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RESEARCH ARTICLE

THE COMPENSATORY INTERACTION BETWEEN USER CAPABILITIES AND TECHNOLOGY CAPABILITIES IN INFLUENCING TASK PERFORMANCE: AN EMPIRICAL ASSESSMENT IN TELEMEDICINE CONSULTATIONS

Christina Serrano
Department of Information Systems, Sam M. Walton College of Business, University of Arkansas,
Fayetteville, AR 72701 U.S.A. {cserrano@walton.uark.edu}

Elena Karahanna
Management Information Systems Department, Terry College of Business, University of Georgia,
Athens, GA 30602 U.S.A. {ekarah@uga.edu}

Appendix A

Qualitative Study Data Collection and Analysis

Methodology

We conducted a qualitative field study incorporating semi-structured interviews for the developmental purpose of mixed methods research; in other words, we initially engaged in qualitative research in order to develop the theoretical constructs and hypotheses of our research model, which we subsequently tested using quantitative methods (Venkatesh et al. 2013).

At the outset of our qualitative inquiry, our research questions guided the development of the interview protocol, which targeted factors that contributed to successful and unsuccessful e-consultations, asking respondents to share personal or observed experiences. Following a widely accepted framework for building theories using qualitative research (Carroll and Swatman 2000; Eisenhardt 1989), we iterated between the steps of data collection, data analysis, and enfolding literature until we reached theoretical saturation in the development of the constructs and hypotheses that formed our research model.

Data Collection

In order to investigate e-consultations, we grounded our data collection within a telemedicine context because users in this context are motivated to perform their focal e-consultation task (evaluation and diagnosis of patients), and the context allows for data collection from multiple types of stakeholders, providing the opportunity to triangulate emergent concepts across the stakeholders. The main stakeholder types were consulting providers, who assumed the role of consultant and used telemedicine to elicit the relevant information needed to evaluate and diagnose patients; presenting providers, who filled the role of presenter and used telemedicine to communicate the patient's problems to the consulting provider; healthcare administrators, who coordinated the implementation of the telemedicine systems and scheduling of telemedicine consultations at their respective sites; and telemedicine consultants, who were responsible for the telemedicine system implementations, training, and maintenance. In total, we conducted 39 semi-structured interviews with 14 consulting providers, 10 presenting providers, 8 healthcare administrators, and 7 telemedicine consultants (see Table A1). The telemedicine consultants worked for the same organization, and the remaining respondents represented 22 different healthcare organizations.

Table A1. List of Interviews for Qualitative Study

Consulting Providers

Title	Mode	Length	Interview ID	Number of Interviewers
Primary Care Physician	FTF	1:23:12	1	2
Pediatrician / Clinical Geneticist	FTF	1:06:54	2	2
Endocrinologist	FTF	2:20:19	3	2
Primary Care Physician/ Medical Director	Phone	0:41:18	5	1
	FTF	1:26:22	21	1
Mental Health Professional	FTF	1:04:37	7	1
Emergency Physician	FTF	0:54:45	9	1
	FTF	0:48:06	27	2
Primary Care Physician/ Medical Director	FTF	0:56:50	11	1
	FTF	0:54:13	28	2
Primary Care Physician/ Medical Director	Phone	0:31:34	32	1
Primary Care Physician/ Medical Director	Phone	0:42:16	34	2
Pediatric Psychiatrist	FTF	1:01:20	35	1
Primary Care Physician	FTF	0:45:59	36	1
Adult/Geriatric Psychiatrist	Phone	0:30:00	37	1
Optometrist	Phone	0:45:43	38	1
Obstetrician/Gynecologist	Phone	0:17:27	39	1

Presenting Providers

Title	Mode	Length	Interview ID	Number of Interviewers
Primary Care Physician	Phone	0:48:51	6	1
Nursing Director	FTF	1:29:01	18	3
Nursing Director	FTF	1:08:38	19	3
	FTF	0:22:23	25	2
	Phone	0:29:12	33	2
Nursing Director	FTF	1:36:11	20	3
Nursing Director	FTF	0:54:11	24	3
Nursing Director	FTF	0:27:18	29	1
Social Worker	FTF	0:54:11	24	3
Nurse	FTF	0:41:31	20	3
Nurse	FTF	0:41:31	20	3
Nurse	FTF	0:40:27	30	1

Table A1. List of Interviews for Qualitative Study (Continued)

Healthcare Administrators				
Title	**Mode**	**Length**	**Interview ID**	**Number of Interviewers**
Parent Organization Administrator	Phone	0:39:29	4	2
	FTF	0:59:42	31	2
Telemedicine Coordinator	FTF	0:39:26	10	1
Healthcare Administrator	FTF	1:29:01	18	3
Healthcare Administrator	FTF	1:08:38	19	3
	FTF	0:22:23	25	2
	Phone	0:29:12	33	2
Healthcare Administrator	FTF	1:36:11	20	2
Healthcare Administrator	FTF	1:00:00	22	2
Healthcare Administrator	FTF	0:41:37	23	2
Healthcare Administrator	FTF	0:54:11	24	3
Telemedicine Consultants				
Title	**Mode**	**Length**	**Interview ID**	**Number of Interviewers**
Executive Director	FTF	0:21:49	15	1
Scheduling Coordinator	FTF	0:47:34	16	1
IT Administrator	FTF	0:43:20	14	1
Telemedicine Liaison	FTF	0:44:16	8	1
	FTF	1:08:38	19	3
	FTF	0:22:23	26	2
Telemedicine Liaison	Phone	0:44:10	12	1
	FTF	1:29:01	18	3
Telemedicine Liaison	Phone	0:37:21	13	1
Telemedicine Liaison	Phone	0:32:49	17	1

FTF = Face to Face
Length is presented in H:MM:SS

Data Analysis

All interviews were transcribed, and the interview transcripts were coded using the qualitative data analysis software MAXQDA. Our coding process was structured into first-order informant-driven concepts, second-order researcher-induced themes, and aggregate analytical dimensions, which adheres to a bottom-up, inductive analysis of the data (Van Maanen 1979). First-order concepts are derived from the insights expressed by the respondents, and second-order themes are the theoretical concepts that the researchers apply to explain the patterns in the first-order data (Van Maanen 1979). During the coding and analysis process, our research team met continuously to discuss the emergent findings, revise the interview protocol, and integrate theoretical concepts found in the literature. Any disagreement in the coding and analysis process was resolved to consensus. Data collection, data analysis, and literature integration ensued in this iterative process until no new concepts emerged (Eisenhardt 1989). Figure A1 portrays the data structure of our findings. These results shaped the theoretical development of the core constructs and hypotheses of our research model.

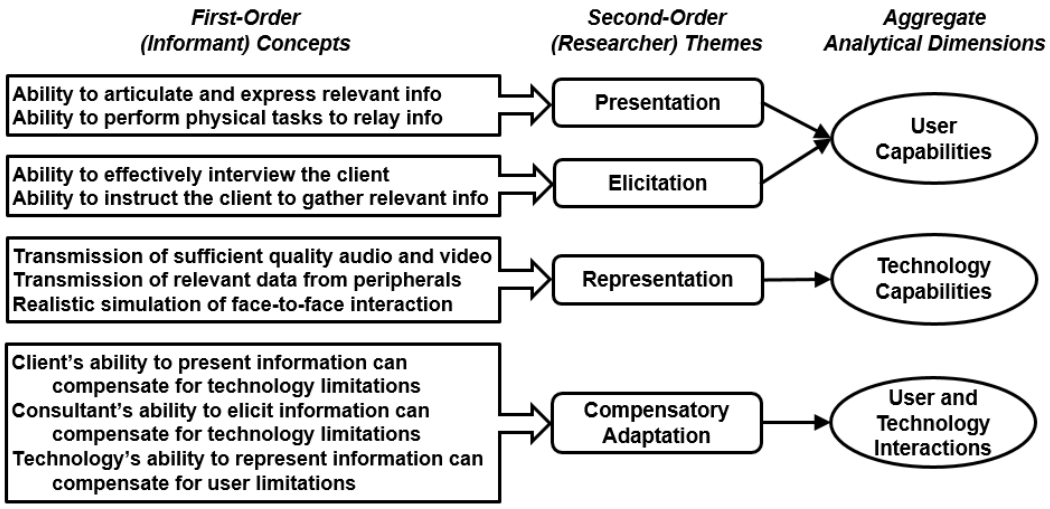

Figure A1. Data Structure of Findings

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Appendix B

Study 1 (Field Survey) Instrument Development

We followed established guidelines to develop scales for constructs in our research model (Mackenzie et al. 2011; Netemeyer et al. 2003; Straub 1989). A complete list of items for this study can be found in Table B1. All constructs were measured using a seven-point Likert scale where 1 = Strongly Disagree and 7 = Strongly Agree.

