Perceptual Congruence between IS Users and Professionals on IS Service Quality – Insights from Response Surface Analysis

Completed Research Paper

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Abstract

Despite the importance of matching different viewpoints on IS service quality in organizations, there is still little understanding about how perceptual congruence between IS professionals and users affects user satisfaction. Drawing on cognitive dissonance theory and perceptual congruence research, our study examines 169 matched-pair survey responses using polynomial regression and response surface analysis. We demonstrate that perceptual congruence on IS service quality between IS professionals and users can have a nonlinear relationship with user satisfaction. We find that greater perceptual congruence is associated with higher user satisfaction and that user satisfaction increases when congruent perceptions of both IS professionals and users are high compared to when they are low. Moreover, the rate in the decrease of user satisfaction away from perfect congruence is dependent on the direction of incongruence, highlighting the importance of developing awareness of congruent perceptions to increase user satisfaction. Implications for research and practice are discussed.

Keywords: perceptual congruence, alignment, IS service quality, SERVQUAL, polynomial modeling, response surface analysis

Introduction

Seeking consonance between different IS stakeholders in organizations on IS service quality is a critical management concern and a continuing challenge in ensuring the alignment between business and IT (Klein et al. 2001; Henderson et al. 1988). This is all the more important in the face of the growing significance of the service component in the work of the IS function (Jiang et al. 2002a) prompted by the proliferation of available service channels for IS users and the increasing adoption of service-oriented concepts, technologies and architectures (e.g., Software-as-a-Service, Service-Oriented Architecture) in companies (e.g., Bardhan et al. 2010). Disagreement on IS service quality among IS professionals and users has been found to be tied to lower user satisfaction with the IS function leading to lower levels of continued IS usage (Klein et al. 2001; Bhattacherjee 2001; Kettinger et al. 1994). Research that examines the congruence (or discrepancy) of perceptions between IS professionals and users on crucial IS service quality factors and its impact on important outcomes for users and the IS function is therefore clearly of strategic value to IS managers. However, while a number of empirical studies in IS research have investigated the *existence and nature* of perceptual congruence on IS service quality (e.g., Boyd et al. 2007; Jiang et al. 2003; Jiang et al. 2002b), only few papers have shed light on the *consequences* of perceptual congruence (e.g., Klein et al. 2001; Tesch et al. 2005). Although important general insights have emerged from these initial studies, there is still a lack of research examining significant nuances of the effects of perceptual congruence between IS professionals and users on important outcome variables. In this study, we attempt to fill this research gap by addressing the following research question: *What are the effects of perceptual congruence between IS professionals and users on user satisfaction with the IS function?*

Understanding how the interplay between the perspectives of IS professionals and users on IS service quality affects user satisfaction can inform IS managers about how to diagnose and design the interaction and communication between IS professionals and users to increase user satisfaction and continued IS usage in organizations (Bhattacherjee 2001). Our study also offers several research and theoretical contributions. First, the study extends existing perceptual congruence literature in IS research by examining important mechanisms of the effects of perceptual congruence between IS professionals and users on user satisfaction. Previous studies in IS have evaluated the congruence of perceptions in a simplistic fashion, such as comparing the perceptions of IS professionals and users by juxtaposing statistical means (e.g., Jiang et al. 2000; Jiang et al. 1998) or by using algebraic or absolute difference scores (e.g., Chen et al. 2005; Klein et al. 2001). In this study, we go beyond these previously used approaches by using polynomial regression analysis (PRA) and response surface methodology (RSM) that provide important conceptual insights that could not be elucidated with former approaches. Our study thus also adds to perceptual congruence theory by explaining novel effect mechanisms of perceptual congruence that could not be provided in past studies. Second, and related to the first point, this study offers a methodological contribution to IS research by applying PRA and RSM to the analysis of perceptual congruence between IS professionals and users. Although studies in IS research have, albeit sparsely, used these techniques to examine alignment or congruence at the organizational (e.g., Oh et al. 2007) or intrapersonal level (e.g., Venkatesh et al. 2010), this study extends these techniques to the interpersonal-dyadic level. Third, on a more general note, this study also adds to IT service science and management research (e.g., Bardhan et al. 2010) by addressing important IT service quality alignment questions in dyadic service customer-provider relationships.

We begin by introducing perceptual congruence in IS research and cognitive dissonance theory representing the conceptual and theoretical background of this paper. Second, we use four distinct IS service quality factors to examine specific hypotheses regarding the perceptual congruence between IS professionals and users and its impact on user satisfaction with the IS function. Third, using survey data from a sample of 169 matched pairs of IS professionals and users, we test these hypotheses. We conclude the paper by discussing the implications of our findings for future research and practice.

Conceptual Background and Hypotheses

Perceptual Congruence in IS Research

The concept of perceptual congruence (the opposite is often called perceptual distance or incongruence) stems from early cognition and perception research in social psychology and captures the degree to which there is alignment, fit or congruence[1] in the perceptions of the same social stimulus (Turban et al. 1988; Srull et al. 1988). According to Allport (1955), the perceptual process of human beings is influenced by many individual factors, including experience, personality, and cognitive complexity, which in turn influence interests, values, and mental scripts. These factors shape the frames and lenses through which people perceive and interpret the world, leading them to attend to certain stimuli but filter out others and to be congruent in their perceptions of certain concepts but incongruent in their perceptions of others (Srull et al. 1988). High perceptual congruence implies great alignment in perceptions of the same stimulus, whereas low perceptual congruence implies large differences in perceptions.

Previous studies in IS research drawing on perceptual congruence have focused on the fit of perceptions of different stakeholders in the assessment of IS staff or their services (e.g., Boyd et al. 2007; Tesch et al. 2005; Chen et al. 2005; Jiang et al. 2002b), in the software development process (e.g., Sheetz et al. 2009; Huisman et al. 2006) or in business and IS planning integration (e.g., Teo et al. 1997). In the majority of these studies, significant perceptual gaps could be identified between the different IS stakeholders. In terms of perceptual congruence between IS professionals (i.e., IS personnel or IS staff) and users on IS service quality, which usually comprises the four dimensions *tangibles*, *reliability*, *responsiveness* and *rapport*[2], the studies consistently found significant divergent perceptions with the IS personnel having significantly higher perceptions of their own performance than IS users (Boyd et al. 2007; Jiang et al. 2003; Jiang et al. 2002b; Klein et al. 2001). While the majority of these studies have investigated *whether there is* perceptual congruence or distance between the relevant stakeholders, only very few have examined the *consequences* of perceptual congruence or distance on important outcomes for users and the IS function (Klein et al. 2001; Tesch et al. 2005). Their results mainly show that a lack of consonance between IS professionals and users has a significant negative relation with user satisfaction. Although these initial studies provide high-level insights into the effects of perceptual congruence on important outcome variables in IS, little is known about important nuances of the interplay between the perceptions of IS professionals and IS users. Does congruence of perceptions on IS service quality for example yield always the same level of user satisfaction irrespective of whether these performance perceptions are high or low in absolute terms? Regarding the direction of incongruence, does a divergence of perceptions (i.e., IS users' perceptions exceed or fall short of those of the IS professionals) on IS service quality translates into the same levels of user satisfaction in either direction?

