國立雲林科技大學資訊管理系
107 學年度第 1 學期博士班資格考
科目：管理計量方法
時間：4 小時 (Closed book)
作答時，請注意各題之比例配分，並清楚標示題號

Part A: 50%

1. Common method bias results from the fact that data were collected from single informants. Research employed several procedural and statistical mechanisms to avoid and to check for such a potential problem.

(1) Please assess procedural mechanisms to reduce common-method bias ex-ante.(10%)

(2) Please explain CFA marker technique to address the issue of common method variance. (15%)

2. What are the violations of Least Square assumptions about error terms? The reason or why normality assumption for the error terms is justifiable. (10%)

3. Describe and discuss appropriate tests for comparison with models below. (15%)

Part B: 50% (第一題與第二題二選一，兩題全做以低分題計算。第三題必做)

Text book (二選一): 20%

1. In multivariate statistics, the multiple regression, logistic regression, and structure equation modelling have some differences and similarities. Please write out their differences and assumption in detail.

2. What is statistical power? Power is not solely a function of alpha. Please explain three factors of determined power and their interrelationships.

Journal article: 30%

The journal paper is attached as Appendix (Title: Precursors of trust in virtual health communities: A hierarchical investigation**).**

Please read the attached journal paper and answer the questions.

(a) What is trust from the provided paper?

(b) From Figure 1. Conceptual model of precursors of online trust in virtual health communities. Please give some improvements and explanations based on you have read the paper.

(c) From research methodology and results, please point out the disadvantages of this article.

Information & Management
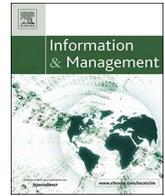
Precursors of trust in virtual health communities: A hierarchical investigation

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A R T I C L E   I N F O

A B S T R A C T

Lack of trust can have a negative influence on consumers' willingness to share and adopt information in virtual health communities. However, not much is known about factors that influence the development of trust in such communities. This paper examined precursors of trust in virtual health communities. Data were collected from 361 users of virtual health community sites in South Africa. Structural equation modelling using version 23 of AMOS was used to analyse the data. The findings show that information usefulness, community responsiveness and shared vision have significant influence on consumers' overall trust in health-related virtual communities. The findings, however, show differences in the extent to which precursor variables influence different dimensions of overall trust. The study provides insights that can help managers of such sites to effectively foster the development of trust in their communities.

1. Introduction

Growing need for online engagement has over the past decade fuelled a proliferation in online-based Social Networking Services (SNSs). SNSs are varied in nature with some primarily targeted at users who already have relationships offline, e.g. friends, relatives and other associates [39]. Other SNSs, however, facilitate formation of relationship among strangers. Individuals are in such cases brought together by issues of common interest often not related to offline interactions [22]. In coming together, they form what are known as online communities or virtual communities. Of interest, in this study are health-related virtual communities. In this study, a virtual health community is defined as a collective of individuals who communicate with each other on health-related matters through dedicated sites in the Internet. Common interest around health issues is what brings individuals together as members of a virtual health community. According to Zhao et al. [72], these sites serve as social spaces that enable people to meet, share information including experiences and advice and provide emotional support to one another. The inter-personal interactions that take place help patients and carers feel less alone and more empowered to make better decisions that relate to managing health conditions faced by them.

The ability of any virtual health community members to derive these benefits largely depends on members' willingness to open up to each other and contribute to discussions on the platform. Many researchers, however, note that because of the perceptions of risk, people in general are reluctant to open up to strangers more so to people they

meet online and that they do not personally know [11]. Studies by Brengman and Karimov [6] and Warren et al. [69] among others note the need for managers of online sites to find ways of fostering trust if they are to attract and/or retain users to their sites. Trust is also noted to be a critical element for ensuring team success and effectiveness [7]. Lack of physical contact and rules that can help guarantee knowledge-sharing behaviour makes the virtual environment an inherently risky one. In situations of risk, people are known to resort to trust as a method of reducing uncertainties [74].

According to Cho et al. [16], trust refers to 'the willingness of the trustor (evaluator) to take risk based on a subjective belief that a trustee (evaluatee) will exhibit reliable behaviour to maximize the trustor's interest under uncertainty (e.g. ambiguity due to conflicting evidence and/or ignorance caused by complete lack of evidence) of a given situation based on the cognitive assessment of past experience with the trustee' (p. 28:5). Chang et al. [11] defined trust as 'a psychological state that allows a person to accept vulnerability based upon positive expectations of the intentions or behaviour of others' (p. 440). It is known to help rule out undesirable, however possible, future opportunistic behaviours of others [26,67]. A review of literature shows that trust exerts significant influence in facilitating greater cooperation [21], commitment [34] and sharing of information between social and economic parties [10,53].

