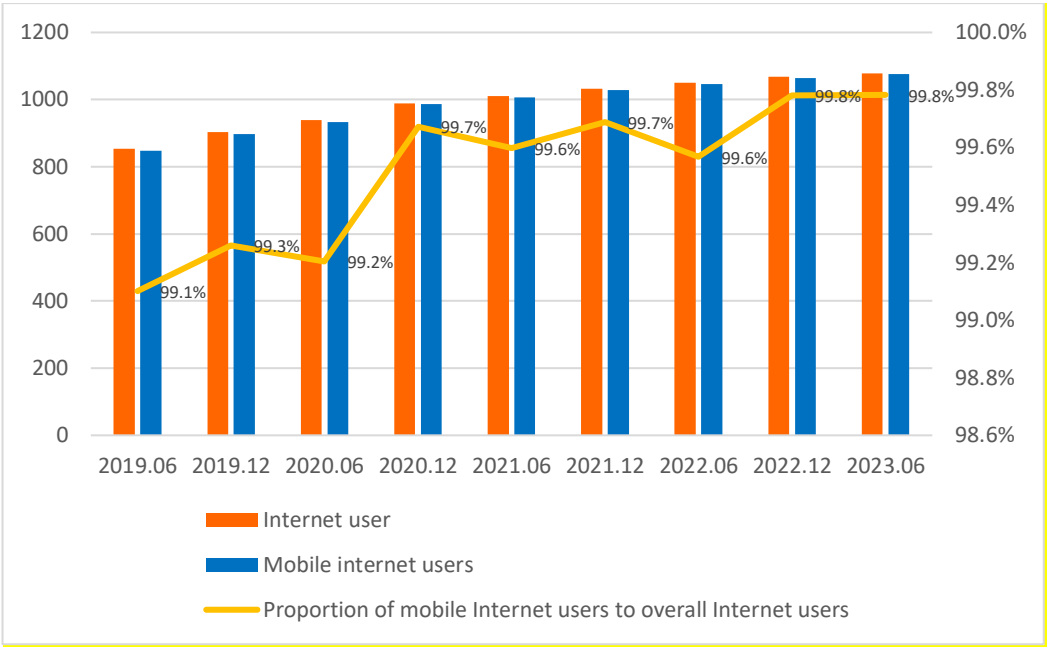
72% of people in America use social media to communicate with one another, engage with news content, exchange information, and entertain themselves (Brooke & Monica, 2021).



*Source: We Are Social and Hootsuite, Digital 2023 Global Overview Report

Figure 1.1 Overview of Social Media Use

In China, Internet and social media users are also growing rapidly. As of August 2022, the number of Chinese Internet users has reached 1.079 billion, the number of mobile Internet users has reached 1.076 billion, of which 1.047 billion used various instant messaging services including social media via cell phones, accounting for 97.3% of the total number of mobile Internet users (see Figure 1.2 below) (CNNIC, 2023).



*Source: China Internet Network Information Center, CNNIC

Figure 1.2 Netizen Size and Internet Penetration of China 2019 to 2023

Since the beginning of 2020, the COVID-19 pandemic has led many countries to implement stay-at-home orders and social distancing, which has increased the use of social media by individuals to a certain extent (Joseph, 2021). With massive user demand, the social interaction and information dissemination functions carried by social media are also constantly being revolutionized. It has reconfigured all aspects of social life, from interpersonal interaction, entertainment and work styles to transaction and service models. Information sharing is an important user behavior in daily Internet use. It is the sharing of content that provides insight into an issue, item, event, person, or other factor (L. Y. C. Wong & Burkell, 2017). This study focuses on health information as a special type of information that not only makes users interact with others by sharing behavior, but also improves users' health awareness, prevents diseases, and maintains a healthy physical and mental state.

1.2.1 Users' Health Information Sharing Behavior

Information is flowing around all the time, between person to person, across media and audience, and among the bigger community in a society. In today's globalized world, social media platforms like Facebook, Twitter, and WeChat act as a link amongst people regardless of their geographical or cultural disparities (Boamah, 2018), they are excellent platforms for information sharing. User health information sharing gets increasingly crucial. For health information providers, sharing behavior improves their health information to be seen by more users and increases exposure visibility (Shi et al., 2018). For users, they benefit from the act of sharing as it may enable them to accumulate their own healthcare knowledge base (Zhao et al., 2020).

