Knowledge sharing in a health infomediary: role of self-concept, emotional empowerment, and self-esteem

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ABSTRACT

Health infomediary systems are emerging as important knowledge sharing platforms that help patients manage their own health outside of traditional health care delivery models. Patients participate in health infomedaries to learn from other patients' experiences and knowledge. Knowledge sharing is an important aspect of the success of a health infomediary. Factors related to self-concept have been widely studied in the domains of psychiatry and psychology, in settings such as mental health and behavioural well-being, but remain unexplored in the digital health context. In particular, it is not known how self-concept influences knowledge sharing behaviours in health infomedaries. This study posits that self-efficacy, social identity, and self-stigma drive knowledge sharing in an infomediary through emotional empowerment and appearance-contingent self-esteem. We use the health belief model as a foundation to propose a two-stage model and testable hypotheses. We used secondary archival data of 222 patients participating in a health infomediary specialising in reconstructive surgery. Analyses using structural equation modelling and econometric methods support the hypotheses. Findings broadly suggest that there are distinct paths through emotional empowerment and appearance-contingent self-esteem that can motivate users to contribute knowledge in health infomedaries. We explain the managerial insights and contributions of our study.

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1. Introduction

Health infomedaries are online platforms, portals, websites, and discussion forums dedicated to health. Their goal is to bring patient and provider or patient and patient together to share knowledge for health management (Khuntia, Yim, Tanniru, & Lim, 2017). Health infomedaries offer health and wellness-related information, including advice, guidance, and health evaluation functionalities. The broad objective of these online platforms is to improve health outcomes for participating patients (Wimble, 2016). The importance of health infomedaries stems from the institutionalised approach in current health systems, which directs patients to hospitals and clinics for small issues, suggestions, diagnosis, or treatment. This approach introduces complicated logistical, scheduling, and financial concerns for patients (Currie, 2009; Mays et al., 2009). Although existing models usually work, they lack just-in-time care delivery at the patient's end.

Most health infomedaries strive to provide patients with improved accessibility to health care information to achieve better health outcome. This objective can be

achieved by disseminating information and knowledge from other patients and providers, and by making that information available to prospective patients (Harwell, Pentoney, & Leroy, 2015; Yim, Khuntia, & Argyris, 2015). Communication and coordination through infomedaries can significantly reduce operational costs for health care delivery. Consequently, the care delivery process can involve and engage a patient self (Leroy, Harber, & Revere, 2016), rather than relying overly on institutions. However, despite the perceived potential for health infomedaries in health care delivery, not many have been successful. A few infomedaries, like patientslikeme.com, realself.com, and webmd.com, claim to reach millions of users. Most others, such as rxwiki.com, doctorondemand.com, and healthboard.com, are struggling to create and sustain their user bases. The value of infomedaries increases exponentially as more users join and participate. The viability of health infomedaries depends on the participation, engagement, and knowledge contribution of the user base. Involved and motivated user participation and engagement leads to the creation and accumulation of a knowledge repository, which, in turn,

serves as part of a system that attracts and benefits a patient community (Sherer, 2014). Once a user base is created, physicians and other vendors are more likely to participate and may provide financial resources for the infomediaries. Hence, for health infomediaries to be sustainable, user engagement and knowledge exchange are essential (Khuntia et al., 2017; Yim et al., 2015). This process underscores the need for a motivation-oriented approach, whereby patients are motivated to participate and contribute to an infomediary's knowledge base.

This study asks the research question: *How do empowerment and self-esteem motivate patients to share knowledge on health infomediaries?* Our broad objective is to address the puzzle concerning knowledge base creation through participation in health infomediaries. Prior research suggests that it is important to understand the factors related to knowledge sharing on health infomediaries to facilitate management of infomediaries effectively from initiation to development (Iriberry & Leroy, 2009). Some suggest that health infomediaries can play a role in the patient's self-motivation and self-empowerment by encouraging sharing of issues that may be difficult to approach in current face-to-face (e.g., clinics, doctor offices) institutional settings (Corrigan, 2004). For instance, HIV discussions may carry a stigma, and some patients may not feel comfortable discussing HIV with doctors. Health infomediaries can arguably address this issue by enabling such discussions while maintaining the privacy of patients' identities. Additionally, health infomediaries can use automated design schemas, such as chatbots and pop-up help windows on a website, that can lead patients to ask questions, seek answers or solutions, and, in turn, self-manage a disease (Deng, Khuntia, & Ghosh, 2013). To achieve this end, patients need to feel empowered that asking questions in the infomediary is helpful, or that sharing knowledge is valuable. There is a gap in empirical investigation of the role of knowledge sharing in health infomediaries on patient empowerment. The current study is an attempt to address the gap.

We adhere to the health belief model and the concepts of self and empowerment in social-psychology literature to conceptualise and test a two-stage model. The first stage suggests that three dimensions of self-concept (i.e., self-efficacy, social identity, and self-stigma) influence patient empowerment and self-esteem. The second stage predicts how empowerment and self-esteem shape knowledge sharing behaviour. While we conceptualise a generic model, the model is contextualised to the reconstructive surgery health infomediary in this study. Accordingly, the variable operationalization is relevant to the context, such as self-stigma in our context refers to stigma associated with one's appearance, social identity is due to the image perceptions due to overall appearance, and self-esteem is the appearance-contingent self-esteem. We acknowledge that the model has

limited generalizability, being constructed with a focus on a specific health infomediary context.