We measured the constructs using the medical consultation as our level of analysis and, thus, required respondents to recall one of their most recent telemedicine consultation experiences and respond to the survey questions based on that one particular telemedicine consultation experience. Prior to answering survey questions, the respondents were asked to describe (in open ended questions) the patient's medical condition and the particular telemedicine consultation experience, including interactions with the telemedicine participants and technology. This served as a validity check to ensure their telemedicine experience was valid for our research purpose (e.g., not a distance learning experience or other non-clinical application) and to facilitate the respondents' anchoring on that one particular experience when answering the remaining survey questions.

For most constructs in our study, we developed new scales because validated scales did not exist. There were no existing scales for presentation and elicitation, and existing scales for representation and perceived diagnosticity were deemed incomplete. Most of the existing items for perceived diagnosticity use language such as "judge" the quality or attribute of a product or "to get a real feel" for the product. Because we are focusing on the process of clinical evaluations of patients rather than products, this language did not seem appropriate and we opted to use wording such as *evaluate* and *assess*. Therefore, in reviewing existing scales for perceived diagnosticity, we chose to adapt one item from the literature that uses the language "carefully evaluate" in operationalizing diagnosticity (Kempf and Laczniak 2001; Pavlou and Fygenson 2006) and developed the remaining items. Similarly, when reviewing existing scales for representation, we found that this construct has been operationalized largely in terms of information completeness (Burton-Jones and Grange 2012; Overby and Konsynski 2010), which, in our context, only narrowly captures the construct's meaning according to our theoretical definition. Consequently, we adapted one information completeness item from Overby and Konsynski (2010) and developed additional items.

The item development process consisted of a prioritization exercise, item sorting, and two phases of pretest. We paid close attention to the content validity of the constructs by first ensuring that items represented the full domain of the construct definitions. Content validity was further assessed using a prioritization exercise (Mackenzie et al. 2011; Netemeyer et al. 2003) completed by four judges (doctoral students) who rated the extent to which each item was representative of the overall construct based on the construct's definition. We next employed item sorting by eight judges (faculty, doctoral students, and an IT professional) to provide a qualitative assessment of construct validity for the scales we created (Mackenzie et al. 2011; Netemeyer et al. 2003). Problematic items were reworded or dropped.

The survey was then pretested in two phases. First, we administered a pen-and-paper version at a practitioner telemedicine conference, where five telemedicine clinicians completed the survey and provided feedback. Based on their feedback, we shortened the survey and made modifications to the wording of some items. Second, we presented the revised instrument to two physicians and specifically requested suggestions concerning both the survey design and item wording. As a result of their review, we clarified survey instructions and modified the wording for some additional items.

References

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Table B1. Construct Definitions and Item Measures
Perceived e-consultation Diagnosticity: *the perceived ability of the telemedicine system (including technology and users) to enable consulting clinicians to understand and evaluate the health conditions of remote patients* During this particular telemedicine consultation, the ***telemedicine consultation***[a] allowed me to: DIAG1: Carefully evaluate the health condition of the patient DIAG2: Thoroughly assess the health condition of the patient DIAG3: Accurately evaluate the patient's health condition
Representation: *the perceived capacity of the telemedicine technology to present information relevant to the clinical evaluation process, including simulations of actors and objects within the physical setting, their properties and characteristics, and how process participants interact with them.* During this particular telemedicine consultation, the ***telemedicine technology***[b]: REP1: Transmitted audio and video feedback that was adequate for the clinical evaluation REP2: Transmitted all of the relevant information I needed for the clinical evaluation REP3: Allowed me to see everything that I needed to see for the clinical evaluation
Presentation: *perception of the presenters' capacity to relay information relevant to the clinical evaluation process, based on their ability to articulate pertinent information and execute actions that inform the process* During this particular telemedicine consultation, the ***presenting provider and/or patient*** was able to: PRES1: Effectively articulate the information I needed to know PRES2: Disregard irrelevant information and communicate to me only what was important PRES3: Execute hands-on tasks in order to give me the clinical information I needed PRES4: Complete the tasks necessary to present me with the information I needed
Elicitation: *perception of the consultants' capacity to solicit information relevant to the clinical evaluation process, based on their ability to interview and instruct the presenter(s) in a manner that informs the process* During this particular telemedicine consultation, ***I*** was able to: ELIC1: Effectively ask questions to elicit important information about the patient's condition ELIC2: Ask questions that were clearly understood by the patient and/or presenting provider ELIC3: Provide clear instructions to the patient and/or presenting provider on observing any patient conditions that needed to be communicated to me
Trust Requirements: *the perceived need for the client (advice-seeker) to trust the consultant (advice-giver) in a medical consultation context*[c] In general, when conducting clinical evaluations for medical conditions such as this one, it is necessary that: TRU1: The patient believes he/she can have confidence in my abilities TRU2: The patient feels that he/she can trust me TRU3: There is a trusting relationship with the patient TRU4: The patient believes I am acting in his/her best interest
Sensory Requirements: *the perceived need for the process participants to be able to enjoy a full sensory experience of the process and other process participants and objects in a medical consultation context*[c] In general, when conducting clinical evaluations for medical conditions such as this one, it is necessary that: SEN1: I use auscultation techniques[d] to evaluate patient organ systems during the clinical evaluation SEN2: I physically examine the patient during the clinical evaluation SEN3: I employ the sense of touch during the clinical evaluation SEN4: I obtain tactile feedback concerning the patient's condition during the clinical evaluation SEN5: I employ palpation and percussion techniques[d] during the clinical evaluation

[a]Respondents were provided with the following definition: *telemedicine consultation refers to both the technology and the interactions with people via the technology*.

[b]Respondents were provided with the following definition: *telemedicine technology refers to the telemedicine equipment, software and network only.*

[xc]The control variables of trust requirements and sensory requirements refer to perceptions of the *need* for trust and sensory experience and not perceptions of whether these needs were met.

[d]The techniques of auscultation, palpation and percussion refer to physical examination techniques employed during medical consultations.