Cognitive Dissonance Theory and Hypotheses Development

In developing our arguments on an extended view on the effects of perceptual congruence on user satisfaction and to be able to explain the psychological mechanisms underlying these effects, we draw from cognitive dissonance theory (Festinger 1957). Cognitive dissonance theory (CDT) is based on the assumption that individuals have a need for cognitive consistency and posits that a state of psychological discomfort is caused by an inconsistency among a person's beliefs, attitudes, and/or actions. Putting it differently, cognitive dissonance refers to the mental conflict that human beings experience when they are presented with or exposed to evidence that their beliefs or attitudes are wrong (Montier 2002). The degree of psychological discomfort usually varies in intensity based on the importance of issue and the degree of inconsistency (Szajna et al. 1993). To meet the need for cognitive consistency, this psychological

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[1] Congruence generally refers to the *"[…] fit, match, agreement, or similarity between two conceptually distinct constructs*" (Edwards 1994b, p. 51). Throughout this paper, the terms congruence, alignment, agreement, fit, and consonance are used interchangeably.

[2] Consistent with Kettinger et al. (2005), we adopted 'rapport' (including aspects of 'empathy' and 'assurance') as fourth dimension of IS service quality. See also Watson et al. (1998) for the definitions of the IS service quality factors.

discomfort in individual's cognitions induces a dissonance reduction strategy by changing beliefs, attitudes, or behaviors (Festinger 1957).

In IS research, CDT has been used to theorize the relationship between unrealistic expectations with users' perceptions and their performance with an IS (Szajna et al. 1993) and the consequences of confirmation/disconfirmation of user expectations regarding IS adoption, usage and service quality (e.g., Brown et al. 2011; Venkatesh et al. 2010; Benlian et al. 2010; Bhattacherjee 2001). Different kinds of comparison standards (or reference points) have been put forth in past studies to examine consistency or inconsistency of IS stakeholders' perceptions, beliefs or attitudes. Most frequently, IS users' pre-exposure expectations, which are usually influenced by training initiatives or social influence through third-parties, were compared to their own post-exposure beliefs or attitudes in terms of IS adoption and usage (e.g., Venkatesh et al. 2010). Other scholars looked at the gap between user expectations and the ability of IS service providers to understand their desires (e.g., Pitt et al. 1998). Ginzberg (1981) presented a concept that proposes that a gap in expectations between IS professionals and IS users will lead to a lack of satisfaction on the part of the user (the so-called *expectation gap*). Jiang et al. (2003) proposed a *performance gap* in which the performance perceptions of IS users are compared with those of IS professionals to determine user satisfaction.

In the present study, we assume the latter premise by arguing *from the perspective of IS users* that user satisfaction with the IS function will be highest when IS users' performance perceptions on the IS service quality factors (i.e., tangibles, reliability, responsiveness and rapport) are in congruence with those of the IS professionals. When users see their perceptions met and confirmed by the perceptions of the IS professionals, they will feel that there is a shared and mutual understanding and thus consistency of performance perceptions on the IS service quality factors (Szajna et al. 1993). This consistency in perceptions leads to a state of consonance on the part of the IS user resulting in user satisfaction (Allport 1955). Conversely, according to CDT, a state of dissonance arises when IS users' own perceptions and beliefs are inconsistent with those of the IS professionals. In such a case, IS users will experience a mental conflict prompted by the incongruence of perceptions on IS service quality. This mental conflict or discomfort would cause IS users to implement a dissonance reduction strategy resulting in a negative effect on their attitude (i.e., lower user satisfaction with the IS function). In line with CDT, both directions of perceptual incongruence (i.e., IS users' perceptions exceed or fall short of those of the IS professionals) lead to a state of dissonance resulting in psychological discomfort and ultimately to lower levels of user satisfaction with the IS function (Wickland et al. 1976). As such, we hypothesize that

H1a-H4a: The higher the perceptual congruence between IS users and IS professionals on the IS function's (1a) tangibles, (2a) reliability, (3a) responsiveness, and (4a) rapport, the higher the user satisfaction with the IS function.

Previous service quality studies in IS research have shown that perceptions of IS professionals (e.g., Jiang et al. 2002a) and users (e.g., Kettinger et al. 1994) on the performance of all four IS service quality factors are positively related to user satisfaction with the IS function. As such, user satisfaction should be higher when perceptions on IS service quality are congruent and high rather than when perceptions on IS service quality are congruent and low. Accordingly, we expect that

H1b-H4b: User satisfaction with the IS function will be highest when the IS users' and the IS professionals' perceptions of (1b) tangibles, (2b) reliability, (3b) responsiveness, and (4b) rapport are congruent and high rather than congruent and low.

Two opposite forms of perceptual incongruence can basically be found between IS professionals and users. First, when the IS users' perceptions on IS service quality exceed those of the IS professionals, they rate the performance of IS service quality relatively better than the IS professionals. This discrepancy of perceptions, however, has an adverse effect on user satisfaction in comparison to perceptual congruence (Venkatesh et al. 2010). Experiencing that the IS professionals would rate the quality of the delivered IS services lower, IS users may be irritated and feel uncertain about their own assessment thinking that there may be room for improvement in the quality of IS services delivery (Pitt et al. 1998). Due to this inconsistency in perceptions, a psychological discomfort would cause the user to implement a dissonance reduction strategy resulting in a negative effect on user satisfaction compared to the state of consistency in perceptions.

Second, when the IS users' perceptions on IS service quality fall short of those of the IS professionals, they rate the performance of IS service quality relatively worse than the IS professionals. Thus, they would experience their own performance perceptions as not being mirrored or confirmed by the IS professionals' perceptions. Even worse, IS professionals' comparatively higher assessments of IS service quality may signal to IS users that IS professionals would not see the necessity for improving the level of IS service quality (Jiang et al. 2003). In line with CDT, this inconsistency of perceptions would also have an adverse effect on user satisfaction compared to perceptual consistency, because the resulting psychological discomfort would induce a dissonance reduction strategy leading to lower levels of user satisfaction.

We expect the effects of perceptual incongruence to be less detrimental to user satisfaction when IS users perceive greater service quality than do the IS professionals. In this circumstance, IS users may experience a 'pleasant surprise' or 'delight' (Oliver et al. 1997) that they have higher performance perceptions and are relatively more content with the service quality than the IS professionals themselves. This positive affect can be expected to mitigate some of the negative effects of the dissonance/inconsistency (Rust et al. 2000). In contrast, when IS users perceive lower service quality than do the IS professionals, there will be no such mitigating effect. Therefore, we hypothesize that

H1c-H4c: *User satisfaction with the IS function will be lower when the IS users' perceptions of (1c) tangibles, (2c) reliability, (3c) responsiveness, and (4c) rapport are lower than the IS professionals' perceptions rather than when the IS professionals' perceptions are lower than the IS users' perceptions.*

Figure 1 summarizes our research model that sheds light on three aspects of perceptual congruence effects on user satisfaction with the IS function regarding four IS service quality factors.