While the importance of trust in social and economic relations is widely acknowledged, a number of limitations in literature on trust affect knowledge development in this area. One limitation relates to how trust is defined and conceptualised. As noted by Sankowska and

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Paliszkiewicz [61] and Whipple et al. [70], some studies on trust conceptualise it as a one dimensional construct, while others conceptualise it as a multidimensional construct. A review of literature further shows that even where multi-dimensional perspective is considered in conceptualising trust, variations and lack of consensus characterise how this is done. This renders current contributions fragmented rather than cumulative and increases the need for studies conducted in different contexts confirming important dimensions. Furthermore, although trust has been widely studied in literature, the way in which trust develops remains an under-researched area [31] more so in virtual communities [54]. This is due to lack of research focused on the development of trust in virtual communities and due to the fact that studies in relationship marketing literature mainly focus on trust as an antecedent variable in trying to understand consumer behaviour. Given its importance in driving desirable interpersonal and group behaviours [24,36], it is important for researchers and managers to have a good understanding of antecedents of trust in virtual communities [54], especially virtual health communities. As noted by Leimeister et al. [42] compared to other types of virtual communities, high involvement communities such as communities of patients cannot be nurtured in the absence of high levels of trust. Patient communities are considered high involvement platforms because they commonly involve sharing of private personal information including intimate feelings, personal concerns and personal experiences, some of which may be associated with a negative stigma [57,40]. A study by Bansal et al. [3] found that the decision to disclose personal information online is highly influenced by trust.

This paper aims at contributing to this understanding by examining precursors of trust in virtual health communities. The key questions addressed in this paper are as follows:

- Are ability, integrity and benevolence distinct dimensions of trust in virtual health communities?
- What are the significant precursors of trust in virtual health communities at both overall and dimensional level?

The specific objectives of the paper are (a) to explore the distinct dimensions of trust in virtual health communities, (b) to examine significant precursors of trust at overall level and at dimensional level and (c) to explore the differential effects of precursors of trust on each dimension of trust and on overall trust among members of virtual health communities.

The paper has been organised such that the next section provides a theoretical framework to the study, and this is followed by description of the methodology and presentation of findings. Thereafter, findings are discussed and their managerial implications outlined. Finally, conclusions drawn from the study, its contributions to theory and limitations and suggestions for future research are presented.

2. Theoretical framework

The study made use of the social exchange theory and the common bond theory to understand trust and its precursors in the communities. The reason for integrating the two theories is to enable a more comprehensive understanding of factors influencing trust in virtual health communities. Integration of theories is known to help provide a broader understanding of consumer behaviour [35,65]. Both theories, i.e. the social exchange theory and the common bond theory, are useful to understand the dynamics of social relations. The social exchange theory focuses specifically on benefits associated with social relations and the influence of such benefits on behaviour [19]. The common bond theory focuses on the importance of attachment in explaining group member behaviour [58]. The two theories thus complement each other. By integrating them, this study comprehensively examines the influence of both benefits and attachment factor of shared vision to explain trust in virtual health communities. The next two sub-sections look at these theories in more detail.

2.1. Social exchange theory

Originating in the 1950s, the social exchange theory has its roots in the fields of psychology, sociology and anthropology [19,63]. Coulson et al. [19] observed that at its core, the theory holds that 'all social life can be treated as an exchange of tangible and intangible resources and rewards between actors' (p. 135). The theory posits that social interaction at inter-personal and organisational levels is contingent upon associated resources and rewards [63]. In looking at resources and rewards, the social exchange theory recognises that exchange relationships involve some level of economic and social interdependence. This interdependence makes parties involved somewhat vulnerable to the relationship [47]. Vulnerability brings with it costs of engaging in exchange relationships.

The fact that exchange relationships entail some vulnerability makes trust core to the social exchange theory [30,47]. The theory argues that trust helps reduce costs of interaction. Empirical evidence abounds in support of the positive influence that trust has on lowering of costs in exchange relationships [12,52]. Trust is noted to facilitate voluntary cooperation [56]. Rewards, however, are said to be helpful in building trust and facilitating ongoing social exchange [51]. They help enhance calculative basis for trusting an exchange partner.

Researchers including Zhao et al. [72] and Chen and Hung [14] pointed out that the key benefit that attracts people to virtual communities is to do with knowledge growth through information sharing. The opportunity to get feedback from many people and to get it fast is another key benefit that attracts people to virtual communities [55,59]. This paper argues that these potential benefits are rewards that can serve as important bases upon which trust in virtual communities can be built. Accordingly, the study postulates that information usefulness and responsiveness are important precursors of trust in virtual health communities (refer to Fig. 1).

