Trust Ecologies and Channel Complementarity for Information Seeking

in Cancer Prevention

Abstract

Our paper extends channel complementarity theory, which has focused on evidence of complementarity and patterns of channel use, by elucidating the notion of trust complementarity. We examined trust, an information carrier characteristic and a core construct in health-focused decision-making to understand cancer information seeking, based on data from two nationally representative surveys in Singapore. Trust is found to be differential, relational, and ecological, with implications for individuals' access to and reliance on doctors, family/friends, newspapers/magazines, radio, TV, and the Internet for cancer prevention information. In an ideal trust complementarity environment, an individual should be able to traverse a range of communication channels seamlessly. Our findings however suggest that although individuals trust different channels complementarily, their trust patterns are limited and fettered. We identified two types of trust ecologies shaped by dual-channel and polymorphic complementarity patterns that suggest that health information seekers are trapped within specific trust ecologies that prevent them from navigating a broader range of communication channels for cancer prevention.

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Health information seeking (HIS) refers to individuals' intentional and active efforts to gather specific information above and beyond routine or habitual patterns of media exposure and interpersonal interactions (Atkin, 1973; Griffin, Dunwoody, & Neuwirth, 1999). In general, HIS positively shapes health-related behaviors and outcomes. Human behavior however remains the largest source of variance, as seen in individual-level variances in HIS behaviors and outcomes as well as societal-level differences due to cultural, social, economic and generational disparities worldwide including questions of access and quality of IT knowledge and infrastructure. Our study provides an important lens for examining channels as sources of health information in Singapore. Cancer, a worldwide affliction, is a leading cause of mortality in Singapore, killing one out of every three Singaporeans yearly. Between 2010 and 2014, 61,522 cancer cases were diagnosed (Singapore Cancer Registry, 2015). Our study investigates cancer information seeking and health information sources based on Singapore's first national health communication surveys.

Trust in health information sources, viewed as knowledge-based trust, is the judgment that the information source will act in your interest (Gilson, 2003) or an individual's confidence in a source for his or her decision-making processes (Mechanic & Meyer, 2000). However, more could be understood about the role of trust in HIS. For one, trust is a key variable in understanding health information sources. In general, trust of information sources is related to health-related factors including age, gender, race and education (Dutta-Bergman, 2003) but there is little understanding of how trust in one source for HIS relates to trust in another within a context of multiple sources. Recent research on trust in HIS has focused on a

single information source, specifically the Internet (Hou & Shim, 2010; Kim, 2016; Neumark, Lopez-Quintero, Feldman, Hirsch Allen, & Shtarkshall, 2013; Selsky et al., 2013), suggesting that trust of the Internet was positively associated with its use as an information source for HIS. However, in today's diverse and complex media landscape, a single-information source approach for analyzing trust is unrealistic.

In the comprehensive model of information seeking (CMIS), trust is conceptualized as an information-carrier factor. CMIS suggests that health-related factors and information-carrier factors predict HIS behavior (Johnson & Meischke, 1993; DeLorme, Huh, & Reid, 2011; Ruppel, 2016). Health-related factors are based on demographics, users' direct experience, personal significance of the information, and health information beliefs (Johnson & Meischke, 1993; Tian & Robinson, 2008, 2009; Shim et al., 2006). Information-carrier factors refer to *characteristics,* the perceived credibility and intention of the source, and *utility*, the perception that the information is relevant, important and topical. Related to information-carrier factors are the concepts of trust and information source type, based on the typology of information-oriented sources vs. entertainment-oriented sources (Ruppel, 2016). Applying CMIS, Ruppel (2016), who examined trust as an information-carrier factor in cancer health information scanning, found trust in information sources was positively associated with demographic factors such as gender, race, and education, and that trust was a robust and consistent predictor of attention to information source.

Channel Complementarity Theory

Channel complementarity postulates that the use of a source is determined by the functions served by the source, and that individuals using a source for a particular function also use other sources that serve the same function. The theory explains how different

channels such as TV, newspapers, magazines, or the Internet are utilized in relation to each other in serving individuals' information needs. Individuals who use one medium to gather information in a particular area are more likely to use other media that contains information in that area. In a nutshell, information sources reinforce rather than displace one another. Drawing from selective exposure (Zillmann & Bryant, 1985) and uses and gratifications (Blumler & Katz, 1974), channel complementarity theory explains how different media channels are used combinatorially, such that traditional and new media converge into a broader symbiosis when people information seek (Dutta-Bergman, 2004a; Ruppel & Burke, 2015; Ruppel & Rains, 2012).