We conducted empirical analysis using a secondary archival data-set with a sample of 222 reconstructive surgery patients participating in a health infomediary providing a forum for reconstructive surgery providers and patients to ask questions, make comments, and provide or dispense reviews. Reconstructive surgery is performed to treat structures of the body affected aesthetically or functionally by congenital defects, developmental abnormalities, trauma, infection, tumours, or any other disease. Reconstructive operations attempt to restore the anatomy or the function of the body part to normal. They are generally done to achieve a more typical appearance of the affected structure through cosmetic or elective procedures, but many are also performed to improve function and ability. According to the American Society of Plastic Surgeons (ASPS), there were 1.7 million cosmetic surgical procedures, 15.4 million surgical and minimally invasive cosmetic procedures, and 5.8 million reconstructive procedures performed in the United States in 2016, with 3% to 4% increase in cosmetic procedures from 2015 (American Society of Plastic Surgeons, 2016). It is reported that the size of the current reconstructive surgery market is more than \$20 billion, and it is expected to reach to over \$27 billion by 2019 (PRNewswire Research & Markets, 2015). In addition, many patients seek reconstructive surgery outside their home countries, whether to save money, for privacy, or owing to faster service availability. In this context, pre- and postoperative information and knowledge associated with the surgery plays a major role in reducing information asymmetry and improving the patient's decision-making and postoperative management processes (Deng et al., 2013). Thus, the reconstructive surgery context is a rich and appropriate one for this study.

We used both structural equation modelling and econometric approaches for our empirical analysis. Findings highlight the importance of self-concept on knowledge sharing; this relationship is mediated through empowerment and self-esteem paths. Comparative analysis of the two mediated paths reveals that self-esteem may be a more important mediator of the relationships between self-efficacy and knowledge sharing, and between internalised self-stigma and knowledge sharing. Conversely, emotional empowerment is a more important mediator in the path from social identity to knowledge sharing. These findings contribute to our understanding of the factors and mechanisms responsible for knowledge sharing in health infomediaries. We discuss the results of our analysis from the health infomediary growth and sustenance perspectives, and we provide managerial implications and theoretical contributions that can be extended to other studies in the future.

2. Prior work and theoretical background

Prior work on health infomediaries includes establishing definitions for health infomediaries and their attributes (Vega, DeHart, & Montague, 2011); qualitatively exploring inhibitors and motivators (Ambrose & Basu, 2012); classification of user categories (Yim et al., 2015); and trust, privacy, and information use issues with infomediaries (Lim & Kim, 2012). Existing studies allude to the need for knowledge sharing and the role of user empowerment in this process (Khuntia et al., 2017; Marabelli, Newell, Krantz, & Swan, 2014).

The *concept of self* is highly relevant to health and health infomediaries. Studies note that understanding the self-related factors that can motivate users' knowledge sharing is key to the initiation or development of a community (Iriberri & Leroy, 2009). Social-psychology literature has established "self-concept" as a multi-dimensional construct that integrates a collection of beliefs about oneself (Greenwald et al., 2002) and consists of at least three aspects: (1) self-efficacy, which refers to the confidence in one's ability to complete a task within a particular context (Bandura, 1997); (2) social identity, which is the acknowledgement of one's position in a social milieu or group that one can connect to or belong to, where a social group is a set of persons having a common social identification (Abrams & Hogg, 2006; Morgan, 2016); and (3) internalised self-stigma, which is the change in or deterioration of one's self-esteem or self-worth as the result of labelling oneself as socially unacceptable (Corrigan, 2004; Goffman, 2009).

Self-esteem refers to the feeling of self-worth. When one's self-esteem is dependent on outcomes within a single domain, it is referred to as contingent self-esteem. In other words, *contingent self-esteem* refers to the situation when one's self-esteem can be affected by, or is staked to, the outcomes of events within a specific domain (Crocker & Park, 2004). Self-esteem is gradually

developed from childhood through adolescence, and may change depending on change in the feeling of self-worth.

Empowerment refers to a process by which individuals, groups, or organisations gain control over matters that are of interest to them (Zimmerman, 1995). Health infomediaries may be able to provide patients with empowerment by contributing to their understanding of how to manage and monitor disease (Khuntia et al., 2017). Prior studies note that empowerment, as a form of intervention, might have varying characteristics in different contexts given different cultural or societal values, power distance, and organisational hierarchies. Patient empowerment, a relatively new concept, includes support for developing treatment strategies and exchanging knowledge, as well as encouraging patients to take responsibility for their own health (Salmon & Hall, 2003). Though empowerment can have multiple dimensions, emotional empowerment captures the underlying psychological state of being empowered, and it shapes patients' state of mind regarding health management (Deng et al., 2013).

3. Research model and hypotheses

The conceptual model (see Figure 1) for this study is founded on the health belief model, which suggests that people's beliefs about health problems, perceived benefits of action, barriers to action, and self-efficacy explain engagement (or lack of engagement) in health-promoting behaviour (Janz & Becker, 1984). Individuals will take action regarding their health when they believe that such action can lead to better outcomes. This health-promoting behaviour must be triggered by a cue to action. We posit that self-esteem and empowerment are two enablers for the cue to action process, and we map the health belief model onto our two-stage

Figure 1. Conceptual model.

conceptual model. The first stage suggests that beliefs about one's health management are manifested through the three dimensions of the self-concept, namely, self-efficacy, self-identity, and self-stigma. We hypothesise that these three dimensions impact appearance-contingent self-esteem and emotional empowerment (stage 1 of the conceptual model), which in turn influence the patient's knowledge sharing on the health infomediary (stage 2 of the conceptual model). Table 1 provides a summary of our arguments to link the constructs in the conceptual model, which we elaborate next.