Appendix C

Study 1 (Field Survey) Sample Characteristics

Table C1. Sample Characteristics (n = 201)

Variable	Category	Freq.	Percent
Gender	Male	121	60.2
	Female	80	39.8
Age	25–34 years	17	8.5
	35–44 years	61	30.3
	45–54 years	68	33.8
	55–64 years	37	18.4
	65+ years	18	9.0
Years of Telemedicine Experience	< 1 year	14	7.0
	1–3 years	76	37.8
	4–6 years	55	27.4
	7–9 years	22	10.9
	10+ years	34	16.9
Hours of Telemedicine Use Per Week	< 1 hour	35	17.4
	1–10 hours	141	70.1
	11–20 hours	15	7.5
	21–30 hours	6	3.0
	31–40 hours	1	0.5
	41–50 hours	2	1.0
	50+ hours	1	0.5
Number of Telemedicine Patients Per Week	< 1 patient	34	16.9
	1–10 patients	119	59.2
	11–20 patients	26	12.9
	21–30 patients	15	7.5
	31–40 patients	4	2.0
	41–50 patients	0	0.0
	50+ patients	3	1.5

Table C2. Geographic Location of Survey Respondents

State	Freq.	Percent	State	Freq.	Percent
Georgia	41	20.4	Washington	3	1.5
Missouri	31	15.4	Maryland	3	1.5
Arkansas	14	7.0	Nebraska	3	1.5
Virginia	11	5.5	Oklahoma	3	1.5
Kentucky	10	5.0	South Carolina	3	1.5
Massachusetts	8	4.0	Arizona	2	1.0
Kansas	6	3.0	Colorado	2	1.0
Texas	5	2.5	Florida	2	1.0
New York	5	2.5	Illinois	2	1.0
Louisiana	4	2.0	Pennsylvania	2	1.0
Michigan	4	2.0	Wyoming	2	1.0
Oregon	4	2.0	Iowa	1	0.5
California	4	2.0	Ohio	1	0.5
Hawaii	4	2.0	Rhode Island	1	0.5
New Mexico	4	2.0	South Dakota	1	0.5
Alaska	3	1.5	Utah	1	0.5
Indiana	3	1.5	West Virginia	1	0.5
Minnesota	3	1.5	Wisconsin	1	0.5
Tennessee	3	1.5			

Table C3. Respondents' Medical Specialties

Medical Specialty	Freq.	Perc.	Medical Specialty	Freq.	Perc.
Psychiatry	39	19.4	Pulmonology	3	1.5
Pediatrics	38	18.9	Genetics	3	1.5
Neurology	20	10.0	Nutrition	3	1.5
Clinical Psychology	10	5.0	Rheumatology	2	1.5
Obstetrics and Gynecology	9	4.5	Urology	3	1.5
Internal Medicine	9	4.5	Orthopedics	2	1.0
Surgery	8	4.0	Physical Medicine	2	1.0
Emergency Medicine	8	4.0	Speech-Language Pathology	2	1.0
Critical Care	8	4.0	Wound Care	2	1.0
Dermatology	7	3.5	Allergy-Immunology	1	0.5
Primary Care	6	3.0	Gastroenterology	1	0.5
Endocrinology	5	2.5	Hematology	1	0.5
Cardiology	4	2.0	Hepatology	1	0.5
Geriatrics	4	2.0	Oncology	1	0.5
Nephrology	4	2.0	Ophthalmology	1	0.5
Infectious Diseases	4	2.0			

Note: Some respondents reported more than one medical specialty. The frequencies reported in this table reflect all reported medical specialties.

Appendix D

Study 1 (Field Survey) Measurement Validation

Table D1. Inter-Construct Correlation Matrix and AVE

Construct	Mean (Std Dev)	DIAG	ELIC	PRES	REP	SENS	TRU
DIAG	5.54 (1.34)	0.94					
ELIC	5.94 (1.13)	0.72**	0.93				
PRES	5.57 (1.23)	0.64**	0.69**	0.82			
REP	5.51 (1.33)	0.69**	0.64**	0.55**	0.81		
SENS	3.79 (1.77)	-0.03	-0.10	-0.01	-0.09	0.78	
TRU	6.19 (1.05)	0.21**	0.14*	0.19**	0.16*	0.03	0.83

Legend: DIAG = e-consultation Diagnosticity; ELIC = Elicitation; PRES = Presentation; REP = Representation; SENS = Sensory Requirements; TRU = Trust Requirements

All constructs measured on a 1–7 Likert scale. The shaded diagonal is the square root of the AVE. **p < 0.01; *p<0.05.

Table D2. Results of CFA Measurement Model Analysis

Construct	Variable Name	Factor Loadings	Cronbach's Alpha	Composite Reliability	AVE
e-consultation Diagnosticity	DIAG1 DIAG2 DIAG3	0.94 0.95 0.94	0.96	0.97	0.89
Presentation	PRES1 PRES2 PRES3 PRES4	0.90 0.77 0.72 0.88	0.89	0.92	0.67
Elicitation	ELIC1 ELIC2 ELIC3	0.95 0.94 0.89	0.95	0.96	0.86
Representation	REP1 REP2 REP3	0.83 0.81 0.80	0.85	0.91	0.66
Sensory Requirements	SEN1 SEN2 SEN3 SEN4 SEN5	0.75 0.72 0.75 0.82 0.84	0.88	0.89	0.61
Trust Requirements	TRU1 TRU2 TRU3 TRU4	0.77 0.92 0.75 0.88	0.89	0.93	0.83

Appendix E

Interaction Effects for Study 1 and Study 2

Study 1: Field Survey

To further interpret the nature of the significant interactions, we employed partial derivative analysis, response surface graphs, and two-way interaction plots with simple slope tests.

Partial Derivative Approach

The partial derivative analysis is based on the analysis of the factored coefficients, or partial derivatives, of the latent variables involved in a significant interaction effect to examine the relationship between the dependent variable and each variable in the interaction effect separately while holding the other variables constant (Ping 2003). In other words, the partial derivative represents the slope of the regression line between one of the independent variables and the dependent variable, while holding constant all other independent variables. This allows us to examine the relationship between the dependent variable and the independent variable at all levels of the "other variable" in the interaction term. Using this method, we calculated the partial derivatives of our dependent variable, e-consultation diagnosticity, with respect to the independent variables involved in the significant interaction effects (presentation × representation and elicitation × representation).

Specifically, given the regression equation for H4, Diag = $\beta_0 + \beta_1$SensReq + β_2TrustReq + β_3Pres + β_4Elic + β_5Rep + β_6(Rep × Pres), the partial derivatives of e-consultation diagnosticity with respect to representation and presentation, respectively, are $\frac{\partial \text{Diag}}{\partial \text{Rep}} = (\beta_5 + \beta_6 \text{ Pres})$ and $\frac{\partial \text{Diag}}{\partial \text{Pres}} = (\beta_3 + \beta_6 \text{ Rep})$. Likewise, given the regression equation for H5, Diag = $\beta_0 + \beta_1$SensReq + β_2TrustReq + β_3Pres + β_4Elic + β_5Rep + β_6(Rep × Elic), the partial derivatives of e-consultation diagnosticity with respect to representation and elicitation, respectively, are $\frac{\partial \text{Diag}}{\partial \text{Rep}} = (\beta_5 + \beta_6 \text{ Elic})$ and $\frac{\partial \text{Diag}}{\partial \text{Elic}} = (\beta_4 + \beta_6 \text{ Rep})$. Results of the partial derivative analysis show that the relationship between presentation and e-consultation diagnosticity is strongest at low levels of representation (see Table E1; significant effects in bold) and nonsignificant at high levels of representation. Likewise, the relationship between representation and e-consultation diagnosticity is strongest at low levels of presentation and nonsignificant at high levels of presentation (see Table E2). In addition, elicitation has its strongest effect on e-consultation diagnosticity at low levels of representation and no significant effect at high levels of representation (see Table E3). Similarly, representation influences e-consultation diagnosticity the most at low levels of elicitation and has no significant impact at high levels of elicitation (see Table E4). Altogether, these results suggest that the user capabilities of presentation and elicitation matter most when representation is low, and vice versa, supporting H4 and H5.