Taking its roots from how content is chosen to assent one's perspectives, attitudes, and belief systems, channel complementarity theory explains how media channels too get adopted to serve content preferences (Dutta-Bergman, 2004a, 2004b). Dutta-Bergman (2004a) argues that channels are not replaced with newer ones, but users in fact, through multiple channel use, complementarily use information across different media platforms to serve their needs, including searching via interpersonal media channels such as social networking sites or traditional media channels such as TV, radio, or newspapers.

The application of channel complementarity in health communication focused on understanding media use patterns in HIS (e.g., Rains & Ruppel, 2016; Tian & Robinson, 2008b). Tian and Robinson (2008b), using U.S. Health Information National Trends Survey (HINTS), compared cancer victims and cancer-free adults' use of health information channels. They found three levels of complementarity: among mass media channels including traditional media and the Internet; between interpersonal channels and mass media channels; and between mass media channels and the Internet. Since 2003, HINTS, developed by the

U.S. National Cancer Institute, regularly collects nationally representative data about Americans' use of health-related information, specifically on cancer.

Ruppel and Rains (2012), also using HINTS data, focused on source characteristics to understand source complementarity. They proposed four complementarity characteristics for HIS: access to medical expertise, tailorability, or the possibility of acquiring information unique to one's situation, anonymity, and convenience.

Most studies focused on testing for empirical evidence of channel complementarity. According to Ruppel and Rains (2012), "[a]lthough channel complementarity theory offers a general explanation for why individuals often use multiple sources, the utility of the theory would be increased for scholars and practitioners if it made possible more specific predictions about when a particular type of source is more or less likely to be used within a specific content domain such as health" (p. 386). One hitherto unexplored variable is trust. Although channel complementarity is a theory of channel use, there is evidence of potential linkages between trust and use (Clayman et al., 2010; Dimitriadis & Kyrezis, 2010; Wang & Mark, 2013). The use of a channel may enhance trust in the channel, and vice-versa.

Our study is the first to extend channel complementarity theory to trust in HIS. Channel complementarity studies typically examine channels and their categorizations to explain complementarity patterns. Dutta-Bergman (2004c) classified channels into two broad categories, cognitive (information-oriented) and affective (entertainment-oriented) channels in explaining channel complementarity. Cognitive channels, which tend to be information-oriented and require intensity in reading and processing of information, include newspapers, magazines, brochures, and books (Benton & Frazier, 1976; Dutta-Bergman, 2004c; Kraft & Goodell, 1993; Moorman & Matulich, 1993; Vivian, 2002).

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In contrast, affective or entertainment-oriented channels tend to be passive, evocative, and do not involve serious information processing (Benton & Frazier, 1976; Bignell, Orlebar, Holland, 2005). Examples include TV and radio that are entertainment-oriented, health-reducing mediums (Benton & Frazier, 1976; Dutta-Bergman, 2004c, Ruppel, 2016) that precipitate accidental or serendipitous information retrieval (Bignell et al., 2005; Vivian, 2002). Related to trust specifically, information-oriented sources (newspapers and magazines) are perceived to contain more credible health information and more trusted compared to entertainment-oriented sources (TV and radio) and the Internet that combines features of both information-oriented and entertainment-oriented sources (Dutta-Bergman, 2004c; Ruppel, 2007, 2016).

A third of all cancer cases are preventable, and prevention strategies offer a more long-term financially viable resolution in managing and controlling the disease (World Health Organization, 2015). The complexity of cancer-related information, shaped by the disease's complex etiology and terminology, in addition to negative stigma associated with cancer, may challenge individuals' efforts to seek out, attend to and process cancer prevention information to reduce their risks for cancer-related morbidity and mortality (Chae et al., 2015; Hesse et al., 2010; Rutten et al., 2006; Tian & Robinson, 2008b). Given the "explosion" of cancer information in an increasingly complex media environment, it is compelling to understand how healthy individuals navigate the wide array of cancer prevention information sources based on trust. Despite the Internet making health information so widely available, doctors are still regarded as the most trustable source (Jones et al., 2012; Hesse et al., 2005; Hillen et al., 2011; Hillen et al., 2012). One study that specifically examined trust and sources of health information on cancer, based on HINTS, found that

despite newly available communication channels, doctors remained the most highly trusted information source, and radio was the least trusted (Hesse et al., 2005).