We first propose that self-efficacy influences emotional empowerment and self-esteem (H1a and H1b). For these relationships, we provide two mechanisms: (1) inhibition overriding and (2) sense of improvement in belief. The self-efficacy concept notes that, as a person feels skilful in managing a task, process, or situation, he or she feels enabled, empowered, and less inhibited (Bandura, 1997). A person with high self-efficacy or confidence in managing health overrides his or her inhibitions related to the disease management process. The individual then understands and makes the required behavioural changes to manage health and disease, such as adhering to medication regimens, seeking and following treatment procedures, and making health-related behaviour adjustments or lifestyle changes. Lack of self-belief or self-control can lead to a sense of powerlessness and subsequent ill health (Graffigna, Barelllo, & Riva, 2013; Tengland, 2008). Similarly, feeling a sense of empowerment could lead to the execution of actions

required for disease treatment or management (Aujoulat, d'Hoore, & Deccache, 2007). The outcomes of health-focused motivation include a goal-directed approach and willingness to engage in behaviours to reach these goals. Thus, we argue that, with higher self-efficacy, a patient's feeling of increased power with respect to managing his or her health situation may increase, thereby leading to higher empowerment. Based on these arguments, we hypothesise that:

Hypothesis H1a: *Self-efficacy of reconstructive surgery patients participating in the health infomediary is positively associated with emotional empowerment.*

Along with the influence of self-efficacy on empowerment, we also argue that self-efficacy may reflect a gap on the patient's part. As much as self-efficacy motivates a person to use available avenues to find solutions to problems, the process of enabling self-efficacy may lead a person to discover or explore problems with his or her body or appearance (Aujoulat et al., 2007). The appearance problems may affect a person's feeling of self-worth. For instance, higher self-efficacy would result in an obese person discovering that there are external ways and means to address his or her appearance or body-related challenges. Hence, his or her self-esteem is less likely to fluctuate with problems related to appearance. In other words, higher self-efficacy might result in a reduction of the dependency of self-esteem on appearance. Thus, we hypothesise:

Hypothesis H1b: *Self-efficacy of reconstructive surgery patients participating in the health infomediary is negatively associated with appearance-contingent self-esteem.*

Table 1. Theoretical mechanisms linking the constructs in the conceptual model.

Relationships		Hyp.	Linking mechanisms/arguments	Association
Self-efficacy	→ Emo. Emp.	H1a	• Inhibition overriding	Positive
Self-efficacy	→ Self-esteem	H1b	• Sense of improvement in belief	Negative
Social identity	→ Emo. Emp.	H2a	• Positive distinctness	Positive
Social identity	→ Self-esteem	H2b	• Achievement motivation • Social value orientation	Positive
Self-stigma	→ Emo. Emp.	H3a	• Awareness of stereotypes	Negative
Self-stigma	→ Self-esteem	H3b	• Identification of stereotypes • Efficacious evaluation	Positive
Emo. Emp.	→ Knowledge share	H4a	• Pursuance or lack of innovative actions	Positive
Self-esteem	→ Knowledge share	H4b	• Monitoring and forward influence	Negative

Note: Emo. Emp.: Emotional empowerment.

The second set of hypotheses (H2a and H2b) proposes that social identity influences emotional empowerment and self-esteem. We argue that these relationships are based on three underlying concepts relevant to positive distinctness, achievement motivation, and social value orientation. First, social identity provides a positive distinctness, or a sense that the individual belongs to a group. Being in a group makes one distinct from others who are either not part of the group or are part of other groups (Hogg, Terry, & White, 1995). From a higher sense of belonging to the group, one derives a positive feeling that people accept one, and one feels good about oneself and one's own appearance (Tajfel & Turner, 2004). For instance, one who has developed a strong sense of belonging to online health infomediary is likely to feel better about oneself, in terms of one's appearance and belief in one's ability to change oneself or others' well-being. If one feels that people are very impressed by someone's health, accept how one looks, it makes one confident about one's appearance and well-being. The positive vibes radiate and reflect in more positivity. This leads to a higher appearance-contingent self-esteem and empowerment regarding one's overall health.

Second, higher social identity means that the individual has a higher motivation or desire to achieve,

maintain, or enhance something good in a social sense. Group affiliations provide people with an increase in their motivation for achievement, and subsequent positive feelings (Abrams & Hogg, 2006). A group of similar patients participating in a health infomediary usually motivate each other to overcome their fears, to ignore criticism, and to see their real value. That enhances users' feelings of self-worth, which can contribute to a desire to feel and look better. As a result, he or she increases his or her appearance-contingent self-esteem and empowerment.

Third, individuals with high group affiliations or social identity can be classified as possessing either prosocial or competitive social value orientations (Balliet, Parks, & Joireman, 2009). Behaviour that is congruent with one's social value orientation increases social worth-related confidence. This then becomes the source of self-esteem. For example, prosocials may gain higher confidence through helping others on the health infomediary because they value the benefits of the group more than their own benefits. On the other hand, individuals with a competitive social value orientation tend to be more concerned about themselves rather than society (Van Lange, Joireman, Parks, & Van Dijk, 2013). They would take actions that make them appear more self-confident and allow them to gain recognition from other group members, which in turn will make the person look and feel better, thereby increasing appearance-contingent self-esteem. In other words, social identity drives prosocial and competitive social value orientations that convert into better appearance-contingent confidence, an increase in self-worth or self-esteem, and an increase in the individual's confidence in his or her ability to manage his or her own health. Based on these arguments, we hypothesise:

Hypothesis H2a: *Social identity of reconstructive surgery patients participating in the health infomediary is positively associated with emotional empowerment.*