Table E1. Presentation to Diagnosticity Relationship at Different Levels of Representation

Rep Levels (Scale 1–7)	$\frac{\partial \text{Diag}}{\partial \text{Pres}}$	Standard Error	T-Statistic
7	-0.02	0.24	-0.09
6	0.09	0.21	0.41
5.51 (Rep Mean)	0.14	0.20	0.70
5	0.19	0.18	1.06
4	0.30	0.16	1.92
3	0.41	0.13	**3.11**
2	0.51	0.11	**4.81**
1	0.62	0.09	**7.23**

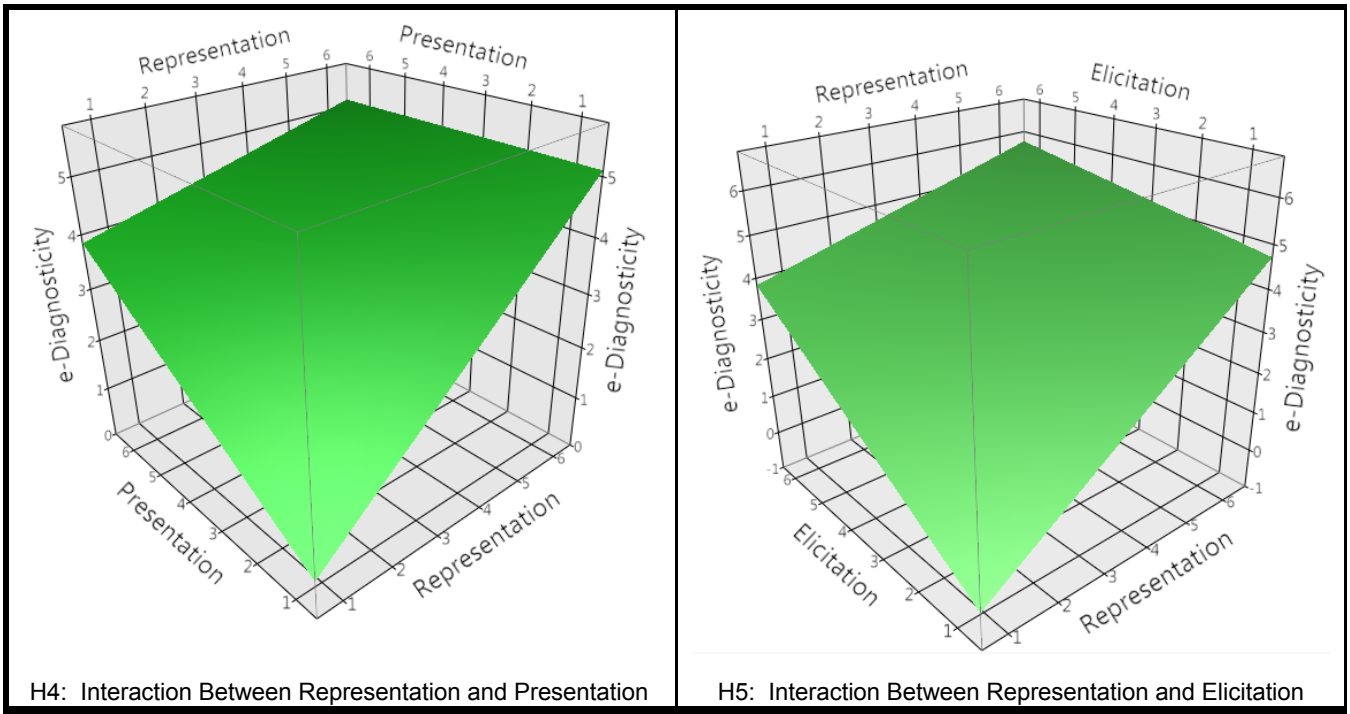
Table E2. Representation to Diagnosticity Relationship at Different Levels of Presentation			
Pres Levels (Scale 1–7)	**$\frac{\partial Diag}{\partial Rep}$**	**Standard Error**	**T-Statistic**
7	0.18	0.23	0.82
6	0.29	0.20	1.47
5.57 (Pres Mean)	0.34	0.19	1.81
5	0.40	0.17	**2.34**
4	0.50	0.14	**3.53**
3	0.61	0.12	**5.23**
2	0.72	0.09	**7.75**
1	0.83	0.07	**11.45**

Table E3. Elicitation to Diagnosticity Relationship at Different Levels of Representation			
Rep Levels (Scale 1–7)	**$\frac{\partial Diag}{\partial Elic}$**	**Standard Error**	**T-Statistic**
7	0.11	0.25	0.44
6	0.23	0.22	1.02
5.51 (Rep Mean)	0.29	0.21	1.36
5	0.35	0.20	1.77
4	0.46	0.17	**2.74**
3	0.58	0.14	**4.04**
2	0.70	0.12	**5.80**
1	0.82	0.10	**8.16**

Table E4. Representation to Diagnosticity Relationship at Different Levels of Elicitation			
Elic Levels (Scale 1–7)	**$\frac{\partial Diag}{\partial Rep}$**	**Standard Error**	**T-Statistic**
7	0.21	0.23	0.91
6	0.32	0.20	1.63
5.94 (Elic Mean)	0.33	0.20	1.68
5	0.44	0.17	**2.58**
4	0.56	0.14	**3.88**
3	0.68	0.12	**5.72**
2	0.80	0.09	**8.44**
1	0.91	0.07	**12.44**

Response Surface Methodology and Interaction Plots

The response surface methodology is an approach that enables three-dimensional visualization of the relationships between independent variables and dependent variables and is useful for interpreting interaction effects (Titah and Barki 2009). Regarding H4, under low levels of representation, there is a steeper slope for the relationship between presentation and e-consultation diagnosticity (lower left edge of the surface), whereas the slope for this relationship at high levels of representation is relatively flat (top right edge of the surface) (see Figure E1). This is



H4: Interaction Between Representation and Presentation

H5: Interaction Between Representation and Elicitation

Figure E1. Response Surface Visualization of Significant Interaction Effects for Study 1

also evident by the two way interaction plots (see Figure E2) and the simple slope tests, which reveal a strong positive relationship between presentation and e-consultation diagnosticity when representation is low ($t = 2.38$, $p < 0.05$) and a nonsignificant relationship between presentation and e-consultation diagnosticity when representation is high ($t = 1.16$, $p = 0.25$). This implies that user presentation capabilities can compensate for limitations in the technology such that when technology has low representation capabilities, user presentation skills become an important determinant of the diagnostic process.

In exploring the other side of this interaction, when presentation capabilities are low, the surface plot shows a steeper slope for the relationship between representation and e-consultation diagnosticity (lower right edge of the surface) compared to the slope at high presentation levels (top left edge of the surface) (Figure E1). Consistent with these results, the two-way interaction plots (Figure E2) and simple slope tests show that when presentation is low, there is a stronger relationship between representation and e-consultation diagnosticity ($t = 5.32$, $p < 0.001$) compared to when presentation is high ($t = 4.27$, $p < 0.001$). This indicates that representation capabilities are especially important when presentation capabilities are low and that the additional information provided by high levels of technology representation can compensate for information that a user fails to present or presents poorly. Collectively, these findings support H4.

Regarding H5, under low levels of representation, there is a steeper slope for the relationship between elicitation and e-consultation diagnosticity (lower left edge of the surface) compared to the slope for this relationship at high levels of representation (top right edge of the surface) (Figure E1). The two-way interaction plots (Figure E2) and simple slope tests reveal that the relationship between elicitation capabilities and e-consultation diagnosticity is stronger at low levels of representation ($t = 3.74$, $p < 0.001$) than at high levels of representation capability ($t = 3.20$, $p < 0.01$). These findings suggest that elicitation capabilities can compensate for lack of technology representation capabilities. Likewise, the surface plot shows that there is a steeper slope for the relationship between representation and e-consultation diagnosticity at low levels of elicitation (lower right edge of the surface) compared to high levels of elicitation (top left edge of the surface) (Figure E1). Consistent with these results, the two-way interaction plots (Figure E2) and the simple slope tests show that when elicitation is low, there is a stronger relationship between representation and e-consultation diagnosticity ($t=4.99$, $p<0.001$) compared to when elicitation is high ($t = 4.29$, $p < 0.001$). This suggests that representation capabilities matter most when user elicitation capabilities are low and can compensate for poor elicitation skills. In sum, these findings lend further support for H5.