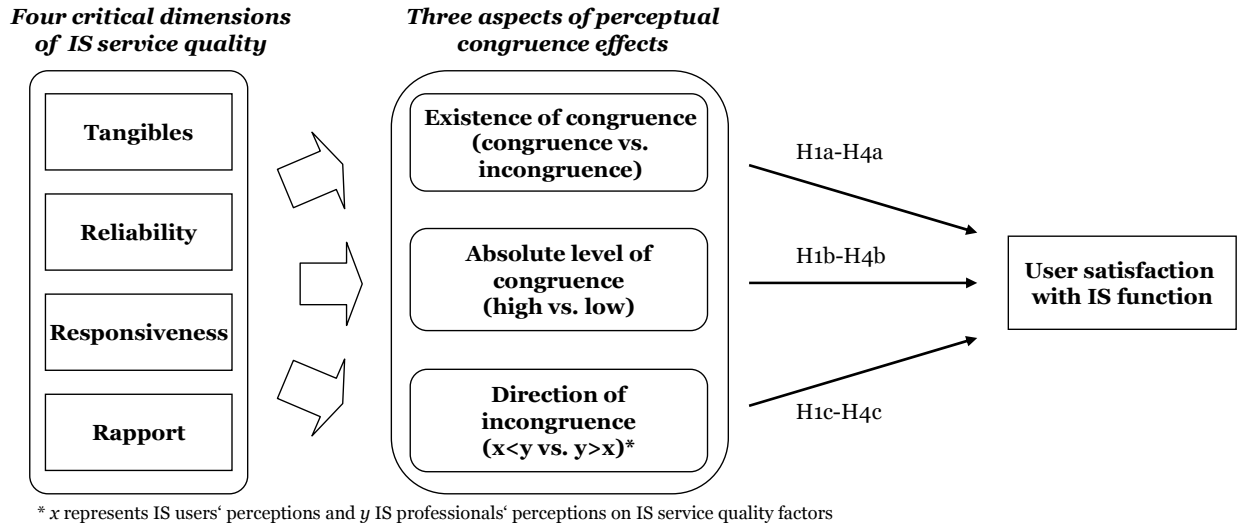

Figure 1. Research Model

Research Methodology

Sample and Procedures

To test our hypotheses, we used online survey data collected from 169 matched pairs of IS professionals and users of companies of different sizes in various industries. We used a two-stage sampling procedure to collect our data. In the first stage, a general request for collaboration was distributed to a random sample of 2,000 companies drawn from the Hoppenstedt firm database, which is one of the largest commercial business data providers in Germany. Our request was directed at human resource professionals at these companies to help us with sample selection and survey administration (e.g., they should ensure that the surveys were independently completed by IS users and IS professionals and verify

that IS users and IS professionals had worked closely together in a service relationship in the last six months). After two e-mail reminders, 215 companies agreed to participate in our study. In the second stage, the human resource professionals of these companies were instructed to randomly select IS users and IS professionals at whom we separately directed our online surveys. We chose to address only one pair of IS user-IS professional per organization to increase participation of companies of different sizes and industries in our sample and to minimize the efforts made by each participating company. On the welcome page of the online questionnaires, we outlined the purpose of the research and solicited participation in the survey, ensuring the confidentiality and anonymity of the responses. The survey for IS users included a series of questions pertaining to IS service quality and user satisfaction with the IS function, while the IS professional survey included only questions on IS service quality. Both surveys had been translated (and back-translated) from the original English to a German version by a professional translation services firm. After two follow-up reminders by e-mail and phone, and after deleting 46 responses because of missing values, overall, we received 169 valid responses (i.e., 169 pairs of IS users and IS professionals in 169 different organizations).

The research sample included organizations with the following industry breakdown: manufacturing (17.4%), wholesale & retail trade (13.5%), financial intermediation (16.5%), TIME (telecommunication, information technology, media, entertainment) industries (14.2%), construction and real estate (11.4%), travel & logistics (19.3%), and public & healthcare (7.7%). All IS professionals in our sample worked in the customer support unit of the IS department, while IS users worked in different business units (e.g., operations, marketing) of their organizations (see Table 1 for more information on sample characteristics). Non-response bias was assessed by verifying that early and late respondents were not significantly different (Armstrong et al. 1977). We compared both samples based on their socio-demographics and responses to principal constructs in our study. T-tests between the means of the early (first 50) and late (last 50) respondents showed no significant differences ($p>0.05$). Drawing on the Hoppenstedt firm database, we also compared the demographic characteristics of the firms that declined to answer our survey with our sample, but we found no significant differences at the $p<0.05$ level indicating that non-response bias was not a pervasive threat.

Table 1. Sample Characteristics (*N=169*)

Category (Company)	Percent	Category (Respondents)	Statistic
Number of employees		*Socio-demographics & work-related factors (IS professionals)*	
< 10	5.4	Age (SD)	36.7 (7.1)
10 – 49	43.6	Sex	77.2% male
50 – 249	45.3	Work experience in months (SD)	91.2 (39.1)
> 250	5.7	# of contacts with IS users per day (SD)	14.7 (8.9)
Annual turnover		*Socio-demographics & work-related factors (IS users)*	
≤ € 2 mio.	13.4	Age (SD)	46.3 (9.2)
≤ € 10 mio.	41.6	Sex	54.1% male
≤ € 50 mio.	30.4	Work experience in months (St.Dev.)	77.7 (45.3)
> € 50 mio.	14.6	# of contacts with IS staff in last 6 months (SD)	23.4 (11.3)

Measurement of Variables and Common Method Bias

Drawing on previous studies on IS user satisfaction, our measure of user satisfaction captured the overall sense of how satisfied IS users were with the IS function (see SUM-USISF scale, Galletta et al. 1989; Kettinger et al. 1994). IS users were asked to rate user satisfaction with respect to four items on a semantic differential scale ranging from 1 = not satisfied to 7 = satisfied. Measures for IS professional-IS user perceptions on IS service quality (IS-SQ) were adopted from previous studies incorporating four dimensions: tangibles, reliability, responsiveness, and rapport (Kettinger et al. 2005; Jiang et al. 2003). We used perceptions-only based measures of service quality because these measures have been shown to demonstrate greater convergent and discriminant validity (Cronin Jr et al. 1992; Brown et al. 1993). The service quality items were assessed using a 7-point Likert scale anchored at (1) = strongly disagree, (4) = neutral, and (7) = strongly agree (see Table 2 for an overview of all constructs and indicators). Following the recommendations in previous studies (e.g., Edwards 1994b), we ensured that the component measures for IS staff-IS user perceptions on IS-SQ were commensurate. Commensurate measures express

both components in terms of the same content dimension (e.g., the degree to which IS staff and IS users view the IS units as dependable). This ensures the conceptual relevance of the component measures to one another and is necessary to meaningfully interpret results in terms of congruence.