2.2. Common bond theory

A review of literature shows that trust can also be built on the basis of the characteristics of the parties involved. The characteristic base for building trust stresses the importance of understanding similarities between parties to explain the existence or lack of trust [44,46]. Gefen [29] and Ziegler and Golbeck [75] observed that similarity facilitates the formation of feelings of shared ethical principles and behaviours and that in doing so helps create ties of friendship and trust. This argument is in line with the common bond theory. Derived from social psychology studies on voluntary groups, the common bond theory focuses on understanding precursors and consequences of group attachment [58]. Research using common bond theory identifies 'similarity' as one of the key precursors of group attachment. People are known to like others who are similar to them in terms of needs, preferences, values and attitude. People can thus be similar in different ways. Hsu et al. [38] note that similarity in terms of shared vision in voluntary groups has a positive influence on the levels of trust. Accordingly, the proposed model in this study includes shared vision as a precursor of trust (refer to Fig. 1).

2.3. Proposed conceptual model

2.3.1. Conceptualising trust

This study took a multi-dimensional perspective in looking at trust. Doing so has the advantage of enabling one identify the important basis for building individual dimensions of trust. A review of literature, however, shows lack of consensus on what constitutes important dimensions of trust. Variations exist on the number and actual dimensions of trust that researchers consider to be important. For example, Nicolaou et al. [50] argued for the importance of two dimensions, namely goodwill and competence, to understand the perceptions of risk in electronic exchanges of data. Wang et al. [68] and Gefen et al. [26],
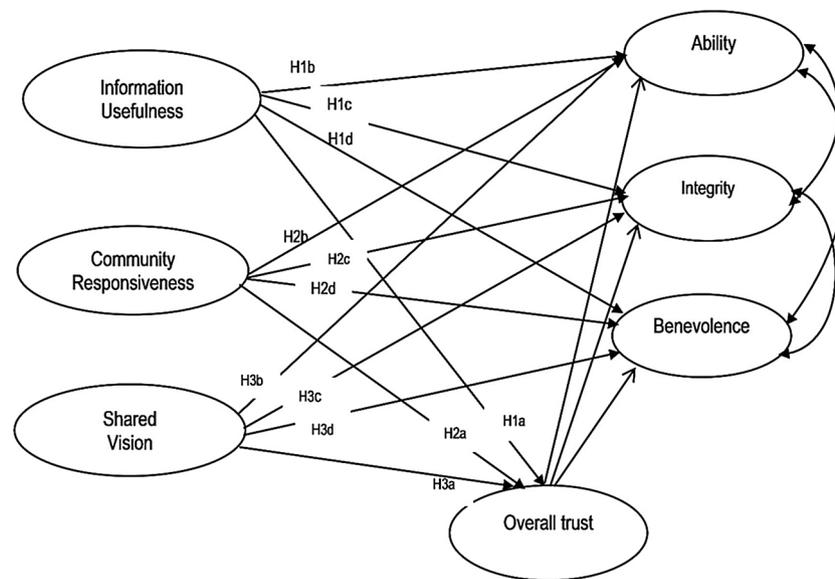
Fig. 1. Conceptual model of precursors of online trust in virtual health communities.

in their respective studies on online buying, argued for three important dimensions of trust, namely, ability, integrity and benevolence. Hart and Saunders [33], however, in a study on adoption and use of electronic interchange identified four dimensions, namely, competence, openness, caring and reliability. Commenting on variations in literature on dimensions of trust, Gefen and Straub [29] argued that 'trust is a context-dependent social concept whose relevant significant dimensions depend on the circumstance of the interaction'. They, however, further pointed out that while this is so, the three beliefs of ability, integrity and benevolence are common among studies that deal with the management of trust. A similar observation was made by Barki et al. [4]. Accordingly, this study includes ability, integrity and benevolence in the proposed model. It tests the existence of these as unique dimensions in health-related communities. Ability in this case represents consumers' beliefs about expertise or level of knowledge possessed by contributors to the community site. Integrity is to do with beliefs relating to honesty and sincerity of contributors, while benevolence denotes having beneficial motives towards other users of a site.

Apart from questions relating to what constitute important dimensions of trust, a review of literature shows that another research area that is not well developed is to do with modelling the trust construct. Commenting on modelling of multi-dimensional constructs, Carlson and O'Cass [9] and Dabholkar et al. [20] pointed out that there are two main ways in which this can be done. They note that one way is to look at dimensions independently while the other is to treat each dimension as a precursor of the construct. Dabholkar et al. [20] argued that for treating each dimension as a precursor of a construct noting that doing so offers greater opportunities for understanding a phenomenon than is the case when each dimension is treated independently. They also argued that treating dimensions as precursors provides higher predictive power to outcomes, a point confirmed in the studies by Carlson and O'Cass [9] and also Mpinganjira [49]. In a similar vein, it may be argued that treating an outcome construct as a second-order construct should be helpful in better understanding the power of different independent predictors on a phenomenon as a whole. To capture the differential influence if any of the proposed independent variables on trust at overall and individual dimensional levels, this study tested two separate models, one with trust as a multi-dimensional first-order construct and the other with trust as a second-order construct. Hsu et al. [38] observed that different types of trust may actually be built best using different strategies. By looking at trust at the individual dimensional level, the study will uncover the independent variables that

contribute more to each dimension of trust examined.