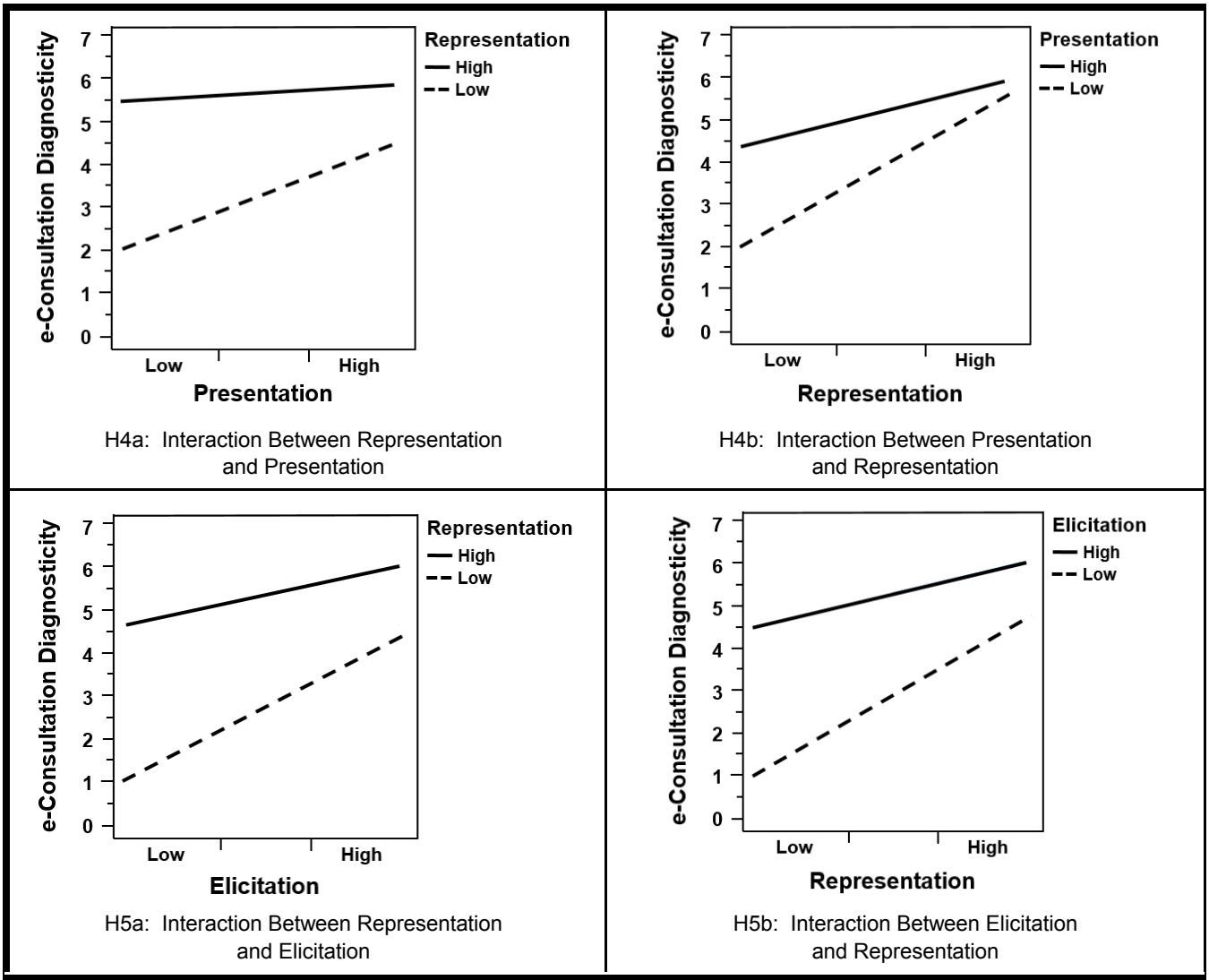
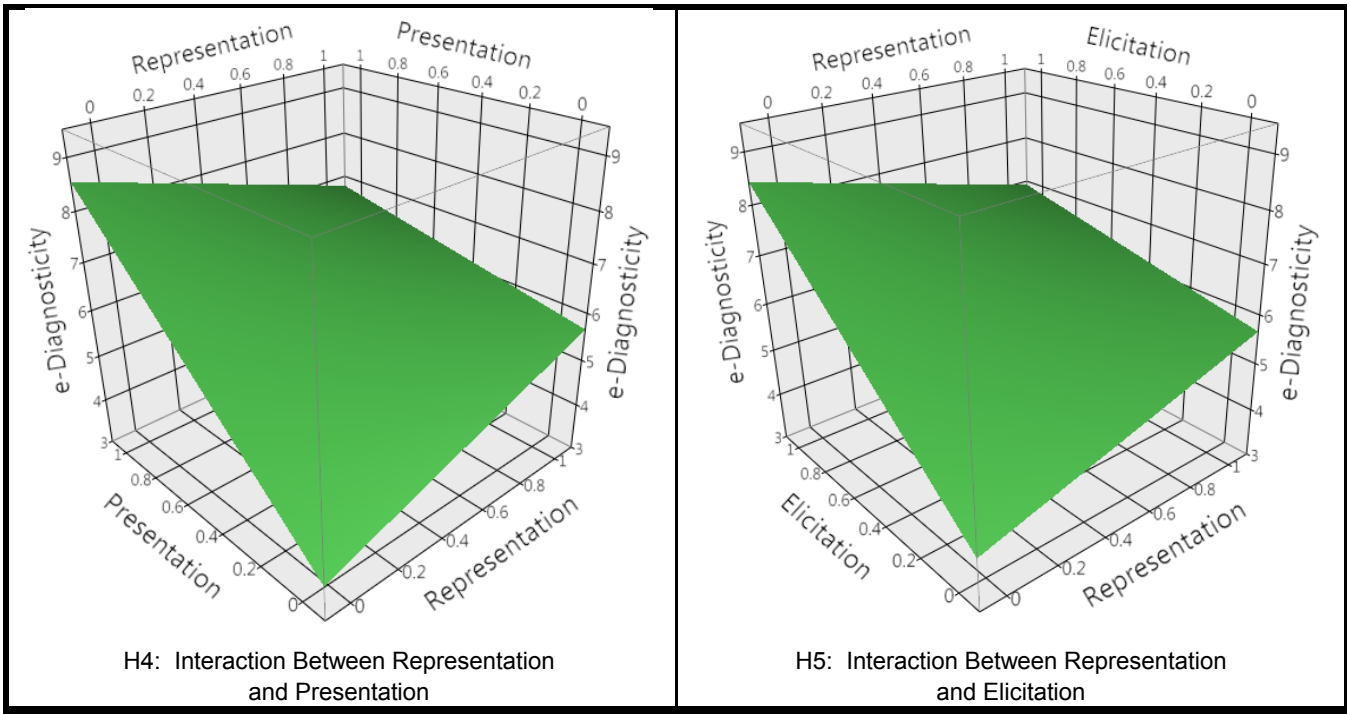


Figure E2. Interaction Plots: Field Survey (Study 1)