In the Singapore context, only one study has examined trust in doctors. Using a single-information source approach and based on a survey of residents in Redhill, a housing estate in Singapore, Lee et al. (2007) found that trust in doctors was high but had room for improvement. The purpose of our study is to test channel complementarity theory in the context of trust to better understand healthy individuals' complementary patterns of trust within the context of a range of six different sources of cancer prevention information. Our study focuses on six channels: doctors, family/friends, newspapers/magazines, radio, TV and the Internet. Although doctors and family/friends do not fit into the classic definition of information-oriented channels, these two channels are more likely to be active, information processing-heavy sources of information. There is respect and reliance on doctors' professional and specialized medical knowledge and trust in doctors remains high (Hesse et al., 2010; Lee, 2008). As an information source, family/friends can be classified as an information-oriented source and act as an important resource of health-related knowledge, attitudes, and behaviors (Hargie, 2011). Hence, in our study, we classify doctors and family/friends as information-oriented channels together with newspapers/magazines. TV and radio are entertainment-oriented channels, whereas the Internet is a mixed-orientation channel because it combines both information-oriented and entertainment-oriented features.

Ideally, HIS should be anchored in reliance on multiple channels. We posited six hypotheses based on RQ1: What is the relationship among health information seekers' patterns of trust in information channels about cancer prevention in Singapore?

H1: Trust in doctors for cancer information is complementary to trust in family/friends, newspapers/magazines, radio, TV, and the Internet.

H2: Trust in family/friends for cancer information is complementary to trust in doctors, newspapers/magazines, radio, TV, and the Internet.

H3: Trust in newspapers/magazines for cancer information is complementary to trust in doctors, family/friends, radio, TV, and the Internet.

H4: Trust in radio for cancer information is complementary to trust in doctors, family/friends, newspapers/magazines, TV, and the Internet.

H5: Trust in TV for cancer information is complementary to trust in doctors, family/friends, newspapers/magazines, radio, and the Internet.

H6: Trust in the Internet for seeking cancer information is complementary to trust in doctors, family/friends, newspapers/magazines, radio, and TV.

In addition, we posed a second research question, RQ2: To what extent does trust in one channel explain trust in another channel?

Method

Study 1

We conducted a national survey between June and December 2014 using HINTS as a frame of reference. Adhering to the HINTS framework used by Nelson et al. (2004), we focused on obtaining a nationally representative adult population not exclusive to cancer patients and survivors in Singapore. To measure trust, we asked respondents, "In general, how much would you trust information about cancer from each of the following channels (doctors, family/friends, newspapers/magazines, radio, TV, the Internet)" on a four-point scale (1=*Not at all*, 2=*A little*, 3=*Some*, 4=*A lot*). Trained interviewers administered the

survey door-to-door among a nationally representative sample of Singaporean households. Through face-to-face interviews, a questionnaire was administered to a randomized sample of 2,029 households in Singapore. A total of 1,200 respondents completed the survey, resulting in a response rate of 59.1%. Of the 289 respondents who had specifically looked for information about cancer, we excluded 10 subjects previously diagnosed with cancer. After eliminating incomplete responses, we arrived at a final sample size of n=273.

Among 273 respondents, 48.7% are men and 51.3% are women, ranging in age from 18 to 78 (mean=40.27, SD=13.58). The mean household monthly income is SGD6,900.78 (SD=3,874.26) or USD5,095.47 [median=SGD6,900.78; the overall median household income in Singapore is SGD8,292 in 2014 (Singstat, 2016); Table 1]. Education-wise, 0.7% of respondents have no formal education, 3.3% have primary school education, 20.9% have secondary school education, 37.0% have post-secondary qualifications; 30.8% have a bachelor's degree, and the remaining 7.3% have graduate degrees. Our respondents took an average of 38.21 minutes (SD=9.40) to complete the questionnaire.

Study 2

A year later, between August 2015 and January 2016, we conducted our second national survey using the same HINTS-based questionnaire that was administered to a randomized sample of 2,954 households. A total of 1,201 respondents completed the survey, resulting in a response rate of 40.6%. Among these, 358 respondents had specifically looked for information about cancer. We excluded 9 cases of individuals who have been previously diagnosed with cancer. After eliminating incompletes, we arrived at a final sample size of n=324. The 324 respondents are equally distributed in gender, ranging in age from 18 to 82 (mean=41.41, SD=14.23). The mean household monthly income is SGD7,104.06

(*SD*=3,598.92) or USD5,245.57. The median household income is SGD7,779.58; the median household income in Singapore is SGD8,666 in 2015 (Singstat, 2016). Regarding education, .9% have no formal education, 3.7% have primary school education, 23.8% have secondary school education, 47.20% have post-secondary qualifications; 18.8% have a bachelor's degree, and 5.6% have graduate degrees. On average, our respondents took 39.09 minutes (*SD*=9.96) to complete the questionnaire.