To test for common method bias, we first conducted Harman's one-factor test (Podsakoff et al. 1986), where the emergence of a single factor that accounts for a large portion of the variance in factor analyses suggest a common method bias. However, no such single factor was observed in an exploratory factor analysis, and no single factor accounted for a majority of the covariance in the variables. Second, a correlational marker technique was used, in which the highest variable from the factor analysis was entered as an additional independent variable (Richardson et al. 2009). This variable did not create a significant change in the variance explained in the dependent variable (i.e., user satisfaction). Both tests suggest that common-method bias is unlikely to have significantly affected our results.

Table 2. Measurement scales (IS user version)

Constructs	***Indicators***		***Source***
User satisfaction (SUM-USISF)	Usa1	How satisfied are you with your involvement and participation in the operation and ongoing development of information systems and applications?	Galletta et al. 1989; Kettinger et al. 1994
	Usa2	How satisfied are you with the support and services of the IS unit's computing services?	
	Usa3	How satisfied are you with information, equipment, software, and documentation provided by your IS unit?	
	Usa4	In summary, how satisfied are you with the *entire* computing systems and services environment?	
Tangibles	Tan1	The IS unit has up-to-date hardware and software.	Jiang et al. 2003; Kettinger et al. 2005
	Tan2	The IS unit's physical facilities are visually appealing.	
	Tan3	Its employees are well-dressed and neat in appearance.	
	Tan4	The appearance of the physical facilities of the IS unit is in keeping with the kind of services provided.	
Reliability	Rel1	When the IS unit promise to do something by a certain time, it does so.	
	Rel2	The IS unit is dependable.	
	Rel3	The IS unit provides its services at the times it promises.	
	Rel4	The IS unit insists on error-free records.	
Responsive-ness	Res1	The IS unit gives prompt service to users.	
	Res2	The IS unit tells users exactly when services will be performed.	
	Res3	The IS unit is always willing to help users.	
	Res4	It is never too busy to respond to users' requests.	
Rapport	Rap1	The IS unit has the users' best interests at heart.	
	Rap2	It has employees who give users individual attention.	
	Rap3	The IS unit is consistently courteous with users.	
	Rap4	The IS unit has the knowledge to do its jobs well.	

Note:
The four IS-SQ factors were rated separately/independently by IS users and IS professionals; the wording of the items were mirrored for IS professionals compared to the version presented above (excluding user satisfaction which was included only in the IS user questionnaire)

Convergent and Discriminant Validity

As a preliminary check of data quality, skewness and kurtosis scores for each item were analyzed. All of these scores were within the -2 to +2 range, suggesting no serious deviations from the normality assumption (Hair et al. 2006). Furthermore, we screened the data set for outliers using Cook's D and standardized residuals but did not detect any outlier cases (Bollen et al. 1990).

We assessed the psychometric properties of the measurement models by examining individual item loadings, internal consistency, convergent validity, and discriminant validity. Convergent validity for all

constructs was evaluated using three criteria recommended by Fornell and Larcker (Fornell et al. 1981): (1) all measurement factor loadings must be significant and above the threshold value of .70, (2) construct reliabilities must exceed .80, and (3) average variance extracted (AVE) by each construct must exceed the variance due to measurement error for that construct (that is, AVE should exceed .50). As evident from the measurement models in Table 3, the loadings of the measurement items on their respective factors were above the threshold value of .70, and all were significant ($p<0.05$). Composite reliabilities and Cronbach's alpha of constructs ranged between .77 and .97, and values for AVEs ranged from .68 to .89. Thus, all of the constructs met the norms for convergent validity.

Table 3. Assessment of Internal Consistency/Convergent Validity

Latent construct	*# of indicators*	*Range of Loadings*[1]	*Cronbach's alpha*	*Composite Reliability*	*AVE*
(1) User satisfaction	4	.80 - .82	.84	.86	.71
(2) IS user-rated tangibles	4	.90 - .91	.93	.95	.85
(3) IS professional-rated tangibles	4	.81 - .89	.85	.88	.79
(4) IS user-rated reliability	4	.74 - .82	.80	.82	.72
(5) IS professional-rated reliability	4	.76 - .81	.79	.81	.68
(6) IS user-rated responsiveness	4	.84 - .88	.89	.91	.78
(7) IS professional-rated responsiveness	4	.89 - .93	.93	.97	.89
(8) IS user-rated rapport	4	.75 - .82	.77	.85	.70
(9) IS professional-rated rapport	4	.78 - .85	.81	.84	.73

[1] All factor loadings are significant at least at the $p<0.05$ level

In addition, for satisfactory discriminant validity, the square root of average variance extracted (AVE) from the construct should be greater than the variance shared between the construct and other constructs in the model (Fornell et al. 1981). As seen from the factor correlation matrix in Table 4, all square roots of AVE exceeded inter-construct correlations, providing strong evidence of discriminant validity. Hence, the constructs in our study represent concepts that are both theoretically and empirically distinguishable. To arrive at a scale score for each IS user and IS professional, we averaged each person's ratings of the IS service quality factors and user satisfaction across items.

Table 4. Means, Standard Deviations, and Correlation Matrix

Latent construct	M	SD	1	2	3	4	5	6	7	8	9
(1) User satisfaction	4.78	.82	**.84**								
(2) IS user-rated tangibles	5.05	.83	.32*	**.92**							
(3) IS professional-rated tangibles	4.25	1.11	.45**	.48**	**.89**						
(4) IS user-rated reliability	3.89	.91	.59**	.22	.20	**.85**					
(5) IS professional-rated reliability	4.51	.89	.34*	.19	.24*	.47**	**.82**				
(6) IS user-rated responsiveness	3.77	1.01	.62**	.21	.14	.57**	.41**	**.88**			
(7) IS professional-rated responsiven.	4.75	.95	.36*	.15	.25*	.41**	.59**	. 46**	**.94**		
(8) IS user-rated rapport	4.21	.74	.66**	.31*	.17	.55**	.36*	.41**	.33*	**.84**	
(9) IS professional-rated rapport	4.36	.82	.54**	.29*	.30*	.45**	.53**	.32*	.40**	.58**	**.85**

Note: Bolded diagonal elements are the square root of AVE. These values should exceed inter-construct correlations (off-diagonal elements) for adequate discriminant validity. *p<0.05; **p<0.01

Results

Analytical Procedures

To avoid the methodological shortcomings of using simple or absolute difference scores or profile similarity indices (see Edwards (1994a, 1994b) for a full discussion) and to test our hypotheses, we used methods that could potentially capture three-dimensional relationships of IS user- and IS professional-rated IS-SQ factors with user satisfaction and provide formal tests of these relationships. These features are provided by polynomial regression analysis and response surface modeling (Khuri et al. 1996; Edwards et al. 1993). Applied to this study, polynomial regression uses measures of IS user- and IS professional-rated IS-SQ factors and their squares and product to predict user satisfaction, thereby yielding a quadratic equation[3]:

$$(1)\ Z = b_0 + b_1X + b_2Y + b_3X^2 + b_4XY + b_5Y^2$$

In the above equation, X represents IS-user rated IS-SQ factors, Y IS-professional rated IS-SQ factors, and Z indicates user satisfaction. Following Edwards (1994a), support for a quadratic regression model can be inferred if: (a) the R^2 for this equation is significant, (b) the appropriate coefficients were significant and in the expected directions, and (c) the set of terms one order higher than those indicated by the model is not significant, as otherwise higher-order equations (e.g., cubic) provide better representations of the data. In addition, equation (1) represents a three-dimensional response surface that can be formally analyzed by testing salient features of the surface (see for example Edwards (2002), p. 376-383 for an overview of assessing salient features of response surfaces).