Study 2: Lab Experiment

To explore the nature of the significant interaction effects, we produced surface response graphs (Figure E3) and interaction plots (Figure E4) and performed simple slope tests. With regard to H4, the surface plot (Figure E3) shows that, under low levels of representation, there is a steeper slope for the relationship between presentation and e-consultation diagnosticity as compared to the slope for this relationship at high levels of representation. Supporting these results, the two-way interaction plots (Figure E4) and simple slope tests show that the relationship between presentation capability and e-consultation diagnosticity is stronger at low levels of representation ($t = 5.85$, $p < .001$) as compared to high levels of representation ($t = 1.67$, $p < 0.10$). Hence, when user presentation skills are poor, technology representation becomes an important informant in the e-consultation process, compensating for weaknesses in the user's problem presentation skills. Furthermore, the surface plot reveals a steeper slope for the relationship between representation and e-consultation diagnosticity at low levels of presentation compared to the slope for this relationship at high levels of presentation. The two-way interaction plots and simple slope tests are consistent with these results. When user presentation capabilities are low, there is a significant positive relationship between representation and e-consultation diagnosticity ($t = 2.11$, $p < 0.05$), and when presentation capabilities are high, there is a weaker and negative relationship between representation and e-consultation diagnosticity ($t = -1.88$, $p < 0.10$). This suggests that technology capabilities are able to compensate for weaknesses in user presentation skills. Altogether, these findings support H4.



H4: Interaction Between Representation and Presentation

H5: Interaction Between Representation and Elicitation

Figure E3. Response Surface Visualization of Significant Interaction Effects for Study 2

In terms of H5, the surface plot (Figure E3) illustrates similar results. The relationship between elicitation and e-consultation diagnosticity has a steeper slope at low levels of representation than at high levels of representation. Moreover, the two-way interaction plots (Figure E4) and simple slope tests show that there is a stronger positive relationship between elicitation and e-consultation diagnosticity when representation is low ($t=5.36$, $p<.001$) and a weaker relationship when representation is high ($t=1.78$, $p<0.10$). These results imply that strong user elicitation skills can compensate for weaknesses in technology representation capabilities. Additionally, the surface plot depicts a steeper slope for the relationship between representation and e-consultation diagnosticity at low levels of elicitation as compared to the slope for this relationship at high levels of elicitation. The two-way interaction plots and simple slope tests also reveal a stronger relationship between representation and e-consultation diagnosticity at low levels of elicitation ($t = 1.68$, $p < 0.10$) versus high levels of elicitation ($t = -1.58$, $p = 0.12$). Thus, technology capabilities can compensate for poor elicitation capabilities. Collectively, these findings provide support for H5.

References

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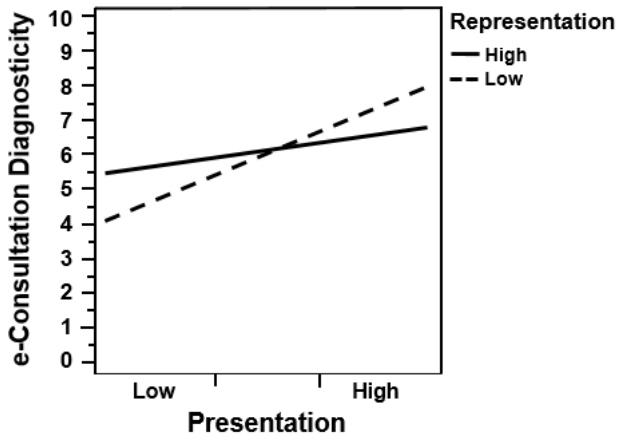
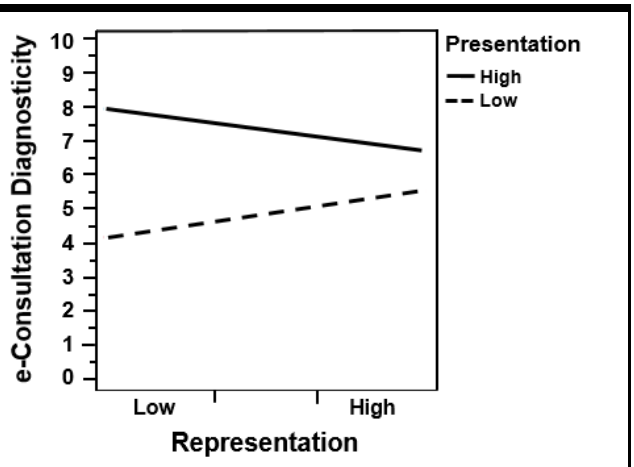
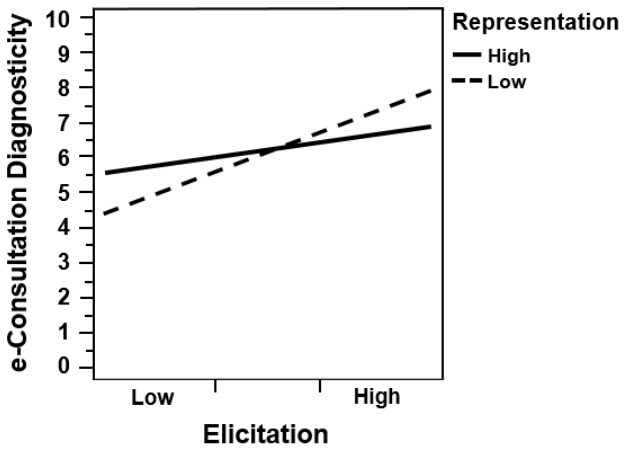


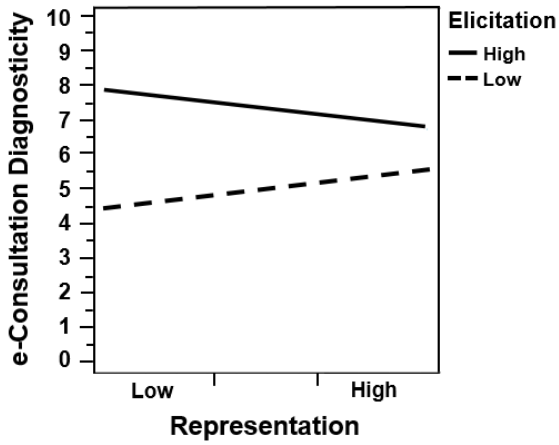
H4a: Interaction Between Representation and Presentation



H4b: Interaction Between Presentation and Representation



H5a: Interaction Between Representation and Elicitation



H5b: Interaction Between Elicitation and Representation

Figure 4. Interaction Plots: Lab Experiment (Study 2)

Appendix F

Post Hoc Analysis for Study 1

In Study 1, due to the possibility of multicollinearity between the interaction effects (correlation = .60) and the fact that the two interaction effects are non-significant when entered together in the regression, we combined the two user capabilities into a composite user capability construct and reran the regression analysis.

Table F1. Results of Post Hoc Hierarchical Regression Analysis (DV = E-Consultation Diagnosticity)

	Model 1		Model 2		Model 3	
Variable	**Beta**	**(S.E.)**	**Beta**	**(S.E.)**	**Beta**	**(S.E.)**
Controls						
Sens Req	-.039	(.070)	.028	(.044)	.034	(.043)
Trust Req	.205**	(.070)	.055	(.044)	.072	(.044)
Main Effects						
User Cap			.485***	(.062)	.439***	(.065)
Representation			.378***	(.057)	.334***	(.059)
Interaction Effects						
Rep × User					-.131*	(.038)
Sig. F Change	.013		.000		.016	
R^2	.043		.633		.643	
R^2 diff.	.043		.590***		.010*	

Standardized coefficients (standard errors), n = 201, ***p < 0.001, **p < 0.01, *p < 0.05

Results (see Table F1) indicate that both user capabilities and technology capabilities (i.e., representation) are significantly related to e-consultation diagnosticity ($p < .001$) and that the interaction between user capabilities and technology capabilities is significantly related to e-consultation diagnosticity ($p < .05$). The response surface and interaction plots reveal the same pattern of relationships as depicted in Appendix E, with a stronger positive relationship between composite user capabilities and e-consultation diagnosticity when representation capability is low ($t = 3.54$, $p < .001$) and a weaker relationship when representation capability is high ($t = 2.47$, $p < .05$). This suggests that user capabilities compensate for limitations in technology capabilities in determining task performance. Furthermore, the simple slope tests also reveal that there is a significant positive relationship between representation and e-consultation diagnosticity when composite user capabilities are low ($t = 2.51$, $p < 0.05$) and a weaker relationship when composite user capabilities are high ($t = 1.84$, $p < 0.10$). This indicates that technology capabilities can compensate for limitations in user capabilities in influencing task performance.