Social media has been widely used for health-related purposes, especially during the COVID-19 pandemic (J. Chen & Wang, 2021). An increasing number of users have used social media to share health information with family and friends, including their own health condition or to prevent the spread of diseases, and to communicate with physicians about health activities (Lefebvre & Bornkessel, 2013). By using the Internet, users can share health-related information, such as physical activity, therapy, food safety, and nutrition. In China, it is common to view and share health information via WeChat. Users in China share social media posts by healthcare professionals with their friends or family to raise awareness of their health. Zhang et al. (2017) found through a national survey that 97.68% of respondents said they used to open and read health information, most of which were obtained from WeChat functions. This information is often shared with their family or friends through WeChat functions such as WeChat Official Account, WeChat Moments, and Groups.

In addition to mainstream social media, there are also health-related social media such as PatientLikeMe and Medhelp. This kind of social media is also called

online health community (OHC). Lin et al. (2016) pointed out that OHC information sharing is a behavior in which community members transfer, disseminate and exchange health-related knowledge, experience, skills, and valuable information to their members in the organization, so that patients can self-check their symptoms. There are also medical and health social media such as PingAnJianKang and DXY in China (as shown in Figure 1.3), which aims to support patients to share their health information with other patients with similar diseases.

Figure 1.3 Snapshot of PingAnJianKang (left) and DXY (right)

No doubt, HISB is a critical component of health information transmission and has emerged as a potential study issue in health communication. According to the 2019 Global Health Estimates released by the World Health Organization (WHO), the global average life expectancy has increased, but in fact, the disability rate is on the rise (WHO, 2020). China's economic development and urbanization process has brought about changes in people's lifestyles. The significant reduction in daily physical activity, paired with unhealthy dietary habits, has resulted in Chinese people

suffering from chronic diseases such as diabetes, cardiovascular diseases, cancer, and chronic respiratory diseases accounting for more than 70% of the total disease burden (NHC, 2019), which has become an important factor in healthy life expectancy. To actively respond to current prominent health problems, the National Health Commission under the State Council of the People's Republic of China have issued the Outline of the Program for Health China 2030 (NHC, 2019) which stated that: *Promotion of health cultivation shall be taken as a premise of enhancing the health of the whole nation, and health education and promotion shall be strengthened pertinently in accordance with the characteristics of different groups of the population, to enable health knowledge, behavior, and skills to become a cultivation and capability that all people universally have, and to see to it that all people have health cultivation.*

To achieve this goal, individuals should pay attention to and share health-related information. Medical staff should master health science knowledge relevant to their positions and actively impart health knowledge to others, and the government should encourage and support health-related content and activities.

Notably, more advanced artificial intelligence is making it possible to massively individualize social media content for audiences (Hermann, 2022). Advances in technology have made the ability to customize information to meet user needs more feasible than ever before (Olsacher et al., 2023), as the predictive power of big data can reliably identify personality traits (Azucar et al., 2018). Considering the technological capability to identify seamlessly customized information (Demir & Kumkale, 2013), there is a need for a more nuanced and targeted approach to communicating health information to the target audience based on an individual's attitudes, social network, personality, and socio-economic background on the one hand (Vanholder et al., 2021), and, on the other hand, the use of different messaging

strategies (Olsacher et al., 2023). By understanding the different responses of different users to the effectiveness of information presentation, researchers and practitioners can tailor the presentation of health information more effectively to the psychological profile of the user, thereby increasing the effectiveness of health information sharing behavioral interventions.

1.2.2 Cognitive bias and Nudge

Countless health-related articles and information are posted online every day. Faced with a vast amount of information, users need to make decisions in a continuous choice frame (e.g., whether to read the full article, like it, share it, etc.), and face constraints of time, information, and intelligence to process the choice options and make decisions. Indeed, although the Internet provides great potential for seeking and sharing information, the interface design and presentation of information, as well as the cognitive conditions of online interactions, can make users vulnerable to *cognitive biases*.