Prior to conducting polynomial regression analyses, we centered all measures at their scale midpoints. Doing so reduces multicollinearity between the component measures and their associated higher-order terms and allows for a meaningful interpretation of coefficients on first-order terms (i.e., the slope at the scale midpoint) (Edwards 1994b). Regression coefficients from the four equations (i.e., for the four IS-SQ factors) were used to calculate the stationary points (i.e., the point at which the slope of the surface is zero in all directions), principal axes (i.e., lines in the X, Y plane perpendicular to one another intersecting at the stationary point), and slopes along four lines, including $Y=X$ (i.e., line of perfect congruence), $Y=-X$ (i.e., line of perfect incongruence), and the first and second principal axes. We tested the slopes along the lines of congruence and incongruence using standard procedures for linear combinations of regression coefficients (Fox 2008) and tested the slopes along the principal axes and the locations of the stationary points and principal axes using the bootstrapping procedure (10.000 samples) and the bias-corrected percentile method (Edwards 2002; Efron et al. 1993). Tables 1 and 2 in the Appendix present the results of these analyses, and Figures 1a-1d in the Appendix show the plots of all four surfaces.

Polynomial Regression Results

As shown in Table 1 in the Appendix, the variance explained (R^2) in user satisfaction was significant for all four IS-SQ factors. However, while higher-order terms accounted for significant incremental variance as a set for tangibles, reliability, and responsiveness, higher-order terms did not account for significant incremental variance for rapport ($p>0.05$). *IS user-rated* reliability, responsiveness and rapport had a significant impact on user satisfaction, whereas *IS professional-rated* tangibles and rapport significantly affected user satisfaction. For tangibles, reliability, and responsiveness, two significant higher-order terms were found, respectively. No significant higher-order terms were found for tangibles. We also estimated equations including cubic terms (i.e., X^3, X^2Y, XY^2, Y^3) to test whether the relationship between IS user- and IS professional-rated IS-SQ factors was more complex than the response surfaces suggested by the quadratic equations (Edwards et al. 1993). None of the cubic terms was significant, and the cubic terms as a set also did not account for a significant increment in R^2 (tangibles: $F_H=1.577$, $p<0.05$; reliability: $F_H=1.046$, $p<0.05$; responsiveness: $F_H=1.215$, $p<0.05$).

[3] Our analyses were based on a quadratic regression equation, which served as an unconstrained equation for a squared difference score. As recommended by Edwards (1994b), we also progressively tested higher-order equations and their terms (i.e., cubic terms) to check whether these were better representations of the data

Response Surface Analysis

The surface for IS user- and IS professional-rated *tangibles* predicting user satisfaction, shown in Figure 1a in the Appendix, was concave (stationary point: X_o=52.81, Y_o=77.73; see Table 2 in the Appendix). The first principal axis (i.e., the line of minimum downward curvature) was not significantly rotated off the line of congruence (i.e., the *Y=X* line) as indicated by its slope that was not significantly different from unity (i.e., the 95% confidence interval for p_{11} included 1.0; Edwards 1994b). Analyses showed that the slope of the surface along the *Y=X* line was positive and linear (a_x=0.36, p<0.05; a_{x2}=-0.02, *ns*), indicating that when IS user- and IS professional-rated values were in agreement, user satisfaction increased as IS user- and IS professional-rated values increased, supporting H1a. In addition, as indicated by the positive and significant slope along the *Y=X* line, user satisfaction was higher when IS user- and IS professional-rated tangibles were both high rather than when both were low, supporting H1b.

Along the line of incongruence (i.e., the *Y=-X* line, when IS professional- and IS user-rated values are opposite to one another), the surface was concave and dome-shaped (a_{x2}=-0.55; p<0.05) with a slightly downward but not significant slope at the origin (a_x=-0.57; p>0.05). User satisfaction increased as IS professional ratings increased to meet IS user-rated values at the midpoint of the scale, and it continued to increase as IS professional ratings slightly exceeded IS user-rated values; as IS professional ratings increased well past the midpoint of the scale and continued to exceed IS user-rated values, user satisfaction decreased. User satisfaction also appeared lower when IS professional ratings were much lower than IS user-rated values, compared to when IS user-rated values were much lower than IS professional ratings. The magnitude and direction of a lateral shift in the surface along the *Y=X* line (i.e., whether the maximum value of user satisfaction is displaced laterally from the *Y=X* line) can be determined by the quantity *(b2 – b1)/2(b3 – b4 + b5)* (Atwater et al. 1998). For tangibles, the lateral shift in the surface along the Y=X line yielded a negative value, *-0.517*, indicating a shift of more than half a unit toward the region where IS professional ratings are greater than IS user-rated values (i.e., $x>y$). In other words, when the IS professionals' perceptions were lower than those of the IS users, user satisfaction decreased more sharply than for the reverse, rejecting Hypothesis 1c.

The response surfaces for *reliability* and *responsiveness* were also both concave (see Figures 1b and 1c in the Appendix) and quite similar in their salient features (stationary points: reliability, X_o=18.53, Y_o=12.35; responsiveness: X_o=40.91, Y_o=26.80). The slopes of the first principal axes for both reliability and responsiveness were not significantly different from unity (Edwards 1994b), indicating that the surfaces run parallel to the *Y=X* line. Analyses showed that the slopes of the surfaces along the *Y=X* line were positive and linear (reliability: a_x=0.35, p<0.05; a_{x2}=-0.03, *ns*; responsiveness: a_x=0.33, p<0.05; a_{x2}=-0.03, *ns*), thereby indicating that when IS professional- and IS user-rated values were in agreement, user satisfaction increased as IS professional- and IS user-rated values increased, supporting H2a and H3a. Additionally, as indicated by the positive and significant slopes along the lines of congruence, user satisfaction was higher when IS professional- and IS user-rated reliability and responsiveness were both high than when both were low supporting H2b and H3b.