As indicated in the proposed model, the independent variables examined in this study are perceived information usefulness, perceived responsiveness and shared vision. Sub-sections below review the literature on each of these factors and their relationship with trust.

2.3.2. Perceived information usefulness and trust

Quality of information in terms of ability to enhance knowledge is important for members to derive the desired benefit of enhancing one's knowledge on health issues of concern [73]. Research shows that there are associations between the quality of available knowledge including perceived usefulness of information and trust. People are in general known to be readily willing to trust those who they consider to be sources of expert knowledge than those who are not [3]. Fisher et al. [25] found that information usefulness has a positive influence on trust in general. Hsu et al. [38] established that knowledge growth is an important antecedent of trust in community members. Song and Zahedi [64] observed that the quality of information embedded in communities exerts significant influence on their ability to build trust. Hsu et al. [38] pointed out that when members perceive that knowledge residing in the community is of high quality, they may consider the community as being able to add value to members. They further observed that existence of high-quality knowledge may signal benevolent intentions. This is more so considering the importance of high-quality knowledge for health-related decision-making and the harm that sharing of poor-quality information may have on users. Accordingly, the following are hypothesised in this study:

H1a. Perceived online health community information usefulness has significant influence on overall trust in the community.

H1b. Perceived online health community information usefulness has significant influence on trust in a community's ability.

H1c. Perceived online health community information usefulness has significant influence on trust in a community's integrity.

H1d. Perceived online health community information usefulness has significant influence on trust in a community's benevolence.

2.3.3. Member responsiveness and trust

Awad and Ragowsky [2] remarked that 'one element of online word of mouth systems that contributes to a greater sense of social support on the web is responsiveness of others' (p. 103). This is due to the fact that

high levels of human responsiveness can help denote a caring attitude. From a social exchange theory perspective, high levels of responsiveness can have a positive impact on trust by enhancing the rewards of being part of a community. Apart from directly enhancing rewards, responsiveness can also have influence on trust by impacting on perceptions of risk. When a post on an online community is able to attract many responses, it can help provide confidence that wide perspectives to an issue have been accessed. Having access to wide perspectives is important for informed decision-making and should in turn help in building trust in an online community as a source of information and support. Ridings et al. [60] further observed that irrespective of the number of responses, the very fact that some response is received to a post is critical to the development of trust. Lack of response may actually signal inability to address questions raised in a post. Furthermore, Gefen and Ridings [28] noted that responsiveness is associated with cooperative intentions, and these help signal reliability and integrity. Accordingly, the following are hypothesised in this study:

H2a. Members' perception of online health community responsiveness has significant influence on overall trust in the community.

H2b. Members' perception of online health community responsiveness has significant influence on trust in a community's ability.

H2c. Members' perception of online health community responsiveness has significant influence on trust in a community's integrity.

H2d. Members' perception of online health community responsiveness has significant influence on trust in a community's benevolence.

2.3.4. Shared vision and trust

The concept of shared vision embodies shared values, mutual goals and understanding in a cooperative relationship [43]. Expósito-Langa et al. [23] stated that 'shared vision represents the degree to which members of a network share an understanding of and perspective on the achievement of the network's activities and results' (p. 294). It helps members of an exchange relationship to believe that everyone will contribute their knowledge to help achieve mutual goals and that self-interest will not adversely affect activities aimed at achievement of goals [17]. A study by Boddy et al. [5] found that lack of shared vision in exchange relations does have a negative impact on cooperation. Hsu et al. [38] ascertained that the existence of shared vision as denoted by common values and goals is conducive to the development of trust. They argued that when individuals believe that they are working for a common goal, they will normally also hold the belief that others will not deliberately take advantage of them in pursuance of self-interest. Tsai and Ghoshal [66] also found that shared vision had a positive influence on trust. Shared vision and pursuit of common goals may drive group members to commit resources to the generation of capacity that ensures achievement of goals. Li [43] pointed out that shared values are an important facilitator of meaningful communication between parties that contributes positively to knowledge creation. Existence of superior knowledge helps enhance the benefits associated with a community which in turn exert a positive influence on trust. Accordingly, the following are hypothesised in this study:

H3a. Perceived level of shared vision in an online health community has significant influence on overall trust in the community.

H3b. Perceived level of shared vision in an online health community has significant influence on trust in a community's ability.

H3c. Perceived level of shared vision in an online health community has significant influence on trust in a community's integrity.

H3d. Perceived level of shared vision in an online health community has significant influence on trust in a community's benevolence.