Unlike flawed reasoning which leads to logical errors, cognitive bias is "a *systematic pattern of deviation from norm or rationality in judgment*" (Haselton et al., 2005, p. 725). Based on Amos Tversky and Daniel Kahneman (1974), cognitive biases are caused by the fact that humans rarely follow a purely rational or normative model when making decisions. Humans have limited cognitive abilities, so we always prefer to take shortcuts when making decisions. Shortcuts lead to speed and efficiency for decision making, but when the brain's thinking system is influenced by contextual factors, information structure, previously held attitudes, preferences, and emotions, it can greatly affect the consistency and rationality of our decisions, and consequently, biased decisions may be made. Cognitive biases are prevalent and have been studied by several researchers in health contexts. For example, cognitive biases of healthcare

professionals when making decisions in providing patient care (Shlonsky et al., 2019), attentional biases in patient health behaviors (Todd et al., 2018), and individual cognitive biases in health information behaviors such as optimism bias (Park et al., 2021), priming effects (Shalev & Bargh, 2011), and confirmation bias (Zhao et al., 2020).

To encourage more health information sharing, appropriate behavioral interventions should be developed. Traditional behavioral interventions are typically built upon a rational agent model of decision making (Mertens et al., 2022), which interprets behavior as the result of a deliberate decision-making process. Therefore, when designing behavioral interventions, informational publicity is used to inform people of the available costs and benefits, to alter their beliefs or attitudes to change behavior (Albarracin & Shavitt, 2017), or guide their behavioral decisions through education, financial subsidies, tax breaks, fines, or similar actions (Ajzen, 1991). Communities, for example, through the publication of brochures, posters and public service announcements, can emphasize that sharing health information online raises awareness of disease, provides social support for people with similar conditions and promotes health information sharing behaviors through the exchange of advice and experiences.

Traditional interventions are too rigid and costly. And Epstein (2004) argued that the law and government have no right to intervene in areas related to individual lifestyle choices, as opposed to areas of high policy and legal relevance such as taxation, education, and medical services, particularly individual Internet use behavior. Alternatively, healthy lifestyles do require government and organizational intervention and guidance, then it should be done using the least invasive or restrictive methods (Quigley, 2013). Along these lines, behavioral interventions that promote health

information sharing should be more “invisible”, guiding users to make better choices by facilitating a change in choice structure without them being aware of it, thereby nudging real and lasting behavior change.

Choice architecture emerged when behavioral economists started looking at how human decision-making works in a practical way. They built on previous research about how people judge and make choices (Münscher et al., 2016). The influential policy book “Nudge” by Thaler and Sunstein (2008) was an early driver of research on choice architecture. Choice architecture, also called nudge, refers to small changes in the environment that can influence individual decisions without limiting freedom of choice (Thaler et al., 2013). For example, putting healthy foods at eye level in a cafeteria or automatically enrolling people in retirement savings plans. Mandates, education campaigns, and financial incentives are not choice architectures because they aim to change general attitudes rather than specific behaviors (Oliver, 2013). A nudge works by focusing on behaviors through unconscious cognitive biases or reflexive cognitive processes like how we judge risks or evaluate choices (Oliver, 2013). This makes nudges a distinct type of behavior change technique compared to strategies targeting conscious beliefs and attitudes.

The nudge in the offline contexts had been proven to be effective. For instance, repositioning junk food in supermarkets to encourage people to choose healthier eating choices. Fruit and other healthy foods are placed next to the cash register while junk food is moved to another part of the store (Kroese et al., 2015). Similarly, the opt-out policy replaces the opt-in policy set by default for organ donation registries (van Dalen & Henkens, 2014). Over 90% of citizens in countries that have opted out of the organ donation system (e.g., Spain) have chosen to become organ donors, whereas in countries that have opted in, such as Denmark, on average less than 20% of citizens

have chosen to become organ donors (N. Huang et al., 2018). In the UK, a behavioral approach has become an integral part of the public health strategy of successive governments. To this aim, the Cabinet Office has established the Behavioral Insights Team (COBIT, or the Nudge Team), which has public health as one of its priority areas. The former government of Boris Johnson decided to use nudge to encourage British people to vaccinate to achieve herd immunity against the COVID-19 pandemic (Costello, 2020). These interventions and studies both adapt the findings of existing decisions to the choice architecture paradigm and contribute insights from the research on choice architecture perspectives, providing a useful reference for this study.