Results

Study 1

Subjects trust doctors (*M*=3.59, *SD*=.70), newspapers/magazines (*M*=2.88, *SD*=.72) and the Internet (*M*=2.88, *SD*=.74), more than TV (*M*=2.84, *SD*=.71), family/friends (*M*=2.77, *SD*=.74), and radio (*M*=2.59, *SD*=.72) (Table 1). Indeed, a repeated measures ANOVA with a Huynh-Feldr correction (ε=.87) showed the mean differed statistically among channels ($F_{(4.42, 1202.60)}$=89.58, *p*<.001). However, post-hoc Bonferroni's tests revealed that trust in doctors is significantly higher than trust in other channels, and trust in radio is significantly lower than trust in other channels. Trust in family/friends newspapers/magazines, TV, and the Internet are not significantly different from each another.

RQ1: Patterns of trust in information channels. The data showed positive correlations among the trust levels in the six different channels, suggesting that overall, Singaporean trusted all channels for cancer-related information (Table 2).

Trust in doctors is correlated with trust in newspapers/magazines (*r*=.36, *p*<.001), TV (*r*=.25, *p*<.001), radio (*r*=.22, *p*<.001), and family/friends (*r*=.19, *p*<.01). There is no significant correlation with trust in the Internet. H1 is partially supported.

Trust in family/friends is positively correlated with trust in newspapers/magazines (r=.36, p<.001), and radio (r=.26, p<.001). Comparatively, the degree of correlation and significance is weaker for trust in doctors (r=.19, p<.01) and TV (r=.15, p<.05). There is no significant in correlation with trust in the Internet. H2 is partially supported. Trust in newspapers/magazines is positively correlated with trust in all the other channels. Therefore, H3 is supported. Specifically, trust in newspapers/magazines is correlated with trust in radio (r=.63, p<.001), TV (r=.57, p<.001), doctors (r=.36, p<.001), family/friends (r=.36, p<.001), and the Internet (r=.29, p<.001). In sum, those who trust newspapers/magazines are more likely to trust all other channels at the same time. Trust in radio is positively correlated with trust in all channels: newspapers/magazines (r=.63, p<.001), TV (r=.53, p<.001), the Internet (r=.28, p<.001), family/friends (r=.26, p<.001), and doctors (r=.22, p<.001), Therefore, H4 is supported. Trust in TV is positively correlated with trust in newspapers/magazines (r=.57, p<.001), radio (r=.53, p<.001), the Internet (r=.42, p<.001) and doctors (r=.25, p<.001), but has a lower correlation with trust in family/friends (r=.15, p<.05). H5 is also supported. Trust in the Internet is positively correlated with trust in every channel; TV (r=.42, p<.001), newspapers/magazines (r=.29, p<.001), and radio (r=.28, p<.001), except doctors, and family/friends. H6 is partially supported.

RQ2: Explaining trust in channels. We used hierarchical linear regression to analyze the effects of control variables including age, education, income, and gender. In the first step, we entered each channel as the outcome variable and entered the control variables. Previous studies have shown that ethnicity, age and gender are critical in explaining usage and trust patterns in health information (Dutta-Bergman, 2003; Mathur et al., 2013; Ruppel, 2016). In the second step, other channels were added. The control variables were insignificant and were

dropped. Regression results show that trust in doctors can be predicted only by trust in newspapers/magazines (β=.30; p<.001), with 12.2% of the variance explained by trust in newspapers/magazines (Table 3). Trust in family/friends can be predicted only by trust in newspapers/magazines (β=.34; p<.001), with 12.7% of the variance explained by trust in newspapers/magazines. Trust in newspapers/magazines can be predicted by trust in radio (β=.40, p<.001), TV (β=.28; p<.001), family/friends (β=.18; p<.001), and doctors (β=.17 ; p<.001), with 53.0% of the variance explained by trust in radio, TV, family/friends, and doctors. Trust in radio can be predicted by trust in newspapers/magazines (β=.47; p<.001) and TV (β=.25; p<.010), with 43.8% of the variance explained by trust in newspapers/magazines and TV. Trust in TV can be predicted by trust in newspapers/magazines (β=.34; p<.001), the Internet (β=.25; p<.001) and radio (β=.25; p<.001), with 42.8% of the variance explained by trust in newspapers/magazines, the Internet, and radio. Trust in the Internet can be predicted by trust in TV (β=.39; p<.001), with 17.3% of the variance explained by trust in TV.

The highest variance is found in the patterns of trust for newspapers/magazines (53.0%), followed by radio (43.8%) and TV (42.8%). The smallest variance is found in the patterns of trust in doctors (12.2%), followed by family/friends (12.7%) and the Internet (17.3%). According to Cohen (1988), a small effect size is .1 or greater but less than .3, a medium effect size is .3 or greater but less than .5, and a large effect size is .5 or greater. Our effect sizes for trust in doctor (.12), family/friends (.12), and the Internet (.17) are small, and effect sizes for trust in newspapers/magazines (.52), radio (.43), and TV (.42) are large.