Hypothesis H2b: *Social identity of reconstructive surgery patients participating in the health infomediary is positively associated with appearance-contingent self-esteem.*

The third set of hypotheses (H3a and H3b) proposes that internalised self-stigma influences self-esteem and emotional empowerment. We argue that these relationships are based on three mechanisms: awareness of stereotypes, identification with stereotypes, and efficacious evaluation. Self-stigma occurs when individuals buy into society's conceptions or misconceptions about their conditions (stereotyping), and it is further aggravated by individuals' internalisation of negative feelings (internalised self-stigma). This leads to feelings of shame, anger, hopelessness, or despair that keep individuals from seeking social support, employment, or treatment for their health conditions (Ritsher, Otilingam, & Grajales, 2003; Vauth, Kleim, Wirtz, & Corrigan, 2007). In one

sense, self-stigma stems from a lack of participation in evidence-based practices that support the achievement of life goals.

Higher self-stigma involves awareness and identification of stereotypes in the society (Major & O'Brien, 2005). For example, stereotypes about mental illness include blame, dangerousness, and incompetence (Corrigan & Kleinlein, 2005). Being aware of the stereotypes, the individual may ignore or identify with them. Identification with the stereotyping may lead to a feeling of inadequacy and subsequent depression. Such a depressive state lingers and interferes with daily life and health management, affecting energy and empowered feelings. The individual would then need professional help rather than a self-empowering path to improved feelings.

Agreement or disagreement with existing stereotypes may not be sufficient to produce self-stigma. Internalisation of self-stigma requires one to apply stereotypes to oneself (e.g., "I am not good looking, and so I am the one to be blamed for my disorder", or, "I am responsible for my mental disorder") (Watson, Corrigan, Larson, & Sells, 2007). The process of applying stereotypes to oneself is called *efficacious evaluation*, and it may generate positive or negative reactions. Fighting against these reactions or the elements of these reactions may be problematic. Thus, as an individual internalises self-stigma, it may be difficult for him or her to fight the stereotyping (Corrigan, 2004; Ritsher et al., 2003). In addition, individuals who internalise self-stigma relative to their appearance (e.g., body image, facial attributes, obesity) are ashamed of their attributes or appearance. This shame means lower feelings of self-worth because of their appearance or higher appearance-contingent self-esteem.

Furthermore, self-stigma is often associated with anxiety (Lysaker, Yanos, Outcalt, & Roe, 2010). In many cases, individuals with anxiety tend to avoid being the centre of attention (which may increase anxiety). Conversely, emotionally empowered individuals like to be the centre of attention. Thus, it can be argued that individuals with self-stigma are less likely to be emotionally empowered and to be motivated to manage their health.

The following two examples substantiate our arguments. An unattractive individual may be bullied from early childhood and might associate the bullying experiences with being unattractive. The feeling of being unattractive is highly internalised, and the individual applies the stereotype of "ugly" to himself or herself. This internalised self-stigma could lead the individual to be embarrassed about his or her identity, capability, or attributes (e.g., appearance) because the individual had a bad experience and subsequently developed self-stigma. Such a process may lead the person to feel that he

or she cannot do anything about his or her appearance, thereby reducing feelings of empowerment (Ilic et al., 2013). As another example, being labelled as oversized or obese also tends to impose stigma on a person and influence the person's self-esteem, especially when that person's self-esteem is highly dependent on appearance. As an obese person internalises self-stigma, self-esteem is more likely to fluctuate with appearance, thereby increasing the degree of appearance-contingent self-esteem. Based on these discussions, we hypothesise:

Hypothesis H3a: *Internalised self-stigma of reconstructive surgery patients participating in the health infomediary is negatively associated with emotional empowerment.*

Hypothesis H3b: *Internalised self-stigma of reconstructive surgery patients participating in the health infomediary is positively associated with appearance-contingent self-esteem.*

The fourth and final set of hypotheses (H4a and H4b), relevant to the second stage of the conceptual model, proposes that appearance-contingent self-esteem and empowerment influence knowledge sharing behaviour. Empowerment energises and sustains individual behaviours (Thomas & Velthouse, 1990). Conger and Kanungo (1988) posit that empowerment stimulates and manages innovativeness, and that they are inextricably linked. Once empowered individuals are motivated to make a change, they are more likely to take some innovative action to achieve a desired outcome. In the context of health infomediaries, such action will involve seeking and sharing disease- or health-related information.

The concepts of *monitoring* and *forward influence* are related to attempts at influencing someone else, either a peer or someone higher in a community or team (Gajendran & Joshi, 2012; Kirkman, Rosen, Tesluk, & Gibson, 2004). Empowered individuals, given their proactive approach to life and work, will monitor and actively influence their peers and the community as a whole. The sense of control and power derived from empowerment leads people to engage in influencing actions. Similarly, a high degree of self-confidence or competence, stemming from empowerment, is a critical determinant for influencing actions, such as words, dialogues, convincing actions, and knowledge sharing behaviours. Thus, emotional empowerment can also involve encouraging other users or patients about the value of their knowledge and experience and the contribution it makes to other patients. Empowered patients are confident, and they prefer to lead conversations rather than being observers or followers (Khuntia et al., 2017).