1.2.3 Digital nudging, a new path for users' digital decision-making

With the advancement of digitalization, an increasing amount of individual decision-making occurs in the digital environment, including social interaction, entertainment, E-commerce, travel, and donation etc. As distinct from the offline environment, in the online environment, the user interface is a choice environment, both for website design and application development. Therefore, in the digital environment, we can still use our knowledge of the systematic biases of the decision-making to support us in making the best decisions (Thaler et al., 2013). Compared with real situations, choice architecture in digital environments relies on human-computer interaction (HCI) interfaces for completion, so interface design can influence the decision-making process (C. Schneider et al., 2018).

Digital nudging has immense potential to subtly persuade pro-social and pro-environmental behaviors that benefit users and society. For instance, by understanding cognitive bias, the platform interface can be made more visible through subtle visual placement or carbon labeling, a visibility effect that can make eco-friendly options more visible and lead users to notice and consider choosing these travel options

(Meske et al., 2022). In the online environment, digital nudging also shows potential to influence consumer health behavior. Interface design changes can subtly encourage people to recognize that choosing a healthy lifestyle is a better choice. For example, improving the appeal of recipe images online to increase healthier recipe choices (Starke et al., 2021), or using labels to provide online consumers with nutrition-related information to help them make healthier food choices (Blitstein et al., 2020). Such gentle nudge that honors freedom of choice online can help consumers make informed decisions that affect their own well-being and that of their communities through frictionless influence on natural cognitive processes. Similarly, digital nudging could have the potential to influence consumer health information behavior.

This digital choice architecture of changing options or their presentation in a digital environment is called *Digital Nudging* by Weinmann et al., (2016), and he gave a definition:*" … as the use of user-interface design elements to guide people's behavior in digital choice environments"*(p.433). User interface design is important for user interaction with applications. Researchers need to understand and comprehend user decisions and motivations, as well as the predictable impact of design on user decisions, to support the design of digital nudging. For example, a German study found that pop-up window information presentation using a pro-social digital nudging framing increased the intention of healthy self-trackers to donate (Pilgrim & Bohnet-Joschko, 2022). Therefore, digital nudging that utilizes users' cognitive biases to guide them to make better decisions.

As technology evolves, smartphones support high-resolution images, making the interface more visually appealing (Fuentes et al., 2017). Kumar et al. (2018) found a positive association between the visual aesthetics used in programming and user loyalty in their study. To give an example, shopping software interface design has a

direct and positive impact on customers' purchase intention (Patel et al., 2020). By adding additional information to the product design, consumers can reduce cognitive bias or increase their confidence in making a decision when purchasing a product (Amin et al., 2021). Digital nudging is not only applicable to online consumer decision making and can be useful in a variety of other contexts, from online health systems to social media applications and to information systems (Weinmann et al., 2016).

The interface design of social media also has its part to play when it comes to users sharing information. To some extent, the role of design interfaces in influencing user decisions is effective in constructing frameworks that can stimulate reflection in shared systems (Niemantsverdriet et al., 2019). The complexity of the interface design reduces the propensity of users to share information. (Spiekermann et al., 2014). In contrast, good interface design draws attention to specific sharing options and tasks (Amin et al., 2021). For example, prominent buttons or tabs make it easier for someone browsing their feed to easily "like" or comment on a post versus an awkward design that hides sharing icons. Displays that highlight sharing as a core part of the experience can encourage more information exchange between users.

It is known from the discussion in the previous content that users often find and share health information through social media. Therefore, careful consideration must be given to how digital architectures can support users in making informed decisions when sharing health content. This intervention needs to be designed in a way that encourages the beneficial exchange of health knowledge and experiences among users, while preserving their autonomy over their personal information and usage choices. To achieve this goal, social media and news sites could experiment with nudge measures based on insights from behavioral science. For example, strategically setting buttons or menu options about shareability based on pre-existing cognitive

biases. Or use visual cues to make keywords clearer and more prominent in the presentation of health information. This study focuses on different types of digital nudges and aims to better understand the HISB patterns of Chinese social media users.