Study 2

Subjects trust doctors (M=3.44, SD=.77), Internet (M=2.89, SD=.76), family/friends (M=2.86, SD=.68), and newspapers/magazines (M=2.81, SD=.74) more than TV (M=2.76, SD=.80) and radio (M=2.48, SD=.77) (Table 1). A repeated measures ANOVA with a Huynh-Feldr correction (ε=.92) showed that the mean differed significantly among channels (F(4.62, 1491.40)=75.95, p<.001). As in Study 1, post-hoc Bonferroni's tests revealed that trust in doctors is significantly higher than the trust in other channels, and trust in radio is significantly lower than trust in the other channels. Similarly, trust in family/friends, newspapers/magazines, TV, and the Internet are not significantly different from one another.

RQ1: Patterns of trust in information channels. Similar to Study 2, the data reflected positive relationships among trust levels in the six channels, suggesting that overall, Singaporeans trusted all channels for cancer information (Table 2). Trust in doctors is positively correlated with trust in all channels, except the Internet. The correlation of trust in doctors with family/friends (r=.20, p<.001), newspapers/magazines (r=.20, p<.001), TV (r=.18, p<.01), and radio (r=.15, p<.01); H1 is partially supported. Trust in family/friends is positively correlated with trust in other channels except the Internet, with strong correlations with trust in newspapers/magazines (r=.31, p<.001) and TV (r=.25, p<.001), and doctors (r=.20, p<.001). The degree of correlation and significance in radio (r=.17, p<.01) is weaker. There is no significant correlation with the Internet. H2 is partially supported.

Trust in newspapers/magazines is positively correlated with trust in all the other channels. Therefore, H3 is supported. Trust in newspapers/magazines is correlated with trust in TV (r=.49, p<.001), radio (r=.46, p<.001), family/friends (r=.31, p<.001), the Internet (r=.22, p<.001), and doctors (r=.20, p<.001). Those who trust newspapers/magazines are

more likely to trust other channels. Trust in radio also is positively correlated with trust in all channels, TV ($r=.56$, $p<.001$), newspapers/magazines ($r=.46$, $p<.001$), the Internet ($r=.23$, $p<.001$), family/friends ($r=.17$, $p<.01$), and doctors ($r=.15$, $p<.01$). H4 is also supported. Trust in TV is positively correlated with trust in radio ($r=.56$, $p<.001$), newspapers/magazines ($r=.49$, $p<.001$), the Internet ($r=.31$, $p<.001$) and family/friends ($r=.25$, $p<.001$), and doctors ($r=.18$, $p<.01$). H5 is also supported. Trust in the Internet shows positive correlations with trust in TV ($r=.31$, $p<.001$), radio ($r=.23$, $p<.001$), and newspapers/magazines ($r=.22$, $p<.001$), but not with trust in doctors and in family/friends. H6 is partially supported. Age is positively correlated with trust in doctors ($r=.13$, $p<.05$) and negatively correlated with trust in the Internet ($r=-.12$, $p<.05$). Older participants are more likely to trust doctors. Younger participants are more likely to trust the Internet.

RQ2: Explaining trust in channels. Control variables including age, education, income, and gender were insignificant and dropped. The regression results show trust in doctors can be predicted by trust in family/friends ($\beta=.17$; $p<.05$), with 5.4% of the variance explained by trust in family/friends. This result differs from Study 1 that shows that trust in doctors is predicted only by trust in newspapers/magazines ($\beta=.30$; $p<.001$). Trust in family/friends can be predicted by trust in newspapers/magazines ($\beta=.22$; $p<.001$) and doctors ($\beta=.12$; $p<.05$), with 11.6% of the variance explained by trust in newspapers/magazines and doctors. Trust in newspapers/magazines can be predicted by trust in TV ($\beta=.25$; $p<.001$), radio ($\beta=.24$, $p<.001$), and family/friends ($\beta=.20$; $p<.001$), with 32.3% of the variance explained by trust in TV, radio, and family/friends. Trust in radio can be predicted by trust in TV ($\beta=.41$; $p<.001$) and newspapers/magazines ($\beta=.26$; $p<.001$), with 34.9% of the variance explained by trust in TV and newspapers/magazines. Trust in TV can

be predicted by trust in radio (β=.40; p<.001), newspapers/magazines (β=.26; p<.001), and Internet (β=.17; p<.001), with 40.3% of the variance explained by trust in radio, newspapers/magazines, and the Internet. Trust in the Internet can be predicted by trust in TV (β=.23; p<.001), with 9.0% of the variance explained by trust in TV. Compared to Study 1, the patterns of significant predictors are identical for most channels (Table 3).