3. Research methodology

To test the proposed conceptual model, data collected in a survey research on members of virtual communities from Gauteng, South Africa, were used. The population of interest was thus individual members of virtual health communities. Screening questions were used to identify respondents. The screening questions required the potential respondents to indicate if they were members of a virtual health community and if they participated in the discussions. In case of participation in a number of virtual health communities, respondents were asked to keep one virtual community in mind when responding the questions. Lack of readily available list of members of virtual health communities necessitated the use of non-probability sampling method. Convenience sampling was used to select the respondents. Convenience sampling entails selecting sampled units based on the ease of accessibility [8]. While convenience sampling was used, efforts were made to ensure that the sample included respondents of diverse backgrounds in terms of gender, age and race.

Constructs of interest as per the proposed conceptual model were conceptualised as multi-item constructs. Items used to measure each construct were adapted from literature. Information usefulness was measured using items adapted from Ma and Yuen [48] and Hsu et al. [37]. Community responsiveness was measured using items adapted from Zhao and Lu [71] and Ridings et al. [60]. Shared vision was measured using items adapted from Chiu et al. [15] and Hsu et al. [37]. Ability, integrity and benevolence were measured using items adapted from Ridings et al. [60] and Lu et al. [45]. All items were measured on a seven-point Likert scale, anchored on 1 = very strongly disagree to 7 = very strongly agree. Details of items used to measure each construct are provided in Table 1.

A registered professional research company based in Gauteng was used to assist with data collection. Questionnaires were administered by trained research assistants belonging to the company. Potential respondents were approached and invited to participate in the study by completing the questionnaire. The research assistants were physically present when the respondents were completing the questionnaires ready to address any questions that the participants may have had while answering the questions. To ensure informed consent, only respondents 18 years or older were allowed to participate in the study. At the end of the data collection period, a total of 361 usable responses were received; 42.7% of the respondents were male, while 57.3% were female; 66.2% were aged between 18 and 35 years, 29.3% belonged to the 36–49 age group, while 4.5% were aged 50 years and above.

Collected data were analysed using version 23 of AMOS software. A two-stage approach to structural equation modelling as recommended by Hair et al. [32] was used in the analysis. The first stage entails assessing measurement model for goodness of fit and the reliability and validity of constructs, while the second stage entails testing hypothesised relationships.

Fit indices used to assess the measurement model included the root mean square error of approximation (RMSEA), the comparative fit index (CFI), the goodness of fit index (GFI), the Tucker-Lewis index (TLI) and the normed Chi-square. Reliability was assessed using Cronbach alpha coefficient. As recommended by Hair et al. [32], the convergent validity of constructs was assessed by examining factor loadings and average variance extracted (AVE) coefficients. Discriminant validity was assessed by examining AVE coefficients in relation to maximum shared variance (MSV) coefficients. AVE coefficients were further compared with the squared correlations for all pairs of constructs.

4. Results

4.1. Assessment of measurement model

The reliability of the primary constructs was assessed first followed

Table 1
Scale Items, Reliability and Factor Analysis.

Constructs and items	Alpha Coefficient	Factor Loadings
ART – Ability-related Trust	0.769	
ART 1 – I feel very confident about the expertise that the contributors on the health forum have in relation to the topics we discuss		0.829
ART 2 – The other participants on the site have much knowledge about the subjects that we discuss		0.831
ART 3 – The other participants on the site have specialised knowledge that adds a lot of value to the conversations in this community		0.822
IRT – Integrity-related Trust	0.868	
IRT 1 – I do not doubt the honesty of members of online health forum		0.814
IRT 2 – I believe that the members of this health forum say the truth		0.865
IRT 3 – I can count on members of the health networking forum to be sincere		0.914
IRT 4 – I expect that the advice given on the online health forum is in the best judgment		0.792
BRT – Benevolence-related Trust	0.861	
BRT 1 – I believe members of the online health forum have good intentions towards each other		0.821
BRT 2 – I believe members of the online health forum would not deliberately do anything that might harm other members		0.838
BRT 3 – I believe members of this health network/forum are ready and willing to assist me		0.873
BRT 4 – I believe this health network is well meaning		0.829
IU – Information Usefulness	0.788	
IU 1 – The information available through this forum helps me learn new things		0.829
IU 2 – The information available on this forum helps me solve problems		0.879
IU 3 – Information available on the forum is useful for decision-making		0.810
CR – Community Responsiveness	0.843	
CR 1 – Members of the online health networking forum are very responsive to my posts		0.856
CR 2 – I can always count on getting a lot of responses to my posts		0.896
CR 3 – I can always count on getting responses to my posts fairly quickly		0.867
SV – Shared Vision	0.782	
SV 1 – The members in the health forum share the vision of helping others solve their health problems		0.812
SV 2 – The members of this health forum share the same goal of learning from each other		0.881
SV 3 – Members of the health forum share similar vision on the purpose of the forum		0.812

by the examination of model fit statistics as and testing for validity. The results, presented in Table 1, show that all the constructs were reliable as all had Cronbach alpha coefficients of greater than 0.7 [32]. The results specifically show that the Cronbach alpha values were 0.788 for information usefulness, 0.843 for community responsiveness, 0.782 for shared vision, 0.769 for ability, 0.868 for integrity and 0.861 for benevolence.