1.3 Problem Statement of the Study

With the development of social economy, many people expect a better life and have a strong demand for medical care, but their health literacy needs to be improved (W. Wang, Zhang, et al., 2020). Besides, it is worth noting that chronic diseases have become the main cause of death and disease burden in the world. The death toll caused by chronic diseases accounted for 74% of the global deaths in 2019 (WHO, 2020). The number of people diagnosed with chronic diseases in China every year is also increasing. Therefore, many people with chronic diseases and their families use social media and health-related online communities to seek health information, share experiences, get social support, etc. The social alienation caused by the Covid-19 pandemic further exacerbated the amount of time people spent searching for health information on internet. This has accelerated the use of social media to become a ubiquitous part of the modern healthcare system (A. Wong et al., 2021).

Social media platforms have revolutionized health information dissemination, creating unique digital environments where users interact with health content. These environments are shaped by their choice architecture - the way options are presented to users. For instance, social media platforms may use features like “trending topics” to highlight certain health information or employ algorithms that prioritize content based on user engagement. Such design elements can significantly influence users’ HISB. However, social media users’ behavior tends to be focused on obtaining health information, and individuals’ intention to share health information is not strong (Zhou,

2020). This imbalance can impede the dissemination of valuable health knowledge and hinder the growth of online health communities. Furthermore, users' interactions with health information on social media are subject to various cognitive biases - systematic errors in thinking that can affect decision-making and judgment (Savioni & Triberti, 2020). For example, Optimism bias would result in those who pay closer attention to health information may perceive themselves to be better informed and therefore less vulnerable to health risks and reluctant to share health information (Meer et al., 2023). Confirmation bias could cause users to seek out and share only health information that aligns with their pre-existing beliefs (Zhao et al., 2020). The bandwagon effect might influence users to share health trends without proper verification, simply because they're popular (Leu et al., 2022). Understanding these biases is crucial, as they can either hinder or, if leveraged appropriately, promote effective health information sharing.

Given these challenges, it becomes essential to explore how the digital choice architecture of social media platforms can be designed to counteract negative biases and leverage positive ones, thereby encouraging more balanced and effective health information sharing. This involves investigating how subtle changes in interface design - such as the placement of share buttons, the framing of health messages, or the use of social proof indicators - can nudge users towards more active and responsible health information sharing behaviors.

1.3.1 Limited understanding on cognitive biases in users' HISB

In the 1950s, Herbert Simon (1955) introduced the concept of *bounded rationality*. He believed that human rationality is a kind of bounded rationality that lies between perfect rationality and perfect irrationality. This concept reveals that people are cognitively incapable of optimizing and often do not follow the principles of

probability and maximum utility in actual judgment, resulting in various deviations from the rules and cognitive biases. On the basis of bounded rationality, researchers such as Tversky and Kahneman (1974) have conducted significant research on heuristics and cognitive biases in cognitive decision making since the 1970s. They concluded that humans have a limited ability to think and are unable to properly focus and process all available information (Kruglanski & Ajzen, 1983). As a result, the human brain has developed mental shortcuts, also referred as heuristics. These heuristics are one of the main causes of cognitive biases in situations where information is incomplete, or time is limited. Cognitive biases are difficult to overcome, and with reference to the Cognitive Bias Codex produced by John Manoogian III et al. (2018), there are over 180 cognitive biases and they are continually being updated.

Different cognitive biases have different causes, but one thing is the same: all cognitive biases are difficult to be detected and eliminated by individuals themselves, so interventions are needed. Cognitive biases have been relatively well studied in fields such as clinical medicine and psychology (Leung et al., 2022; Rinck et al., 2018), public administration (Battaglio Jr. et al., 2019), business and finance (Nuijten et al., 2020), and education (Stammers, 2018). Cognitive biases in information-seeking behavior have gained the attention of several researchers. Studies with online users have shown that anchoring, order bias, and confirmation bias may influence health information seeking (Lau & Coiera, 2009; Meppelink et al., 2019). However, research on cognitive biases in information sharing behavior is unfortunately scarce, especially in health information.