In contrast to empowered individuals, individuals with high self-esteem may feel confident, but they are not driven. Rather, appearance-contingent self-esteem is highly related to self-image; it does not necessarily encourage any innovative, behaviour-oriented actions (Crocker, Luhtanen, Cooper, & Bouvrette, 2003; Knee,

Canevello, Bush, & Cook, 2008). Thus, we argue that emotional empowerment is the primary enabler for an individual to take a new action or engage in innovative behaviour, such as sharing knowledge about health. On the other hand, appearance-contingent self-esteem is fragile and does not provide any action-oriented push. Appearance-contingent self-esteem individuals are likely to avoid any actions or behaviours that could undermine their self-esteem, and hence are less likely to engage in sharing processes.

Individuals with high self-esteem exhibit more self-monitoring behaviours than forward-influencing behaviours (Gajendran & Joshi, 2012; Kirkman et al., 2004). Monitoring, in appearance-contingent self-esteem, involves assessing deviations from a desired appearance. This involves controlling appearance-related attributes in a highly self-oriented process rather than in an influencing process. Thus, self-esteem-based monitoring can be seen as an antithesis of forward-influence or knowledge sharing behaviours. We would expect such anti-knowledge sharing behaviours to be aggravated among health infomediary users because any sharing of information by an individual with higher self-esteem may be perceived as sharing something personal and private (Bansal & Gefen, 2010). For example, when discussing reconstructive surgery, one might show images of oneself before and after the surgery. The before-image usually depicts one's bad or worse version of appearance. Individuals with high appearance-contingent self-esteem are likely to keep it personal and are less likely to share those pictures with anybody. Thus, we posit that empowerment is positively associated with knowledge sharing, whereas appearance-contingent self-esteem has a negative relationship with knowledge sharing. Based on these arguments, we posit our final set of hypotheses:

Hypothesis H4a: *Emotional empowerment positively influences knowledge-sharing behavior within a health infomediary.*

Hypothesis H4b: *Appearance contingent self-esteem negatively influences knowledge-sharing behavior within a health infomediary.*

4. Methodology

This study uses archived and de-identified data collected by a consulting firm that tracks users of a health infomediary. This infomediary is focused on reconstructive surgery, where patients and providers share their knowledge and experiences through questions, comments, and reviews. Figure 2 shows an example of a review and comments from patients. The consulting firm sent out a survey to 2542 active members between 2014 and 2015. After incomplete responses were removed, the data contain the responses and demographic data from 222 patients. The response rate was 8.73%. There was no significant difference in demographic attributes

Figure 2. Screenshot showing a user's activities in a health infomediary.

between responses and non-responses. Most of the respondents (87.7%) are female, consistent with the contextual and research observations that reconstructive surgery patients are predominantly females (95.6%) (Schlessinger, Schlessinger, & Schlessinger, 2010).

Table 2 provides the variable descriptions and operationalization using survey items, along with relevant references. Variables were measured using existing reliable and validated constructs used in prior studies. Table 3 provides the descriptive statistics and pairwise correlations among variables. Internal consistency (Cronbach's alpha) of all variables was between 0.79 and 0.88, which is higher than the suggested threshold of 0.7 (Gefen, Straub, & Boudreau, 2000). We checked the loadings of the indicators on their underlying constructs and found them to be higher than or equal to the suggested threshold of 0.7. Discriminant validity was observed

and validated in two ways: (1) when the indicators load much higher on their underlying constructs than on the others, and (2) when average variance extracted (AVE) is higher than 0.5 and the square root of AVE is higher than correlations among the underlying construct and all other constructs. We found that these two conditions for AVEs for all constructs were satisfied. This pattern demonstrates high reliability and high discriminant validity. The number of observations in some models is less than the total sample size due to missing observations in some of the variables.

5. Empirical analysis and findings

We use both partial least squares (PLS) and econometric methods for empirical analysis. PLS is a component-based structural equation modelling (SEM)

Table 2. Description and operationalization of variables.

Variable	Description and survey questions	References
Self-efficacy (EFF)	The confidence in one's ability to complete a task within a particular context • I am confident that I could deal efficiently with unexpected events • I can always manage to solve difficult problems if I try hard enough • If I am in trouble, I can usually think of a solution • I can solve most problems if I invest the necessary effort	Luszczynska, Scholz, and Schwarzer (2005) and Tams and Røysamb (2014)
Social identity (SID)	One's acknowledgement of a social group that he or she belongs to • Overall, my group memberships have a strong effect on how I feel about myself • The social groups I belong to are an important reflection of who I am • In general, belonging to social groups is an important part of my self-image • The social groups I belong to are important to my sense of what kind of a person I am	Luhtanen and Crocker (1992)
Internalised self-stigma (ISS)	Internalisation of negative feelings, shame, anger, hopelessness, or despair • My physical appearance makes me feel bad • I feel guilty about my physical appearance • I am ashamed of my physical appearance • My physical appearance has spoiled my life	Kalichman et al. (2009)
Appearance-contingent self-esteem (CSE)	When one's self-esteem is dependent on the outcomes within the domain of physical appearance • My self-esteem is influenced by how good looking I think I am • My self-esteem does not depend on whether or not I look good. (reverse coded) • My self-esteem is not related to how I feel about the way I look. (reverse coded) • My sense of self-worth suffers whenever I think I don't look good	Crocker et al. (2003)
Emotional empowerment (EMO)	Emotional component of psychological empowerment, the process through which people and groups gain greater control over their lives. • I would prefer to be a leader rather than a follower in a conversation • I would prefer someone else act as a leader when I'm involved in a conversation. (reverse coded) • I am often a leader in a conversation	Speer and Peterson (2000) and Vauth et al. (2007)
Knowledge-sharing behaviour (KSB)	The behaviour when a person disseminates his or her knowledge to other members within a community. • I frequently participate in knowledge-sharing activities on health websites • I usually spend a lot of time conducting knowledge-sharing activities on health websites • I usually share my knowledge with others on health websites	Oliveira, Curado, Maçada, and Nodari (2015) and Xue, Bradley, and Liang (2011)
AGE	Age of the respondent. Scale: 1 = 18–24 years, 2 = 25–34 years, 3 = 35–44 years, 4 = 45–54 years, 5 = 55–64 years, 6 = 65–74 years, and 7 = 75 years or older	
Education (EDU)	Highest education attained: 1 = Did not attend school, 2 = Pursuing high school, 3 = Finished high school, 4 = Pursuing college, 5 = Finished college	
Income (INC)	Income of the respondent. Scale: 1 = \$0–\$24,999; 2 = \$25,000–\$49,999; 3 = \$50,000–\$74,999; 4 = \$75,000–\$99,999; 5 = \$100,000–\$124,999; 6 = \$125,000–\$149,999; 7 = \$150,000–\$174,999; 8 = \$175,000–\$199,999; 9 = \$200,000 and up	