Model fit was found to be good as per Hair et al. [32]. The RMSEA was 0.060, CFI was 0.944, GFI was 0.913, TLI was 0.932 and the normed Chi-square value (χ^2/df) was 2.294. The Chi-square statistic was 355.571; df = 155; p = 0.000.

The results of factor analysis conducted, presented in Table 1, show that indicators loaded strongly (> 0.5) on their corresponding constructs. According to Hair et al. [32], factor loadings of 0.5 or greater are an indication of convergent validity. Convergent validity of each of the constructs examined was further examined using AVE coefficients. Table 1 shows that the AVE values of each construct were above 0.5. As per Hair et al. [32] AVE values of 0.5 and above indicate convergent validity.

Results relating to discriminant validity (refer to Table 2) show that the AVE coefficients of all six constructs were greater than the MSV coeeficients. The AVE coefficients of all six constructs were also greater

than the squared correlations for all pairs of constructs. These findings provide support for discriminant validity as per Hair et al. [32].

4.2. Assessing overall trust as a second-order factor

After assessing the primary constructs for reliability and validity, the existence of a second-order construct of trust made up of three dimensions was investigated. The main consideration in deciding on treating the first-order constructs as reflective constructs and not formative constructs was the expectation of interaction among the three dimensions of trust. The expectation was later confirmed by the presence of significant positive correlations between the constructs (refer to Table 2). Coltman [18] noted that in a reflective model, indicators have positive and significant intercorrelations, while in a formative model, indicators have no preconceived pattern of intercorrelation, as they do not necessarily share a similar theme. Akter et al. [1], Chen [13] and Kayhan et al. [41] also noted that reflective modelling is appropriate when first-order factors are assumed to interact, correlate or share a common theme.

The findings in this study show that all the three dimensions of trust as first-order factors, load significantly on the second-order factor. The loadings were 0.668 for ability, 0.831 for integrity and 0.918 for

Table 2
Descriptives, construct correlation and validity.

Construct	Mean	Standard Deviation	IU	CR	SV	ART	IRT	BRT
IU	6.08	0.733	**0.753**					
CR	5.90	0.805	0.330**	**0.804**				
SV	5.99	0.691	0.437**	0.503**	**0.746**			
ART	6.07	0.664	0.502**	0.466**	0.609**	**0.725**		
IRT	5.99	0.737	0.424**	0.428**	0.537**	0.558**	**0.798**	
BRT	6.05	0.715	0.493**	0.394**	0.577**	0.614**	0.766**	**0.782**
AVE			0.568	0.646	0.557	0.526	0.637	0.611
MSV			0.252	0.253	0.371	0.377	0.587	0.587

Note: Coefficients in bold are the square root of the average variance extracted. Below them are the correlation coefficients between.
Constructs; **Correlation is significant at 0.01 level.

Table 3
Hypotheses test results.

Predicted Variable	Predictor Variable	Standardised regression coefficient	SE	p	R^2
Second-order model					
Overall trust	Information usefulness	0.306	0.059	0.000	0.577
	Community responsiveness	0.177	0.054	0.004	
	Shared vision	0.460	0.084	0.000	
First-order model					
Ability-related trust	Information usefulness	0.261	0.052	0.000	0.546
	Community responsiveness	0.137	0.048	0.039	
	Shared vision	0.498	0.085	0.000	
Integrity-related trust	Information usefulness	0.202	0.063	0.001	0.463
	Community responsiveness	0.092	0.061	0.145	
	Shared vision	0.510	0.104	0.000	
Benevolence-related trust	Information usefulness	0.271	0.067	0.000	0.533
	Community responsiveness	0.019	0.063	0.765	
	Shared vision	0.557	0.108	0.000	

benevolence. The fit indices showed good fit as evidenced by a RMSEA coefficient of 0.088, CFI of 0.945, GFI of 0.929, TLI of 0.926 and normed χ^2/df coefficient of 3.808. The Chi-square statistic was 156.146 with 41° of freedom and a non-significant p value of 0.000. The findings thus provide support for the existence of a second-order trust factor hereby called overall trust.

4.3. Hypotheses testing

To test the study's hypotheses, two structural models were run. The first structural model had trust as a second-order construct, while the second model had the individual dimensions of trust. Table 3 presents results of the findings. According to the results, all three hypothesised predictor variables had significant influence on overall trust ($p < 0.05$). The standardised regression coefficients were 0.306 for information usefulness, 0.177 for community responsiveness and 0.460 for shared vision. On the basis of these results, hypotheses H1a, H2a and H3a are accepted. Results of the second structural model show that at the dimensional level, ability-related trust is driven by all the three hypothesised predictor variables. The standardised regression coefficients were 0.261 ($p = 0.000$) for information usefulness, 0.137 ($p = 0.039$) for community responsiveness and 0.498 ($p = 0.000$) for shared vision. From these results, hypotheses H1b, H2b and H2c are accepted.