Existing research demonstrates that sharing health information can be linked to psychological rewards such as increasing optimism and self-control (van Uden-Kraan et al., 2008), obtaining peer and family support (K.-Y. Huang et al., 2019),

enhancing doctor-patient relationships (Q. B. Liu et al., 2020), and improving health self-efficacy and social relationships (H.-C. Lin & Ho, 2018). However, there are also constraints such as privacy disclosure (Whiddett et al., 2006), information overload (Crook et al., 2016), fear of discrimination (Marwick & Hargittai, 2019), technological limitations (Vaala et al., 2018), and personality traits (Bansal et al., 2010) that make users hesitant to share health information. With an understanding of the factors that make users willing to share or resistant to share health information, identifying the cognitive biases that underlie these reasons can be important in the design of the choice architecture.

Given the general gap in current research on the understanding of the role of cognitive biases in health information sharing. This study therefore has to first identify possible cognitive biases in HISB to enable a more scientific design of digital nudging, as to some extent tools and systems can also influence cognitive biases (R. White, 2013).

1.3.2 Insufficiency research on the impact of choice architecture in health information sharing

Social media has undoubtedly become the predominant platform for individuals worldwide to generate, access, and share a diverse range of information, including matters related to health and wellness. As the central actors involved in exchanging data on social networking sites, users' behaviors and decision-making play a pivotal role in influencing diffusion dynamics. Previous research has significantly contributed valuable theoretical frameworks grounded in fields such as Social Exchange Theory, Social Cognitive Theory, and motivation science to dissect determinants impacting users' propensities to engage in information sharing acts. While insightful perspectives have been gleaned regarding users' personal motivations,

attitudes, and emotional states, investigation of how the design of the social media digital choice architecture itself molds user conduct remains limited.

Only a handful of studies to date have touched upon privacy issues surrounding information dissemination from the vantage point of technology platforms. However, empirically exploring links between discrete interface design aspects and functionalities inherent to social media and habits pertaining to health information diffusion among user networks has been largely neglected. As relationships and decision-making processes transition increasingly to digital contexts, it is prudent to consider how the construction of these virtual spaces may subtly steer behaviors. Nudge theory postulates that so-called choice architects equipped with cognitive understanding of human psychology can leverage minor alterations to default settings, phrasing of selections, and system structures to favor more beneficial outcomes without eliminating freedom of choice (Hausman & Welch, 2010). This notion has found applications geared toward positively swaying consumer nutrition (Carroll et al., 2018), investment practices (Pilaj, 2017), and prosocial conduct (Goswami & Urminsky, 2016).

Inquiry into digital nudging has started exploring its potential use for addressing health problems by leveraging emerging technologies. For example, disease management platforms applying interface nudges show promise for facilitating chronic illness self-care regimens by judiciously utilizing content, messaging, and micro-functions to guide choices in virtual settings (Hershcovitz et al., 2021). Studies have discussed how nudges may strengthen digital transformation efforts across domains such as service uptake, value invention, structural reforms, and economic dimensions within healthcare (Meske et al., 2019). Additional research has examined

employing nudges to promote daily health behaviors (Chin et al., 2019) and nutritious dietary selections (Michels et al., 2021).

However, research findings are conflicting regarding whether and how digital technologies change people's health behaviors (Tyers, 2018; Wijk et al., 2016). While some of these differences may be related to common methodological and study evaluation-related reasons (e.g., differences in study duration or outcomes), there are also many potential intervention design-related reasons for these inconsistencies. Numerous behavioral psychology studies have shown that small contextual changes can have a dramatic effect on behavior, such as the size of buttons on a website or the way information is communicated and displayed (Amin et al., 2021b; D. S. Kumar et al., 2018; Patel et al., 2020). Both in online and offline research, contextual issues may affect the success of an intervention (e.g., the participants' race/ethnicity, gender, personality, and cultural background may affect participant adherence and engagement) (Thornhill et al., 2019; Yu et al., 2021a), but these issues become more complex when delivering an intervention digitally because the variables change more frequently and with greater difficulty in digital technology than in offline interventions (Young, 2020).