Along the *Y=-X* lines, the surfaces for reliability and responsiveness were both concave and had an inverted U-shape (reliability: a_{x2}=-0.59; p<0.01; responsiveness: a_{x2}=-0.63; p<0.01) with slightly upward but not significant slopes at the origin (reliability: a_x=0.59; p>0.05; responsiveness: a_x=0.66; p>0.05). User satisfaction increased as IS professional ratings increased to meet IS user ratings at the midpoint of the scale, and it continued to increase as IS user-rated values slightly exceeded IS professional-rated values; as IS professional-rated values increased well past the midpoint of the scale and continued to exceed IS user-rated values, user satisfaction decreased. Further, user satisfaction appeared lower when IS user-rated values were much lower than IS professional ratings than when IS professional ratings were much lower than IS user-rated values. Interestingly, user satisfaction fell at a faster pace for responsiveness than for reliability when IS user-rated values were increasingly incongruent with IS professional ratings, in both directions. For reliability and responsiveness, the lateral shift in the surfaces along the *Y=X* lines resulted in positive values, *0.507* (reliability) and *0.528* (responsiveness), indicating a shift of about half a unit toward the region where IS user-rated values are smaller than IS professional-rated values (i.e., $y>x$). Conversely, when the IS professionals' ratings were higher than the IS user ratings, user satisfaction decreased more sharply than for the reverse, supporting H2c and H3c.

Despite the rejection of the quadratic regression equation for *rapport*, we plotted the response surface to analyze our hypotheses. The surface for IS user- and IS professional-rated rapport predicting user satisfaction (see Figure 1d in the Appendix) was concave, with its stationary point located at X_o=2.48, Y_o=2.70, near the back end of the plotted response surface. The first principal axis was not significantly rotated off the *Y=X* line. Analyses showed that the slope of the surface along the line of congruence was positive and linear (a_x=1.03, p<0.01; a_{x2}=-0.20, *ns*), indicating that when IS user- and IS professional-rated values were in agreement, user satisfaction increased as IS user- and IS professional-rated values increased supporting H4a. Further, user satisfaction was higher when ratings of IS users and IS professionals on rapport were both high, compared to when both were low supporting H4b.

Along the line of incongruence, the surface was slightly (but not significantly) concave (a_{x2}=-0.18; p>0.05) with a flat slope at the origin (a_x=-0.01; p>0.05). User satisfaction increased as IS user-rated values increased to meet IS professional-rated values at the midpoint of the scale and decreased right after IS user ratings exceeded IS professional ratings. User satisfaction appeared to decrease equally in both directions of incongruence. This was supported by the analysis of the lateral shift of the surface along the *Y=X* line. A small negative but not significant value of *-0.039* (p>0.05) indicated that the surface was not significantly shifted off the *Y=X* line. Hypothesis 4c, suggesting that user satisfaction will be lower when IS users' perceptions of rapport are lower than IS professionals' perceptions, thus had to be rejected.

Discussion

The aim of this study is to advance our understanding of how the congruence of perceptions of IS users and IS professionals on IS service quality factors affects user satisfaction with the IS function. Our basic hypothesis, which draws on cognitive dissonance and perceptual congruence theories, is that, all other things being equal, if the perceptions of IS users match the perceptions of IS professionals on these factors, user satisfaction should improve. However, when perceptions of IS users are incongruent with those of IS professionals, user satisfaction should deteriorate.

Our findings provide empirical support for cognitive dissonance and perceptual congruence theory and demonstrate that IS user–IS professional perceptual congruence is an important consideration in the alignment between business units and IT departments. IS user–IS professional congruence on tangibles, reliability, responsiveness and rapport had significant effects on user satisfaction. These results support our contention that perceptual congruence between IS users and IS professionals should not simply be disregarded as error but can, in and of themselves, have an impact on user satisfaction. They also indicate for all of the factors examined in this study that user satisfaction with the IS function is higher when IS users' and IS professionals' perceptions are aligned and high than aligned and low. These findings underscore the importance of considering absolute values of perceptions in addition to the level of fit between the perceptions (Venkatesh et al. 2010). Common approaches to measure incongruence between two perspectives (e.g., difference scores or profile similarity indices) do not capture the absolute levels of the different component scores, as the three-dimensional relationship between the two component measures (i.e., IS user and IS professional ratings) and the outcome variable (i.e. user satisfaction) is reduced to a two-dimensional relationship when the two component scores are collapsed to a difference score or profile similarity index (Edwards 2002).

Finally, our study revealed that if perceptual incongruence exists among these factors, there are differences in how fast user satisfaction decreases with greater distance to perfect congruence, and thus our study captured the direction of the incongruence. When the IS users' perceptions *exceed* those of the IS professionals regarding *tangibles*, the decline in user satisfaction is higher than the other way round. Conversely, when the IS users' perceptions *fall short* of those of the IS professionals regarding *reliability* and *responsiveness*, the decrease in user satisfaction is stronger than for the reverse. Although we did not find a significant difference in the rate of the decline in user satisfaction on either side of perceptual incongruence regarding rapport, our overall results show that examining the direction of incongruence provides a deeper understanding of the effects of perceptual incongruence on user satisfaction. Our study thus contributes to perceptual congruence theory by extending its reach to effect mechanisms that could not be examined before in IT service quality research.

Two of our findings that warrant attention are the directions of incongruence of perceptions on tangibles and rapport and their impact on user satisfaction. In contrast to our prediction, we found that when IS

users' perceptions of tangibles exceeded those of the IS professionals, user satisfaction decreased faster than for the reverse. For rapport, we found that incongruence of perceptions between IS users and IS professionals had equally detrimental effects on user satisfaction on either side of incongruence. It may be argued here that the direction of incongruence of perceptions and its impact on user satisfaction depends on how critical potential underperformance of the IS function is perceived from a user's (i.e., business unit) point-of-view. While an IS function's underperformance in reliability and responsiveness usually affects business units' processes directly (e.g., subsequent process steps can be delayed or lack of quality of IS services compromises overall process quality), rapport (i.e., knowledge, caring and courteous support) and, in particular, tangibles (i.e., physical facilities, equipment and appearance of IS personnel) have rather an indirect impact on business units' workflows (e.g., Watson et al. 1998). Using this line of reasoning, we surmise that when IS users' perceptions of *reliability* and *responsiveness* fall short of those of IS professionals, it will have a strong detrimental impact on user satisfaction because the negative consequences are comparatively high for business units. In contrast, we conjecture that when IS users' perceptions of *tangibles* and *rapport* fall short of those of IS professionals, the detrimental effects on user satisfaction will be relatively lower, because the negative consequences of underperformance are comparatively weaker for business units. In addition, it may be argued that potential underperformance on *tangibles* (e.g., hardware and software are outdated or IS personnel's appearance is disregarded) more strongly and directly affects the IS department itself which may also be obvious to business units. In this regard, a shortfall of IS professionals' perceptions on tangibles compared to those of IS users may even have a more detrimental effect on user satisfaction than for the reverse. This may be due to the fact that IS users would feel more unsettled to see the IS staff having lower ratings on its facilities and appearance compared to IS users' own ratings on tangibles. This, of course, is our *ex-post* explanation and will benefit from future investigation that focuses more closely on comparing competing theoretical explanations.