The results further show that information usefulness and shared vision each has significant influence on integrity and benevolence. They, however, show that community responsiveness did not have significant influence on integrity-related trust. This is evidenced by standardised regression coefficients of 0.092 ($p = 0.145$) for integrity and 0.019 ($p = 0.765$) for benevolence. Accordingly, hypotheses H2c and H2d are not accepted, while H1c, H1d, H3c and H3d are accepted.

5. Discussion and implications

5.1. Key findings

The findings in this study show that ability, integrity and benevolence not only are distinct dimensions of trust but also contribute significantly to overall trust in virtual health communities. The findings further point to the importance of information usefulness, community responsiveness and shared vision in building overall levels of trust among members of virtual health communities. These findings are consistent with arguments posited in the social exchange theory and the common bond theory. The findings are also in line with observations by Fisher et al. [25] and Hsu et al. [38]. However, differences in the level of influence that various factors have on overall levels of trust should be considered. The findings specifically show that of the three precursor variables examined, overall levels of trust in virtual health community is influenced more by users' perceptions on shared vision among community members followed by information usefulness and community responsiveness.

Findings relating to trust at the dimensional level point to the fact that although all three dimensions contribute significantly to the formation of overall trust, different dimensions are affected differently by different precursors. The findings specifically show that while users' perceptions relating to shared vision has the most influence on all dimensions, its level of influence is stronger on benevolence-related trust followed by integrity-related trust and ability-related trust. The findings also show that the influence of community responsiveness plays a statistically significant role only in influencing ability-related trust and not benevolence-related trust or integrity-related trust. The findings on the influence of responsiveness on ability-related trust are consistent with those reported by Ridings et al. [60]. However, the findings that show that high levels of members' responsiveness do not necessarily influence beliefs signal benevolence is rather inconsistent with observations by Ridings et al. [60]. Possible reason for the findings on the influence of responsiveness on integrity- and benevolence-related beliefs is that health-related virtual communities, unlike other social networking communities, are likely to be associated with high utilitarian value. Consumers of information on such sites are mostly individuals dealing with serious situations as health concerns can be matters of great discomfort, if not life and death. In such situations, perceptions relating to common interest in so far as the purpose of the community is concerned and usefulness of information in assisting to manage health issues of concern is likely to be of more relevance than responsiveness for the sake of just dialogue.

5.2. Implications for practice

The findings in this study have important managerial implications for those tasked with the responsibility of managing health-related virtual communities. First, as more health-related virtual community sites open up, managers of such sites need to realise and appreciate the importance of building trust in their community if they are to retain users including contributors to their sites. In looking at trust, managers need to take interest in not only overall levels of trust but also users' trust in their site in relation to ability, integrity and benevolence.

In trying to build trust, it is important that managers have a good understanding of benefits that users derive from their sites. This entails the need for managers to find ways of assessing users' needs and satisfaction with their community sites. In doing so, managers need to take cognisance of the fact that ability to appeal to consumers of information on their sites, particularly with regard to influencing perceptions on usefulness of information, is likely to depend on the nature of health-related information one is looking for. Moreover, health issues of concern to community members are likely to be varied. This may

make it difficult for a single virtual community site to be able to generate user content that is detailed enough on a wide range of health topics. Managers of such sites thus need to decide on the range of health-related issues to focus on. They can decide to broaden or to focus on specific ailments. For example, a site manager can decide to focus on cancer or HIV or they may decide to focus on issues affecting a specific group of people such as health issues associated with old age. The more focused a site is, the higher the chances of it appealing to its targeted consumers of information.

Apart from deciding on areas of focus and irrespective of whether the decision is to go broad or narrow, managers can also enhance perceived usefulness of information on their sites by paying attention to issues of how information is presented. Mpinganjira [49] points out the need for online site managers to make their sites as user friendly as possible when it comes to site layout so as to facilitate ease of information search and processing. For example, to facilitate ease of search, managers can have group discussions relating to similar issues under one topic with a link to the relevant discussion content.

As for high levels of responsiveness, managers can promote this behaviour by engaging in active recruitment of participants to their sites. Different tactics can be used to entice active participation to their sites including the use of promotional efforts such as providing participants with opportunities to gain rewards in exchange for active participation. Site managers can negotiate with health service providers such as pharmacies for possible rewards in exchange for promotional opportunities on their sites.