Considering that social interaction and data exchange lie at the core of networking sites, it is surprising that very few empirical works have probed how subtle adjustments to interface design could motivate productive dissemination of wellness material between users. By applying Nudge Theory to analyze users' online HISB, the current study aims to begin addressing this notable gap. With social networking sites now serving as primary conduits circulating wellness data in contemporary societies, comprehending how digital nudges may optimize diffusion processes carries meaningful practical implications.

1.3.3 Lack of integrated model in relation to digital nudging

Nudge relies on theories and perspective from behavioral economics, cognitive psychology, and social psychology, and is based on microeconomic decision theory (Thaler & Sunstein, 2008). Scholars also used Dual Process Theory to explain the mechanism by which nudge works (Hansen P. G. & Jespersen, 2013). So, there is currently research on nudge that have attempted to develop theoretical knowledge around nudging, like cognitive biases (Dolan et al., 2012; Mirsch et al., 2017; Weinmann et al., 2016). The basis for effective nudging lies in a sound understanding of the psychological mechanisms underlying individual behavioral choices. Encouragingly, previous academic research has well established the theoretical mechanisms by which digital nudging works. Apart from the Behavioral Economics theory of the origin of nudging, most other studies on digital nudging lack a strong theoretical framework. As a tool to help drive behavioral decisions, it often requires actual data to prove its effectiveness. Therefore, scholars also study the effectiveness of digital nudging by quantitative research. There are experiments on which type of nudge to use to cause behavior change (Esposito et al., 2017; Kaiser, 2018; Thornhill et al., 2019). These are great attempts, and as recent reviews (Caraban et al., 2019) have demonstrated, most behavior change online lacks definitive theoretical support.

To initially fill this theoretical gap, the researcher intends to draw on Social Capital Theory to refine the theoretical framework of this study. According to Nahapiet and Ghoshal (Nahapiet & Ghoshal, 1998), social capital reflects various resources embedded in the relationship network, including three aspects: structural dimension, relational dimension, and cognitive dimension. Social media users establish structural dimension capital in communication and interaction with others, and form relationship dimension capital in information interaction. For common views,

common values, and cognitive dimension capital of common language (Chang & Chuang, 2011; Chiu et al., 2006; Zhou, 2020). From this, Social Capital Theory emphasizes interconnection and resource sharing among individuals. In digital environments, structural, cognitive and relational social capital are often interrelated and mutually reinforcing. They facilitate collective action by making people's behavior more rewarding and predictable and by encouraging collaboration, communication, and interaction. In the digital age, social media dominate a great deal of communication and interaction in virtual community environments where information is more visible (Junaidi et al., 2020). As a result, users play the dual role of information provider and searcher, influencing each other by interacting with others to form networks of capital (Alkhamees et al., 2021).

Additionally, existing papers have studied user HISB from the perspective of social capital (Chiu et al., 2006; Y. Hong et al., 2021). Through existing studies, it was found that all dimensions of social capital contribute to the creation, exchange, and dissemination of information through the connection and exchange of resources. Indeed, Social Capital Theory not only provides a deeper explanation of the motivation of social members' actions, but also effectively combines individual choices at the micro level with collective and social choices at the macro level. In collectivist cultures like China, individuals often prioritize group harmony and community well-being over personal interests (T. Huang et al., 2022). This can enhance the effectiveness of digital nudges that appeal to social norms and collective benefits, encouraging users to share health information for the greater good. The interconnectedness among individuals means that health behaviors are often influenced by family, friends, and community (Hussein, 2022). Social capital can facilitate information sharing, making individuals more receptive to nudges that highlight communal benefits. This fits to some extent

with digital nudging and user HISB, and it suggests that social capital may well be part of the theoretical framework in this study.

Although health information sharing is done through the online, the users offline are all vivid individuals. Individuals with different personality traits have different uses of social media (Deng et al., 2017; T. Ryan & Xenos, 2011). Personality is an individual system of intrinsic and enduring characteristics that promote consistency in individual behavior (O. P. John & Robins, 2021). The Big Five personality theory proposed by Costa and McCrae (1992) is one of the most popular theories in human personality research, which states that personality is composed of five traits including neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness.