Notes: Survey items are measured on a seven-point scale: 1 = highly disagree to 7 = highly agree.

Table 3. Descriptive statistics and pairwise correlation among variables.

	Obs	Mean	SD	Min	Max	Alpha	AVE	1	2	3	4	5	6	7	8	9
EFF	222	5.82	1.17	1	7	0.86	0.71	0.84								
SID	222	3.35	1.64	1	7	0.88	0.74	–0.01	0.86							
ISS	222	3.00	1.88	1	7	0.91	0.79	–0.29	0.09	0.89						
CSE	222	3.99	1.69	1	7	0.87	0.72	–0.32	0.21	0.56	0.85					
EMO	222	4.64	1.50	1	7	0.80	0.71	0.40	0.12	–0.22	–0.27	0.84				
KSB	222	5.59	1.44	1	7	0.81	0.72	0.59	0.11	–0.56	–0.47	0.37	0.85			
AGE	222	3.43	1.40	1	6	1.00	1.00	0.08	–0.04	–0.18	–0.26	0.12	0.22	1.00		
EDU	220	4.40	0.73	2	5	1.00	1.00	–0.04	0.08	0.05	–0.07	–0.07	–0.05	–0.15	1.00	
INC	220	3.58	2.21	0	9	1.00	1.00	0.00	0.07	0.07	–0.02	–0.02	–0.12	–0.09	–0.21	1.00

Notes: Correlations above 0.2 are significant at the $p < 0.05$ level; the values on the matrix diagonals represent the square roots of AVEs.

Figure 3. Results of partial least squares estimation ($n = 220$).

technique that estimates path coefficients, appropriate for multistage latent variable-based models (Garson, 2016). PLS results are presented in Figure 3.

In addition to PLS, we use two structural econometrics methods, 3-stage least squares (3SLS) and seemingly unrelated regressions (SUREG), to address any potential endogeneity concerns and validate the PLS results. In these models, appearance-contingent self-esteem and emotional empowerment are simultaneously determined

by the first stage model, thus making them endogenous explanatory variables for knowledge sharing behaviour in the second stage. The 3SLS estimation allowed us to explicitly account for possible contemporaneous correlations among the disturbances of the specified equations, and SUREG estimation used predicted probabilities of the two mediating variables to estimate the parameters (Greene, 2012). The results, as shown in Table 4, are comparable with the PLS results. Results are consistent

Table 4. Econometric estimation results.

	SUREG		3SLS		PLS	
First stage: health relevant actions (EMO and CSE)						
	CSE	EMO	CSE	EMO	CSE	EMO
EFF	-0.26*** (0.08)	0.46*** (0.08)	-0.25*** (0.08)	0.44*** (0.07)	-0.17*** (0.06)	0.37*** (0.06)
SID	0.15*** (0.06)	0.12** (0.06)	0.12** (0.05)	0.18*** (0.04)	0.16*** (0.05)	0.15** (0.06)
ISS	0.44*** (0.05)	-0.10* (0.05)	0.45*** (0.05)	-0.12*** (0.04)	0.47*** (0.06)	-0.11* (0.06)
AGE	-0.20*** (0.07)	0.01(0.07)	-0.22*** (0.06)	0.06(0.04)	-0.16*** (0.05)	0.06(0.06)
EDU	-0.17 (0.13)	0.09 (0.13)	-0.11 (0.12)	-0.05 (0.08)	0.00 (0.06)	-0.05 (0.06)
INC	0.10** (0.04)	-0.04 (0.04)	0.07* (0.04)	0.02 (0.03)	-0.04 (0.06)	-0.03 (0.06)
Observations	218	218	218	218	220	220
R ²	0.396	0.193	0.394	0.178	0.394	0.203
χ ²	143.03	52.27	143.87	64.37		
RMSE	1.32	1.34	1.32	1.36		
Second stage: infomediary contingent action (KSB)						
	KSB		KSB		KSB	
CSE	-0.41*** (0.08)		-0.41*** (0.14)		-0.40*** (0.06)	
EMO	1.11*** (0.13)		1.11*** (0.23)		0.27*** (0.06)	
Observations	218		218		222	
R ²	0.529		0.558		0.287	
F(2, 215)	124.10					
χ ²			73.97			
RMSE	1.00		1.80			
GOF					0.4641	

Notes: Standard errors in parentheses. Pseudo R^2 are presented for Ordered Probit results. R^2 and χ^2 are all significant at $p < 0.01$. Some models have less observations due to missing data in controls variables.

*** $p < 0.01$;

** $p < 0.05$;

* $p < 0.1$.

with slight variations across coefficients, significance levels, and model fit parameters.