The largest magnitude of variance is found in the patterns of trust for TV (40.3%), followed by radio (34.9%), and newspapers/magazines (32.3%). The smallest variance is found in the patterns of trust related to doctors (5.4%), the Internet (9.0%), and family/friends (11.6%). Based on Cohen's (1988) classification, the effect sizes for trust in doctor (.05), family/friends (.11), and the Internet (.09) are small. The effect sizes for trust in newspapers/magazines (.32), radio (.34) are medium whereas trust in TV (.40) is large.

Discussion

Our two studies extended channel complementarity theory by explicating trust as a conceptual driver in cancer prevention information seeking. Existing studies examine the use and relationships among channels without considering how trust in one channel relates to trust in another channel, and could be explained by trust in another channel. Our findings are consistent with Ruppel (2016), who found that "information source trust is differentially relevant depending on source type" (p. 214). Our paper contributes to the theory in several ways. First, our study is the first to apply the theory in Singapore, expanding on the geographical and cultural range of studies based on U.S. data (Dutta-Bergman, 2004c; Rains & Ruppel, 2016; Ruppel & Burke, 2015; Ruppel & Rains, 2012; Tian & Robinson, 2008a; 2008b). Second, we extend the theory, which has hitherto focused on the use of different channels, to elucidate the notion of trust in different channels. Based on systematic patterns

of trust complementarity found in our two-study data, we argue that trust is an important conceptual locus for explicating healthy individuals' simultaneous trust of multiple channels for health information for preventive cancer information seeking.

We found that trust is differential, relational, and ecological. Among the six channels, trust is differential and unequally distributed. Trust in doctors, an information-oriented source, is higher than trust in other channels whereas trust in radio, an entertainment-oriented source, is lower. Our finding supports the literature suggesting that despite new communication channels, doctors remained the most highly trusted information source, and radio the least trusted source for cancer information (Hesse et al., 2010; Hesse et al., 2005). Our finding also is consistent with the literature that found that information-oriented sources are more trusted than entertainment-oriented channels or a mixed-orientation channel (the Internet) (Dutta-Bergman, 2004c; Ruppel, 2007, 2016).

The relational aspect of trust is evident in the complementary patterns of trust relationships observed in the six channels. Existing studies hypothesized that the use of one channel complements the use of other channels but our study advances the theory by proposing that trust in one channel is complementary to trust in other channels by offering an alternative theoretical construct for explicating individuals' health decision-making. An elucidation of trust's differential and relational qualities remains incomplete without expanding it into the notion of trust ecology, defined as a network of unequal trust relationships centered upon trust in a particular channel. In each channel-driven trust ecology, patterns of trust relationships are differentiated between and among channels. Using regression analyses, magnitude of variance, and effect size, we identified two types of trust

ecologies: dual-channel and polymorphic, based on the number of trust relationships converging upon a particular channel (Figure 1).

Dual-Channel Trust Ecologies

We found three dual-channel trust ecologies: the Internet, doctors, and family/friends. On one end of the continuum, trust in the Internet is explained by trust in only one other channel, TV in both Study 1 and Study 2. When individuals trust the Internet, they are less likely to trust other channels complementarily. Trust in the Internet is explained only by trust in TV. Both the Internet (combining information-oriented and entertainment-oriented features) and TV (entertainment-oriented) are viewed as less credible compared to information-oriented information sources such as newspapers (Dutta-Bergman, 2004c, Ruppel, 2007; 2016). TV is an entertainment/affective, health-reducing channel that requires low heavy cognitive involvement. Similarly, the Internet, although mixing both informational and entertainment features, shares the entertainment-oriented features of TV.

Another dual-channel trust ecology, doctors, is explained by trust in only one other channel (newspapers/magazines in Study 1; family/friends in Study 2). When individuals trust doctors, they are less likely to trust other channels complementarily. The pairings of trust in doctors with trust in newspapers/magazines and trust in family/friends can be explained by their shared characteristic as information-oriented channels. This finding is consistent with studies that found doctors remain the most trusted source of health information for cancer (Hesse et al., 2010; Hesse et al., 2005).

The third dual-channel trust ecology, family/friends, is explained only by trust in newspapers/magazines in Study 1. In Study 2, trust in family/friends is also explained by trust in newspapers/magazines and to a lesser extent, trust in doctors. The inclusion of doctors

explains only an additional 1% increase in the R Square, suggesting trust in doctors is not an important variable explaining trust in family/friends. The trust complementarity patterns linking newspapers/magazines and family/friends are expected. Both newspapers /magazines and family/friends are information-oriented channels. It is reasonable that family/friends, as an interpersonal channel, scores high in trust due to familial/personal ties as well as their social support functions.