This study makes several contributions to IS research and practice. From a theoretical standpoint, this study offers a deeper understanding of the effect mechanisms underlying perceptual congruence between IS users and IS professionals. We show that user satisfaction with the IS function is contingent on the level of congruence between the perceptions of IS users and IS professionals in terms of IS service quality factors. Where perceptions of IS users match those of IS professionals, user satisfaction will be enhanced. However, where the perceptions of either IS users or IS professionals exceed (or fall short of) the perceptions of the other party, user satisfaction decreases. To our best knowledge, studies assessing the role of perceptual congruence between key informants in IS research and its effects on important outcome variables are still scarce. Although some IS research studies have investigated congruence between perceptions of different stakeholders (e.g., IS managers and software developers), the consequences of congruence and incongruence of perceptions have received little attention in IS research. We feel that IT service science and management researchers can particularly benefit from examining the effects of perceptual congruence because they better understand how IT service supply and demand have to be aligned on a dyadic, interpersonal level to effectively design IT service consumer-provider relationships.

Second, our study constitutes a unique application of polynomial regression and response surface methodology to examine perceptions between important informants of IS research. Previous studies on perceptual congruence in IS have evaluated the congruence or incongruence of perceptions in a simplistic fashion, such as comparing the perceptions of IS users and software developers by comparing statistical means (e.g., Jiang et al. 2000) or rank orders (e.g., Agarwal et al. 2006), or by using simple or absolute difference scores (e.g., Chen et al. 2005). In this study, we went beyond these previously used approaches. As suggested by Edwards and his colleagues (e.g., Edwards et al. 1993), the use of quadratic polynomial regressions and response surface methodology provides important insights that cannot be elucidated with (simple or absolute) difference terms and two-dimensional graphic representations. For example, the examination of shifts away from perfect congruence between IS users and IS professionals by means of response surface methodology revealed important aspects that cannot be observed with two-dimensional representations (Edwards 2002). Specifically, relationships of tangibles, reliability and responsiveness with user satisfaction were not entirely symmetrical when comparing cases in which IS professionals' perceptions exceeded IS users' perceptions versus cases in which IS users' perceptions exceeded IS professionals perceptions. The results of the polynomial regression results reported above, which are free of the problems imposed by difference terms and profile similarity indices, clearly show that the direction of incongruence and the absolute values of perceptions can make a difference and help extend the reach of theory (i.e., in our case perceptual congruence theory).

Our results have also implications for practice. Managers can learn from our study that bringing the perspectives of IS users and IS professionals on IS service quality factors into congruence yields higher user satisfaction with the IS function. Organizations should thus introduce and support procedures that ascertain whether the IS professionals' and IS users' perceptions of service quality factors agree. Suitable procedures for this facilitation can vary in degree of formality ranging from standardized, scheduled procedures to informal, discretionary ones. For example, pertaining to perceptual incongruence regarding the four IS service quality factors examined in this study, the IS department and business units can define clear, explicit, and measurable guidelines around, for example, minimum expected and desired levels of reliability or responsiveness. Then they can agree on metrics that track the actual performance in these areas and allow to identify sources of discrepancies between IS professionals and IS users and to discuss how to bridge these perceptual gaps. 360-degree feedback might be a particularly useful tool to increase perceptual alignment, as our study's findings revealed that both IS users' and IS professionals' perceptions may fall short of the other parties' perceptions with varying detrimental effects on user satisfaction. Managers might also supplement this feedback process with informal dialogue sessions between IS users and IS professionals (e.g., via corporate internal blogs) or formal IS user-IS professional retreats to foster a shared understanding of IS service quality. Finally, managers should not only pay attention to perceptual congruence between IS users and IS professionals but also to the absolute levels of perceptual ratings and the direction of incongruence. Inattention to absolute levels of perceptual alignment may undermine user satisfaction with the IS function. Conversely, careful thought to ensuring high levels of perceptions on different service quality factors, while providing high perceptual correspondence, can allow managers to better achieve high levels of user satisfaction. Regularly examining the direction of perceptual incongruence on IS service quality can be useful for management interventions to address specifically those stakeholders that react more sensitively towards deviations from stipulated service quality standards.

Limitations, Future Research and Conclusion

Four limitations of the study merit consideration. First, our study is cross-sectional and static; we did not study the IS user-IS professional dyads longitudinally. Therefore, our data can only ascertain association, not causal relationships. It is conceivable that perceptual misalignments vary over the lifecycle of the IS user-IS professional relationship, and future research should explore this as well. Such studies may also inform the design of interventions to help manage perceptual congruence. Second, our survey methodology had the advantage of allowing data collection from a diverse set of companies of different industries and sizes. Yet, without direct observation of the IS user-IS professional dyads, we were unable to directly examine the mechanics of how perceptual congruence occurred and how it impacted user satisfaction. Although existing research and theory on cognitive dissonance and perceptual congruence largely support our arguments, we do not know with absolute certainty that this is the actual mechanism driving the empirical results. A welcome extension of our research involves verifying the mechanisms hypothesized herein. Third, by comparing the perceptions of IS users and IS professionals (the 'performance gap'), we explicitly selected *performance*-based measurements of service quality (e.g., Cronin Jr et al. 1994; Jiang et al. 2003). Future research may also examine how congruence and incongruence on IS users' and IS professionals' service quality *expectations* impacts user satisfaction (the 'expectation gap'). Finally, a limitation of the approach taken in this study is to focus on the congruence of single commensurate influencing factors and how the level of congruence impacts user satisfaction. We thereby neglected to examine how fit across different commensurate influencing factors affect user satisfaction. Future research studies may explicitly examine situations in which congruence within and across several factors plays an important role for enhancing user satisfaction.

In conclusion, IS managers in organizations need to become more aware of the role of perceptions and their influence on user satisfaction with the IS function. Unfortunately, in the quest to be ever more efficient, IS managers often become focused largely on an IS department's task accomplishment. As a side product, they fail to reflect on the impact of agreement on and a shared understanding of service quality factors between IS professionals and IS users in an organization. To overlook or ignore such shared understanding, however, means that an IS department may pay a significant price when it comes to creating and sustaining user satisfaction with the IS function.

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Appendix

Table 1. Results from Polynomial Regressions of User satisfaction on IS Service Quality Factors (IS-SQ)

	Non-standardized regression coefficients					*User satisfaction (Z)*		
IS-SQ	X_{b1}	Y_{b2}	X^2_{b3}	XY_{b4}	Y^2_{b5}	R^2	ΔR^2	F_H
Tangibles	-0.108	0.463**	-0.194*	0.265*	-0.093	0.234**	0.035**	1.577
Reliability	0.472**	-0.121	-0.105	0.164*	-0.203*	0.221**	0.038**	1.046
Responsiveness	0.494***	-0.169	-0.104	0.299**	-0.225**	0.254**	0.052**	1.215
Rapport	0.506**	0.520*	-0.097	-0.009	-0.092	0.450***	0.029	--

Note: *X*, IS user-rated values; *Y*, IS professional-rated values; X^2, IS user-rated values squared; *XY*, interaction of IS user- and IS professional-rated values; Y^2, IS professional-rated values squared; values presented in the column labeled R^2 indicate the variance explained in user satisfaction by the IS-SQ predictors, entered simultaneously, and ΔR^2 indicates the incremental variance accounted for by the quadratic, higher-order terms; the column F_H contains F-ratios for the test of higher-order terms, which include the four cubic terms X^3, X^2Y, XY^2, Y^3. The coefficients of the IS-SQ factors were tested using the standard errors reported by polynomial regression output using PASW Statistics 18.0; *$p<0.1$; **$p<0.05$; ***$p<0.01$