Appendix G

Description of Hyperthyroidism (Study 2)

Hyperthyroidism is a condition that results from overproduction of thyroid hormones. The thyroid is a gland located at the front of the neck below the voice box (larynx). The most common cause of hyperthyroidism is Graves disease, an autoimmune disorder that causes elevated activity in the thyroid gland. This disease is most common among women, with a peak onset of hyperthyroidism signs and symptoms occurring between the ages of 20 and 40 years. Evaluation and diagnosis of hyperthyroidism involve history taking, physical examination, and laboratory testing (Blackwell 2004; Singer et al. 1995; Skugor 2006). However, because the clinical interview only involves history taking and the physical examination, the experiment only includes these two diagnostic tasks (see Table G1).

Table G1. Evaluation of Hyperthyroidism

Diagnostic Task	Description
History Taking	Patients often present with the following medical history and symptoms: nervousness, irritability, sleep disturbance, fatigue, shortness of breath, heart palpitations, fine tremors of hands, heat intolerance (often with flushed cheeks and hands), increased perspiration, thinning hair, loose nails, weight loss, increased appetite and thirst, increased frequency of bowel movements, irregular menstrual cycle in women, joint swelling and pain, bulging eyes (exophthalmos), and enlarged thyroid (goiter).
Physical Exam	A physical exam to evaluate hyperthyroidism entails obtaining the patient's height, weight, heart rate*, and blood pressure*. Furthermore, the clinician should examine the patient's thyroid (e.g., palpate for enlargement), skin (for dryness and flushing), and eyes (for protrusion and vision impairment).

*Hyperthyroidism is associated with an accelerated heart rate and high blood pressure.

This condition was selected for a variety of reasons. From an experimental design perspective, we were interested in a health disorder that presents with visual signs that could be shown via the high representation treatment. However, we did not want the visual signs to be such obvious indicators of the health disorder that subjects would be able to discern the health condition upon first sight of the patient, thereby precluding the need for information gathering via an interview. Thus, of the two most conspicuous physical signs of hyperthyroidism, an enlarged thyroid and bulging eyes, we chose to represent only the enlarged thyroid and we displayed moderate swelling of the thyroid. This was deemed appropriate because not all patients with hyperthyroidism present with eye issues or severe enlargement of the thyroid. Furthermore, this condition was selected because all recruited subjects had completed a course on Adult Health and Illness, in which they learned about hyperthyroidism.

References

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Singer, P. A., Cooper, D. S., Levy, E. G., Ladenson, P. W., Braverman, L. E., Daniels, G., Greenspan, F. S., McDougall, I. R., and Nikolai, T. F. 1995. "Treatment Guidelines for Patients with Hyperthyroidism and Hypothyroidism," *JAMA: The Journal of the American Medical Association* (273:10), pp. 808-812.

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Appendix H

Summary of Experiment Procedures (Study 2)

Of the 102 students scheduled to participate in the experiment, 9 cancelled, yielding a final sample size of 93 subjects. All subjects were scheduled to participate in the experiment over three consecutive days between semester sessions. This was to maintain consistency in the experiment procedures, the confederate's cosmetic makeup in the high representation condition, and the confederate's performance of the two scripts. Furthermore, because the experiment took place when no classes were in session, we were able to minimize in-class student interactions, which could potentially threaten the internal validity of the study.

When each subject arrived, he/she was checked in by the same research assistant and debriefed on the experimental task of conducting a telemedicine-based interview followed by completing a survey. All subjects were required to sign a confidentiality agreement stating that they would not discuss any details concerning the experiment to any outsiders to prevent contamination of the study. Each subject received a folder that contained a cover story explaining his/her role as a nurse who would perform a telemedicine-based assessment of a patient with a health problem located at a rural clinic who was contacting him/her via a nursing hotline to obtain triage advice. The subjects were provided with a patient assessment form, which listed basic information about the patient (name: Julie Smith, age: 35 years, gender: female, height: 5'3", and weight: 118 lbs.) and allowed them to take notes about the patient during the telemedicine session. Furthermore, the subjects were provided with a lab coat to wear during the telemedicine consultation. These steps were taken to mirror the typical procedures they would follow when conducting a face-to-face health assessment.

After the subjects completed the telemedicine patient assessment, they were directed to a computer where they completed the electronic survey and were distributed their cash incentive.

Appendix I

Presentation Scripts (Study 2)

Two nursing experts and the primary researchers of this study collaborated on writing the two scripts (high presentation and low presentation) for the confederate. Based on the signs and symptoms of hyperthyroidism, they chose the signs and symptoms the confederate would communicate in each script and the order in which she would present the symptoms. In addition, they constructed both a medical history and social history for the confederate and her fictional family members. See Table I1 for more details regarding the content of the two scripts.

Validity and Reliability of Presentation Scripts

To ensure validity and reliability of the scripts, the confederate engaged in multiple rehearsals with the first author and the nursing expert who co-wrote the script and also had opportunities to practice the script during two pretests (n = 5) and two pilot tests (n = 13). Furthermore, the experimental setup on the confederate's end was configured to facilitate her consistency in performing the two scripts. There was a printout of her script that was readable from where she sat on the patient exam table. Additionally, during breaks between subjects, she wrote extra details as needed on a large whiteboard visible to her. Finally, two monitors with a real-time instant messaging window were displayed to her. There was one monitor on each side of the camera, and the text was enlarged to be legible to her. The nursing expert who co-wrote the script was present during the three days of the experiment and observed all telemedicine interactions via a live stream on LifeSize UVC Video Center. This allowed her to use the instant messaging tool to send real-time messages to the confederate as a way of teleprompting the confederate to remain on script. This was especially important regarding the nonverbal communication and any unanticipated questions that arose to which there were no scripted answers. The nursing expert or confederate scripted answers to the new questions in real-time, and the nursing expert then recorded the newly scripted answers and instant messaged them to the confederate when the same questions were asked subsequently. Figure I1 depicts the experimental setup for the confederate.