There is no doubt that personality affects the way people use social media (Buchanan, 2020). Extraversion, agreeableness and dutifulness can positively influence the use of different types of social media, but neuroticism and openness to experience are negatively correlated with them (Gil de Zúñiga et al., 2017). This gives rise to the possibility that personality variables may also influence users' interactions with health information. Indeed, in most cases, extroversion, conscientiousness, agreeableness, and openness to experience have a positive effect on individuals' information sharing behavior (Akbar et al., 2023). In contrast, neuroticism, characterized by emotional instability, anxiety, and insecurity, often negatively affects information sharing (Khan & Zaman, 2022). However, present empirical studies on the HISB of users' personality traits are inadequate. Do users' personality traits affect his HISB on social media? In this study, personality traits are incorporated into the theoretical framework to explore its influence on users' health information sharing.

In general, scholars have studied user sharing behavior based on the relevant theories of sociology and communication and used theories and methods of behavioral economics and cognitive psychology to explain whether digital nudges are effective. However, there is a lack of an integrated model to combine two of them. This study will develop an integrated model that combines various important factors in previous research on user information sharing behavior. Social capital theory provides a theoretical framework for integrating these factors, so that the design of digital nudging has a certain direction.

1.4 Research Objectives of the study

RO1: To discover the effect of digital nudging on users' HISB.

RO2: To examine the direct effect of social capital and personality traits on users' HISB.

RO3: To investigate the moderating role of social capital on the relationship between digital nudging and users' HISB.

RO4: To investigate the moderating role of personality traits on the relationship between digital nudging and users' HISB.

1.5 Research Questions of the Study

RQ1: What are the effects of different nudges on users' HISB?

RQ2: What are the direct effects of social capital and personality traits on users' HISB?

RQ3: What are the effects of social capital in moderating the relationship between digital nudging and HISB?

RQ4: What are the effects of personality traits in moderating the relationship between digital nudging and HISB?

1.6 Significance of The Study

With the above background and problem statement, it is clear that digital nudging research not only can provide people with a simple and low-cost choice structure for the decision environment to change their behavior in the expected direction, but also make a little exploration and discovery on behavioral economics. Thus, this section provides an initial summary of the significance and value of this research, providing a reasonable explanation of the research from both theoretical and practical perspectives.

1.6.1 Theoretical significance

Social media has permeated every area of our everyday lives, and worldwide social media user coverage has continued to increase. Social media has been a focal point of communication, marketing, management, and a variety of other professions during the last, and there are more and more topics about health communication in academia. At the same time, since the concept of digital nudging was put forward in 2016, it has played a significant positive role in helping improve user behavior decision-making in the new media field. However, the combined research of digital nudging and users' online information sharing behavior, especially in Chinese academic circles, is a blank field.

This research aims to make meaningful contributions to theory development in several key respects. Firstly, it will address notable gaps in understanding the influence of digital platforms on health information sharing behaviors. By applying nudging theory to analyze how subtle interface adjustments impact user conduct online, insights will be generated to supplement current literature overwhelmingly focused on individual motivations. Establishing empirical links between nudges and information

diffusion outcomes expands knowledge of technology's role in shaping social interactions.

Secondly, the study explores potentially important moderating factors rarely considered previously - social capital and personality traits. Integrating these contextual elements into theoretical frameworks enriches comprehension of their interplay with design cues. It moves beyond examining human factors alone to recognize environmental influences. The findings will help clarify under what conditions nudges prove more or less effective for diverse users. This nuanced perspective has the potential to guide more tailored interface optimizations targeting specific communities.

Thirdly, the moderation analysis paves the way for future hypotheses development. Establishing when social capital or personality traits strengthen or weaken nudging's impact yields testable predictions about their contingent relationships. This advances a more sophisticated theoretical understanding of how individual characteristics interact with environmental cues to determine conduct. It also guides selection of optimal implementation strategies accounting for audience segmentation.

Lastly, utilizing survey experiment methods permits quantitative validation of observed relationships. The multi-faceted inquiry enriches theoretical explanations beyond what single methodologies facilitate alone. It fosters a more nuanced, contextualized comprehension of the issue from complementary angles. This integrated theoretical approach sets an example for research designs that are increasingly recognized as most insightful. Overall, the study is positioned to meaningfully progress theory on multiple levels relevant to researchers, practitioners and policymakers invested in online health and behavior change.