Polymorphic Trust Ecologies

On the other end of the continuum, we found three polymorphic trust ecologies that defy the information-oriented vs. entertainment-oriented dichotomy that helps explain the dual-channel trust ecologies. The three polymorphic trust ecologies (newspapers /magazines, TV, and radio) are characterized by simultaneous trust in more than one other channel. Trust in newspapers/magazines is explained by trust in family/friends, radio, and TV in Study 1 and Study 2, and trust in doctors in Study 1. Trust in TV is explained by trust in newspapers/magazines, radio, and the Internet in Study 1 and Study 2. Trust in radio is explained by trust in newspapers/magazines, and TV in Study 1 and 2.

For these three traditional mass media channels—newspapers/magazines, TV, and radio—trust in one channel is explained by trust in more than one other media channel, unlike the dual-channel trust ecologies of trust in the Internet, doctors, and family/friends that are shaped only by trust in one other channel. Doctors, family/friends, and the Internet offer qualities of interactivity, tailorability, access to customizable information (Rains & Ruppel, 2016; Ruppel & Rains, 2012), and information sharing (Balka et al., 2010). Doctors, and family/friends are interpersonal and information-oriented channels, and share many commonalities with the mixed-orientation features of the Internet, which also takes on some

interpersonal characteristics of an expert prescriber and social support through online social networks (Bignell et al., 2005; Rice & Katz, 2001).

On the other hand, the three polymorphic trust ecologies featuring traditional media channels of newspapers/magazines, TV, and radio share commonalities that differentiate them from dual-channel trust ecologies (doctors, family/friends, and the Internet). First, the information on traditional media channels is likely to have been shaped by agenda setting (McCombs & Shaw, 1972) and gatekeeping processes (Shoemaker & Reese, 1991). Consequently, the information found on traditional media platforms such as newspapers/magazines, TV, and radio is likely to be similar and less likely to generate skepticism. Second, these traditional channels closely resemble linear communication models with little interactivity, tailorability, and access to customizable information. Our findings suggest that trust ecologies can be valuably incorporated into channel complementarity theory and other theoretical frameworks to help explain and predict HIS.

An important implication revolves around the disconcerting patterns of trust complementarity shaping the trust ecologies. According to channel complementarity theory, complementarity emerges through the use of different sources to serve the same information need as sources reinforce rather than displace one another. Implicit is the notion that channel complementarity allows for more comprehensive satisfaction of individuals' needs for information about a particular topic or subject matter. In our two studies, however, the complementarity patterns shown by networks of relationships in the trust ecologies for cancer prevention information are not as robust as expected. Although individuals trust different channels complementarily, their trust patterns are limited and fettered. That individuals who trust doctors trust only newspapers/magazines; that respondents who trust the Internet trust

only TV, or that those who trust traditional media tend to trust only other traditional media, indicate that our respondents could not break free to navigate a wider range of channels, thus potentially compromising the individuals' quality of decision-making.

In sum, our respondents are trapped in specific ecologies of trust without an ability to freely traverse a range of different channels for more robust cross-checking, greater exposure to new knowledge and ideas, and unfettered access to diverse resources that can strengthen their decision-making and health outcomes. Despite the explosion of health information across multiple channels and evidence suggesting the Internet has become one of the most frequently used health information channel (e.g., Ruppel & Rains, 2012), we found that for individuals who trust traditional media, or in doctors, the Internet is not a trusted channel.

In an ideal trust complementarity environment, an individual should be able to traverse all communication channels seamlessly. A broad-based strategy of HIS can better serve cancer-free individuals, given the abundance and complexity of cancer-related information, and the weak institutional and poor social support faced by healthy individuals who have not been diagnosed with cancer but are nevertheless actively seeking cancer prevention information. If an individual who trusts TV is likely to trust the Internet only, he or she is confined to a dual-channel trust ecology that excludes doctors, family/friends, and traditional media altogether. Similarly, someone who is trapped in a trust ecology of newspapers, TV, and radio is severely limiting his or her understanding of cancer prevention by excluding doctors, family/friends, and the Internet as information channels.

Future studies can further explicate the dynamics of trust transfer and causality, and to address the relationships between trust in a channel and actual channel usage to better understand the behavioral outcomes of trust complementarity in HIS. More granularity in

examining the Internet would be important. Although we examined "the Internet"

conceptually as a single entity, as what many HIS studies have done, this is an increasingly

less useful approach as the Internet evolves into a multifarious mix of both entertainment-

oriented and information-oriented sources, as well as a blend of media and interpersonal

communication.