Table 2. Results from Response Surface Analysis

	Stationary point		First principal axis		Second principal axis		Shape along line of congruence		Shape along line of incongruence	
			intercept	*slope*	*intercept*	*slope*	*slope*	*curvature*	*slope*	*curvature*
IS-SQ	X_o	Y_o	p_{10}	p_{11}	p_{20}	p_{21}	$a_x=b_1+b_2$	$a_{x2}=b_3+b_4+b_5$	$a_x=b_1-b_2$	$a_{x2}=b_3-b_4+b_5$
Tangibles	52.81**	77.73**	1.09*	1.45*	114.11*	-0.69	0.36**	-0.02	-0.57	-0.55**
Reliability	18.53**	12.35**	-0.76	0.71*	38.56**	-1.41*	0.35**	-0.03	0.59	-0.59***
Responsive.	40.91**	26.80**	-0.77	0.67*	87.49**	-1.48*	0.33***	-0.03	0.66	-0.63***
Rapport	2.48*	2.70*	6.92*	-1.70	1.24	0.59	1.03***	-0.20	-0.01	-0.18

Note: Significance levels for the stationary points and principal axes are based on confidence intervals constructed from coefficients from ten thousand bootstrap samples, using the bias-corrected percentile method to determine critical values. Significance levels for slopes and curvatures of the lines of congruence and incongruence are based on significance tests presented in Shanock et al. (2010); *$p<0.1$; **$p<0.05$; ***$p<0.01$

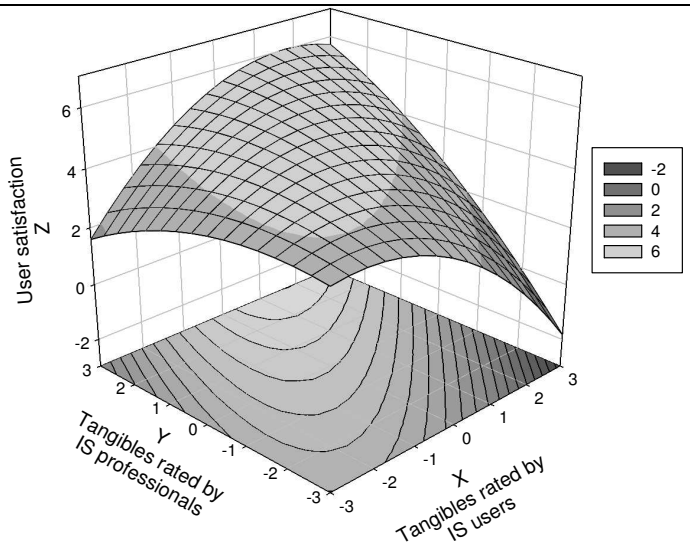

Figure 1a

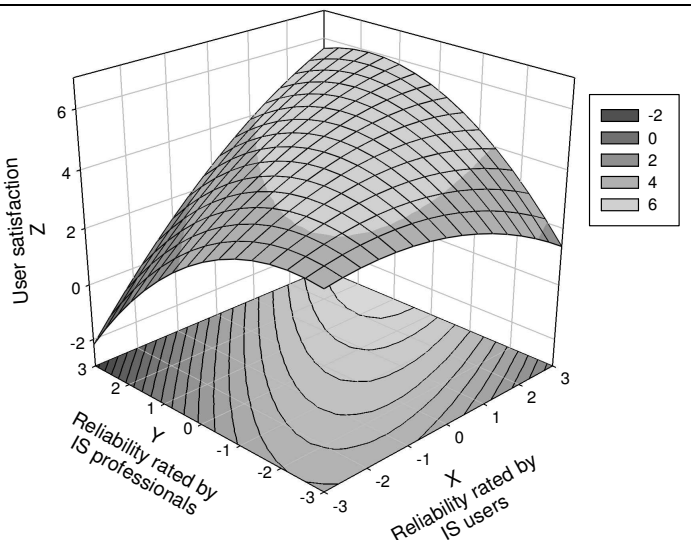

Figure 1b

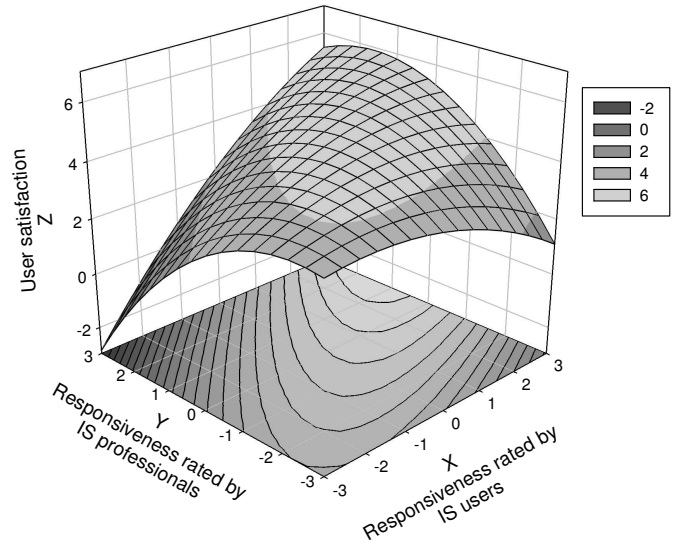

Figure 1c

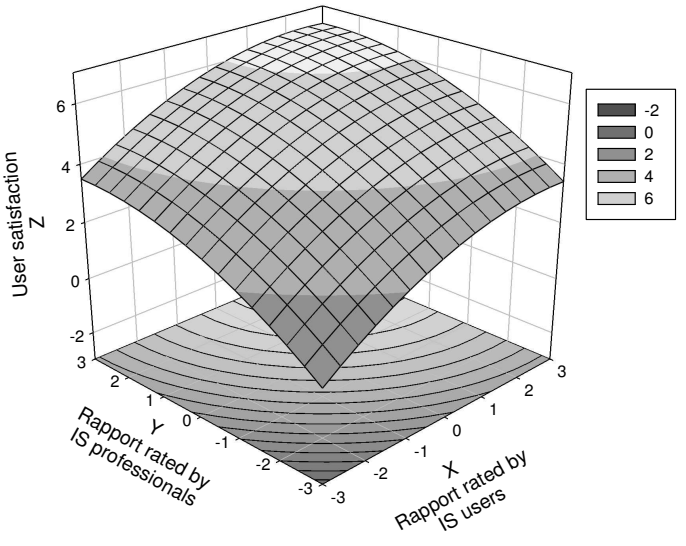

Figure 1d

Figure 1. Response Surfaces for User Satisfaction Predicted by (1a) Tangibles, (1b) Reliability, (1c) Responsiveness, (1d) Rapport