Table I1. Script Content for Low and High Presentation

	Low Presentation	High Presentation
Baseline Signs & Symptoms Always Presented, by Order of Presentation	"I'm just not feeling myself."	"For the past three months, I just have not been feeling myself."
	"I have a hard time settling down most of the day but I'm also really sleepy. My eyes look tired."	"I'm shaky and trembling most of the day. I'm always fidgeting and can't sit still, even now as I'm talking to you. I'm also really sleepy. I have these dark circles under my eyes because I only sleep about three hours per night."
		"My face and hands are red and flushed. I'm just sweaty and hot all the time."
	"My hair feels different."	"My hair has gotten dry and brittle. In the shower, when I wash my hair, there is a whole gob of hair that ends up in my drain."
		"I'm losing weight. You'd think that's a good thing, but I'm not trying to lose weight."
		"Every time I swallow, I feel like there is a lump in my throat, like something is caught in my throat. It doesn't hurt or anything, and I can still eat fine, but if I touch it, it feels kind of swollen."
Additional Signs & Symptoms Presented Only if Elicited	Presented with minimum details: Heat intolerance, weight loss, swelling on front of neck, increased appetite and thirst, shortness of breath, heart palpitations, joint pain in legs, loose stools, irregular menstruation	Presented in great detail: Increased appetite and thirst, shortness of breath, heart palpitations, joint pain in legs, loose stools, irregular menstruation
Physical Execution of Tasks	Does not know how to take her own blood pressure or read output (132 over 94) from the blood pressure machine, needs explicit instructions Does not know how to take her own pulse (112/min.), needs explicit instructions	Knows how to take her own blood pressure (132 over 94) and read output from the blood pressure machine, little instruction needed Knows how to take her own pulse (112/min.), little instruction needed
Medical History Presented Only if Elicited	Takes 500 mg of Tylenol daily for pain in legs. Takes no vitamins or supplements. Delivered a baby (son named John) three months prior. Healthy pregnancy and vaginal delivery. Baby sleeps through the night and is healthy. Did not breast feed. Attended six week postpartum visit to OB/GYN physician. No reports from the physician of anything out of the ordinary medically at this visit. Father is deceased from a car accident. Mother is alive and healthy. No siblings. No medical history of chronic illnesses from mother's or father's side of the family.	
Social History Presented Only if Elicited	Moved in with her mother who lives in a rural town 1½ months ago. Single mother but father of baby is involved in the baby's life. Used to work as a full-time accountant but is currently unemployed by choice to spend time with her baby.	

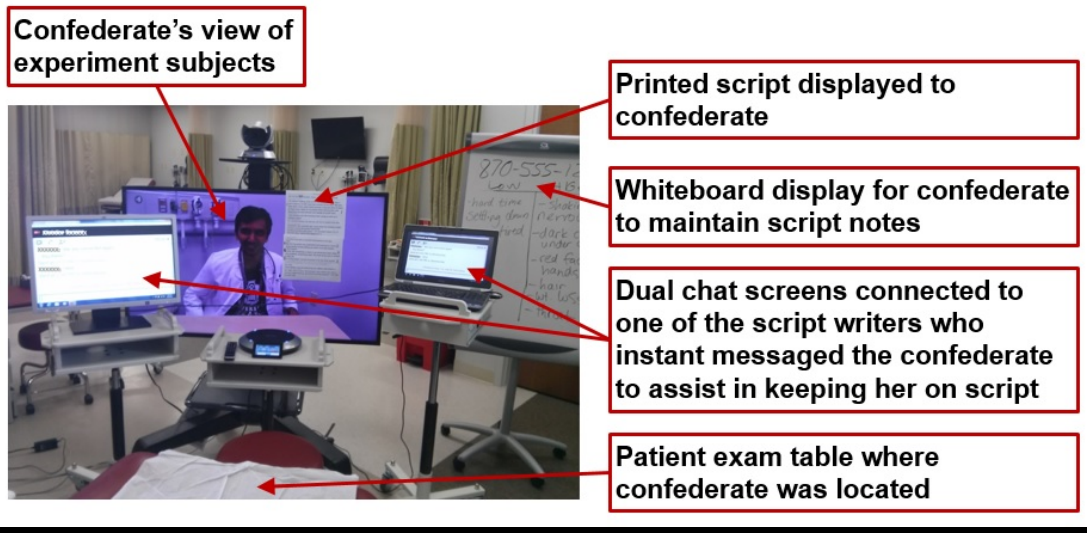

Figure I1. Experimental Setup for the Confederate/Patient

Appendix J

Experiment Manipulation Checks (Study 2)

Questions in Table J1 were used to test the manipulations. Responses from both subjects and expert judges were utilized for the manipulation checks. For subjects, responses were recorded on a seven-point Likert scale, with 1 representing "strongly disagree" and 7 indicating "strongly agree." For expert judges, responses were recorded on a five-point Likert scale, with 1 representing "strongly disagree" and 5 indicating "strongly agree." Construct means and reliabilities are presented in Table J2. Results of manipulation tests are shown in Table J3.

Table J1. Construct Definitions and Item Measures for Manipulation Checks

Construct and Items[a, b]	SOURCE	
	SUB	JUD
Representation: *the perceived capacity of the telemedicine technology to present information relevant to the clinical evaluation process, including simulations of actors and objects within the physical setting, their properties and characteristics, and how process participants interact with them.* During this particular telemedicine consultation, the telemedicine technology:		
REP1: Transmitted audio and video feedback that was adequate for the clinical evaluation[c]	✓	✓
REP2: Allowed me to see everything that I needed to see for the clinical evaluation[c]	✓	
REP3: Provided a realistic representation of a traditional face-to-face health assessment	✓	✓
Presentation: *perception of the presenters' capacity to relay information relevant to the clinical evaluation process, based on their ability to articulate pertinent information and execute actions that inform the process* During this particular telemedicine consultation, the patient was able to:		
PRES1: Effectively articulate the information I needed to know[c]	✓	✓
PRES2: Execute hands-on tasks in order to give me the clinical information I needed[c]	✓	
PRES3: Complete the tasks necessary to present me with the information I needed[c]	✓	✓
RES4: Disregard irrelevant information and communicate to me only what was important[c]	✓	
PRES4: Clearly articulate her symptoms and concerns to me	✓	✓
PRES5: Volunteer relevant clinical information without being prompted		✓
Elicitation: *perception of the consultants' capacity to solicit information relevant to the clinical evaluation process, based on their ability to interview and instruct the presenter(s) in a manner that informs the process* During this particular telemedicine consultation, the subject (student) was able to:		
ELIC1: Effectively ask questions to elicit important information about the patient's condition[c]		✓
ELIC2: Provide clear instructions to the patient on observing any patient conditions that needed to be communicated to him/her[c]		✓
ELIC3: Conduct an effective focused assessment interview based on presenting symptoms		✓
ELIC4: Elicit from the patient all essential information about the patient's condition		✓
ELIC5: Conduct an effective patient interview, overall		✓

Legend: SUB = Experiment Subject; JUD = Expert Judge

[a]Subjects' survey items used first person perspective (I and me). This wording was changed to "the subject" in the expert judges' survey items.

[b]Operationalization of the dependent variable, e-consultation diagnosticity, is described in the methodology section of Study 2 in the manuscript.

[c]Survey items that are included in both Study 1 and Study 2.

Table J2. Construct Means and Reliabilities

	Subjects (7-pt Likert Scale)			Expert Judges (5-pt Likert Scale)		
Construct	**Mean**	**Std. Dev.**	**Cronbach's Alpha**	**Mean**	**Std. Dev.**	**Cronbach's Alpha**
Representation	4.05	1.42	0.75	2.84	1.75	0.97
Presentation	4.87	1.19	0.87	2.91	1.67	0.98
Elicitation[a]				3.09	0.88	0.94

[a]Only expert judges' evaluation of subjects' elicitation skills were included in the analysis.

Table J3. Manipulation Test Results

	Subjects (Seven-Point Likert Scale)				Expert Judges (Five-Point Likert Scale)			
	Low Mean (Std. Dev.)	High Mean (Std. Dev.)	F	Sig	Low Mean (Std. Dev.)	High Mean (Std. Dev.)	F	Sig
REP	3.42 (1.33)	4.82 (1.11)	29.40	.000	1.26 (0.17)	4.75 (0.20)	4168.82	.000
PRES	4.24 (1.21)	5.43 (0.85)	30.65	.000	1.18 (0.25)	4.47 (0.26)	3919.82	.000
ELIC[a]					2.34 (0.45)	3.83 (0.49)	236.93	.000

Legend: ELIC = Elicitation; PRES = Presentation; REP = Representation

[a]Only expert judges' evaluation of subjects' elicitation skills were included in the analysis.