The first set of hypotheses predicts an influence of self-efficacy on emotional empowerment and appearance-contingent self-esteem. We find that self-efficacy has a positive and significant effect on emotional empowerment ($\beta = 0.37, p < 0.01$), supporting hypothesis H1a. Results show that self-efficacy has a negative and significant effect on appearance-contingent self-esteem ($\beta = -0.17, p < 0.01$), supporting hypothesis H1b. Regarding the second set of hypotheses, we find that social identity has a significant positive effect on emotional empowerment ($\beta = 0.15, p < 0.05$), supporting hypothesis H2a. Hypothesis H2b is also supported, with a positive and significant association between social identity and appearance-contingent self-esteem ($\beta = 0.16, p < 0.01$).

The third set of hypotheses related self-stigma to the emotional empowerment and appearance-contingent self-esteem variables. Results show that self-stigma has a negative and significant association with emotional empowerment ($\beta = -0.11, p < 0.1$), supporting hypothesis H3a. Furthermore, H3b is also supported, with a positive and significant coefficient ($\beta = 0.47, p < 0.01$) for the association between self-stigma and appearance-contingent self-esteem.

Finally, we also find support for the fourth and final set of hypotheses. Emotional empowerment has a positive and significant effect on knowledge sharing behaviour ($\beta = 0.27, p < 0.01$). Appearance-contingent self-esteem has a significant but negative effect on knowledge sharing behaviour ($\beta = -0.40, p < 0.01$).

5.1. Robustness checks and mediation analysis

We conducted several robustness checks. First, results remain similar with or without control variables. Gender is not used as a control variable because more than 87.7% of respondents were female, so the results may

not be generalizable across gender. Among the control variables, only the effect of age on appearance-contingent self-esteem is significant ($\beta = -0.16, p < 0.01$), while the others are not significant. This result implies that younger respondents tended to have more highly appearance-contingent self-esteem.

Second, we tested for multicollinearity by computing condition indices. We also calculated variation inflation factors (VIFs); the mean VIF is less than 7 in our models, indicating that multicollinearity is not a serious concern in our analyses. Third, because the dependent and independent variables are from the same survey instrument, we conduct Harman's one-factor test to assess the sensitivity of our results to common method bias. The principal component analysis for key variables yields multiple factors, some with eigenvalues exceeding one. Since no single factor emerges as a dominant factor accounting for most of the variance, common method bias does not seem to be a serious problem.

Given that there are two paths in the model (i.e., emotional empowerment and appearance-contingent self-esteem paths) to arrive at the knowledge sharing outcome from the dimensions of self-concept, we conducted an additional mediation analysis and compared the two paths for each of the independent variables related to self-concept (i.e., self-efficacy, social identity, and internalised self-stigma) on knowledge sharing behaviour (see Table 5). We find that, while the appearance-contingent self-esteem path is a more influential mediator between self-efficacy and internalised self-stigma to knowledge sharing, the emotional empowerment path is better from social identity to knowledge sharing.

6. Discussion

6.1. Insights from findings

The first set of findings suggests that self-efficacy has a positive association with emotional empowerment and a negative association with appearance-contingent

Table 5. Mediation analysis and path comparison tests.

Dependent variable	Independent variable	Mediating variable	Direct effect coefficient	Indirect effect coefficient	Proportion of total effect that is mediated	Ratio of indirect to direct effect
KSB	EFF	EMO	0.66*** (0.07)	0.08*** (0.03)	0.11	0.12
KSB	EFF	CSE	0.63*** (0.06)	0.11*** (0.03)	0.14	0.17
KSB	SID	EMO	0.09* (0.06)	0.04* (0.02)	0.28	0.39
KSB	SID	CSE	0.21*** (0.06)	-0.08** (0.03)	-0.60	-0.37
KSB	ISS	EMO	-0.38*** (0.04)	-0.05*** (0.02)	0.11	0.12
KSB	ISS	CSE	-0.34*** (0.05)	-0.08*** (0.03)	0.19	0.23

Notes: Sample size: 218 (less than the total sample due to missing values). Parameter estimates are based on Sobel–Goodman mediation tests using Stata software. Sobel and/or Goodman coefficients are significant at the $p < 0.01$ levels but significant at $p < 0.1$ level for the KSB→SID→EMO path. Estimations include age, education, and income as controls. Standard errors in parentheses.

Significance levels:

*** $p < 0.01$;

** $p < 0.05$;

* $p < 0.1$.

self-esteem. In addition, social identity has significant positive effects on emotional empowerment and appearance-contingent self-esteem. These findings suggest that people with higher self-efficacy and social identity will have a stronger sense of emotional empowerment and that their self-esteem will not be contingent on their feelings about their appearance. However, individuals with higher self-stigma will try to analyse and reanalyse their internalisation and related self-worth to follow an “internal self-realisation” path. This is validated from the finding that self-stigma is negatively associated with emotional empowerment. These insights suggest that the concept of self in a health management context is highly relevant. How an individual perceives his or her skills regarding health management, his or her social identity, and the extent to which he or she has internalised of stigmas, such as guilt, shame and anger, are precursors to the actions that the person takes towards managing his or her health. In other words, beyond physical health, the psychological self has a key role to play in subsequent steps towards action, such as seeking encouragement and improving feelings of self-worth.