The fact that consumers' perceptions regarding sense of shared vision prevailing in the community are associated with the largest influence on overall trust and trust at all the three dimensional levels examined points to the need for managers to cultivate the spirit of care and concern among users of their sites. Members of health-related virtual community sites especially contributors need to be seen to be doing so to the benefit of all members. As noted by Hsu et al. [38], high sense of shared purpose among group members helps curtail feelings of uncertainty and suspicion towards others. As a way of ensuring that members act for the common good, management of health-related sites need to monitor contributions posted on their sites and check and ensure that posts that are not for the common good or that may be offensive to other users do not get published on their sites. Site managers can also come up with regulations on acceptable and unacceptable behaviours on their site. Where contributors may act not in accordance with site regulations, managers may need to sanction such contributors.

Site managers need to also consider taking steps towards actively recruiting health professionals to regularly contribute their specialist knowledge on their sites. In so doing site, managers can have a positive influence on the chances of consumers viewing their sites as a good source of information.

5.3. Implications for theory

This study contributes to understanding trust in the context of health-related virtual communities and ways in which trust can be fostered. It provides insights into the conceptualisation of trust in health-related virtual communities. Specifically, the study offers empirical evidence to the existence of different dimensions of trust in health-related virtual communities. It shows that ability-, integrity- and benevolence-related beliefs are different facets of trust and that all these facets are part of exchange relationships among members of virtual health communities. Because trust is widely accepted to play an important part in influencing positive behaviour in social relations [36], it is important for researchers to take cognisance of the fact that as distinct dimensions, some behaviours in a virtual community may be compromised by lack in some of the facets of trust. This can be so despite overall trust being high, more so when overall trust is measured without considering beliefs associated with all three dimensions.

By undertaking a hierarchical analysis, this study contributes to the theory on trust in virtual health communities by empirically demonstrating the relative contributions of the different dimensions of trust to the formation of overall trust. As evidenced by the factor loadings, the findings in this study specifically show that perceived benevolence is a stronger contributor to overall trust followed by perceived integrity and perceived levels of competence. As per Carlson and O'Cass [9], the value of undertaking a hierarchical approach to modelling multi-dimensional constructs lies in the ability to capture important nuances such as the associations between items and relationships between precursor or outcome variables with the multi-dimensional constructs of concern. In the context of this study, the hierarchical analysis helps to specifically uncover the influence of information usefulness, community responsiveness and shared vision on formation of trust in virtual health communities.

Another research contribution of the study thus relates to provision of empirical evidence on how trust can be developed or enhanced in health-related virtual communities. As noted by Hadjikhani and LaPlaca [31], the question of how trust develops and how it can be sustained has not received much attention in research studies. Piorkowski [54] specifically appeals for studies that help understand conditions that give rise to the development of trust in online contexts. This study points to the need for researchers to examine conditions relating to three specific factors in trying to understand levels of overall trust prevailing among users of health-related virtual community sites. These factors are to do with users' perceptions relating to usefulness of information available on online community sites, users perceptions about levels of shared vision among members and perceptions about community responsiveness to requests for information posted on such sites.

Furthermore, the study points to the need for researchers interested in examining trust among members of virtual communities to take cognisance of the fact that different dimensions of trust may be associated with different precursors. The findings in this study demonstrate that the extent to which different factors may influence trust is inextricably related to the type including dimension of trust under consideration. As also observed by Seppänen et al. [62], there is often a lot of ambiguity in the study of trust insofar as precursors are concerned. This study provides insights that can help researchers disentangle not only trust but also precursors of different types of trust.

6. Conclusion, limitations and future studies

Use of online platforms for health networking purposes is a growing phenomenon. The new platform and form of interaction brings with it unique challenges on how to build trust more so considering that members are often total strangers to each other and may never have a chance of physically meeting each other. This study contributes to the understanding of trust in health-related virtual communities. The findings need to, however, be understood in line with a number of limitations. The first limitation relates to the fact that the study is based only on sample of respondents drawn from Gauteng, South Africa. The findings may thus not be generalised to all consumers of information from health-related virtual communities in South Africa. It is recommended that future studies consider drawing samples from wider geographical areas including in developed countries where Internet technology and health services are more developed than in South Africa. Findings from such studies can help isolate context-related factors that may explain consumer behaviour in virtual health communities. Furthermore, in looking at precursors of trust, this study focused only on three factors, namely, information usefulness, community responsiveness and shared vision. The findings show that together the three factors were able to explain only 57.7% of the variance in overall trust, 54.6% of variance in ability-related trust, 46.3% of variance in integrity-related trust and 53.3% of the variance in benevolence-related trust. Future studies should consider examining additional factors that may enhance the amount of variance in trust explained. Another limitation relates to the fact that the study did not

differentiate between different types of consumers. Future studies can also explore trust issues in health-related virtual communities considering different types of consumers including patients and carers. Other issues that future research can seek to address include examining specific behaviour-related outcomes of trust among members of health-related virtual communities, examining how trust evolves over time and factors that lead to changes in trust.

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