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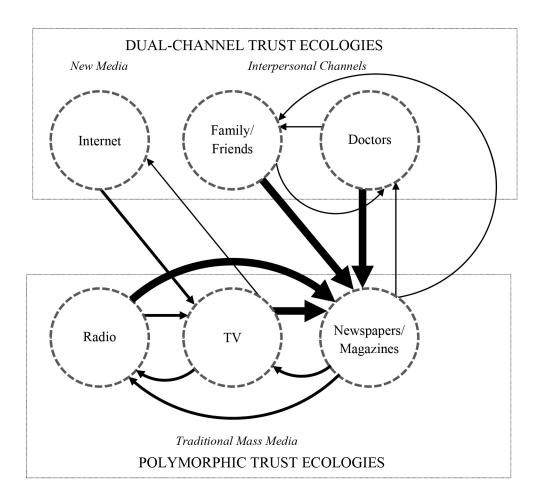Moorman, C., & Matulich, E. (1993). A model of consumers' preventive health behaviors: The role of health motivation and health ability. *Journal of Consumer Research, 20*, 208-228. doi:10.1086/209344

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Figure 1 Channel-Specific Trust Ecologies

Trust in a channel predicting trust in another channel

Small effect size

Medium effect size

Large effect size

Table1 Descriptive Statistics (Study 1 n=273; Study 2 n=324)

	Range		Min		Max		Mean		Std. Deviation	
Study	1	2	1	2	1	2	1	2	1	2
Age	60	64	18	18	78	82	40.27	41.41	13.58	14.23
Income (S$/monthly)	22550	19600	450	400	23000	20000	6900.78	7104.06	3874.26	3598.92
Doctor	3	3	1	1	4	4	3.59	3.44	.70	.77
Family /Friends	3	3	1	1	4	4	2.77	2.86	.74	.68
Newspapers/ Magazines	3	3	1	1	4	4	2.88	2.81	.72	.74
Radio	3	3	1	1	4	4	2.59	2.48	.72	.77
TV	3	3	1	1	4	4	2.84	2.76	.71	.80
Internet	3	3	1	1	4	4	2.88	2.89	.74	.76

Table 2 Correlations of Channel Complementarity (Study 1 n=273; Study 2 n=324)

	Doctors		Family/Friend		Newspapers/ Magazines		Radio		TV	
Study	1	2	1	2	1	2	1	2	1	2
Doctors	-	-								
Family/ Friends	.19**	.20***	-	-						
Newspapers/ Magazines	.36***	.20***	.36***	.31***	-	-				
Radio	.22***	.15**	.26***	.17**	.63***	.46***	-	-		
TV	.25***	.18***	.15*	.25***	.57***	.49***	.53***	.56***	-	-
Internet	.09	.05	.12	.10	.29***	.22***	.28***	.23***	.42***	.31***

* $p < .05$; **$p < .01$, ***$p < .001$

Table 3 Evidence of Channel Complementarity (Study 1 n=273; Study 2 n=324)

Outcome Variables

Channels	Doctor		Family/Friends		Newspapers/ Magazines		Radio		TV		Internet	
Study	1	2	1	2	1	2	1	2	1	2	1	2
Doctors	-	-	.08 (.06)	.12** (.05)	.17*** (.05)	.07 (.05)	-.02 (.05)	.03 (.05)	.07 (.05)	.05 (.05)	-.04 (.06)	-.02 (.05)
Family/ Friends	.07 (.06)	.17** (.07)	-	-	.18*** (.04)	.20*** (.05)	.05 (.05)	-.02 (.05)	-.08 (.05)	.10 (.05)	.04 (.06)	.01 (.06)
Newspapers/ Magazines	.30 *** (.08)	.11 (.07)	.34*** (.08)	.22*** (.06)	-	-	.47*** (.06)	.26*** (.06)	.34*** (.06)	.26*** (.06)	.04 (.08)	.08 (.07)
Radio	-.04 (.07)	.04 (.07)	.08 (.08)	-.02 (.06)	.40*** (.05)	.24*** (.05)	-	-	.25*** (.06)	.40*** (.05)	.06 (.08)	.06 (.07)
TV	.10 (.07)	.07 (.07)	-.13 (.08)	.11 (.06)	.28*** (.05)	.25*** (.05)	.25*** (.06)	.41*** (.05)	-	-	.39*** (.07)	.23*** (.06)
Internet	-.04 (.06)	-.02 (.06)	.04 (.06)	.01 (.05)	.02 (.04)	.05 (.05)	.04 (.05)	.04 (.05)	.25*** (.05)	.17*** (.05)	-	-
Adjusted R Square	.122	.054	.127	.116	.530	.323	.438	.349	.428	.403	.173	.090
Effect Size	.12	.05	.12	.11	.52	.32	.43	.34	.42	.40	.17	.09

Note. Unstandardized Coefficient β. Standard errors are in parentheses.

* p <.05; **p <.01, ***p<.001