We find that self-stigma has a negative and significant association with emotional empowerment while it has positive and significant effect on appearance-contingent self-esteem. These results emphasise the role of self-stigma in infomediaries. The health infomediary designers and managers should foster social support for those with self-stigma and take immediate action to intervene when the discussion contributing to self-stigma may be helpful. For instance, coordinating self-empowered users with self-stigmatised users can easily be automated with the assistance of machine learning algorithm such as similarity measure matching. Developing interventions to minimise the feeling of being excluded from the community or the feeling of being labelled as inferior may also help foster emotional empowerment and reduce the effect of appearance-contingent self-esteem. As an example, it may be helpful to make patients believe that the infomediary has a unique value and is a unique community, and that they are important to the community.

Emotional empowerment has a positive and significant effect on knowledge sharing, but appearance-contingent self-esteem has a significant but negative effect on knowledge sharing. Emotional empowerment can help foster active knowledge sharing on health infomediaries. When infomediary users are empowered, they are motivated to share their knowledge and personal experiences in the infomediaries. Therefore, the health infomediaries should focus on strategies to facilitate emotional empowerment among members. For example, infomediaries could foster empowerment using mechanisms like badges based on the user's level of participation.

Patients whose self-esteem is contingent on their appearance are less likely to share their knowledge in infomediaries. This implies that patients with highly

appearance-contingent self-esteem do not always share their knowledge. Only patients whose self-esteem is not highly contingent on appearance will likely share their knowledge in the infomediaries. However, as patients gain higher self-efficacy, their self-esteem tends to be less dependent on appearance, and they are more likely to share their knowledge. In other words, although the infomediaries cannot directly change the extent to which self-esteem is contingent on appearance, they may be able to boost knowledge sharing by increasing the members' self-efficacy.

6.2. Implications for Practice

This study establishes the importance of self-concept, consisting of self-efficacy, social identity, and self-stigma, along with emotional empowerment and appearance-contingent self-esteem, as important parameters for knowledge sharing behaviour in a reconstructive surgery health infomediary. The key implication from the findings is that empowerment reinforces self-efficacy when self-efficacy is high. Higher social identity implies that an individual looks for external validation, and external validation is required to change one's social identity. Conversely, self-stigma and self-efficacy relate to how one perceives and judges oneself. Therefore, these traits are less influenced by external validation and more influenced by self-evaluation. Thus, self-efficacy is likely to be “better” than empowerment from the point of view of behaviour change with information gleaned from the infomediary because it focuses on improving one's own well-being. On the other hand, social identity links the self with the social context, which implies that empowerment is more likely to result in knowledge sharing because one needs some reinforcement from outside. Broadly, these findings suggest that a single path is not necessarily ideal, and both paths are necessary to manage knowledge sharing in infomediaries.

These path comparisons have practical implications for health infomediaries. To design effective intervention systems, health infomediaries need to personalise the interventions to the users' characteristics. Rather than a “panacea for all”-type intervention that asks users share their knowledge using chatbots, for example, intervention systems need to follow an assessment and recommendation process. For example, prior or current assessment using a few questions can determine if the patient has higher social identity. Then, since empowering reinforcement will work well for this type of patient, the chatbot or intervention system can suggest that, by sharing his or her knowledge regarding the procedures or treatments with others, the individual will be providing value to the community, and others will recognise that value. For a patient with higher self-stigma, perhaps the request to participate could use different language, for example by suggesting that the individual's participation

will help others, thereby suggesting that participation will lead the individual to feel higher self-worth. Thus, from our findings, we provide a strong recommendation that the design of intervention systems (e.g., chatbots, pop-up suggestions, or human call-agents) in health infomediaries incorporate personalization strategies following users' individual attributes.

6.3. Contributions to research

This is the first study to combine self-concept and emotional empowerment to explain knowledge sharing behaviour online. This study contributes to theory by identifying and validating the ideas of self-concept and emotional empowerment, and providing evidence that these can lead to engagement with health infomediaries. Because it shows that emotional empowerment plays a role in patient responsiveness within a health infomediary, this study could lead to further discussion on the role of health infomediaries in patients' management of their own health. This is especially critical in chronic disease management because patients who live alone need constant motivation to manage their diseases. These findings could be applicable to a wide variety of knowledge sharing situations where the knowledge being shared could be personal or embarrassing. In addition, the findings motivate the need for further research in interface design in the information systems design stream-related research, and appropriate incentive structure for knowledge sharing within a health infomediary, as health information technology and economic stream of research.

6.4. Study limitations

This study was used in one health infomediary context. A majority of survey participants have been users of health infomediary, so the survey response may be biased towards infomediary users, than non-users. This is a sample-bias limitation of this study. In addition, the cross-sectional design of the study limits any causal interpretation of the findings. Furthermore, as highlighted earlier, the model used in this study is specifically constructed using reconstructive surgery context as the focus. We note that the variables, in general, are quite health-management centric, and can be applied to other contexts, with appropriate modifications in their operationalization. Thus, the model is limited to the context of this study, but it has enough scope to be generalised to other health infomediary contexts, with suitable modifications.

7. Conclusion

In conclusion, this study provides a new perspective on the importance of self-concept (and its dimensions) to patient empowerment and knowledge sharing in a health infomediary. The dimensions of self-concept,

via appearance-contingent self-esteem and emotional empowerment, influence knowledge sharing behaviour. Data collected from a health infomediary designed for reconstructive surgery patients are used to validate several hypotheses. The findings highlight the role of self-efficacy, self-stigma, and social identity in the health infomediary context. Most importantly, fostering self-efficacy alone may not encourage knowledge sharing. Instead, health infomediaries should facilitate knowledge sharing through emotional empowerment and minimise the negative effect of appearance-contingent self-esteem through manipulation of self-efficacy, social identity, and self-stigma.

Disclosure statement

No potential conflict of interest was reported by the authors.

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